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Standard Components for Tooling and Production

2020 Catalog

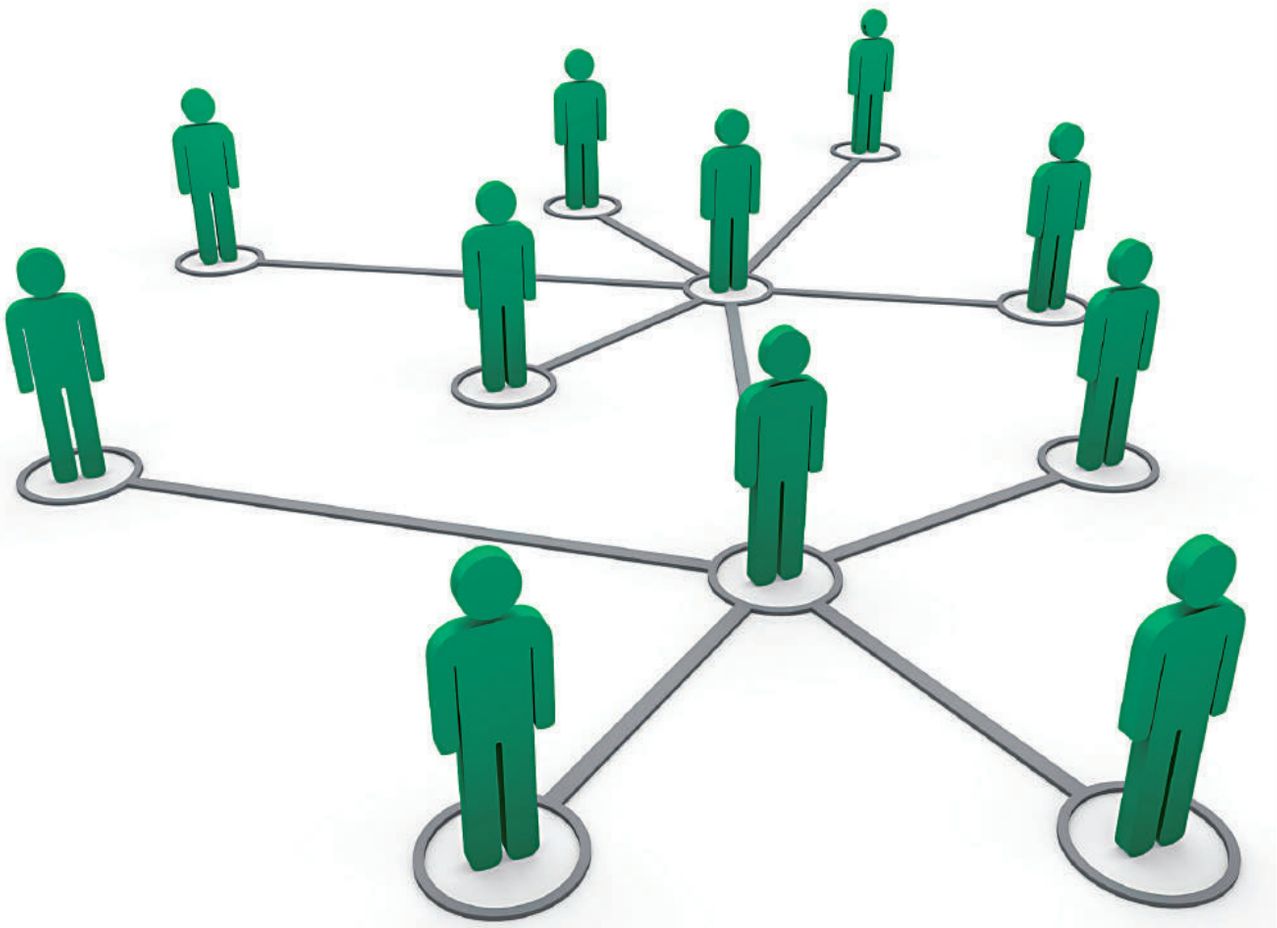
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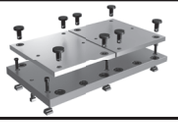

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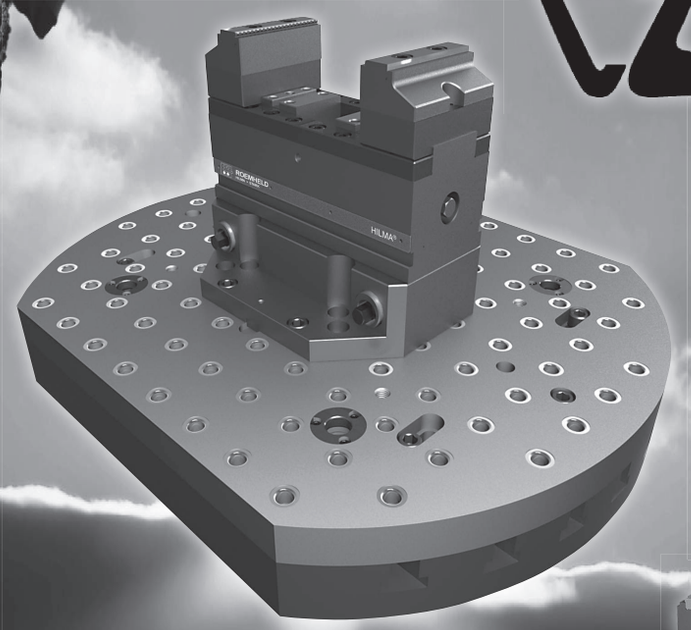
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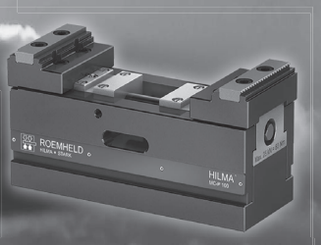
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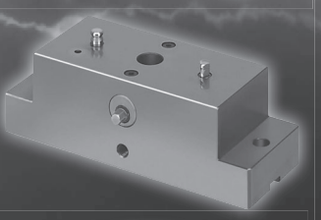
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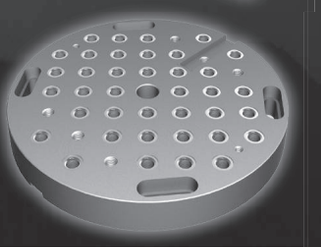
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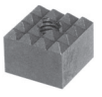


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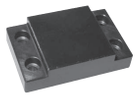
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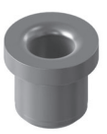
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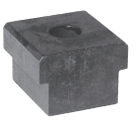


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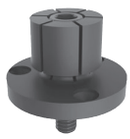
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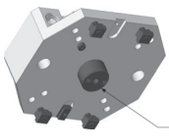
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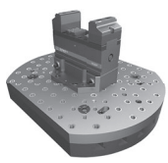
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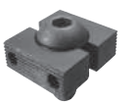


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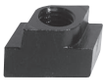
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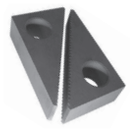
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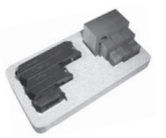


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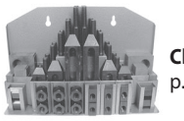
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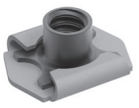


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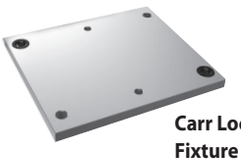
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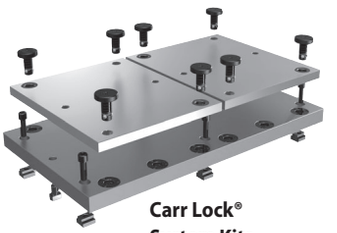
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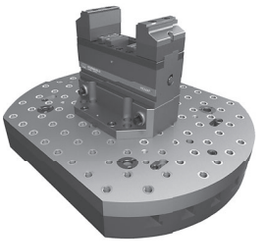


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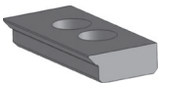
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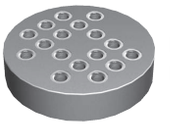
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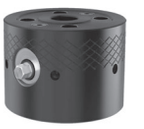
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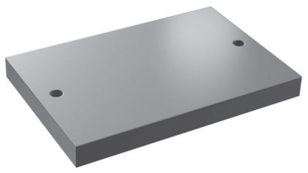
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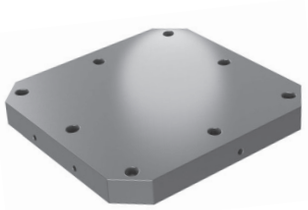
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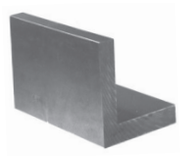


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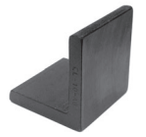
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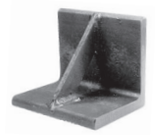


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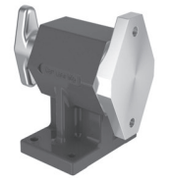


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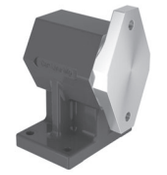


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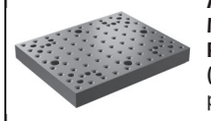
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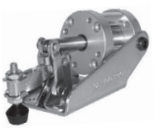
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GENERAL INFORMATION

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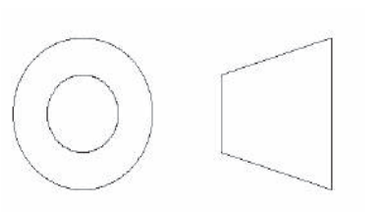
Carr Lane Manufacturing products are sold by authorized distributors located throughout North America and the rest of the world. Please see our website or contact us for the name of our qualified stocking distributor nearest you. For technical information, contact our factory engineering staff at 314-647-6200 (1-800-827-2526 for power workholding technical information).

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Carr Lane Manufacturing will gladly make any special tooling components or company tooling standards to your specifications. Please send a print or sketch with your request. Our wide range of manufacturing capabilities allows us to quickly produce special items for you at economical prices.

DIMENSIONS AND TOLERANCES:

All drawings in this catalog are shown in Third-Angle Projection:



In general, the following maximum tolerances apply to dimensions in this catalog, unless otherwise specified:

.xxx ±.005
.xx ±.020
.x ±.050
Fractions ± 1/32
Castings, forgings, molded plastics, and assemblies ± 1/8

FINISH SPECIFICATIONS:

The finishes shown in this catalog are applied according to the following specifications:

Black Oxide—MIL-C-13924C
Zinc Plate Yellow Chromate
Zinc Plate Clear Chromate
Cadmium Plate—QQ-P-416, Class 3, Type 1
Black Anodize—MIL-A-8625, Type II, Class 2

Other finishes are available as specials.

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ALIGNMENT PINS



L Pins, T Pins, and Jig Pins



Clamping Pins



Slotted Locator Bushings



Ball Lock Pins



Detent Pins



Expanding Pins



Cable

Also see:



Hand-Retractable Plungers
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Index Plungers
pp. 187-192



Carr Lock® System
pp. 358-372

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L PINS, T PINS, JIG PINS AND CLAMPING PINS

L PINS, T PINS, AND JIG PINS



L Pins



T Pins



Shoulder Pins



Shoulder Potting Pins



Jig Pins

Standard Type

These L Pins, T Pins, Shoulder Pins, and Jig Pins are removable locating pins, precision ground for accurately aligning holes. Available in pin diameters from 1/8 to 3/4", including some number and letter sizes (4 to 20mm in metric), most in a choice of several pin lengths.



Locking L Pins



Locking T Pins



Captive Jig Pins

Captive Type

Similar to standard jig pins, except that the pin body is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the pin's groove. This holds the pin fully retracted by spring force and positively prevents removal. Spring pressure also holds the pin in intermediate extended positions, an advantage especially if the fixture is turned upside down. Available in pin diameters from 3/16 to 1/2" (6 to 12mm in metric), most in a choice of several pin lengths. Choice of standard or long bushing in most sizes, for installation in thinner or thicker plates.

CLAMPING PINS



Clamping Pins

Standard Type

Clamping Pins are threaded alignment pins that can be used for locating and clamping, or clamping only, depending on extended screw length. Available in thread sizes from #10-32 to 1/2-13 (M6 to M12 in metric).



Locking Clamping Pins



Captive Locating Screws



Captive Locating Screws with Hand Knob



Captive Locating Screws with Swivel-Washer Hand Knob



Captive Clamping Pins with Knurled Knob

Captive Type

Captive clamping pins and locating screws can be used for locating and clamping, or for clamping only, by selecting the appropriate screw length. The locating screw's precision-ground body is positively retained in a locking bushing. In fully retracted position, the bushing's springclip snaps into the body's radial groove. This holds the screw fully retracted by spring force and positively prevents removal. Spring pressure also holds the screw in intermediate extended positions, an advantage especially if the fixture is turned upside down. Available in thread sizes from 1/4-20 to 1/2-13 (M6 to M12 in metric). Choice of standard or long bushing in most sizes, for installation in thinner or thicker plates.

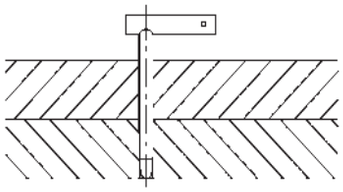
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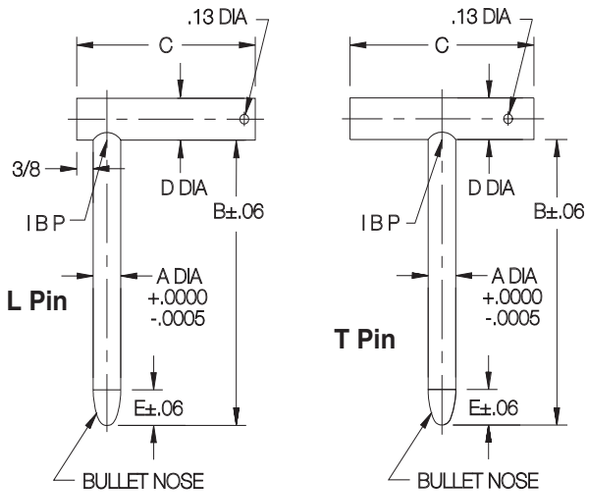
L & T PINS

PIN: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
HANDLE: 12L14 STEEL, BLACK OXIDE FINISH





L and T Pins are removable locating pins, precision ground for accurately aligning holes. The pin is inset in the handle and silver soldered to create a sturdy assembly. The handle is drilled for attaching a cable.





To order L or T Pins with a standard 10-12" cable assembly attached, add "-C" to the part number. (CL-2-C cable with a terminal for #10-32 or M5 attachment screw).
Example: CL-7-LP-C

INCH

L PIN PART NO.	T PIN PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E
CL-0-LP	CL-0-TP	1/8	.1250	2-1/2	1-1/2	1/4	1/4
CL-41-LP	CL-41-TP	#30	.1285	3			
CL-00-LP	CL-00-TP	5/32	.1562	3-1/2	2-1/2	5/16	1/4
CL-1-LP	CL-1-TP	3/16	.1875	3			
CL-21-LP	CL-21-TP			4			
CL-2-LP	CL-2-TP			6			
CL-3-LP	CL-3-TP	#11	.1910	3			
CL-23-LP	CL-23-TP			4			
CL-4-LP	CL-4-TP			6			
CL-43-LP	CL-43-TP	#10	.1935	3			
CL-20-LP	CL-20-TP	#9	.1960	3			
CL-44-LP	CL-44-TP	7/32	.2188	3	2-1/2	3/8	3/8
CL-38-LP	CL-38-TP	1/4	.2500	2			
CL-5-LP	CL-5-TP			3			
CL-25-LP	CL-25-TP			4			
CL-6-LP	CL-6-TP			6			
CL-17-LP	CL-17-TP	F	.2570	3			
CL-37-LP	CL-37-TP			4			
CL-45-LP	CL-45-TP	9/32	.2812	4	3	7/16	1/2
CL-39-LP	CL-39-TP	5/16	.3125	2	2-1/2		
CL-7-LP	CL-7-TP			3-1/2	3		
CL-27-LP	CL-27-TP			4			
CL-8-LP	CL-8-TP			6			
CL-40-LP	CL-40-TP	3/8	.3750	3	2-1/2	1/2	1/2
CL-9-LP	CL-9-TP			4	3-1/2		
CL-29-LP	CL-29-TP			5			
CL-10-LP	CL-10-TP			6			
CL-30-LP	CL-30-TP			7			
CL-11-LP	CL-11-TP	7/16	.4375	4	3-1/2	9/16	5/8
CL-31-LP	CL-31-TP			5			
CL-12-LP	CL-12-TP			6			
CL-32-LP	CL-32-TP			7			
CL-13-LP	CL-13-TP	1/2	.5000	4	3-1/2	5/8	5/8
CL-14-LP	CL-14-TP			6			
CL-33-LP	CL-33-TP			7			
CL-34-LP	CL-34-TP			9			
CL-18-LP	CL-18-TP	9/16	.5625	4			
CL-19-LP	CL-19-TP			6			
CL-15-LP	CL-15-TP	5/8	.6250	6	3-1/2	7/8	3/4
CL-35-LP	CL-35-TP			8			
CL-16-LP	CL-16-TP	3/4	.7500	6			
CL-36-LP	CL-36-TP			8			

METRIC

CLM-4-LP	CLM-4-TP	4mm	.1575	3-1/2	2-1/2	5/16	3/16
CLM-5-LP	CLM-5-TP	5mm	.1969	3			
CLM-50-LP	CLM-50-TP			6			
CLM-6-LP	CLM-6-TP	6mm	.2362	3	2-1/2	3/8	1/4
CLM-60-LP	CLM-60-TP			6			
CLM-8-LP	CLM-8-TP	8mm	.3150	3-1/2	3	7/16	7/16
CLM-80-LP	CLM-80-TP			6			
CLM-10-LP	CLM-10-TP	10mm	.3937	3	2-1/2	1/2	7/16
CLM-100-LP	CLM-100-TP			6	3-1/2		
CLM-12-LP	CLM-12-TP	12mm	.4724	4	3-1/2	5/8	7/16
CLM-120-LP	CLM-120-TP			6			
CLM-16-LP	CLM-16-TP	16mm	.6299	6	3-1/2	7/8	11/16
CLM-160-LP	CLM-160-TP			8			
CLM-20-LP	CLM-20-TP	20mm	.7874	6			
CLM-200-LP	CLM-200-TP			8			

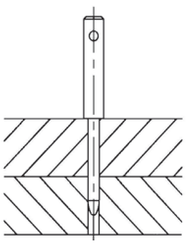
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SHOULDER PINS

PIN: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
HANDLE: 12L14 STEEL, BLACK OXIDE FINISH



Removable locating pin with a straight handle, precision ground for accurately aligning holes. The handle is drilled for attaching a cable.





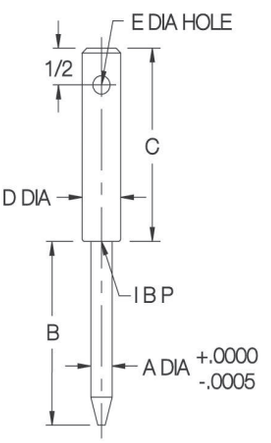
To order Shoulder Pins with a standard 10-12" cable assembly attached, add "-C" to the part number. (CL-2-C cable with a terminal for #10-32 or M5 attachment screw).
Example: CL-7-SP-C

INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E DIA
CL-7-SP	1/4	.2500	2-1/2	2-5/8	1/2	1/4
CL-10-SP	5/16	.3125			9/16	
CL-14-SP	3/8	.3750	4		5/8	1/4
CL-19-SP	1/2	.5000	3		3/4	5/16

METRIC

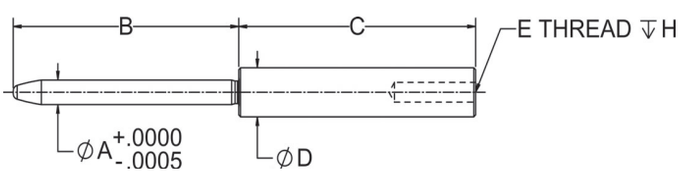
CLM-6-SP	6mm	.2362	2.56	2.6	1/2	1/4
CLM-8-SP	8mm	.3150			9/16	
CLM-10-SP	10mm	.3937	3.94		5/8	1/4
CLM-12-SP	12mm	.4724	2.95		3/4	5/16



SHOULDER POTTING PINS

1144 STEEL, BLACK OXIDE FINISH





New item!

Shoulder Potting Pins are removable alignment pins used for positioning components to be potted in carbon-fiber composites. The precision-ground pin body and the handle are made from one solid piece of high-carbon steel. The handle end is tapped to allow using a pulling tool. Available in pin diameters from 1/8 to 1/2".

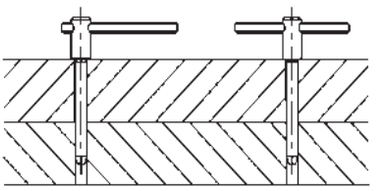
PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E THREAD	H
CL-225-SPP	1/8	.1250	2.50	2-5/8	1/2	1/4-20	3/4
CL-425-SPP	1/4	.2500	2.50	2-5/8	1/2	1/4-20	3/5
CL-525-SPP	5/16	.3125	4.00	2-5/8	5/8	1/4-20	3/6
CL-640-SPP	3/8	.3750	4.00	2-5/8	5/8	1/4-20	3/7
CL-840-SPP	1/2	.5000	4.00	2-5/8	3/4	1/4-20	3/8

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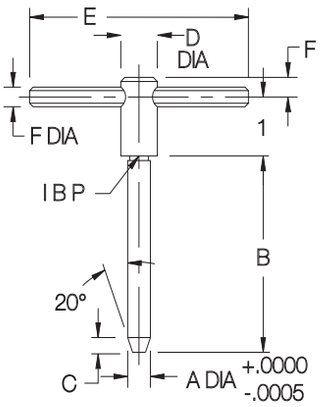
JIG PINS

PIN: 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH
HANDLE: SPRING STEEL, BLACK OXIDE FINISH





Similar to L and T Pins, but with a shoulder to keep the handle raised. Pins are ground slightly undersize. To convert from an L handle to a T handle, slide the roll-pin handle by tapping it with a hammer.



INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E	F
CL-10-JP	3/16	.1872	1-7/8	1/8	3/8	2	3/16
CL-20-JP	1/4	.2497	2	5/32			
CL-30-JP	5/16	.3120	2-1/2	3/16	1/2	3	1/4
CL-40-JP	3/8	.3745	3-1/4	1/4			
CL-50-JP	1/2	.4995	4	9/32	9/16	3	1/4

METRIC

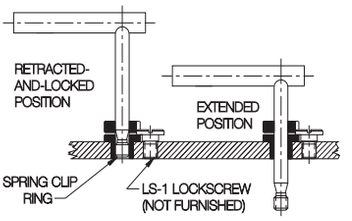
CLM-5-JP	5mm	.1966	1-7/8	1/8	3/8	2	3/16
CLM-6-JP	6mm	.2359	2	5/32			
CLM-8-JP	8mm	.3145	2-1/2	3/16	1/2	3	1/4
CLM-10-JP	10mm	.3932	3-1/4	1/4			
CLM-12-JP	12mm	.4719	4	9/32	9/16	3	1/4

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LOCKING L PINS

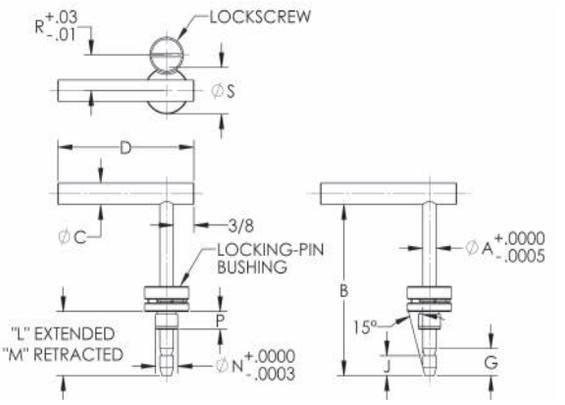
PIN: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
HANDLE: 12L14 STEEL, BLACK OXIDE FINISH
BUSHING: 8620 STEEL, CASE HARDENED, BLACK OXIDE FINISH





Similar to a standard L Pin, except that the pin body is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the pin's radial groove. This holds the pin fully retracted by spring force and positively prevents removal. Spring pressure also holds the pin in intermediate extended positions, an advantage especially if the fixture is turned upside down. Available in pin diameters from 3/16 to 1/2" (6 to 12mm in metric), most in a choice of several pin lengths.

Locking-Pin Bushings are designed to press fit in a standard reamed hole. Secure with the included Lockscrew to positively hold the bushing in place. Shorter or longer bushings are available in most sizes, for thinner or thicker plates.



COMPLETE ASSEMBLY (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B PIN LENGTH	P BUSHING LENGTH UNDER HEAD		C DIA	D	G	J	L	M	N DIA NOMINAL	N DIA ACTUAL	R	S	L PIN (INCLUDED)	BUSHING (INCLUDED)	LOCKSCREW (INCLUDED)
CL-1A-LLP-B	3/16	.1865	1-1/2	Standard	.31	5/16	2-1/2	.47	.35	1	.20	13/16	.4078	.62	13/16	CL-1A-LLP	CL-3-LPB	LS-1
CL-1-LLP-B			3	Standard	.31					2-1/2						CL-1-LLP	CL-3-LPB	
CL-38-LLP-B	1/4	.2490	2	Standard	.31	3/8	2-1/2	.47	.35	1-1/2	.20	13/16	.4078	.62	13/16	CL-38-LLP	CL-4-LPB	LS-1
CL-38-LLP-B-2				Long	.50												CL-4A-LPB	
CL-5-LLP-B			3	Standard	.31					2-1/2						CL-5-LLP	CL-4-LPB	
CL-5-LLP-B-2				Long	.50												CL-4A-LPB	
CL-25-LLP-B			4	Standard	.31					3-1/2						CL-25-LLP	CL-4-LPB	
CL-25-LLP-B-2				Long	.50												CL-4A-LPB	
CL-39-LLP-B-1	5/16	.3115	2	Standard	.31	5/8	3	.47	.35	1-1/2	.20	1/2	.5017	.62	13/16	CL-39-LLP	CL-5-LPB	LS-1
CL-39-LLP-B				Medium	.37												CL-5A-LPB	
CL-39-LLP-B-3				Long	.50												CL-5B-LPB	
CL-7-LLP-B-1			3-1/2	Standard	.31					3						CL-7-LLP	CL-5-LPB	
CL-7-LLP-B				Medium	.37												CL-5A-LPB	
CL-7-LLP-B-3				Long	.50												CL-5B-LPB	
CL-8-LLP-B-1			6	Standard	.31					5-1/2						CL-8-LLP	CL-5-LPB	
CL-8-LLP-B				Medium	.37												CL-5A-LPB	
CL-8-LLP-B-3				Long	.50												CL-5B-LPB	
CL-40A-LLP-B-1	3/8	.3740	2	Standard	.31	5/8	3-1/2	.47	.35	1-1/2	.20	5/8	.6267	.62	13/16	CL-40A-LLP	CL-6-LPB	LS-1
CL-40A-LLP-B				Long	.50												CL-6A-LPB	
CL-9-LLP-B-1			4	Standard	.31					3-1/2						CL-9-LLP	CL-6-LPB	
CL-9-LLP-B				Long	.50												CL-6A-LPB	
CL-10-LLP-B-1			6	Standard	.31					5-1/2						CL-10-LLP	CL-6-LPB	
CL-10-LLP-B				Long	.50												CL-6A-LPB	
CL-13A-LLP-B-1	1/2	.4990	2	Standard	.50	5/8	3-1/2	.47	.35	1-1/2	.20	3/4	.7518	.75	1-1/16	CL-13A-LLP	CL-8-LPB	LS-1
CL-13A-LLP-B				Long	.75												CL-8A-LPB	
CL-13-LLP-B-1			4	Standard	.50					3-1/2						CL-13-LLP	CL-8-LPB	
CL-13-LLP-B				Long	.75												CL-8A-LPB	
CL-14-LLP-B-1			6	Standard	.50					5-1/2						CL-14-LLP	CL-8-LPB	
CL-14-LLP-B				Long	.75												CL-8A-LPB	

COMPLETE ASSEMBLY (METRIC)

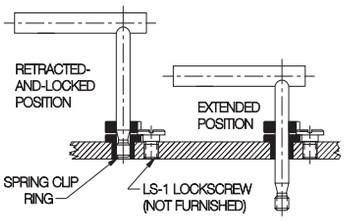
CLM-6-LLP-B	6mm	.2352	3	Standard	.31	3/8	2-1/2	.47	.35	2-1/2	.20	10mm	.3952	.630	.87	CLM-6-LLP	CLM-6-LPB	LSM-3
CLM-8-LLP-B	8mm	.3140	3	Standard	.39	7/16	3	.47	.35	2-1/2	.20	13mm	.5135	.630	.87	CLM-8-LLP	CLM-8-LPB	LSM-3
CLM-10-LLP-B	10mm	.3927	3	Standard	.47	1/2	3-1/2	.47	.35	2-1/2	.20	16mm	.6316	.630	.87	CLM-10-LLP	CLM-10-LPB	LSM-3
CLM-12-LLP-B	12mm	.4715	4	Standard	.71	5/8	3-1/2	.47	.35	3-1/2	.20	20mm	.7892	.709	1.02	CLM-12-LLP	CLM-12-LPB	LSM-3

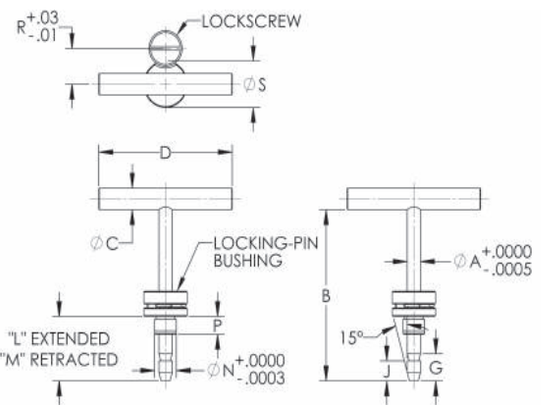
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LOCKING T PINS

PIN: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
HANDLE: 12L14 STEEL, BLACK OXIDE FINISH
BUSHING: 8620 STEEL, CASE HARDENED, BLACK OXIDE FINISH







Similar to a standard T Pin, except that the pin body is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the pin's radial groove. This holds the pin fully retracted by spring force and positively prevents removal. Spring pressure also holds the pin in intermediate extended positions, an advantage especially if the fixture is turned upside down. Available in pin diameters from 3/16 to 1/2" (6 to 12mm in metric), most in a choice of several pin lengths.

Locking-Pin Bushings are designed to press fit in a standard reamed hole. Secure with the included Lockscrew to positively hold the bushing in place. Shorter or longer bushings are available in most sizes, for thinner or thicker plates.

COMPLETE ASSEMBLY (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B PIN LENGTH	P BUSHING LENGTH UNDER HEAD		C DIA	D	G	J	L	M	N DIA NOMINAL	N DIA ACTUAL	R	S	T PIN (INCLUDED)	BUSHING (INCLUDED)	LOCKSCREW (INCLUDED)
CL-1A-LTP-B	3/16	.1865	1-1/2	Standard	.31	5/16	2-1/2	.47	.35	1	.20	13/16	.4078	.62	13/16	CL-1A-LTP	CL-3-LPB	LS-1
CL-1-LTP-B			3	Standard	.31					2-1/2						CL-1-LTP	CL-3-LPB	
CL-38-LTP-B	1/4	.2490	2	Standard	.31	3/8	2-1/2	.47	.35	1-1/2	.20	13/16	.4078	.62	13/16	CL-38-LTP	CL-4-LPB	LS-1
CL-38-LTP-B-2				Long	.50												CL-4A-LPB	
CL-5-LTP-B			3	Standard	.31					2-1/2						CL-5-LTP	CL-4-LPB	
CL-5-LTP-B-2				Long	.50												CL-4A-LPB	
CL-25-LTP-B			4	Standard	.31					3-1/2						CL-25-LTP	CL-4-LPB	
CL-25-LTP-B-2				Long	.50												CL-4A-LPB	
CL-39-LTP-B-1	5/16	.3115	2	Standard	.31	5/8	3	.47	.35	1-1/2	.20	1/2	.5017	.62	13/16	CL-39-LTP	CL-5-LPB	LS-1
CL-39-LTP-B				Medium	.37												CL-5A-LPB	
CL-39-LTP-B-3				Long	.50												CL-5B-LPB	
CL-7-LTP-B-1			3-1/2	Standard	.31					3						CL-7-LTP	CL-5-LPB	
CL-7-LTP-B				Medium	.37												CL-5A-LPB	
CL-7-LTP-B-3				Long	.50												CL-5B-LPB	
CL-8-LTP-B-1			6	Standard	.31					5-1/2						CL-8-LTP	CL-5-LPB	
CL-8-LTP-B				Medium	.37												CL-5A-LPB	
CL-8-LTP-B-3				Long	.50												CL-5B-LPB	
CL-40A-LTP-B-1	3/8	.3740	2	Standard	.31	5/8	3-1/2	.47	.35	1-1/2	.20	5/8	.6267	.62	13/16	CL-40A-LTP	CL-6-LPB	LS-1
CL-40A-LTP-B				Long	.50												CL-6A-LPB	
CL-9-LTP-B-1			4	Standard	.31					3-1/2						CL-9-LTP	CL-6-LPB	
CL-9-LTP-B				Long	.50												CL-6A-LPB	
CL-10-LTP-B-1			6	Standard	.31					5-1/2						CL-10-LTP	CL-6-LPB	
CL-10-LTP-B				Long	.50												CL-6A-LPB	
CL-13A-LTP-B-1	1/2	.4990	2	Standard	.50	5/8	3-1/2	.47	.35	1-1/2	.20	3/4	.7518	.75	1-1/16	CL-13A-LTP	CL-8-LPB	LS-1
CL-13A-LTP-B				Long	.75												CL-8A-LPB	
CL-13-LTP-B-1			4	Standard	.50					3-1/2						CL-13-LTP	CL-8-LPB	
CL-13-LTP-B				Long	.75												CL-8A-LPB	
CL-14-LTP-B-1			6	Standard	.50					5-1/2						CL-14-LTP	CL-8-LPB	
CL-14-LTP-B				Long	.75												CL-8A-LPB	

COMPLETE ASSEMBLY (METRIC)

CLM-6-LTP-B	6mm	.2352	3	Standard	.31	3/8	2-1/2	.47	.35	2-1/2	.20	10mm	.3952	.630	.87	CLM-6-LTP	CLM-6-LPB	LSM-3
CLM-8-LTP-B	8mm	.3140	3	Standard	.39	7/16	3	.47	.35	2-1/2	.20	13mm	.5135	.630	.87	CLM-8-LTP	CLM-8-LPB	LSM-3
CLM-10-LTP-B	10mm	.3927	3	Standard	.47	1/2	3-1/2	.47	.35	2-1/2	.20	16mm	.6316	.630	.87	CLM-10-LTP	CLM-10-LPB	LSM-3
CLM-12-LTP-B	12mm	.4715	4	Standard	.71	5/8	3-1/2	.47	.35	3-1/2	.20	20mm	.7892	.709	1.02	CLM-12-LTP	CLM-12-LPB	LSM-3

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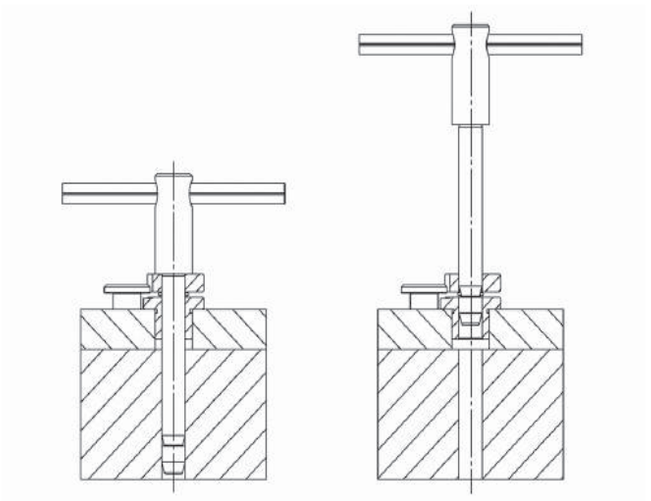
CAPTIVE JIG PINS

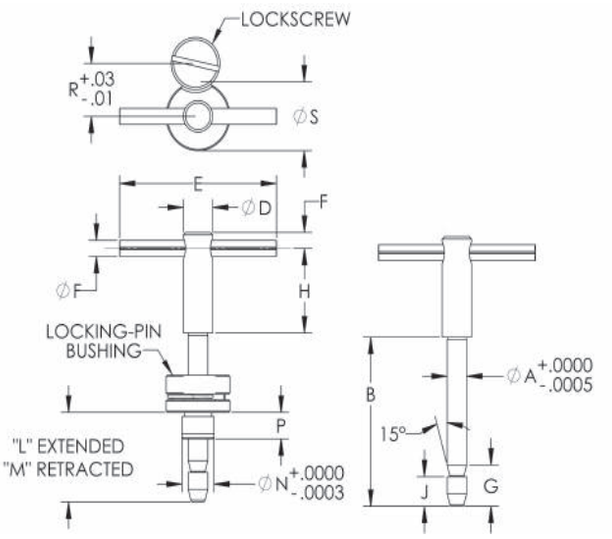
PIN: 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH
HANDLE: SPRING STEEL, BLACK OXIDE FINISH
BUSHING: 8620 STEEL, CASE HARDENED, BLACK OXIDE FINISH



Similar to a standard Jig Pin, except that the pin body is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the pin's groove. This holds the pin fully retracted by spring force and positively prevents removal. Spring pressure also holds the pin in intermediate extended positions, an advantage especially if the fixture is turned upside down. Like standard Jig Pins, Captive Jig pins have an integral shoulder to keep the handle raised. Available in pin diameters from 3/16 to 1/2". Made in USA.

Locking-Pin Bushings are designed to press fit in a standard reamed hole. Secure with the included Lockscrew to positively hold the bushing in place. Shorter or longer bushings are available in most sizes, for thinner or thicker plates.





COMPLETE ASSEMBLY (INCH)

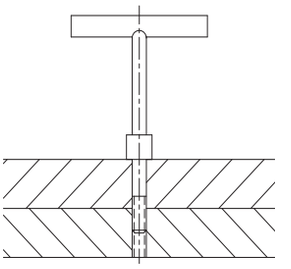
PART NO.	A DIA NOMINAL	A DIA ACTUAL	B PIN LENGTH	P BUSHING LENGTH UNDER HEAD		C	D DIA	E	F	G	H	J	L	M	N DIA NOMINAL	N DIA ACTUAL	R	S DIA	JIG PIN (INCLUDED)	BUSHING (INCLUDED)	LOCKSCREW (INCLUDED)
CL-1-CJPA	3/16	.1872	1-7/8	Standard	.31	.35	3/8	2	3/16	.49	1	.35	1.40	.20	13/32	.4078	.62	13/16	CL-1-CJP	CL-3-LPB	LS-1
CL-2-CJPA	1/4	.2497	2	Standard	.31	.35	3/8	2	3/16	.49	1	.35	1.60	.20	13/32	.4078	.62	13/16	CL-2-CJP	CL-4-LPB	LS-1
CL-21-CJPA				Long	.50															CL-4A-LPB	
CL-31-CJPA	5/16	.3120	2-1/2	Standard	.31	.35	1/2	3	1/4	.49	1	.35	2.10	.20	1/2	.5017	.62	13/16	CL-3-CJP	CL-5-LPB	LS-1
CL-3-CJPA				Medium	.37															CL-5A-LPB	
CL-33-CJPA				Long	.50															CL-5B-LPB	
CL-41-CJPA	3/8	.3745	3-1/4	Standard	.31	.35	1/2	3	1/4	.49	1	.35	2.80	.20	5/8	.6267	.62	13/16	CL-4-CJP	CL-6-LPB	LS-1
CL-4-CJPA				Long	.50															CL-6A-LPB	
CL-51-CJPA	1/2	.4995	4	Standard	.50	.35	9/16	3	1/4	.49	1	.35	3.60	.20	3/4	.7518	.75	1-1/16	CL-5-CJP	CL-8-LPB	LS-1
CL-5-CJPA				Long	.75															CL-8A-LPB	

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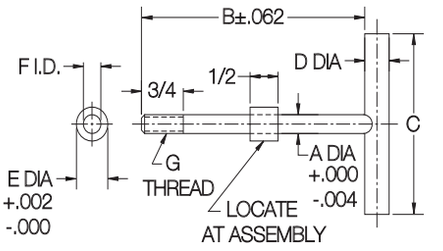
CLAMPING PINS

PIN: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
BUSHING: 12L14 STEEL, BLACK OXIDE FINISH





These threaded alignment pins can be used for locating and clamping, or clamping only, depending on extended screw length. The clamping bushing is furnished separate from the pin, and must be welded in place at the proper length to suit the application. Available in thread sizes from #10-32 to 1/2-13 (M6 to M12 in metric).



INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E DIA	F DIA	G
CL-0-CP	#10	.193	3	1-1/2	1/4	3/8	.203	#10-24
CL-0A-CP								#10-32
CL-1-CP	1/4	.250	4	2-1/2	3/8	1/2	.252	1/4-20
CL-2-CP	5/16	.312		3	7/16	9/16	.315	5/16-18
CL-3-CP	3/8	.375	4-1/2	3-1/2	1/2	5/8	.378	3/8-16
CL-4-CP	1/2	.500	5		5/8	3/4	.503	1/2-13

METRIC

CLM-6-CP	6mm	.236	4	2-1/2	3/8	1/2	.252	M6
CLM-8-CP	8mm	.315		3	7/16	9/16	.315	M8
CLM-10-CP	10mm	.394	4-1/2	3-1/2	1/2	5/8	.378	M10
CLM-12-CP	12mm	.472	5		5/8	3/4	.503	M12

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LOCKING CLAMPING PINS

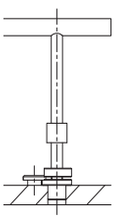
PIN: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
HANDLE: 12L14 STEEL, BLACK OXIDE FINISH
BUSHING: 8620 STEEL, CASE HARDENED, BLACK OXIDE FINISH



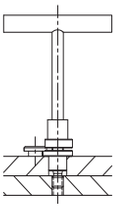
Locking Clamping Pins are similar to standard Clamping Pins, except that the pin body is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the pin's radial groove. This holds the pin fully retracted by spring force and positively prevents removal. Spring pressure also holds the pin in intermediate extended positions, an advantage especially if the fixture is turned upside down.

These threaded alignment pins can be used for locating and clamping, or for clamping only, depending on extended screw length. The upper bushing is furnished separate from the pin, and must be welded in place at the proper length to suit the application. Available in thread sizes from 1/4-20 to 1/2-13 (M6 to M12 in metric).

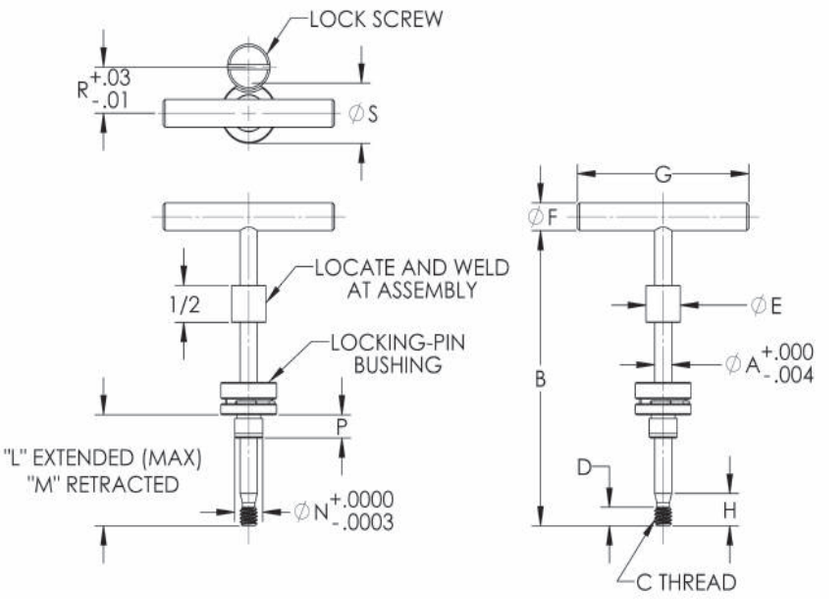
Locking-Pin Bushings are designed to press fit in a standard reamed hole. Secure with the included Lockscrew to positively hold the bushing in place. Shorter or longer bushings are available in most sizes, for thinner or thicker plates.



Retracted-and-locked position



Clamped position



COMPLETE ASSEMBLY (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B PIN LENGTH	P BUSHING LENGTH UNDER HEAD		C THREAD	D	E DIA	F DIA	G	H	L	M	N DIA NOMINAL	N DIA ACTUAL	R	S	CLAMPING PIN (INCLUDED)	BUSHING (INCLUDED)	LOCKSCREW (INCLUDED)
CL-1-LCP-B	1/4	.2490	4	Standard	.31	1/4-20	1/4	1/2	3/8	2-1/2	.44	3	.10	13/32	.4078	.62	13/16	CL-1-LCP	CL-4-LPB	LS-1
CL-1-LCP-B-2				Long	.50														CL-4A-LPB	
CL-2-LCP-B-1	5/16	.3115	4	Standard	.31	5/16-18	5/16	9/16	7/16	3	.50	3	.16	1/2	.5017	.62	13/16	CL-2-LCP	CL-5-LPB	LS-1
CL-2-LCP-B				Medium	.37														CL-5A-LPB	
CL-2-LCP-B-3				Long	.50														CL-5B-LPB	
CL-3-LCP-B-1	3/8	.3740	4-1/2	Standard	.31	3/8-16	3/8	5/8	1/2	3-1/2	.57	3-1/2	.23	5/8	.6267	.62	13/16	CL-3-LCP	CL-6-LPB	LS-1
CL-3-LCP-B				Long	.50														CL-6A-LPB	
CL-4-LCP-B-1	1/2	.4990	5	Standard	.50	1/2-13	1/2	3/4	5/8	3-1/2	.69	4	.35	3/4	.7518	.75	1-1/16	CL-4-LCP	CL-8-LPB	LS-1
CL-4-LCP-B				Long	.75														CL-8A-LPB	

COMPLETE ASSEMBLY (METRIC)

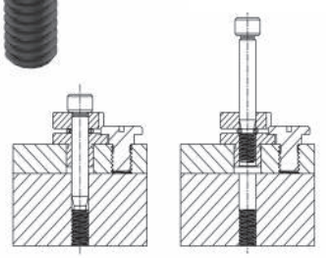
CLM-6-LCP-B	6mm	.2352	4	Standard	.31	M6	.24	1/2	3/8	2-1/2	.43	3	.09	10mm	.3952	.630	.87	CLM-6-LCP	CL-6-LPB	LSM-3
CLM-8-LCP-B	8mm	.3140	4	Standard	.39	M8	.31	9/16	7/16	3	.56	3	.16	13mm	.5135	.630	.87	CLM-8-LCP	CL-8-LPB	LSM-3
CLM-10-LCP-B	10mm	.3927	4-1/2	Standard	.47	M10	.39	5/8	1/2	3-1/2	.67	3-1/2	.24	16mm	.6316	.630	.87	CLM-10-LCP	CL-10-LPB	LSM-3
CLM-12-LCP-B	12mm	.4715	5	Standard	.71	M12	.47	3/4	5/8	3-1/2	.78	4	.32	20mm	.7892	.709	1.02	CLM-12-LCP	CL-12-LPB	LSM-3

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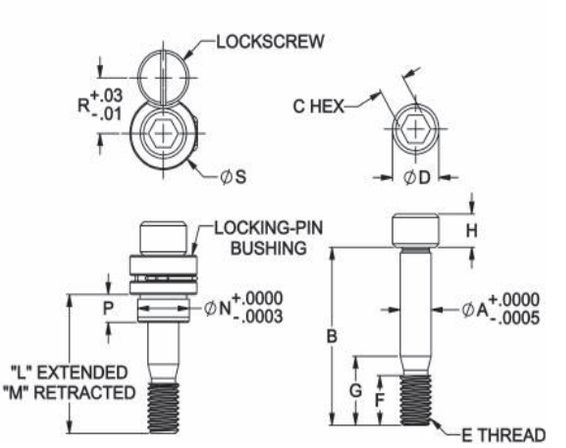
CAPTIVE LOCATING SCREWS

SCREW: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
LOCKING-PIN BUSHING: 8620 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
RETAINER CLIP: SPRING STEEL





Captive Locating Screws can be used for locating and clamping, or for clamping only, by selecting the appropriate screw length. The locating screw's precision-ground body is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the body's radial groove. This holds the screw fully retracted by spring force and positively prevents removal. Spring pressure also holds the screw in intermediate extended positions, an advantage especially if the fixture is turned upside down.



SOCKET HEAD – COMPLETE ASSEMBLY (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B SCREW LENGTH	P BUSHING LENGTH UNDER HEAD		C	D DIA	E THREAD	F	G	H	L	M	N DIA NOMINAL	N DIA ACTUAL	R	S DIA	LOCATING SCREW (INCLUDED)	BUSHING (INCLUDED)	LOCK-SCREW (INCLUDED)
CL-4-CLSA-1.25	1/4	.2490	1-1/4	Standard	.31	3/16	3/8	1/4-20	.40	.59	1/4	.81	.25	13/32	.4078	.62	13/16	CL-4-CLS-1.25	CL-4-LPB	LS-1
CL-42-CLSA-1.25				Long	.50														CL-4A-LPB	
CL-4-CLSA-1.75			1-3/4	Standard	.31							1.31						CL-4-CLS-1.75	CL-4-LPB	
CL-42-CLSA-1.75				Long	.50														CL-4A-LPB	
CL-5-CLSA-1.38	5/16	.3115	1-3/8	Standard	.31	1/4	15/32	5/16-18	.47	.65	5/16	.94	.32	1/2	.5017	.62	13/16	CL-5-CLS-1.38	CL-5-LPB	LS-1
CL-52-CLSA-1.38				Medium	.37														CL-5A-LPB	
CL-53-CLSA-1.38				Long	.50														CL-5B-LPB	
CL-5-CLSA-1.75			1-3/4	Standard	.31							1.31						CL-5-CLS-1.75	CL-5-LPB	
CL-52-CLSA-1.75				Medium	.37														CL-5A-LPB	
CL-53-CLSA-1.75				Long	.50														CL-5B-LPB	
CL-5-CLSA-3.00			3	Standard	.31							2.56						CL-5-CLS-3.00	CL-5-LPB	
CL-52-CLSA-3.00				Medium	.37														CL-5A-LPB	
CL-53-CLSA-3.00				Long	.50														CL-5B-LPB	
CL-6-CLSA-1.50	3/8	.3740	1-1/2	Standard	.31	5/16	9/16	3/8-16	.56	.75	3/8	1.06	.41	5/8	.6267	.62	13/16	CL-6-CLS-1.50	CL-6-LPB	LS-1
CL-62-CLSA-1.50				Long	.50														CL-6A-LPB	
CL-6-CLSA-1.75			1-3/4	Standard	.31							1.31						CL-6-CLS-1.75	CL-6-LPB	
CL-62-CLSA-1.75				Long	.50														CL-6A-LPB	
CL-6-CLSA-2.00			2	Standard	.31							1.56						CL-6-CLS-2.00	CL-6-LPB	
CL-62-CLSA-2.00				Long	.50														CL-6A-LPB	
CL-6-CLSA-3.00			3	Standard	.31							2.56						CL-6-CLS-3.00	CL-6-LPB	
CL-62-CLSA-3.00				Long	.50														CL-6A-LPB	
CL-8-CLSA-1.50	1/2	.4990	1-1/2	Standard	.50	3/8	3/4	1/2-13	.75	.93	1/2	1.06	.60	3/4	.7518	.75	1-1/16	CL-8-CLS-1.50	CL-8-LPB	LS-1
CL-82-CLSA-1.50				Long	.75														CL-8A-LPB	
CL-8-CLSA-2.00			2	Standard	.50							1.56						CL-8-CLS-2.00	CL-8-LPB	
CL-82-CLSA-2.00				Long	.75														CL-8A-LPB	
CL-8-CLSA-3.00			3	Standard	.50							2.56						CL-8-CLS-3.00	CL-8-LPB	
CL-82-CLSA-3.00				Long	.75														CL-8A-LPB	

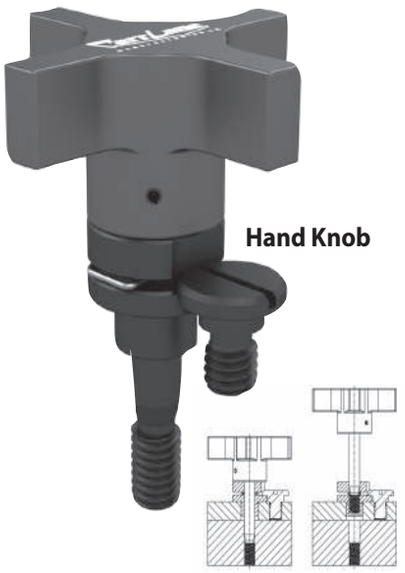
SOCKET HEAD – COMPLETE ASSEMBLY (METRIC)

CLM-6-CLSA-30	6mm	.2352	1.18	Standard	.31	5mm	.39	M6	.39	.56	.24	.71	.15	10mm	.3952	.630	.87	CLM-6-CLS-30	CLM-6-LPB	LSM-3
CLM-8-CLSA-35	8mm	.3140	1.38	Standard	.39	6mm	.51	M8	.47	.66	.31	.91	.29	13mm	.5135	.630	.87	CLM-8-CLS-35	CLM-8-LPB	LSM-3
CLM-8-CLSA-45			1.77									1.30						CLM-8-CLS-45		
CLM-8-CLSA-75			2.95									2.48						CLM-8-CLS-75		
CLM-10-CLSA-40	10mm	.3927	1.57	Standard	.47	8mm	.63	M10	.55	.76	.39	1.10	.45	16mm	.6316	.630	.87	CLM-10-CLS-40	CLM-10-LPB	LSM-3
CLM-10-CLSA-50			1.97									1.50						CLM-10-CLS-50		
CLM-10-CLSA-75			2.95									2.48						CLM-10-CLS-75		
CLM-12-CLSA-50	12mm	.4715	1.97	Standard	.71	10mm	.71	M12	.79	1.02	.47	1.50	.68	20mm	.7892	.709	1.02	CLM-12-CLS-50	CLM-12-LPB	LSM-3
CLM-12-CLSA-60			2.36									1.89						CLM-12-CLS-60		
CLM-12-CLSA-75			2.95									2.48						CLM-12-CLS-75		

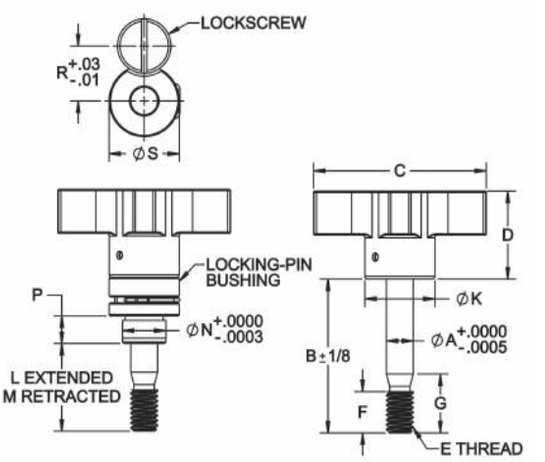
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CAPTIVE LOCATING SCREWS

SCREW: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
WASHER: 1010 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
LOCKING-PIN BUSHING: 8620 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH. RETAINER CLIP: SPRING STEEL



These Captive Locating Screws have an integral hand knob for tightening by hand. Captive Locating Screws can be used for locating and clamping, or for clamping only, by selecting the appropriate screw length. The locating screw's precision-ground body is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the body's radial groove. This holds the screw fully retracted by spring force and positively prevents removal. Spring pressure also holds the screw in intermediate extended positions, an advantage especially if the fixture is turned upside down.



HAND KNOB — COMPLETE ASSEMBLY (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	P BUSHING LENGTH UNDER HEAD		C	D	E THREAD	F	G	K DIA	L	M	N DIA NOMINAL	N DIA ACTUAL	R	S DIA	LOCATING SCREW (INCLUDED)	BUSHING (INCLUDED)	LOCKSCREW (INCLUDED)
CL-4-CSHKA-1.25	1/4	.2490	1-1/4	Standard	.31	1.8	1.1	1/4-20	.40	.59	3/4	.81	.25	13/32	.4078	.62	13/16	CL-4-CSHK-1.25	CL-4-LPB	LS-1
CL-42-CSHKA-1.25				Long	.50														CL-4A-LPB	
CL-4-CSHKA-1.75			1-3/4	Standard	.31							1.31							CL-4-LPB	
CL-42-CSHKA-1.75				Long	.50														CL-4A-LPB	
CL-5-CSHKA-1.38	5/16	.3115	1-3/8	Standard	.31	1.8	1.1	5/16-18	.47	.65	3/4	.94	.32	1/2	.5017	.62	13/16	CL-5-CSHK-1.38	CL-5-LPB	LS-1
CL-52-CSHKA-1.38				Medium	.37														CL-5A-LPB	
CL-53-CSHKA-1.38				Long	.50														CL-5B-LPB	
CL-5-CSHKA-1.75			1-3/4	Standard	.31							1.31						CL-5-CSHK-1.75	CL-5-LPB	
CL-52-CSHKA-1.75				Medium	.37														CL-5A-LPB	
CL-53-CSHKA-1.75				Long	.50														CL-5B-LPB	
CL-5-CSHKA-3.00			3	Standard	.31							2.56						CL-5-CSHK-3.00	CL-5-LPB	
CL-52-CSHKA-3.00				Medium	.37														CL-5A-LPB	
CL-53-CSHKA-3.00				Long	.50														CL-5B-LPB	
CL-6-CSHKA-1.50	3/8	.3740	1-1/2	Standard	.31	2.1	1.4	3/8-16	.56	.75	1	1.06	.41	5/8	.6267	.62	13/16	CL-6-CSHK-1.50	CL-6-LPB	LS-1
CL-62-CSHKA-1.50				Long	.50														CL-6A-LPB	
CL-6-CSHKA-2.00			2	Standard	.31							1.56						CL-6-CSHK-2.00	CL-6-LPB	
CL-62-CSHKA-2.00				Long	.50														CL-6A-LPB	
CL-6-CSHKA-3.00			3	Standard	.31							2.56						CL-6-CSHK-3.00	CL-6-LPB	
CL-62-CSHKA-3.00				Long	.50														CL-6A-LPB	
CL-8-CSHKA-1.50	1/2	.4990	1-1/2	Standard	.50	2.1	1.4	1/2-13	.75	.93	1	1.06	.60	3/4	.7518	.75	1-1/16	CL-8-CSHK-1.50	CL-8-LPB	LS-1
CL-82-CSHKA-1.50				Long	.75														CL-8A-LPB	
CL-8-CSHKA-2.00			2	Standard	.50							1.56						CL-8-CSHK-2.00	CL-8-LPB	
CL-81-CSHKA-2.00				Long	.75														CL-8A-LPB	
CL-8-CSHKA-3.00			3	Standard	.50							2.56						CL-8-CSHK-3.00	CL-8-LPB	
CL-82-CSHKA-3.00				Long	.75														CL-8A-LPB	

HAND KNOB — COMPLETE ASSEMBLY (METRIC)

CLM-6-CSHKA-30	6mm	.2352	1.18	Standard	.31	1.8	1.1	M6	.39	.56	3/4	.71	.15	10mm	.3952	.630	.87	CLM-6-CSHK-30	CLM-6-LPB	LSM-3
CLM-8-CSHKA-35	8mm	.3140	1.38	Standard	.39	1.8	1.1	M8	.47	.66	3/4	.91	.29	13mm	.5135	.630	.87	CLM-8-CSHK-35	CLM-8-LPB	LSM-3
CLM-8-CSHKA-45			1.77									1.30						CLM-8-CSHK-45		
CLM-8-CSHKA-75			2.95									2.48						CLM-8-CSHK-75		
CLM-10-CSHKA-40	10mm	.3927	1.57	Standard	.47	2.1	1.4	M10	.55	.75	1	1.10	.45	16mm	.6316	.630	.87	CLM-10-CSHK-40	CLM-10-LPB	LSM-3
CLM-10-CSHKA-50			1.97									1.50						CLM-10-CSHK-50		
CLM-10-CSHKA-75			2.95									2.48						CLM-10-CSHK-75		
CLM-12-CSHKA-50	12mm	.4715	1.97	Standard	.71	2.1	1.4	M12	.79	1.02	1	1.50	.68	20mm	.7892	.709	1.02	CLM-12-CSHK-50	CLM-12-LPB	LSM-3
CLM-12-CSHKA-60			2.36									1.89						CLM-12-CSHK-60		
CLM-12-CSHKA-75			2.95									2.48						CLM-12-CSHK-75		

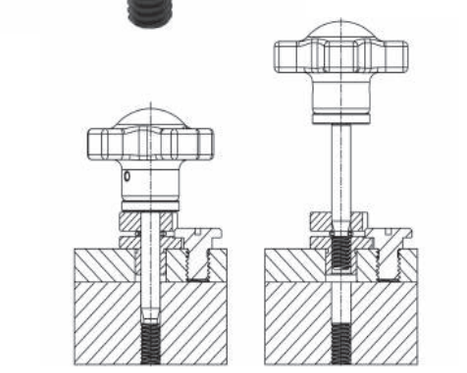
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CAPTIVE LOCATING SCREWS

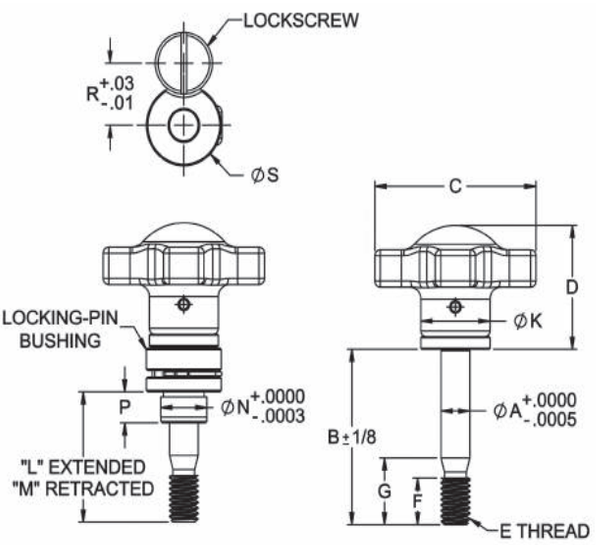
SCREW: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
WASHER: 1010 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
LOCKING-PIN BUSHING: 8620 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH.
RETAINER CLIP: SPRING STEEL



Swivel Washer Hand Knob



These Captive Locating Screws have an integral hand knob with a rotating swivel washer, which provides smooth clamping with consistent force. Captive Locating Screws can be used for locating and clamping, or for clamping only, by selecting the appropriate screw length. The locating screw's precision-ground body is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the body's radial groove. This holds the screw fully retracted by spring force and positively prevents removal. Spring pressure also holds the screw in intermediate extended positions, an advantage especially if the fixture is turned upside down.



SWIVEL WASHER HAND KNOB — COMPLETE ASSEMBLY (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D	E THREAD	F	G	K DIA	L	M	N DIA NOMINAL	N DIA ACTUAL	P	R	S DIA	LOCATING SCREW (INCLUDED)	BUSHING (INCLUDED)	LOCKSCREW (INCLUDED)
CL-4-CLSSHA-1.25	1/4	.2490	1-1/4	1.75	1.33	1/4-20	.40	.59	3/4	.81	.25	13/32	.4078	.31	.62	13/16	CL-4-CLSSH-1.25	CL-4-LPB	LS-1
CL-5-CLSSHA-1.38			1-3/8							.94							CL-5-CLSSH-1.38		
CL-5-CLSSHA-1.75	5/16	.3115	1-3/4	1.75	1.34	5/16-18	.47	.65	3/4	1.31	.32	1/2	.5017	.31	.62	13/16	CL-5-CLSSH-1.75	CL-5-LPB	LS-1
CL-5-CLSSHA-3.00			3							2.56							CL-5-CLSSH-3.00		
CL-6-CLSSHA-1.50			1-1/2							1.06							CL-6-CLSSH-1.50		
CL-6-CLSSHA-2.00	3/8	.3740	2	2.13	1.47	3/8-16	.56	.75	1	1.56	.41	5/8	.6267	.31	.62	13/16	CL-6-CLSSH-2.00	CL-6-LPB	LS-1
CL-6-CLSSHA-3.00			3							2.56							CL-6-CLSSH-3.00		
CL-8-CLSSHA-1.50			1-1/2							1.06							CL-8-CLSSH-1.50		
CL-8-CLSSHA-2.00	1/2	.4990	2	2.13	1.53	1/2-13	.75	.93	1	1.56	.60	3/4	.7518	.50	.75	1-1/16	CL-8-CLSSH-2.00	CL-8-LPB	LS-1
CL-8-CLSSHA-3.00			3							2.56							CL-6-CLSSH-3.00		

SWIVEL WASHER HAND KNOB — COMPLETE ASSEMBLY (METRIC)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D	E THREAD	F	G	K DIA	L	M	N DIA NOMINAL	N DIA ACTUAL	P	R	S DIA	LOCATING SCREW (INCLUDED)	BUSHING (INCLUDED)	LOCKSCREW (INCLUDED)
CLM-6-CLSSHA-30	6mm	.2352	1.18	1.8	1.33	M6	.39	.56	3/4	.71	.15	10mm	.3952	.31	.630	.87	CLM-6-CLSSH-30	CLM-6-LPB	LSM-3
CLM-8-CLSSHA-35			1.38							.91							CLM-8-CLSSH-35		
CLM-8-CLSSHA-45	8mm	.3140	1.77	1.8	1.34	M8	.47	.66	3/4	1.30	.29	13mm	.5135	.39	.630	.87	CLM-8-CLSSH-45	CLM-8-LPB	LSM-3
CLM-8-CLSSHA-75			2.95							2.48							CLM-8-CLSSH-75		
CLM-10-CLSSHA-40			1.57							1.10							CLM-10-CLSSH-40		
CLM-10-CLSSHA-50	10mm	.3927	1.97	2.1	1.47	M10	.55	.76	1	1.50	.45	16mm	.6316	.47	.630	.87	CLM-10-CLSSH-50	CLM-10-LPB	LSM-3
CLM-10-CLSSHA-75			2.95							2.48							CLM-10-CLSSH-75		
CLM-12-CLSSHA-50			1.97							1.50							CLM-12-CLSSH-50		
CLM-12-CLSSHA-60	12mm	.4715	2.36	2.1	1.53	M12	.79	1.02	1	1.89	.68	20mm	.7892	.71	.709	1.02	CLM-12-CLSSH-60	CLM-12-LPB	LSM-3
CLM-12-CLSSHA-75			2.95							2.48							CLM-12-CLSSH-75		

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CAPTIVE CLAMPING PINS

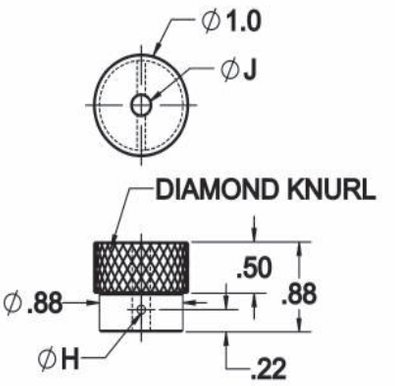
KNOB: 8620 STEEL, CASE HARDENED, BLACK OXIDE FINISH
PIN BODY: 12L14 STEEL, CARBURIZE HARDENED, BLACK OXIDE FINISH

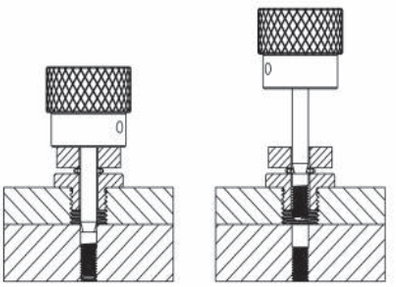


Assembly with Knurled Knob

These Captive Clamping Pins have a knurled knob for tightening by hand and a pin body that is positively retained in a locking bushing. In fully retracted position, the bushing's spring clip snaps into the pin's radial groove. This holds the pin fully retracted by spring force. These pins also incorporate a positive thread stop (the .10"-long unthreaded portion with a square shoulder, above the threads) to positively prevent screwing the pin past the spring clip. Spring pressure also holds the pin in intermediate extended positions, an advantage especially if the fixture is turned upside down. Available in fine-thread sizes from #10-32 to 3/8-24.

These clamping pins must be ordered as three separate items: (1) Knurled Knob with roll pin; (2) Pin Body; (3) Locking-Pin Bushing. The Pin Body must be cut to length and pinned by the customer to suit the specific application (3" maximum A dimension). For dimensions and specifications of Locking-Pin Bushings, see opposite page.





KNURLED KNOB WITH ROLL PIN (INCH)

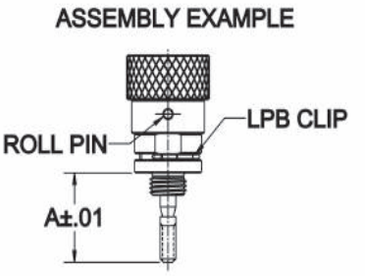
PART NO.	KNOB DIA	H DIA	J DIA
CL-190-CPKK	1	1/16	.190
CL-250-CPKK		3/32	.250
CL-313-CPKK		3/32	.313
CL-375-CPKK		1/8	.375

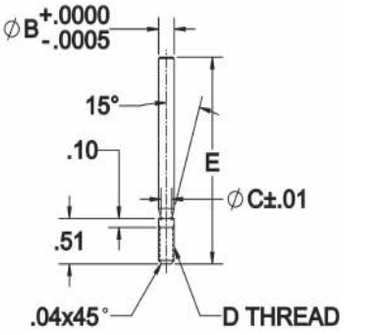


Knurled Knob with Roll Pin

Pin Body

Locking-Pin Bushing





PIN BODY (INCH)

PART NO.	A MAX	B DIA NOMINAL	B DIA ACTUAL	C DIA	D THREAD	E
CL-190-CCPT-3.000	3.000	#10	.1890	.13	#10-32	4.32
CL-250-CCPT-3.000		1/4	.2490	.17	1/4-28	
CL-313-CCPT-3.000		5/16	.3115	.21	5/16-24	
CL-375-CCPT-3.000		3/8	.3740	.26	3/8-24	

LOCKING-PIN BUSHINGS (INCH)

PART NO. STANDARD PRESS-FIT BUSHING	PART NO. OVERSIZE PRESS-FIT BUSHING	PART NO. OVERSIZE THREADED BUSHING	FOR PIN BODY DIA
—	—	CL-3-TLPB-OS	#10
CL-4-LPB	CL-4-LPB-OS	CL-4-TLPB-OS	1/4
CL-5-LPB	CL-5-LPB-OS	CL-5-TLPB-OS	5/16
CL-6-LPB	CL-6-LPB-OS	CL-6-TLPB-OS	3/8

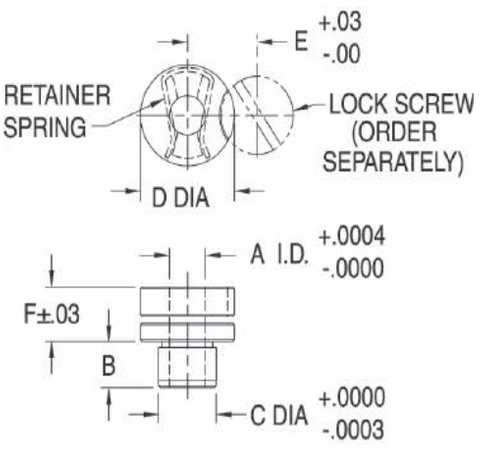
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LOCKING-PIN BUSHINGS

PRESS FIT: 8620 STEEL, CASE HARDENED, BLACK OXIDE FINISH
THREADED: 12L14 STEEL, CARBURIZE HARDENED, BLACK OXIDE FINISH

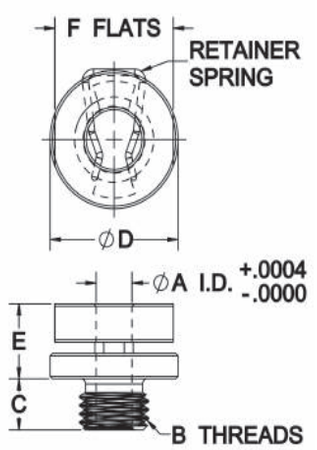


Press Fit





Threaded



Locking-Pin Bushings are equipped with a retainer spring clip on the inside diameter. These bushings are used with all types of locking/captive pins and locating screws. Available for pin diameters 3/16 to 1/2" (6 to 12mm in metric). Some bushings are available in a choice of lengths, to suit thinner or thicker plates. Several bushing sizes are optionally available with an oversize ID (.040" larger), for applications with multiple pins where additional clearance is desired to prevent binding. Locking-Pin Bushings are designed to press fit in a standard reamed hole. Secure with a Lockscrew to positively hold the bushing in place – order separately as part number LS-1 (inch) or LSM-3 (metric).

PRESS FIT (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C DIA NOMINAL	C DIA ACTUAL	D DIA	E	F	MATCHING P BUSHING FOR BOTTOM PLATE
CL-3-LPB	3/16	.1868	.31	13/32	.4078	13/16	.62	.44	P-26-6-.1865
CL-4-LPB	1/4	.2493	.31						P-26-6-.2490
CL-4A-LPB			.50						
CL-5-LPB	5/16	.3118	.31	1/2	.5017				P-32-6-.3115
CL-5A-LPB			.37						
CL-5B-LPB			.50						
CL-6-LPB	3/8	.3743	.31	5/8	.6267				P-40-8-.3740
CL-6A-LPB			.50						
CL-8-LPB	1/2	.4993	.50	3/4	.7518	1-1/16	.75		P-48-12-.4990
CL-8A-LPB			.75						

PRESS FIT (METRIC)

CLM-6-LPB	6mm	.2355	.31	10mm	.3952	.87	.630	.47	—
CLM-8-LPB	8mm	.3143	.39	13mm	.5135				—
CLM-10-LPB	10mm	.3930	.47	16mm	.6316				—
CLM-12-LPB	12mm	.4717	.71	20mm	.7892	1.02	.709		—

PRESS FIT, WITH OVERSIZE ID (INCH)

CL-4-LPB-OS	1/4	.2643	.31	13/32	.4078	13/16	.62	.44	—
CL-5-LPB-OS	5/16	.3268	.31	1/2	.5017	13/16	.62	.44	—
CL-6-LPB-OS	3/8	.3893	.31	5/8	.6267	13/16	.62	.44	—
CL-8-LPB-OS	1/2	.5143	.50	3/4	.7518	1-1/16	.75	.44	—

PRESS FIT, WITH OVERSIZE ID (METRIC)

CLM-6-LPB-OS	6mm	.2755	.31	10mm	.3952	.87	.630	.47	—
CLM-8-LPB-OS	8mm	.3543	.39	13mm	.5135				—
CLM-10-LPB-OS	10mm	.4330	.47	16mm	.6316				—
CLM-12-LPB-OS	12mm	.5117	.71	20mm	.7892	1.02	.709		—

Also available in threaded version!

Locking-Pin Bushings are now optionally available with a threaded OD, for installation in a tapped hole. This version is designed for use with clamping pins in non-locating applications, with an ID size .040" over nominal size.

THREADED, WITH OVERSIZE ID (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B THREAD	C	D DIA	E	F
CL-3-TLPB-OS	3/16	.2268	7/16-20	.300	.81	.44	3/4
CL-4-TLPB-OS	1/4	.2893	1/2-20				
CL-5-TLPB-OS	5/16	.3518	9/16-18				
CL-6-TLPB-OS	3/8	.4143	5/8-18	.350			
CL-8-TLPB-OS	1/2	.5393	3/4-16	.375	1.06		1

THREADED, WITH OVERSIZE ID (METRIC)

CLM-6-TLPB-OS	6mm	.2755	M12x1.25	.300	.87	.47	20mm
CLM-8-TLPB-OS	8mm	.3543	M16x1.5				
CLM-10-TLPB-OS	10mm	.4330	M18x1.5	.350			
CLM-12-TLPB-OS	12mm	.5117	M20x1.5	.350	1.02		24mm

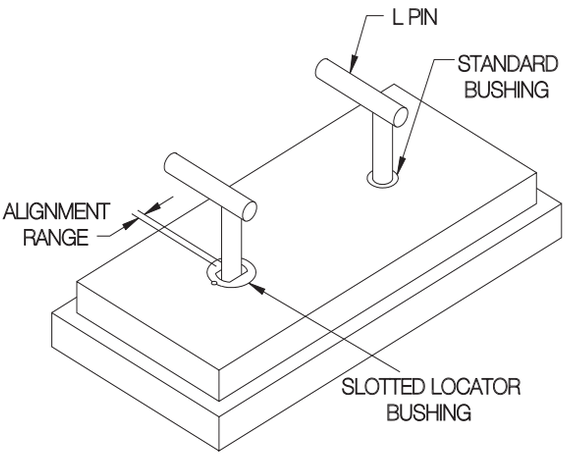
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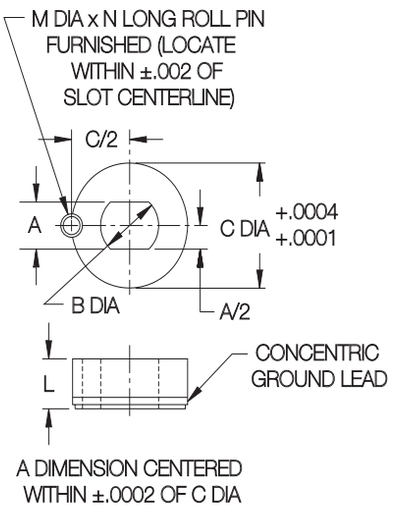
SLOTTED LOCATOR BUSHINGS

STEEL: TOOL STEEL, HEAT TREATED RC 58-62, BLACK OXIDE FINISH
STAINLESS: 440C STAINLESS STEEL, HEAT TREATED



Use with L Pins, T Pins, Shoulder Pins, or Carr Lock® Clamps to align two holes without binding. Precision bushing with a tight tolerance in one direction and full relief in the perpendicular direction. Available for 1/8 through 1" diameter pins (5mm-25mm in metric sizes). To install, first drill and ream hole for roll pin (furnished), then bore large bushing hole for .0003-.0005 press fit. Press in bushing and roll pin simultaneously for accurate orientation. **Patent no. 3,381,554.**





INCH

PART NO.		PIN		B	C		M	
STEEL	STAINLESS	DIA	A	DIA	DIA	L	DIA	N
CL-2-SLLB	—	1/8	.1251/.1257	.250	.7500	.40	3/16	3/8
CL-3-SLLB-.1285	—	#30	.1286/.1292	.312	.7500	.40		
CL-3-SLLB-.1562	—	5/32	.1563/.1569	.312	.7500	.40		
CL-3-SLLB	CL-3-SLLB-S	3/16	.1876/.1882	.312	.7500	.40		
CL-4-SLLB-.1910	—	#11	.1911/.1917	.375	.7500	.40		
CL-4-SLLB-.1935	—	#10	.1936/.1942	.375	.7500	.40		
CL-4-SLLB-.1960	—	#9	.1961/.1967	.375	.7500	.40		
CL-4-SLLB-.2188	—	7/32	.2189/.2195	.375	.7500	.40		
CL-4-SLLB	CL-4-SLLB-S	1/4	.2501/.2507	.375	.7500	.40		
CL-4A-SLLB	—				1.0000			
CL-5-SLLB-.2570	—	F	.2571/.2577	.437	1.0000	.40		
CL-5-SLLB-.2812	—	9/32	.2813/.2819	.437	1.0000	.40		
CL-5-SLLB	CL-5-SLLB-S	5/16	.3126/.3132	.437	1.0000	.40		
CL-6-SLLB	CL-6-SLLB-S	3/8	.3751/.3757	.500				
CL-8A-SLLB	CL-8A-SLLB-S	1/2	.5001/.5007	.625	1.0000	.40		
CL-8-SLLB	—					.90		
CL-10-SLLB	CL-10-SLLB-S	5/8	.6251/.6257	.750	1.2500	.90		
CL-12-SLLB	CL-12-SLLB-S	3/4	.7501/.7510	.812	1.5000	.98		
CL-14-SLLB	—	7/8	.8751/.8760	1.000	1.5000	.98		
CL-16-SLLB	—	1	1.0001/1.0010	1.062	1.5000	.98		

METRIC

CLM-5-SLLB	—	5mm	.1970/.1980	.315	.7874	.35	5mm	8mm
CLM-6-SLLB	CLM-6-SLLB-S	6mm	.2363/.2373	.354	.7874	.35		
CLM-8-SLLB	CLM-8-SLLB-S	8mm	.3151/.3161	.433	.9449	.35		
CLM-10-SLLB	CLM-10-SLLB-S	10mm	.3938/.3948	.512		.55		
CLM-12-SLLB	CLM-12-SLLB-S	12mm	.4725/.4735	.591		.55		
CLM-16-SLLB	CLM-16-SLLB-S	16mm	.6300/.6310	.709	1.1811	.47		
CLM-20-SLLB	CLM-20-SLLB-S	20mm	.7875/.7885	.866	1.4173	.75		
CLM-25-SLLB	CLM-25-SLLB-S	25mm	.9844/.9854	1.063	1.5748			

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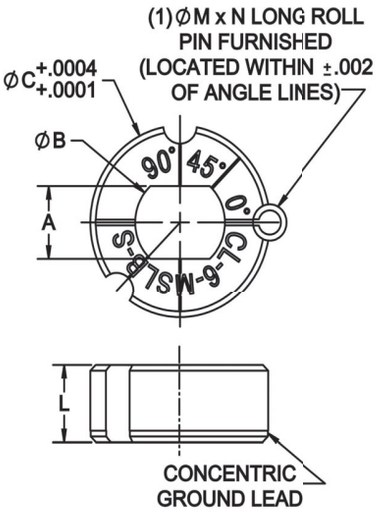
MULTI-ANGLE SLOTTED LOCATOR BUSHINGS

440C STAINLESS STEEL, HEAT TREATED, PASSIVATED

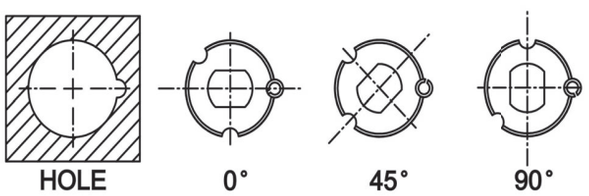


New item!

Slotted Locator Bushings can be used with many types of alignment pins and locating pins to align two holes without binding. The multi-angle version shown here can be installed normally (0°) or at a 90° or 45° angle in the same mounting hole without machining a different pin location. Slotted Locator Bushings have a tight tolerance in one direction and full relief in the perpendicular direction. Available for pin diameters from 1/4 to 1/2", in hardened 440C stainless steel. To install, first drill and ream the small hole for the roll pin, then bore the large bushing hole to provide .0003-.0005" press fit. Press in the bushing and roll pin simultaneously for accurate orientation.



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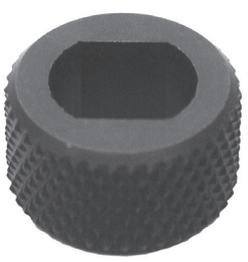
Multi-Angle Slotted Locator Bushings can be installed normally (0°) or at a 90° or 45° angle in the same mounting hole without machining a different pin location.

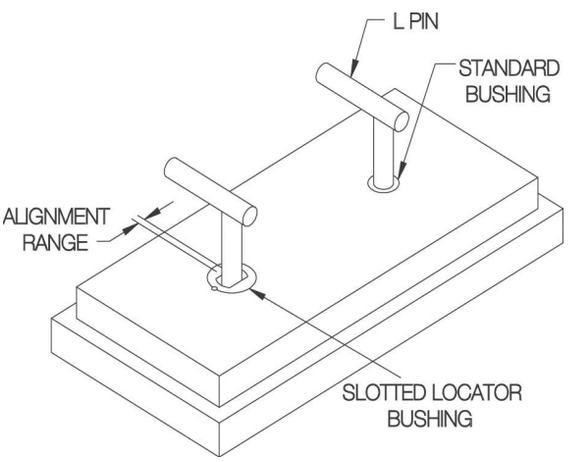
INCH

PART NO.	PIN DIA	A	B DIA	C DIA	L	M DIA	N
CL-4-MSLB-S	1/4	.2501 / .2507	.375	.7500	.40	3/16	3/8
CL-5-MSLB-S	5/16	.3126 / .3132	.437	1.0000			
CL-6-MSLB-S	3/8	.3751 / .3757	.500	1.0000			
CL-8A-MSLB-S	1/2	.5001 / .5007	.625	1.0000			

KNURLED SLOTTED LOCATOR BUSHINGS

TOOL STEEL, HEAT TREATED RC 58-62, BLACK OXIDE FINISH

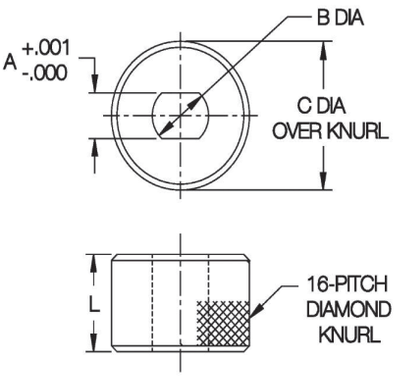




Slotted Locator Bushings with a knurled design for embedding in plastic tooling. Use with L Pins, T Pins, and Shoulder Pins to align two holes without binding. Precision bushing with a tight tolerance in one direction and full relief in the perpendicular direction. Available for 3/16 through 1/2" pin diameters.

INCH

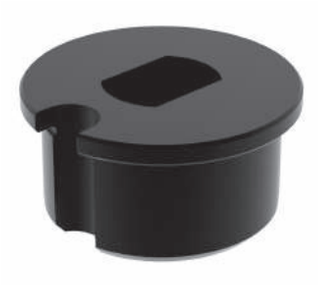
PART NO.	PIN DIA	A	B DIA	C DIA	L
CL-30-SLLB	3/16	.188	.312	.565	1/2
CL-40-SLLB	1/4	.250	.375	.640	
CL-50-SLLB	5/16	.313	.437	.765	
CL-60-SLLB	3/8	.375	.500	.890	
CL-80-SLLB	1/2	.500	.625	1.015	



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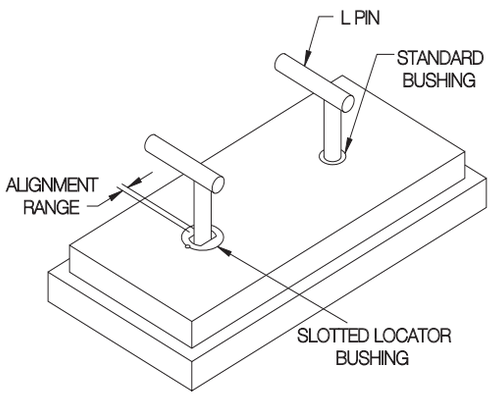
HEADED SLOTTED LOCATOR BUSHINGS

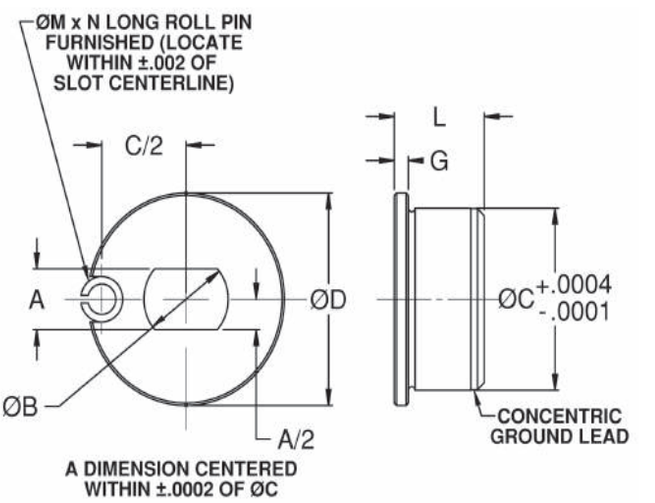
STEEL: TOOL STEEL, HEAT TREATED RC 58-62, BLACK OXIDE FINISH
STAINLESS STEEL: 440C STAINLESS STEEL, HEAT TREATED



Slotted Locator Bushings can be used with many types of alignment pins and locating pins to align two holes without binding. Precision bushing with a tight tolerance in one direction and full relief in the perpendicular direction. This headed version provides more resistance to axial loads. The head can be left exposed, or recessed by counterboring the installation hole. Available for pin diameters from 3/16 to 1/2".

To install, first drill and ream hole for roll pin (furnished), then bore large bushing hole for .0003-.0005" press fit. Press in bushing and roll pin simultaneously for accurate orientation.





STEEL (INCH)

PART NO.	PIN DIA	A	B DIA	C DIA	D DIA	G	L	M DIA	N
CL-3-HSLB	3/16	.1876/.1882	.312	.7500	.875	.0625	.40	3/16	3/8
CL-4-HSLB	1/4	.2501/.2507	.375						
CL-5-HSLB	5/16	.3126/.3132	.437	1.0000	1.125	.0625	.40	3/16	3/8
CL-6-HSLB	3/8	.3751/.3757	.500						
CL-8-HSLB	1/2	.5001/.5007	.625						

STAINLESS STEEL (INCH)

PART NO.	PIN DIA	A	B DIA	C DIA	D DIA	G	L	M DIA	N
CL-3-HSLB-S	3/16	.1876/.1882	.312	.7500	.875	.0625	.40	3/16	3/8
CL-4-HSLB-S	1/4	.2501/.2507	.375						
CL-5-HSLB-S	5/16	.3126/.3132	.437	1.0000	1.125	.0625	.40	3/16	3/8
CL-6-HSLB-S	3/8	.3751/.3757	.500						
CL-8-HSLB-S	1/2	.5001/.5007	.625						

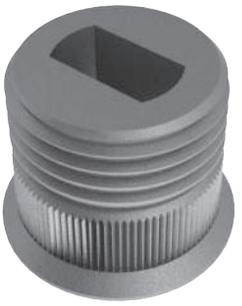
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SLOTTED LOCATOR TEMPLATE BUSHINGS

BUSHING: 1144 STEEL, CARBURIZED-HARDENED
RETAINER RING: ALUMINUM



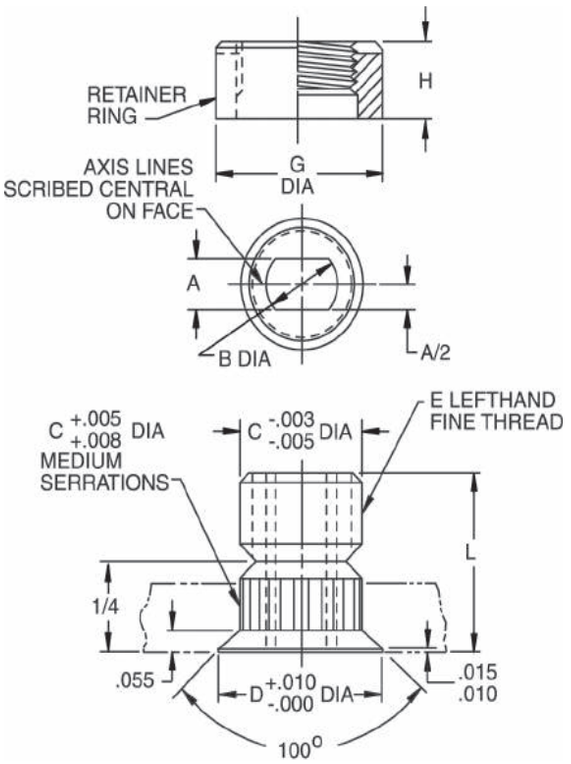
Retainer Ring



Bushing

These Slotted Locator Bushings are designed for thin template jig plates from 3/64" to 3/8" thick. Use with L Pins, T Pins, or Shoulder Pins to align two holes without binding. Precision bushing with a tight tolerance in one direction and full relief in the perpendicular direction. Bushings are held in place by a threaded Retainer Ring (order separately). Flush contact of the Retainer Ring against the jig plate ensures perpendicularity. OD serrations prevent the bushing from rotating. Threaded Template Bushings can be easily removed to replace or reuse. Available for pin diameters from 3/16 to 3/4".

To install, drill hole in jig plate to nominal bushing OD (B diameter). Countersink 90° to allow bushing to seat flush to .015" below surface of plate. Install and tighten Retainer Ring to secure. To make Retainer Ring installation easier, we offer a handy Socket-Type Installation Tool that fits 1/4" square drives — **INFO+**: see page 583.



INCH

PART NO.	PIN DIA	A	B DIA	C DIA	D DIA	E	L	RETAINER RING PART NO.	TEMPLATE THICKNESS	G DIA	H
CL-40-SLTB-.1875	3/16	.1876/.1882	3/8	.625	.725	5/8-18 LH	1/2	TTR-40-6	.047-.125	3/4	3/8
								TTR-40-5	.126-.188		5/16
								TTR-40-3	.189-.375		3/16
CL-40-SLTB-.1935	#10	.1936/.1942	3/8	.625	.725	5/8-18 LH	1/2	TTR-40-6	.047-.125	3/4	3/8
								TTR-40-5	.126-.188		5/16
								TTR-40-3	.189-.375		3/16
CL-40-SLTB-.2500	1/4	.2501/.2507	3/8	.625	.725	5/8-18 LH	1/2	TTR-40-6	.047-.125	3/4	3/8
								TTR-40-5	.126-.188		5/16
								TTR-40-3	.189-.375		3/16
CL-48-SLTB-.3125	5/16	.3126/.3132	7/16	.750	.850	3/4-16 LH	1/2	TTR-48-6	.047-.125	1	3/8
								TTR-48-5	.126-.188		5/16
								TTR-48-3	.189-.375		3/16
CL-48-SLTB-.3750	3/8	.3752/.3757	1/2	.750	.850	3/4-16 LH	1/2	TTR-48-6	.047-.125	1	3/8
								TTR-48-5	.126-.188		5/16
								TTR-48-3	.189-.375		3/16
CL-48-SLTB-.5000	1/2	.5001/.5007	5/8	.750	.850	3/4-16 LH	1/2	TTR-48-6	.047-.125	1	3/8
								TTR-48-5	.126-.188		5/16
								TTR-48-3	.189-.375		3/16
CL-64-SLTB-.6250	5/8	.6251/.6257	3/4	1.000	1.100	1"-14 LH	5/8	TTR-64-6	.047-.125	1-1/4	3/8
								TTR-64-5	.126-.188		5/16
								TTR-64-3	.189-.375		3/16
CL-64-SLTB-.7500	3/4	.7501/.7510	13/16	1.000	1.100	1"-14 LH	5/8	TTR-64-6	.047-.125	1-1/4	3/8
								TTR-64-5	.126-.188		5/16
								TTR-64-3	.189-.375		3/16

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BALL LOCK PINS

1

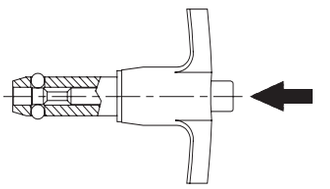
TECHNICAL INFORMATION



Pages 48-49

BALL LOCK PINS

Precision alignment pin with a ground shank. This popular single-acting type is positive locking until released by pushing the button, which moves the center spindle forward to allow the locking balls to retract into a radial groove. Widest range of types and sizes, in steel or stainless steel. Choice of four handle styles: T, L, Button, and Ring. Standard shank diameters from 3/16 to 1" (5 to 20mm in metric). Any grip length up to 6" (150mm in metric) is available as standard, at no extra charge. Available from stock in many standard grip lengths, or quickly made to order in custom lengths and diameters.

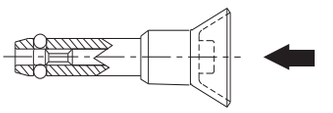




Pages 50-51

MARINE BALL LOCK PINS

Similar to our standard single-acting Ball Lock Pins in stainless steel, except this type has its handle and button made of 300-series stainless steel. Choice of two handle styles: Recessed Button and Ring. Shank diameters from 3/16 to 1/2", each available in a choice of several standard grip lengths. Available from stock only (not made to order).

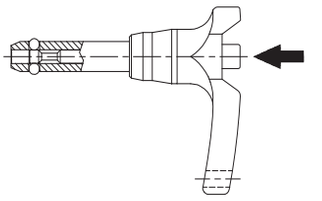


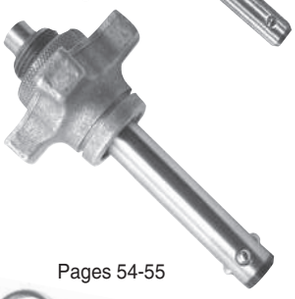


Pages 52-53

HEAVY-DUTY BALL LOCK PINS

Similar to our standard single-acting Ball Lock Pins, except with a heavier handle for rough service. Available only in stainless steel. Handles are made of solid stainless steel for maximum impact strength and are specially shaped to prevent accidentally pressing the release button. Choice of four handle styles: T, L, Button, and Ring. Shank diameters from 3/16 to 1/2" (5 to 12mm in metric), each in a choice of several standard grip lengths. Available from stock only (not made to order).

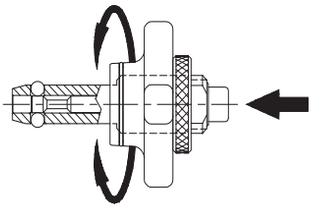




Pages 54-55

ADJUSTABLE BALL LOCK PINS

These Ball Lock Pins have an adjustable grip length. They can be used for clamping, or simply to provide a variable grip length. The threaded handle turns to provide a 1/2" clamping range or adjustment range. Available in steel or stainless steel. Choice of three handle styles: Knob, T, and L. Standard shank diameters from 1/4 to 1" (6 to 20mm in metric), each in a choice of many standard grip lengths. Other grip lengths are available as specials (extra charge and longer delivery time).

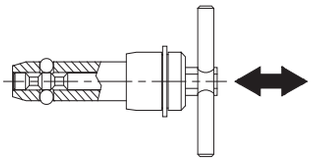




Pages 56-57

DOUBLE-ACTING BALL LOCK PINS

Similar to a single-acting pin, except the center spindle has *two* grooves instead of one, to release the ball by either pushing or pulling. Pushing on the handle releases the balls and inserts the pin in one motion. Pulling on the handle releases the balls and removes the pin in one motion. Available in steel or stainless steel. Choice of three handle styles: T, L, and Ring. Standard shank diameters from 3/16 to 1" (5 to 20mm in metric). Any grip length up to 6" (150mm in metric) is available as a standard, at no extra charge. Available from stock in some standard grip lengths, or quickly made to order in custom lengths and diameters.

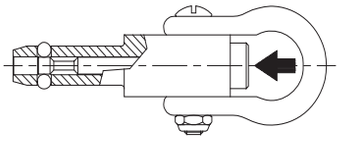




Pages 58-59

LIFTING PINS

A single-acting ball lock pin with a solid, one-piece body and four balls for high tension loads. Positive locking until released by pushing the button. Sturdy forged shackle for heavy lifting. Shank diameters from 1/4 to 1", each in a choice of several standard grip lengths. Available from stock only (not made to order).



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STRENGTH DATA (INCH)

NOM. DIA	ALLOWABLE HOLE DIA		BLP, BPD, ABP APPROXIMATE PULL OUT STRENGTH (LBS)	BLP, BPD, ABP, LFP CALCULATED DOUBLE SHEAR STRENGTH (LBS)***		DEP CALCULATED DOUBLE SHEAR STRENGTH (LBS)***		BLP, BPD APPROX. WEIGHT (OUNCES)		DEP INSERTION/ REMOVAL FORCE (LBS)	
	MAX	MIN		STEEL	STAINLESS	STEEL	STAINLESS	HANDLE	PER IN.	MAX	MIN
3/16 (#10)	.194	.190	200	2,100	2,300	2,200	2,000	1.25	.15	7	2
1/4	.254	.250	230	4,000	4,500	4,200	2,200	1.75	.25	7	2
5/16	.317	.313	510	6,000	7,100	6,700	3,500	2.00	.40	14	6
3/8	.379	.375	575	9,200	10,200	9,700	5,000	2.40	.50	14	6
7/16	.443	.438	710	12,300	13,600	13,200	7,000	2.90	.62	17	8
1/2	.505	.500	1160	16,000	18,000	17,500	9,200	3.40	.80	22	10
9/16	.568	.563	1420	20,500	23,000	22,000	11,500	3.65	1.20	22	10
5/8	.630	.625	2070	25,500	28,700	27,500	13,500	4.00	1.35	30	15
3/4	.757	.750	2970	36,700	41,000	39,500	20,500	4.25	2.30	30	15
7/8	.882	.875	3900	50,000	56,200	50,000	28,500	8.31	2.73	35	20
1	1.010	1.000	5400	65,500	73,500	70,700	37,200	9.00	3.47	40	20

STRENGTH DATA (METRIC)

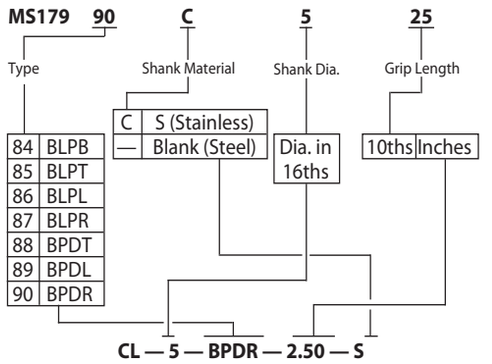
NOM. DIA	ALLOWABLE HOLE DIA		BLP, BPD, ABP APPROXIMATE PULL OUT STRENGTH (LBS)	BLP, BPD, ABP, LFP CALCULATED DOUBLE SHEAR STRENGTH (LBS)***		DEP CALCULATED DOUBLE SHEAR STRENGTH (LBS)***		BLP, BPD APPROX. WEIGHT (OUNCES)		DEP INSERTION/ REMOVAL FORCE (LBS)	
	MAX	MIN		STEEL	STAINLESS	STEEL	STAINLESS	HANDLE	PER IN.	MAX	MIN
5mm	.201	.197	230	2,600	3,000	2,500	1,400	1.25	.15	7	2
6mm	.240	.236	230	4,000	4,400	4,000	2,100	1.75	.25	7	2
8mm	.319	.315	510	7,000	8,000	7,200	3,700	2.00	.40	14	6
10mm	.398	.394	710	11,000	12,500	11,400	5,800	2.40	.50	14	6
12mm	.477	.472	1160	16,000	18,000	16,500	8,500	3.40	.80	22	10
16mm	.635	.630	2070	29,000	32,500	29,500	15,400	4.00	1.35	30	15
20mm	.794	.787	2970	45,200	50,900	46,100	21,600	4.25	2.30	30	15

**Pins with grip lengths over 8" (special) are not heat treated, in order to maintain straightness. Double shear strength will be reduced approximately 20-50%. Steel pins over 8" long will have a black oxide finish instead of plating. Pins in larger diameters than listed here are available as specials (may be made from alternate steels).

***2:1 Safety factor

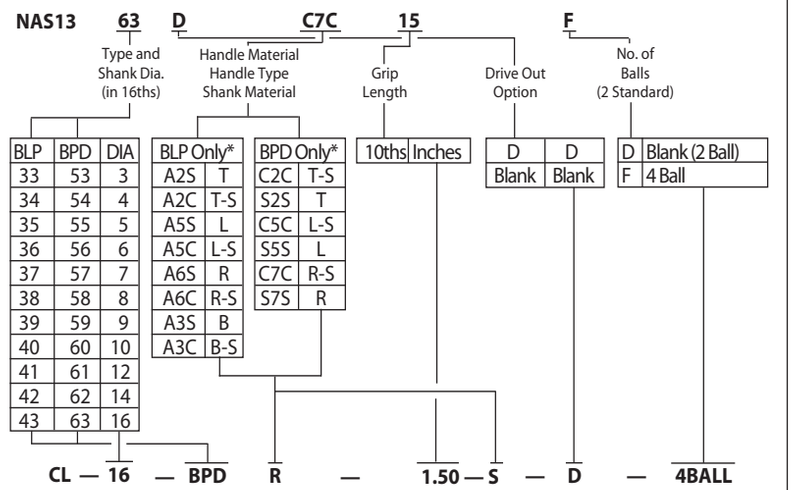
MS CONVERSIONS

(MS-certified pins available as specials at higher cost)



NAS CONVERSIONS

(NAS-certified pins available as specials at higher cost)



*These are the only standard combinations of Handle Material, Handle Style, Spindle Material, and BLP-BPD type directly convertible from NAS to Carr Lane. Other combinations are available as specials.

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BALL LOCK PINS



T Handle



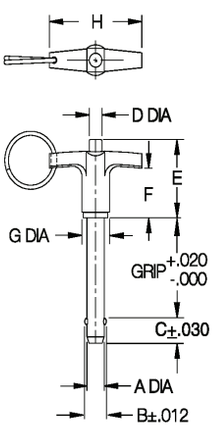
L Handle



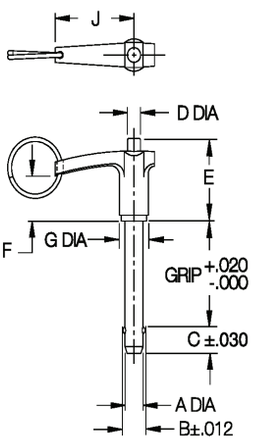
Button Handle



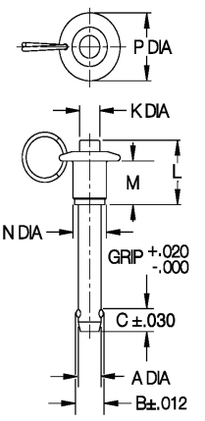
Ring Handle



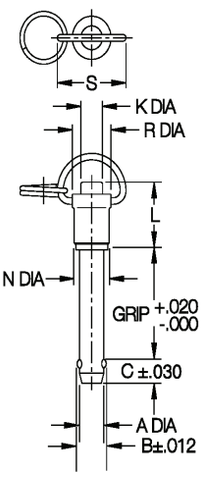
BLPT



BLPL



BLPB



BLPR

INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E	F	G DIA	H	J	K DIA	L	M	N DIA	P DIA	R DIA	S
CL- 3-BLPx-x.xx	3/16 (#10)	.1885/.1870	.219	.245	.22	1.26	.78	.47	1.75	1.50	.22	1.26	.89	.47	.82	.57	1.13
CL- 4-BLPx-x.xx	1/4	.2485/.2470	.290	.275													
CL- 5-BLPx-x.xx	5/16	.3110/.3095	.375	.315													
CL- 6-BLPx-x.xx	3/8	.3735/.3720	.438	.350	.27	1.47	.94	.59	2.00	1.62	.27	1.47	1.02	.59	1.00	.69	1.13
CL- 7-BLPx-x.xx	7/16	.4360/.4345	.508	.365													
CL- 8-BLPx-x.xx	1/2	.4985/.4970	.592	.445	.39	1.61	1.06	.75	2.25	1.88	.39	1.61	1.08	.75	1.31	.82	1.33
CL- 9-BLPx-x.xx	9/16	.5610/.5595	.666	.495													
CL-10-BLPx-x.xx	5/8	.6235/.6220	.750	.565	.50	1.81	1.06	.93	3.00	2.50	.50	1.81	1.25	.93	1.56	1.01	1.33
CL-12-BLPx-x.xx	3/4	.7485/.7470	.886	.655													
CL-14-BLPx-x.xx	7/8	.8735/.8720	1.044	.745	.71	2.07	1.25	1.31	3.50	2.90	.71	2.07	1.49	1.31	2.16	1.41	1.90
CL-16-BLPx-x.xx	1	.9985/.9970	1.217	.875													

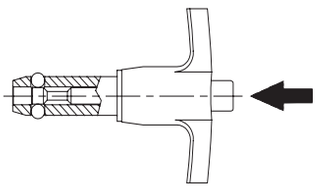
METRIC

CLM-5-BLPx-xx	5mm	.1954/.1939	.212	.245	.22	1.26	.78	.47	1.75	1.50	.22	1.26	.89	.47	.82	.57	1.13
CLM-6-BLPx-xx	6mm	.2347/.2332	.278	.275													
CLM-8-BLPx-xx	8mm	.3135/.3120	.371	.315													
CLM-10-BLPx-xx	10mm	.3922/.3907	.469	.350	.27	1.47	.94	.59	2.00	1.62	.27	1.47	1.02	.59	1.00	.69	1.13
CLM-12-BLPx-xx	12mm	.4709/.4694	.567	.445													
CLM-16-BLPx-xx	16mm	.6284/.6269	.748	.565	.50	1.81	1.06	.93	3.00	2.50	.50	1.81	1.25	.93	1.56	1.01	1.33
CLM-20-BLPx-xx	20mm	.7859/.7844	.948	.795													

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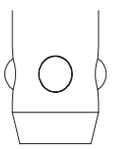
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BALL LOCK PINS



SHANK (STEEL): 4130 STEEL, HEAT TREATED RC 36-40, ZINC PLATED YELLOW CHROMATE; SHANK (STAINLESS STEEL): 17-4PH STAINLESS STEEL, HEAT TREATED RC 40 MIN, PASSIVATED; SPINDLE: 17-4PH STAINLESS STEEL, PASSIVATED; HANDLE: ALUMINUM ALLOY, BLACK FINISH; BUTTON: ALUMINUM ALLOY, ANODIZED; COLLAR: 300-SERIES STAINLESS STEEL, PASSIVATED; SPRING & RING: 302 STAINLESS STEEL; BALLS: 440C STAINLESS STEEL

Precision alignment pin with a ground shank. This popular single-acting type is positive locking until released by pushing the button, which moves the center spindle forward to allow the locking balls to retract into a radial groove. Widest range of types and sizes, in steel or stainless steel. Choice of four handle styles: T, L, Button, and Ring. Standard shank diameters from 3/16 to 1" (5 to 20mm in metric). Any grip length up to 6" (150mm in metric) is available as standard, at no extra charge. Available from stock in many standard grip lengths, or quickly made to order in custom lengths and diameters.





Options

Ball Lock Pins are optionally available in stainless steel instead of alloy steel for greater corrosion resistance. (Note: Both types have aluminum handles, and buttons.) Pins are also available with four balls instead of two, as specials, for more-distributed ball-contact force.

The optional attached Cable Assembly (-C) is 12" long (part no. CL-82-KA-12.0 if ordered separately), while the optional attached Nylon Lanyard (-NL) is 10" long (part no. CL-1-NL-10 if ordered separately). Both have an eyelet at the free end for a #10 or M5 attachment screw.

Ordering Example (INCH):

CL — 4 — BLPR — 1.50 — S — 4BALL — C

- 4 — Diameter (16ths of an inch)
- BLPR — Handle type (T, L, B, R)
- 1.50 — Grip length (inches)
- S — Add -S for stainless steel (steel is standard)
- 4BALL — Add for 4 balls (2 are standard)
- C — Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard

Ordering Example (Metric):

CLM — 6 — BLPR — 50 — S — 4BALL — C

- CLM — Add M for metric
- 6 — Diameter (mm)
- BLPR — Handle type (T, L, B, R)
- 50 — Grip length (mm)
- S — Add -S for stainless steel (steel is standard)
- 4BALL — Add for 4 balls (2 are standard)
- C — Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard

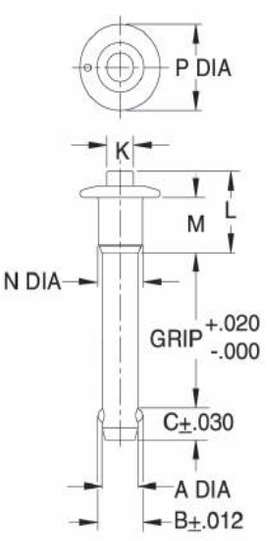
STOCK GRIP LENGTHS (INCH)

| PART NO. CL-X-BLP-x-x.xx | NOMINAL SHANK DIA | GRIP LENGTH (INCHES) | | |

MARINE BALL LOCK PINS



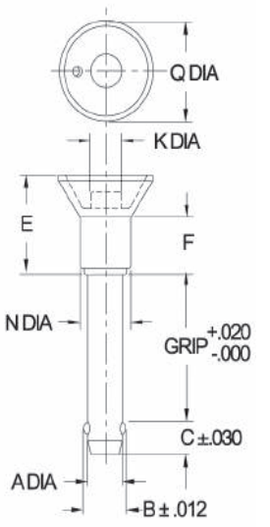
Button Handle (B)



MBPB



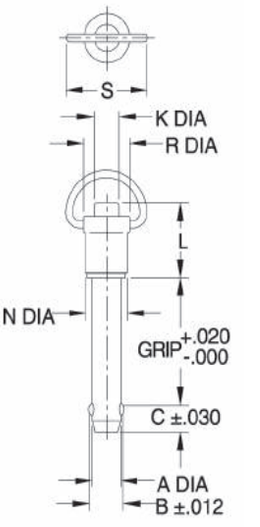
Recessed Button Handle (M)



MBPM



Ring Handle (R)



MBPR

INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	E	F	K DIA	L	M	N DIA	P DIA	Q DIA	R	S
CL-3-MBPx-x.xx-S	3/16 (#10)	.1885/.1870	.219	.245	.94	.62	.25	.81	.56	.47	.79	1.00	.52	1.13
CL-4-MBPx-x.xx-S	1/4	.2485/.2470	.290	.275										
CL-5-MBPx-x.xx-S	5/16	.3110/.3095	.375	.315	1.00	.68		.92	.65		.88		.58	
CL-6-MBPx-x.xx-S	3/8	.3735/.3720	.438	.350	1.06	.78	.31	.98	.65	.59	1.00	1.00	.64	1.13
CL-8-MBPx-x.xx-S	1/2	.4985/.4970	.592	.445	1.19	.93	.44	1.20	.80	.75	1.31	1.33	.80	1.33
CL-10-MBPx-x.xx-S	5/8	.6235/.6220	.750	.565	1.50	1.00	.44	1.56	1.00	.93	1.56	1.50	1.01	1.33
CL-12-MBPx-x.xx-S	3/4	.7485/.7470	.886	.655			.50							

METRIC

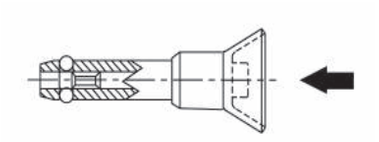
CLM-5-MBPx-xx-S	5mm	.1954/.1939	.212	.245	.94	.62	.22	.81	.56	.47	.82	1.00	.52	1.13
CLM-6-MBPx-xx-S	6mm	.2347/.2332	.278	.275										
CLM-8-MBPx-xx-S	8mm	.3135/.3120	.371	.315	1.00	.68		.92	.65				.58	
CLM-10-MBPx-xx-S	10mm	.3922/.3907	.469	.350	1.06	.78	.27	.98	.65	.59	1.00	1.00	.64	1.13
CLM-12-MBPx-xx-S	12mm	.4709/.4694	.567	.445	1.19	.93	.39	1.20	.80	.75	1.31	1.33	.80	1.33
CLM-16-MBPx-xx-S	16mm	.6283/.6268	.748	.565	1.50	1.00	.50	1.56	1.00	.93	1.56	1.50	1.01	1.33

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MARINE BALL LOCK PINS

SHANK: 17-4PH STAINLESS STEEL, HEAT TREATED RC 40 MIN, PASSIVATED
SPINDLE: 17-4PH STAINLESS STEEL, PASSIVATED
HANDLE, BUTTON & COLLAR: 300-SERIES STAINLESS STEEL, PASSIVATED
SPRING & RING: 302 STAINLESS STEEL
BALLS: 440C STAINLESS STEEL



Similar to our standard single-acting Ball Lock Pins in stainless steel, except this type has its handle and button made of 300-series stainless steel. Choice of three handle styles: Buttons, Recessed Button and Ring. Shank diameters from 3/16 to 3/4" (5 to 16mm in metric), each available in a choice of several standard grip lengths. Available from stock only in the standard grip lengths listed below (other grip length available as specials).

Ordering Example (INCH):

CL — 4 — MBPR — 1.50 — S — C

- 4 — Diameter (16ths)
- MBPR — Handle type (B, M, or R)
- 1.50 — Grip length (inches)
- C — Add -C for attached cable assembly or – NL for attached Nylon Lanyard



Optional Cable

The optional attached Cable Assembly (-C) is 12" long (part no. CL-82-KA-12.0 if ordered separately), while the optional attached Nylon Lanyard (-NL) is 10" long (part no. CL-1-NL-10 if ordered separately). Both have an eyelet at the free end for a #10 or M5 attachment screw.

Ordering Example (Metric):

CLM — 6 — MBPR — 50 — S — C

- CLM — Add M for metric
- 6 — Diameter (mm)
- MBPR — Handle type (B, M, or R)
- 50 — Grip length (mm)
- C — Add -C for attached cable assembly or – NL for attached Nylon Lanyard

STOCK GRIP LENGTHS (INCH)

PART NO.	NOMINAL SHANK DIA	GRIP LENGTH (INCHES)																																				
		0.50			0.75			1.00			1.25			1.50			1.75			2.00			2.25			2.50			3.00			3.50			4.00		
		B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R
CL-3-MBPx-x.xx-S	3/16 (#10)							•		•												•																
CL-4-MBPx-x.xx-S	1/4	•			•			•		•	•		•	•						•	•					•		•										
CL-5-MBPx-x.xx-S	5/16							•	•	•		•										•	•	•			•	•	•		•								
CL-6-MBPx-x.xx-S	3/8				•	•		•	•					•			•			•		•					•	•	•		•		•			•			•
CL-8-MBPx-x.xx-S	1/2								•																		•			•	•				•				
CL-10-MBPx-x.xx-S	5/8																													•	•								
CL-12-MBPx-x.xx-S	3/4																				•																		

STOCK GRIP LENGTHS (METRIC)

PART NO.	NOMINAL SHANK DIA	GRIP LENGTH (mm)																				
		15			20			25			30			40			50			60		
		B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R	B	M	R
CLM-5-MBPx-x.xx-S	5mm				•	•		•					•						•			
CLM-6-MBPx-x.xx-S	6mm	•					•							•			•			•			
CLM-8-MBPx-x.xx-S	8mm														•				•				
CLM-10-MBPx-x.xx-S	10mm										•												
CLM-12-MBPx-x.xx-S	12mm																•		•				

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HEAVY-DUTY BALL LOCK PINS



T Handle



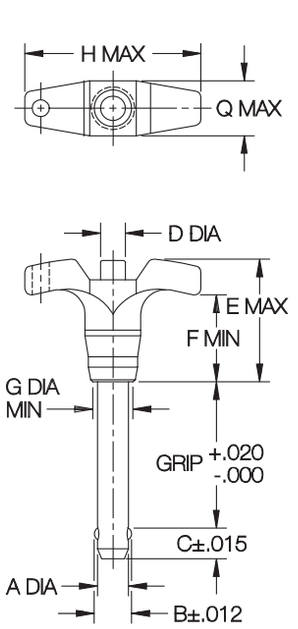
L Handle



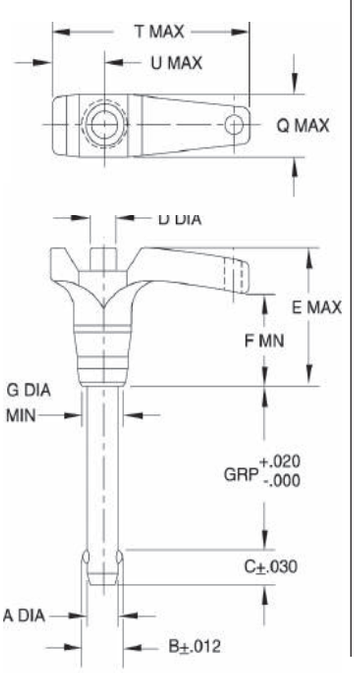
Button Handle



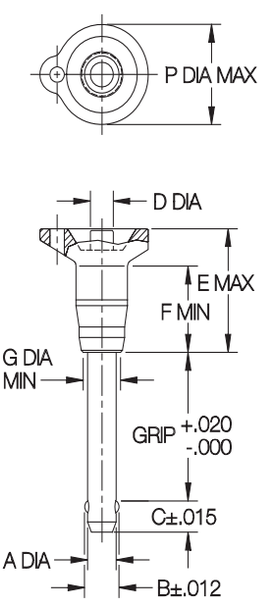
Ring Handle



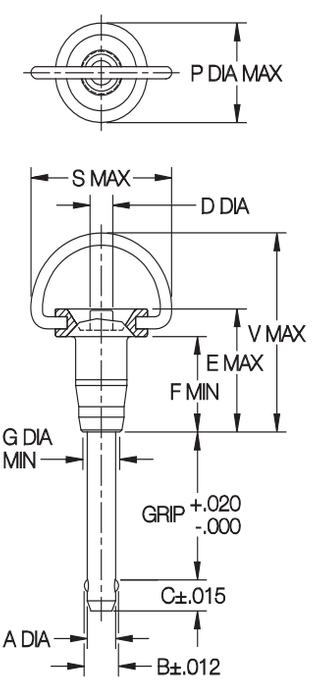
BLHT



BLHL



BLHB



BLHR

INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E	F	G DIA	H	P DIA	Q	S	T	U	V
CL-3-BLHx-x.xx-S	3/16 (#10)	.1885/.1870	.220	.245	.25	1.27	.70	.38	1.82	1.07	.63	1.56	1.95	.54	2.13
CL-4-BLHx-x.xx-S	1/4	.2485/.2470	.289	.275											
CL-5-BLHx-x.xx-S	5/16	.3110/.3095	.375	.315											
CL-6-BLHx-x.xx-S	3/8	.3735/.3720	.440	.350	.30	1.60	.85	.51	2.35	1.39	.80	2.00	2.51	.70	2.34
CL-7-BLHx-x.xx-S	7/16	.4360/.4345	.509	.365											
CL-8-BLHx-x.xx-S	1/2	.4985/.4970	.594	.445											

METRIC

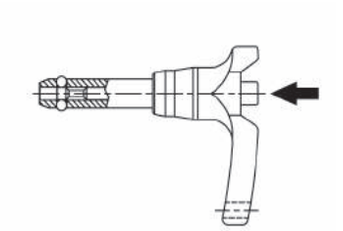
CLM-5-BLHx-xx-S	5mm	.1954/.1939	.210	.245	.25	1.27	.70	.38	1.82	1.07	.63	1.56	1.95	.54	2.13
CLM-6-BLHx-xx-S	6mm	.2347/.2332	.275	.275											
CLM-8-BLHx-xx-S	8mm	.3135/.3120	.371	.315											
CLM-10-BLHx-xx-S	10mm	.3922/.3907	.467	.350	.30	1.60	.85	.51	2.35	1.39	.80	2.00	2.51	.70	2.34
CLM-12-BLHx-xx-S	12mm	.4709/.4694	.569	.445											

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HEAVY-DUTY BALL LOCK PINS

SHANK: 17-4PH STAINLESS STEEL, HEAT TREATED RC 40 MIN, PASSIVATED
SPINDLE: 17-4PH STAINLESS STEEL, PASSIVATED
HANDLE: 17-4PH STAINLESS STEEL, PASSIVATED
HEAD, BUTTON & COLLAR: 300-SERIES STAINLESS STEEL, PASSIVATED
SPRING: 302 STAINLESS STEEL
BALLS: 440C STAINLESS STEEL



Similar to our standard single-acting Ball Lock Pins, except with a heavier handle for rough service. Available only in stainless steel. Handles are made of solid stainless for maximum impact strength, and are specially shaped to prevent accidentally pressing the release button. Choice of four handle styles: T, L, Button, and Ring. Shank diameters from 3/16 to 1/2" (5 to 12mm in metric), each in a choice of several standard grip lengths. Available from stock only (not made to order).

Ordering Example (INCH):

CL — 4 — BLHR — 1.50 — S — C

- Diameter (16ths of an inch)
- Handle type (T, L, B, R)
- Grip length (inches)
- Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard



Optional Cable

The optional attached Cable Assembly (-C) is 12" long, while the optional attached Nylon Lanyard (-NL) is 10" long. Both have an eyelet at the free end for a #10 or M5 attachment screw.

Ordering Example (Metric):

CLM — 6 — BLHR — 50 — S — C

- Add M for metric
- Diameter (mm)
- Handle type (T, L, B, R)
- Grip length (mm)
- Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard

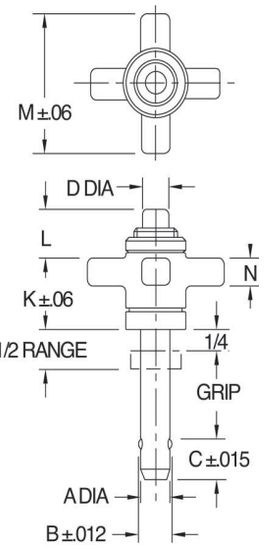
STOCK GRIP LENGTHS (INCH)

| PART NO. CL-X-BLHx-x.xx-S | NOMINAL SHANK DIA | GRIP LENGTH (INCHES) | | |

ADJUSTABLE BALL LOCK PINS



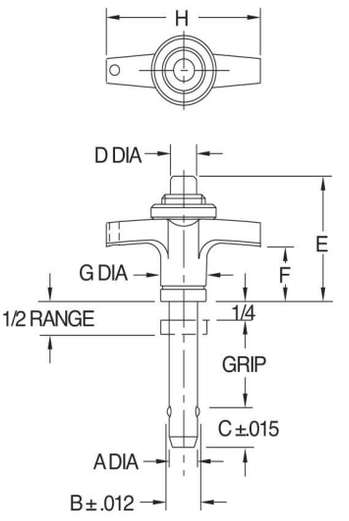
Knob Handle



ABPK



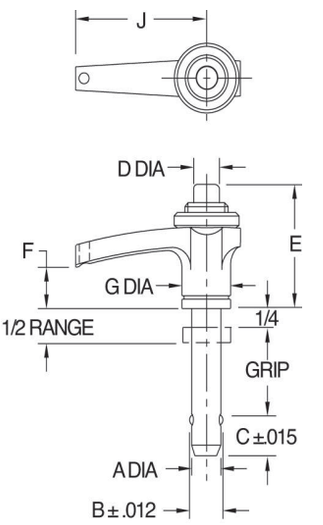
T Handle



ABPT



L Handle



ABPL

INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E	F	G DIA	H	J	K	L	M	N
CL-4-ABPx-x.xx-S	1/4	.2485/.2470	.290	.275	.22	1.51	1.06	.75	2.25	1.87	.88	.58	1.75	.38
CL-5-ABPx-x.xx-S	5/16	.3110/.3095	.375	.315		1.45								
CL-6-ABPx-x.xx-S	3/8	.3735/.3720	.438	.350	.27	1.48	1.06	.93	3.00	2.50	.88	.63	2.12	.44
CL-7-ABPx-x.xx-S	7/16	.4360/.4345	.508	.365										
CL-8-ABPx-x.xx-S	1/2	.4985/.4970	.592	.445	.39	1.55	1.06	.93	3.00	2.50	1.00	.55	2.12	.44
CL-9-ABPx-x.xx-S	9/16	.5610/.5595	.666	.495										
CL-10-ABPx-x.xx-S	5/8	.6235/.6220	.750	.565	.50	2.07	1.25	1.31	3.50	2.87	1.25	1.13	2.75	.50
CL-12-ABPx-x.xx-S	3/4	.7485/.7470	.886	.655										
CL-14-ABPx-x.xx-S	7/8	.8735/.8720	1.044	.745	.71	2.34	1.62	1.50	4.30	4.00	1.62	1.00	4.00	.75
CL-16-ABPx-x.xx-S	1	.9985/.9970	1.217	.875										

METRIC

CLM-6-ABPx-xx-S	6mm	.2346/.2331	.278	.275	.22	1.51	1.06	.75	2.25	1.87	.88	.65	1.75	.38
CLM-8-ABPx-xx-S	8mm	.3134/.3118	.371	.315		1.45						.75		
CLM-10-ABPx-xx-S	10mm	.3921/.3906	.469	.350	.27	1.48	1.06	.93	3.00	2.50	.88	.72	2.12	.44
CLM-12-ABPx-xx-S	12mm	.4709/.4693	.567	.445							1.00	.73	2.12.	.44
CLM-16-ABPx-xx-S	16mm	.6283/.6268	.748	.565	.50	2.07	1.25	1.31	3.50	2.87	1.25	1.13	2.75	.50
CLM-20-ABPx-xx-S	20mm	.7858/.7843	.948	.795							2.00	1.00		

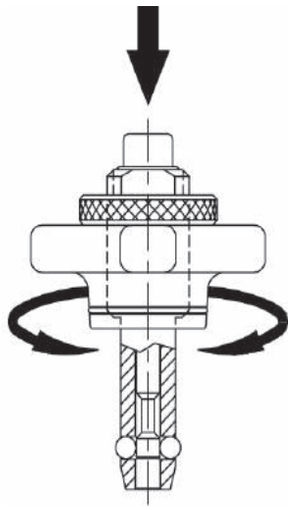
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ADJUSTABLE BALL LOCK PINS

SHANK: 17-4PH STAINLESS STEEL, HEAT TREATED RC 40 MIN, PASSIVATED;
SPINDLE: 17-4PH STAINLESS STEEL, PASSIVATED;
T & L HANDLE: ALUMINUM ALLOY, BLACK FINISH; KNOB HANDLE: 319 ALUMINUM ALLOY;
HEAD & LOCKNUT: 300-SERIES STAINLESS STEEL, PASSIVATED; BUTTON: ALUMINUM ALLOY, ANODIZED;
SPRING: 302 STAINLESS STEEL; BALLS: 440C STAINLESS STEEL

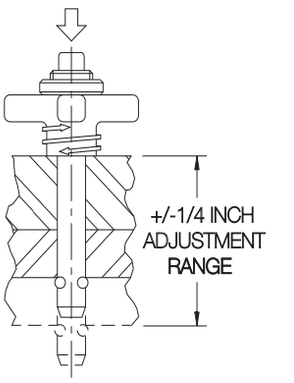


Adjustable Ball Lock Pins can be used for clamping, or simply to provide a variable grip length.

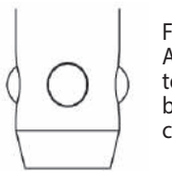
These Ball Lock Pins have an adjustable grip length. They can be used for clamping, or simply to provide a variable grip length. The threaded handle turns to provide a +/- 1/4" clamping range or adjustment range. When used just for variable grip length (not for clamping), the handle can be secured with the supplied knurled locknut. These single-acting pins are manufactured with four balls as standard, instead of two, for more-distributed ball-pullout force in clamping applications. Available in stainless steel only.

Choice of three handle styles: Knob, T, and L. Standard shank diameters from 1/4 to 1" (6 to 20mm in metric), each in a choice of many standard grip lengths. Available from stock only in the standard grip lengths listed below. Other grip lengths are available as specials (extra charge and longer delivery time).

To order pins with a standard Cable Assembly attached (#2 cable size, 12" long, with a terminal at the free end for a #10 or M5 attachment screw), add "-C" to the part number:
CL-4-ABPK-1.50-S-C



Grip length adjusts +/- 1/4" from nominal.



Four balls are standard on Adjustable Ball Lock Pins, to provide more distributed ball-pullout force in clamping applications.

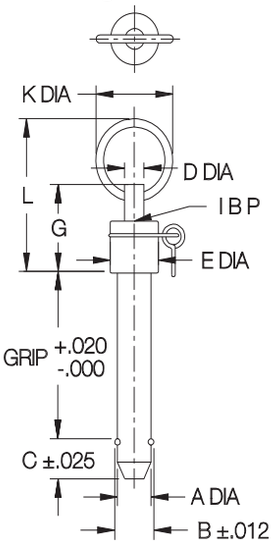
STOCK GRIP LENGTHS (INCH)

| PART NO. | NOMINAL SHANK DIA | GRIP LENGTH (INCHES) | | |

DOUBLE-ACTING BALL LOCK PINS



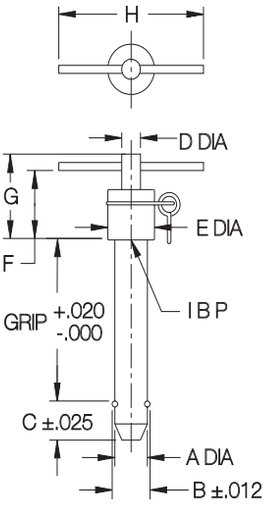
Ring Handle



BPDR



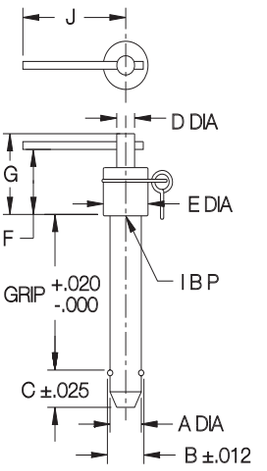
T Handle



BPDT



L Handle



BPDL

INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E DIA	F	G	H	J	K DIA	L	M
CL-3-BPDx-x.xx-S	3/16 (#10)	.1885/.1870	.219	.385	.19	7/16	.86	1.02	1-1/2	1-1/4	1	1.86	.12
CL-4-BPDx-x.xx-S	1/4	.2485/.2470	.290										.12
CL-5-BPDx-x.xx-S	5/16	.3110/.3095	.375	.415	.25	1/2	.86	1.06	1-15/16	1-7/16			.14
CL-6-BPDx-x.xx-S	3/8	.3735/.3720	.438	.485		5/8							.15
CL-7-BPDx-x.xx-S	7/16	.4360/.4345	.508										.16
CL-8-BPDx-x.xx-S	1/2	.4985/.4970	.592	.565	.31	11/16	.97	1.24	2-3/16	1-19/32		1.97	.18
CL-9-BPDx-x.xx-S	9/16	.5610/.5595	.666	.635									.18
CL-10-BPDx-x.xx-S	5/8	.6235/.6220	.750	.725	.43	13/16	1.14	1.44	2-7/16	1-3/4	1-5/16	2.45	.26
CL-12-BPDx-x.xx-S	3/4	.7485/.7470	.886	.765		15/16	1.13	1.43				2.44	.29
CL-14-BPDx-x.xx-S	7/8	.8735/.8720	1.044	.925	.56	1-1/8	1.29	1.59	2-25/32	2-3/16		2.62	.28
CL-16-BPDx-x.xx-S	1	.9985/.9970	1.217	1.075		1-1/4	1.47	1.77				2.79	.30

METRIC

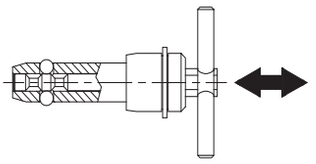
CLM-5-BPDx-xx-S	5mm	.1954/.1939	.212	.385	.19	7/16	.86	1.02	1-1/2	1-1/4	1	1.86	.12
CLM-6-BPDx-xx-S	6mm	.2347/.2332	.278										.12
CLM-8-BPDx-xx-S	8mm	.3135/.3120	.371	.415	.25	1/2							.14
CLM-10-BPDx-xx-S	10mm	.3922/.3907	.469	.485		5/8	.86	1.06	1-15/16	1-7/16			.15
CLM-12-BPDx-xx-S	12mm	.4709/.4694	.567	.565	.31	11/16	.97	1.24	2-3/16	1-19/32		1.97	.18
CLM-16-BPDx-xx-S	16mm	.6284/.6269	.748	.725	.43	13/16	1.14	1.44	2-7/16	1-3/4	1-5/16	2.45	.26
CLM-20-BPDx-xx-S	20mm	.7859/.7844	.948	.925	.56	1-1/8	1.29	1.59	2-25/32	2-3/16		2.62	.28

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DOUBLE-ACTING BALL LOCK PINS

SHANK: 17-4PH STAINLESS STEEL, HEAT TREATED RC 40 MIN, PASSIVATED
SPINDLE: 17-4PH STAINLESS STEEL, PASSIVATED
HEAD, BUTTON & HANDLE: 300-SERIES STAINLESS STEEL, PASSIVATED
SPRING & RING: 302 STAINLESS STEEL
BALLS: 440C STAINLESS STEEL

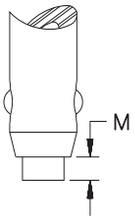


Similar to a single-acting pin, except the center spindle has two grooves instead of one, to release the ball by either pushing or pulling. Pushing on the handle releases the balls and inserts the pin in one motion. Pulling on the handle releases the balls and removes the pin in one motion. Available in steel or stainless steel. Choice of three handle styles: T, L, and Ring. Standard shank diameters from 3/16 to 1" (5 to 20mm in metric). Any grip length up to 6" (150mm in metric) is available as a standard, at no extra charge. Available in stainless steel only.

Ordering Example (INCH):

CL — 5 — BPDT — 2.50 — S — D — 4BALL — C

- 5: Diameter (16ths of an inch)
- BPDT: Handle type (R, T, L)
- 2.50: Grip length (inches)
- D: Add -D for drive-out option
- 4BALL: Add for 4 balls (2 are standard)
- C: Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard



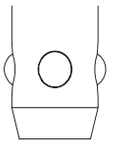
Drive-Out Option

Double-acting Ball Lock Pins are available with a "drive-out" option, where the center spindle extends slightly beyond the shank end (see M dimension). This allows removing a pin under slight shear load by tapping the shank end with a hammer (releasing the balls at the same time).

Ordering Example (METRIC):

CLM — 8 — BPDT — 50 — S — D — 4BALL — C

- CLM: Add M for metric
- 8: Diameter (mm)
- BPDT: Handle type (R, T, L)
- 50: Grip length (mm)
- D: Add -D for drive-out option
- 4BALL: Add for 4 balls (2 are standard)
- C: Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard



4-Ball Option

Ball Lock Pins are optionally available in stainless steel instead of alloy steel for greater corrosion resistance. Pins are also available with four balls instead of two, as specials, for additional pull-out strength and more distributed ball-contact force.



Optional Cable

The optional attached Cable Assembly (-C) is 12" long (part no. CL-82-KA-12.0 if ordered separately), while the optional attached Nylon Lanyard (-NL) is 10" long (part no. CL-1-NL-10 if ordered separately). Both have an eyelet at the free end for a #10 or M5 attachment screw.

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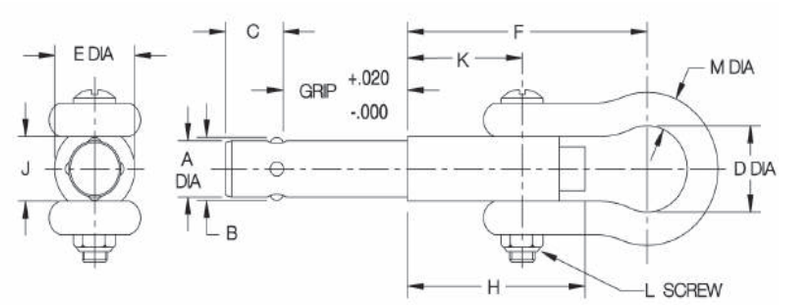
LIFTING PINS

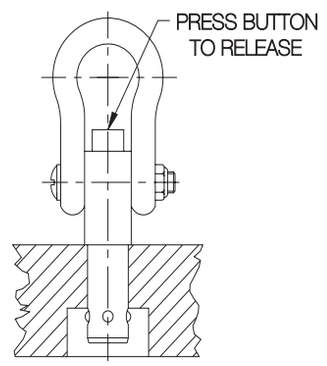
SHANK: 17-4PH STAINLESS STEEL, HEAT TREATED RC 40 MIN; SPINDLE: 17-4PH STAINLESS STEEL;
SHACKLE: FORGED STEEL PER RR-C271, ZINC PLATED CLEAR CHROMATE; BUTTON: 303 STAINLESS STEEL;
CAP SCREW, NUT, AND BUSHING: 300-SERIES STAINLESS STEEL; SPRING: 302 STAINLESS STEEL; BALLS: 440C STAINLESS STEEL



Stainless Steel

A single-acting ball lock pin with a solid, one-piece body and four balls for high tension loads. Sturdy forged shackle for heavy lifting. Shank diameters from 1/4 to 1" are available, in several standard lengths. **INFO+**: See safety precautions on page 74.

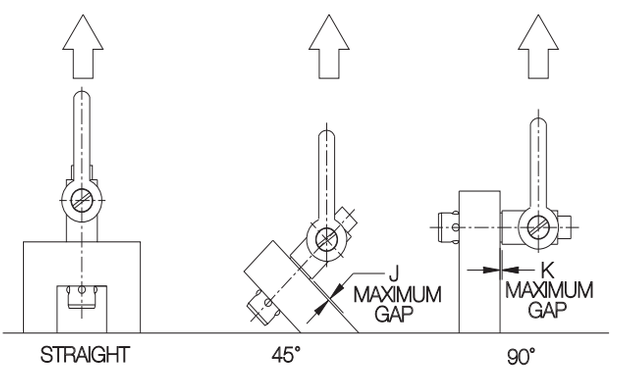




TYPICAL INSTALLATION

STAINLESS STEEL (INCH)

PART NO.	A DIA	GRIP	B	C	D DIA	E DIA	F	H	J	K	L	M DIA
CL-4-LFP-0.25-S	1/4 .2470/.2485	0.25	.287	.333	9/16	9/16	2.45	1.50	1/2	7/8	M6	3/16
CL-4-LFP-0.50-S		0.50										
CL-4-LFP-1.00-S		1.00										
CL-4-LFP-1.50-S		1.50										
CL-4-LFP-2.00-S		2.00										
CL-6-LFP-0.25-S	3/8 .3720/.3735	0.25	.438	.425	11/16	3/4	2.85	1.60	9/16	15/16	5/16-18	1/4
CL-6-LFP-0.50-S		0.50										
CL-6-LFP-1.00-S		1.00										
CL-6-LFP-1.50-S		1.50										
CL-6-LFP-2.00-S		2.00										
CL-6-LFP-3.00-S		3.00										
CL-8-LFP-0.50-S	1/2 .4970/.4985	0.50	.593	.519	13/16	13/16	3.15	1.80	11/16	1	3/8-16	5/16
CL-8-LFP-1.00-S		1.00										
CL-8-LFP-1.50-S		1.50										
CL-8-LFP-2.00-S		2.00										
CL-8-LFP-3.00-S		3.00										
CL-12-LFP-0.50-S	3/4 .7470/.7485	0.50	.887	.707	1-1/8	1-1/8	4.05	2.20	15/16	1-1/4	1/2-13	7/16
CL-12-LFP-1.00-S		1.00										
CL-12-LFP-2.00-S		2.00										
CL-12-LFP-3.00-S		3.00										
CL-16-LFP-0.50-S	1 .9970/.9985	0.50	1.217	.957	1-1/4	1-3/8	4.55	2.75	1-1/8	1-1/2	M8	1/2
CL-16-LFP-1.00-S		1.00										
CL-16-LFP-2.00-S		2.00										



TECHNICAL DATA

PART NO.	LOAD CAPACITY (LBS)*			J	K	RECOMMENDED HOLE DIA	
	STRAIGHT	45°	90°	(45°)	(90°)	MAX	MIN
CL-4-LFP-x.xx-S	210	170	120	.031	.037	.254	.250
CL-6-LFP-x.xx-S	520	520	350	.036	.042	.379	.375
CL-8-LFP-x.xx-S	980	900	770			.505	.500
CL-12-LFP-x.xx-S	2200	2200	2000	.041	.047	.757	.750
CL-16-LFP-x.xx-S	2900	2800	2500	.046	.052	1.010	1.000

* 5:1 Safety factor, based on the average failing load of test specimens. See above for allowable installation-hole tolerances. Straight pull capacity assumes pin is installed in a hardened tool steel plate or bushing. Use standard lifting hook so that button is not depressed while lifting.

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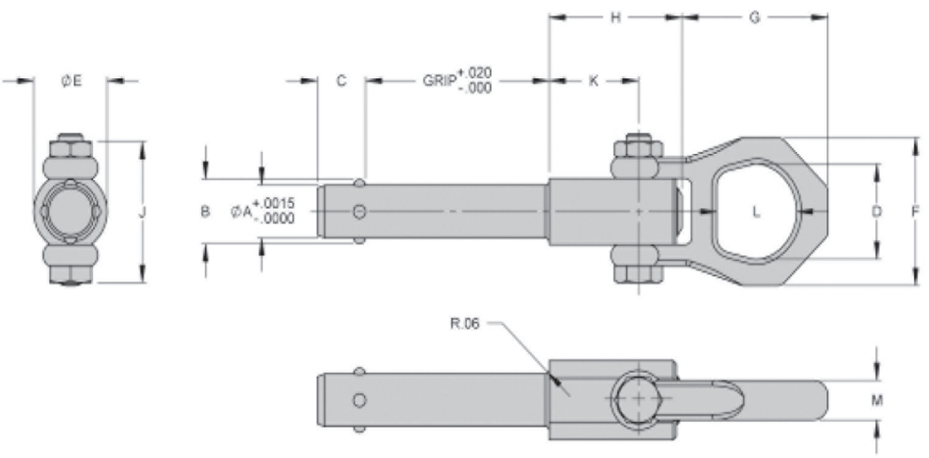
LIFTING PINS

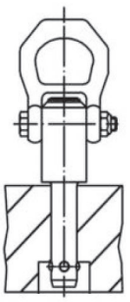
SHANK: ALLOY STEEL, HEAT TREATED, MANGANESE PHOSPHATE FINISH; SPINDLE: ALLOY STEEL, MANGANESE PHOSPHATE FINISH; SHACKLE: ALLOY STEEL, HEAT TREATED, MANGANESE PHOSPHATE FINISH; BUTTON: ALUMINUM ALLOY, RED ANODIZED; CAP SCREW, NUT, AND BUSHING: STEEL, ZINC PLATED CLEAR CHROMATE; SPRING: STAINLESS STEEL; BALLS: 440C STAINLESS STEEL



Alloy Steel

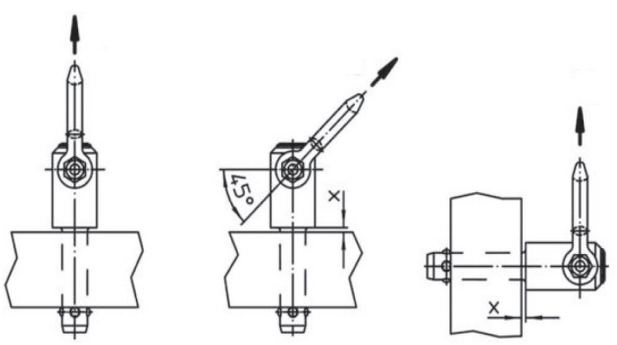
A single-acting ball lock pin with a solid, one-piece body and four balls for high tension loads. Positive locking until released by pushing the button. Sturdy forged shackle for heavy lifting. Manganese phosphate finish provides excellent lubricity and corrosion resistance. **INFO+**: See safety precautions on page 74.





ALLOY STEEL (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	GRIP LENGTH	B	C	D	E DIA	F	G	H	J	K	L	M
CL-4-LFPM-0.50	1/4	.2470/.2485	0.50	.29	.33	1.18	0.85	1.93	1.94	1.50	2.06	1.01	1.06	0.37
CL-4-LFPM-1.00			1.00											
CL-4-LFPM-1.50			1.50											
CL-6-LFPM-0.50	3/8	.3720/.3735	0.50	.44	.40									
CL-6-LFPM-1.00			1.00											
CL-6-LFPM-1.50			1.50											
CL-6-LFPM-2.00			2.00											
CL-8-LFPM-1.50	1/2	.4970/.4985	1.50	.59	.44									
CL-8-LFPM-2.00			2.00											
CL-8-LFPM-3.00			3.00											



Straight 45° 90°

TECHNICAL DATA

PART NO.	LOAD CAPACITY (LBS)* STRAIGHT	45°	90°	X MIN	X MAX	RECOMMENDED HOLE DIA MAX	MIN
CL-4-LFPM-X.XX	210	170	110	.06	.20	.254	.250
CL-6-LFPM-X.XX	600	540	470		.39	.379	.375
CL-8-LFPM-X.XX	790	630	630		.59	.505	.500

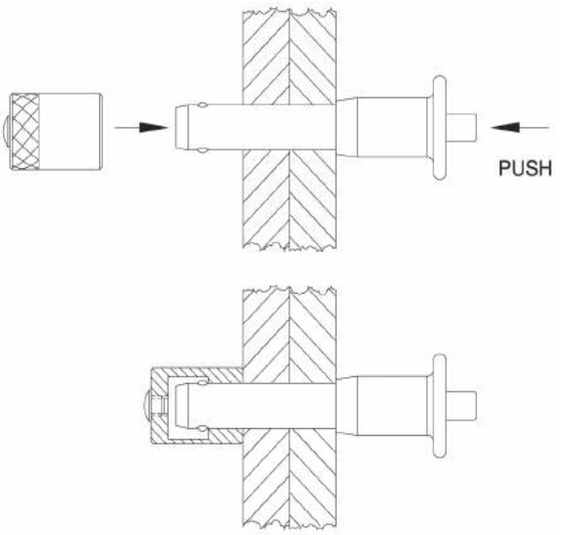
* 5:1 Safety factor, based on the average failing load of test specimens. See above for allowable installation-hole tolerances. Straight pull capacity assumes pin is installed in a hardened tool steel plate or bushing. Use standard lifting hook so that button is not depressed while lifting.

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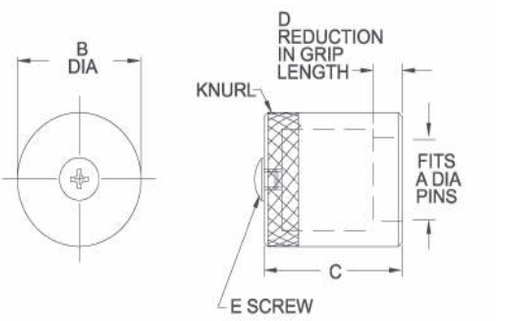
BALL LOCK RECEIVER CAPS

300+ SERIES STAINLESS STEEL, PASSIVATED





Receiver Caps are ideal for securing Ball Lock Pins used in clevis applications, especially when the through-hole has excess clearance. The Receiver Cap's inside diameter fits the Ball Lock Pin exactly, and is stepped to provide a perfect locking surface for the balls. Available to fit Ball Lock Pin diameters from 3/16 to 1" (5 to 20mm in metric). Made of 300-series stainless steel. Please note, using a Receiver Cap reduces the Ball Lock Pin's effective grip length slightly (see D dimension).





Receiver Caps are tapped to allow fastening the eyelet end of a standard Ball Lock Pin Cable Assembly (12" long) or Nylon Lanyard (10" long), and include a fastening screw.

INCH

PART NO.	A DIA	B DIA	C	D	E
CL-3-BLR-S	3/16 (#10)	.50	.72	1/4	#10-32
CL-4-BLR-S	1/4	.50	.81		
CL-5-BLR-S	5/16	.63	.81		
CL-6-BLR-S	3/8	.75	1.16	1/2	
CL-7-BLR-S	7/16	.75	1.16		
CL-8-BLR-S	1/2	.88	1.25		
CL-9-BLR-S	9/16	.88	1.25		
CL-10-BLR-S	5/8	1.00	1.31		
CL-12-BLR-S	3/5	1.25	1.45		
CL-14-BLR-S	7/8	1.50	1.48		
CL-16-BLR-S	1	1.50	1.69		

METRIC

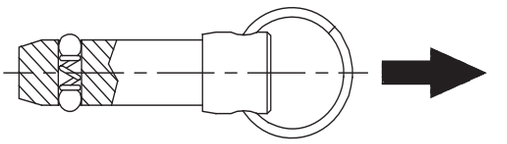
PART NO.	A DIA	B DIA	C	D	E
CLM-5-BLR-S	5mm	.50	.93	.39 (10mm)	M5
CLM-6-BLR-S	6mm	.50	.95		
CLM-8-BLR-S	8mm	.63	1.00		
CLM-10-BLR-S	10mm	.75	1.03		
CLM-12-BLR-S	12mm	.88	1.13		
CLM-16-BLR-S	16mm	1.00	1.25		
CLM-20-BLR-S	20mm	1.25	1.50		

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DETENT PINS

SHANK & HEAD: 300-SERIES STAINLESS STEEL, PASSIVATED; SPRING & RING: 302 STAINLESS STEEL; BALLS: 440C STAINLESS STEEL





Solid alignment pin with spring-loaded locking balls (not positive locking like a Ball Lock Pin). Simply push pin to insert, and pull to remove. Available in steel or stainless steel. Standard shank diameters from 3/16 to 1" (6 to 20mm in metric). Note: 3/16-diameter pins have one ball, instead of two, due to their small size. Any grip length up to 6" (150mm in metric) is available as a standard, at no extra charge. Available from stock in many standard grip lengths, or quickly made to order in custom lengths and diameters.

Optional Cable

The optional attached Cable Assembly (-C) is 12" long (part no. CL-82-KA-12.0 if ordered separately), while the optional attached Nylon Lanyard (-NL) is 10" long (part no. CL-1-NL-10 if ordered separately). Both have an eyelet at the free end for a #10 or M5 attachment screw.

Ordering Example (INCH):

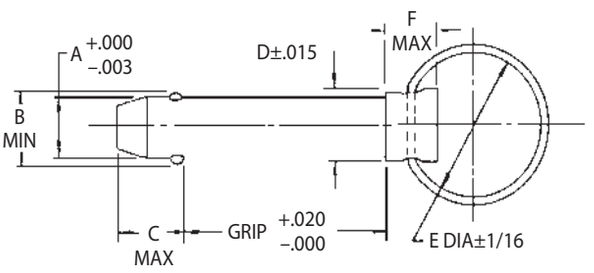
CL - 4 - DEP - 1.50 - S - C

- 4 — Diameter (16ths of an inch)
- 1.50 — Grip length (inches)
- S — Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard

Ordering Example (Metric):

CLM - 6 - DEP - 50 - S - C

- CLM — Add M for metric
- 6 — Diameter (mm)
- 50 — Grip length (mm)
- S — Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard



INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E DIA	F	STOCK GRIP LENGTH (INCHES) 0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	3.00	3.50	4.00
CL-3-DEP-x.xx-S	3/16(#10)	.1880	.217	.250	.375	1.00	.562	•	•	•	•	•							
CL-4-DEP-x.xx-S	1/4	.2480	.280	.344				•	•	•	•	•	•	•	•	•	•		
CL-5-DEP-x.xx-S	5/16	.3105	.360	.359	.438							•		•		•			
CL-6-DEP-x.xx-S	3/8	.3730	.430	.390	.500				•	•	•	•		•		•	•		
CL-8-DEP-x.xx-S	1/2	.4980	.570	.516	.625					•		•		•		•		•	•
CL-10-DEP-x.xx-S	5/8	.6230	.720	.672	.750	1.50													
CL-12-DEP-x.xx-S	3/4	.7480	.860	.750	.875	2.00													
CL-16-DEP-x.xx-S	1	.9980	1.16	.984	1.125														

METRIC

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	D DIA	E DIA	F	STOCK GRIP LENGTH (mm) 15	20	25	30	40	50
CLM-6-DEP-x.xx-S	6mm	.2342	.266	.344	.375	1.00	.562	•	•			•	•
CLM-8-DEP-x.xx-S	8mm	.3130	.363	.359	.438						•	•	•
CLM-10-DEP-x.xx-S	10mm	.3917	.451	.390	.500				•	•	•	•	•
CLM-12-DEP-x.xx-S	12mm	.4704	.540	.516	.563								•

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MARINE DETENT PINS

SHANK: 316 STAINLESS STEEL
RING: 316 OR 300-SERIES STAINLESS STEEL
SPRING & BALLS: 316 STAINLESS STEEL

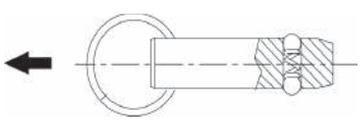


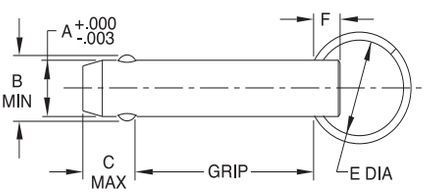
Marine Detent Pins are made of 316 stainless steel for extra corrosion resistance. Economical quick-release alignment pin with a solid shank and spring-loaded locking balls. This type of Detent Pin has a ring instead of a solid shoulder, for applications where exact grip length is not important. Locking balls hold the pin in place by spring force (not positive locking like a Ball Lock Pin). Simply push the pin to insert, and pull to remove. Available in standard pin diameters from 3/16 to 1/2", in stainless steel only. Note: 3/16" pins have only one locking ball instead of two due to their small size. Available from stock in many standard grip lengths, with other grip lengths available as specials. Optionally available with an attached Cable Assembly (-C) or an attached Nylon Lanyard (-NL).

Ordering Example (INCH):

CL - 4 - MDP - 1.50 - S - C

- 4 — Diameter (16ths of an inch)
- 1.50 — Grip length (inches)
- C — Add -C for attached Cable Assembly or – NL for attached Nylon Lanyard





DIMENSIONS (INCH)

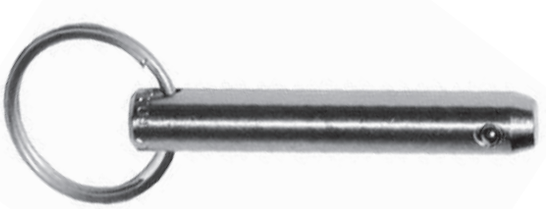
PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C	E DIA	F DIA
CL-3-MDP-x.xx-S	3/16 (#10)	.1880	.200	.329	1.00	.25
CL-4-MDP-x.xx-S	1/4	.2480	.280	.344		
CL-5-MDP-x.xx-S	5/16	.3105	.360	.359		
CL-6-MDP-x.xx-S	3/8	.3730	.430	.390		
CL-8-MDP-x.xx-S	1/2	.4980	.570	.516		

STANDARD STOCK GRIP LENGTHS (INCH)

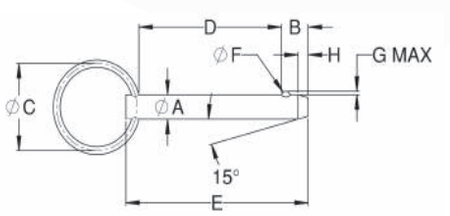
PART NO.	NOMINAL SHANK DIA	GRIP LENGTH (INCHES) 0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	3.00	3.50	4.00
CL-3-MDP-x.xx-S	3/16 (#10)	X	X	X	X	X	X	X		X			
CL-4-MDP-x.xx-S	1/4	X	X	X	X	X	X	X	X	X	X		
CL-5-MDP-x.xx-S	5/16		X	X	X	X	X	X		X	X	X	X
CL-6-MDP-x.xx-S	3/8		X	X	X	X	X	X	X	X	X	X	X
CL-8-MDP-x.xx-S	1/2			X	X	X	X	X		X	X	X	X

ECONOMY DETENT PINS

SHANK: MILD STEEL, ZINC PLATED CLEAR CHROMATE
RING: STEEL SPRING WIRE, ZINC PLATED CLEAR CHROMATE
SPRING & BALLS: STEEL



Economical quick-release alignment pin with a solid steel shank and one spring-loaded locking ball. This type of Detent Pin has a ring instead of a solid shoulder, for applications where exact grip length is not important. Locking ball holds the pin in place by spring force (not positive locking like a Ball Lock Pin). Simply push the pin to insert, and pull to remove. Available in standard pin diameters 3/16", 1/4", 5/16", and 1/2", in the standard grip lengths listed below. Optionally available with an attached Cable Assembly (-C) or an attached Nylon Lanyard (-NL). For other diameters and grip lengths, see above for Marine Detent Pins (the stainless steel version of this pin).



INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C DIA	D GRIP LENGTH	E	F DIA	G	H
CL-3-EDP-1.00	3/16	.1855 / .1880	.23	7/8	1.00	1.37	3/32	.028	.08
CL-4-EDP-1.25	1/4	.2480 / 2505	.28	1	1.25	1.67	1/8	.038	.09
CL-4-EDP-1.50					1.50	1.92			
CL-5-EDP-1.00	5/16	.3105 / .3130	.34	1	1.00	1.53	5/32	.047	.13
CL-8-EDP-1.50	1/2	.4980 / .5005	.52	1-1/4	1.50	2.25	1/4	.075	.17
CL-8-EDP-2.00					2.00	2.75			

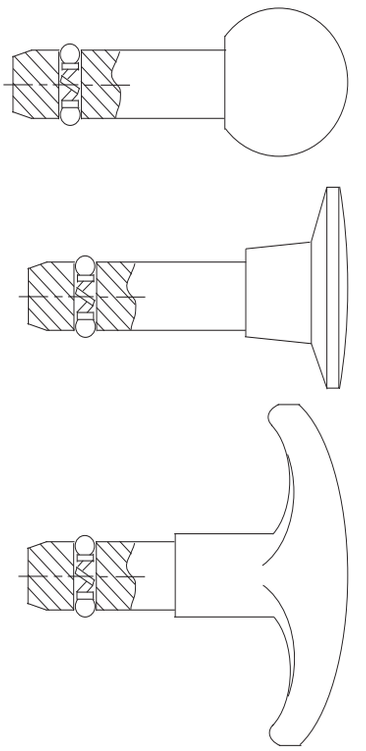
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THREADED DETENT PINS

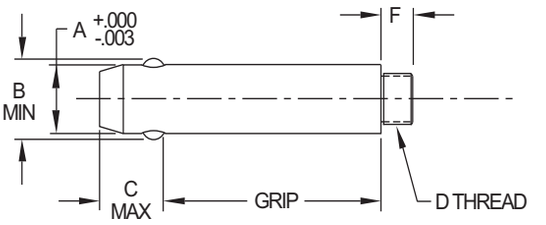
SHANK: 300-SERIES STAINLESS STEEL
SPRING: 17-7PH OR 302 STAINLESS STEEL
BALLS: 440C STAINLESS STEEL



Threaded Detent Pins are solid alignment pins with a ground shank and a threaded end for a knob handle. Two locking balls hold the pin in place by spring force. Simply push to insert, and pull to remove. The threaded end accepts virtually any type of knob handle (order separately — available in steel, stainless steel, and several different plastics). Knob handles can be permanently secured with thread-locking adhesive if desired. Threaded Detent Pins are available in stainless steel only. Standard shank diameters from 3/16 to 1/2" (6 to 10mm in metric), each in a choice of many standard grip lengths. Note: 3/16-diameter pins have only one locking ball instead of two due to their small size. Available from stock only in the standard grip lengths listed (other grip lengths available as specials).



INFO+: For a wide selection of knob handles to fit these Threaded Detent Pins, see pages 152-159.



INCH

PART NO.	A DIA NOMINAL	A DIA ACTUAL	GRIP LENGTH	B	C	D	F
CL-3-TDP-0.50-S	3/16(#10)	.1880	.50	.200	.250	#8-32	1/4
CL-3-TDP-0.75-S			.75				
CL-3-TDP-1.00-S			1.00				
CL-3-TDP-1.25-S			1.25				
CL-3-TDP-1.50-S			1.50				
CL-3-TDP-1.75-S			1.75				
CL-3-TDP-2.00-S			2.00				
CL-4-TDP-0.50-S	1/4	.2480	0.50	.280	.344	#10-32	1/4
CL-4-TDP-0.75-S			0.75				
CL-4-TDP-1.00-S			1.00				
CL-4-TDP-1.25-S			1.25				
CL-4-TDP-1.50-S			1.50				
CL-4-TDP-1.75-S			1.75				
CL-4-TDP-2.00-S			2.00				
CL-4-TDP-2.50-S			2.50				
CL-4-TDP-3.00-S			3.00				
CL-5-TDP-0.75-S	5/16	.3105	0.75	.360	.359	1/4-20	3/8
CL-5-TDP-1.00-S			1.00				
CL-5-TDP-1.25-S			1.25				
CL-5-TDP-1.50-S			1.50				
CL-5-TDP-1.75-S			1.75				
CL-5-TDP-2.00-S			2.00				
CL-5-TDP-2.50-S			2.50				
CL-5-TDP-3.00-S			3.00				
CL-6-TDP-0.75-S	3/8	.3730	0.75	.430	.390	1/4-20	3/8
CL-6-TDP-1.00-S			1.00				
CL-6-TDP-1.25-S			1.25				
CL-6-TDP-1.50-S			1.50				
CL-6-TDP-1.75-S			1.75				
CL-6-TDP-2.00-S			2.00				
CL-6-TDP-2.50-S			2.50				
CL-6-TDP-3.00-S			3.00				
CL-6-TDP-3.50-S			3.50				
CL-6-TDP-4.00-S			4.00				
CL-8-TDP-1.00-S	1/2	.4980	1.00	.570	.516	3/8-16	1/2
CL-8-TDP-1.50-S			1.50				
CL-8-TDP-2.00-S			2.00				
CL-8-TDP-2.50-S			2.50				
CL-8-TDP-3.00-S			3.00				
CL-8-TDP-3.50-S			3.50				
CL-8-TDP-4.00-S			4.00				

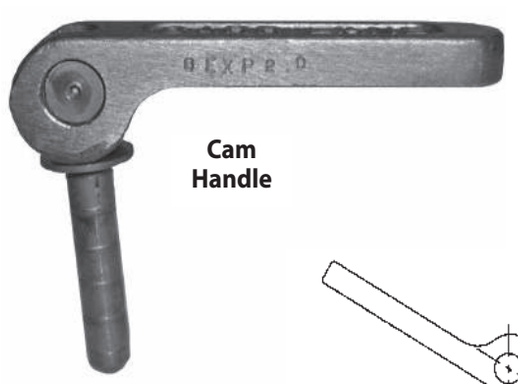
METRIC

PART NO.	A DIA NOMINAL	A DIA ACTUAL	GRIP LENGTH	B	C	D	F
CLM-6-TDP-15-S	6mm	.2342	15mm	.266	.344	M5	.24
CLM-6-TDP-20-S			20mm				
CLM-6-TDP-25-S			25mm				
CLM-6-TDP-30-S			30mm				
CLM-6-TDP-40-S			40mm				
CLM-6-TDP-50-S			50mm				
CLM-8-TDP-20-S	8mm	.3130	20mm	.363	.359	M6	.39
CLM-8-TDP-25-S			25mm				
CLM-8-TDP-30-S			30mm				
CLM-8-TDP-40-S			40mm				
CLM-8-TDP-50-S			50mm				
CLM-10-TDP-20-S	10mm	.3917	20mm	.451	.390	M8	.39
CLM-10-TDP-25-S			25mm				
CLM-10-TDP-30-S			30mm				
CLM-10-TDP-40-S			40mm				
CLM-10-TDP-50-S			50mm				

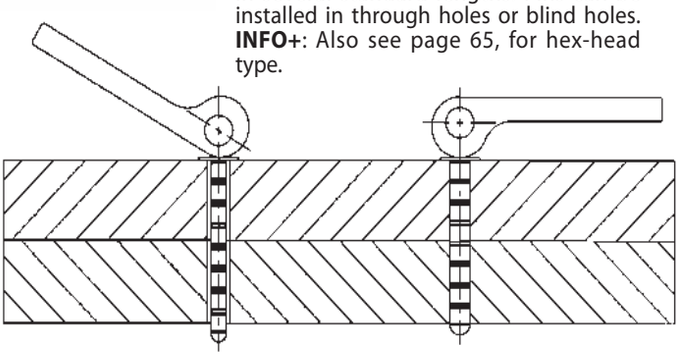
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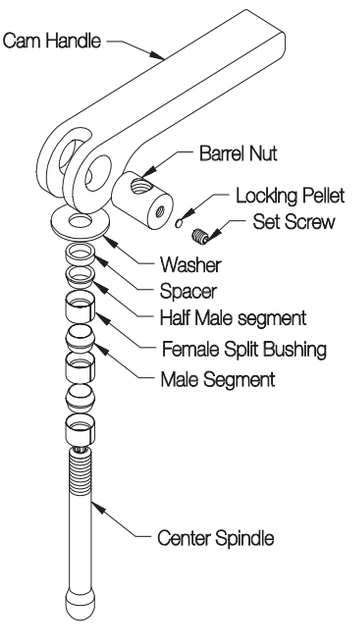
EXPANDING PINS

SPLIT BUSHINGS, MALE SEGMENTS, & SPACERS: 17-4PH STAINLESS STEEL, RC 40 MIN, PASSIVATED, DRY FILM LUBE
CENTER SPINDLE: 17-4PH STAINLESS STEEL, RC 36-40, PASSIVATED, DRY FILM LUBE
BARREL NUT & WASHER: 17-4PH STAINLESS STEEL, PASSIVATED, DRY FILM LUBE
HANDLE: ALUMINUM ALLOY, POWDER COATED

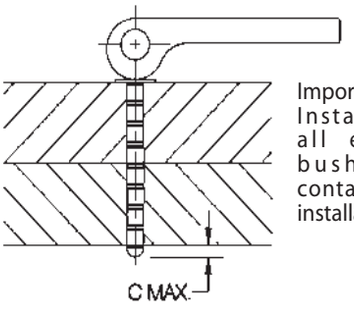


Precision alignment pin that expands up to .006 inches to tighten up hole clearance. The pin is an assembly of female split bushings separated by male segments, on a center spindle, that expands when drawn together. This assembly provides excellent shear strength, comparable to a solid pin. Diameters from 1/4 to 3/4" are available in several standard lengths. Pins can be installed in through holes or blind holes. **INFO+**: Also see page 65, for hex-head type.

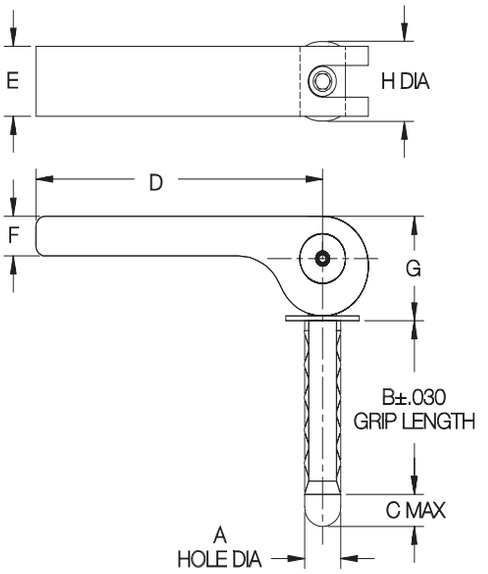




Moving the cam handle expands pin diameter up to .006 inches, to take up slack and secure the pin in place. If additional adjustment is required, remove set screw and turn the cam handle.



Important: Install so that all expanding bushings are contained in the installation hole.



CAM HANDLE

PART NO.	A DIA NOMINAL	A DIA MIN	A DIA MAX	B	C	D	E	F	G	H DIA	DOUBLE-SHEAR STRENGTH (LBS)*
CL-4-EXP-0.50	1/4	.250	.254	.50	1/4	2-3/8	1/2	5/16	.81	5/8	4,000
CL-4-EXP-0.75				.75							
CL-4-EXP-1.00				1.00							
CL-4-EXP-1.50				1.50							
CL-4-EXP-2.00				2.00							
CL-4-EXP-3.00				3.00							
CL-5-EXP-1.00	5/16	.312	.317	1.00	5/16	2-3/8	1	1/2	1.12	1	6,300
CL-5-EXP-2.00				2.00							
CL-5-EXP-3.00				3.00							
CL-6-EXP-1.00	3/8	.375	.380	1.00	3/8	4-1/2	1	1/2	1.12	1	9,000
CL-6-EXP-1.50				1.50							
CL-6-EXP-2.00				2.00							
CL-6-EXP-3.00				3.00							
CL-8-EXP-0.50	1/2	.500	.505	.50	1/2	4-1/2	1	1/2	1.12	1	16,100
CL-8-EXP-1.00				1.00							
CL-8-EXP-1.50				1.50							
CL-8-EXP-2.00				2.00							
CL-8-EXP-3.00				3.00							
CL-10-EXP-1.00	5/8	.625	.630	1.00	5/8	4-1/2	1	1/2	1.31	1	25,100
CL-10-EXP-1.50				1.50							
CL-10-EXP-2.00				2.00							
CL-10-EXP-3.00				3.00							
CL-12-EXP-2.00	3/4	.750	.757	2.00	3/4	6	1-1/4	3/4	2.09	1-1/4	36,200
CL-12-EXP-3.00				3.00							
CL-12-EXP-4.00				4.00							

* 2:1 Safety Factor

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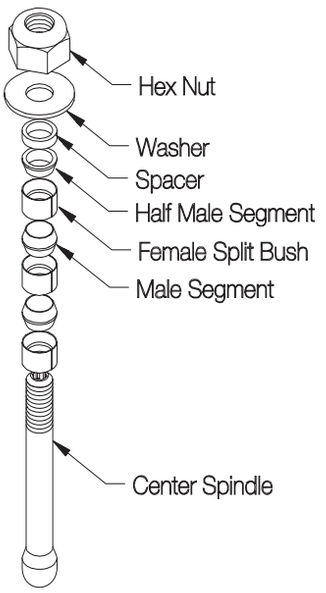
EXPANDING PINS

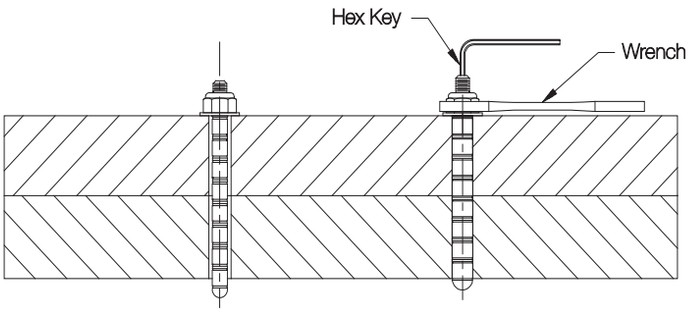
SPLIT BUSHINGS, MALE SEGMENTS, & SPACERS: 17-4PH STAINLESS STEEL, RC 40 MIN, PASSIVATED, DRY FILM LUBE
CENTER SPINDLE: 17-4PH STAINLESS STEEL, RC 36-40, PASSIVATED, DRY FILM LUBE
WASHER: 17-4PH STAINLESS STEEL, PASSIVATED, DRY FILM LUBE
HEX NUT: 17-4PH STAINLESS STEEL, WITH LOCKING ELEMENT



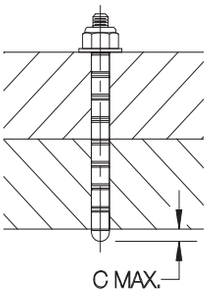
Hex Head

Precision alignment pin that expands up to .006 inches to tighten up hole clearance. The pin is an assembly of female split bushings separated by male segments, on a center spindle, that expands when drawn together. This assembly provides excellent shear strength, comparable to a solid pin. Diameters from 1/4 to 3/4" are available in several standard lengths. Pins can be installed in through holes or blind holes. **INFO+**: Also see page 64, for cam-handle type.

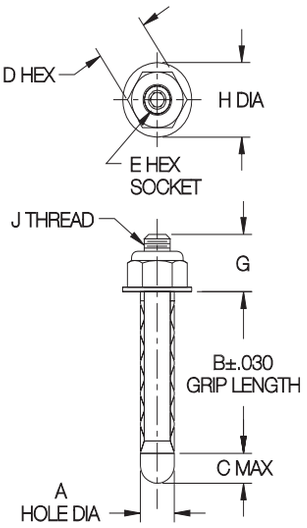




Tightening the hex nut with a wrench expands pin diameter up to .006 inches, to take up slack and secure the pin in place. Hold center spindle stationary with a hex key while tightening.



Important: Install pin so that all split bushings are contained in the installation hole.



HEX HEAD

PART NO.	A DIA NOMINAL	A DIA MIN	A DIA MAX	B	C	D	E	G	H DIA	J	DOUBLE-SHEAR STRENGTH (LBS)*	INSTALLATION TORQUE (FT-LBS)
CL-4-EXPH-0.50	1/4	.250	.254	.50	1/4	3/8	3/32	.39	.67	#10-32	4,000	3
CL-4-EXPH-0.75				.75								
CL-4-EXPH-1.00				1.00								
CL-4-EXPH-1.50				1.50								
CL-4-EXPH-2.00				2.00								
CL-4-EXPH-3.00				3.00								
CL-5-EXPH-1.00	5/16	.312	.317	1.00	5/16	3/8	3/32	.40	.67	#10-32	6,300	3
CL-5-EXPH-2.00				2.00								
CL-5-EXPH-3.00				3.00								
CL-6-EXPH-1.00	3/8	.375	.380	1.00	3/8	7/16	1/8	.49	.67	1/4-28	9,000	7.5
CL-6-EXPH-1.50				1.50								
CL-6-EXPH-2.00				2.00								
CL-6-EXPH-3.00				3.00								
CL-8-EXPH-0.50	1/2	.500	.505	.50	1/2	9/16	3/16	.71	.92	3/8-24	16,100	29
CL-8-EXPH-1.00				1.00								
CL-8-EXPH-1.50				1.50								
CL-8-EXPH-2.00				2.00								
CL-8-EXPH-3.00				3.00								
CL-10-EXPH-1.00	5/8	.625	.630	1.00	5/8	3/4	1/4	.90	1.22	1/2-20	25,100	83
CL-10-EXPH-1.50				1.50								
CL-10-EXPH-2.00				2.00								
CL-10-EXPH-3.00				3.00								
CL-12-EXPH-2.00	3/4	.750	.757	2.00	3/4	7/8	1/4	1.02	1.35	9/16-18	36,200	121
CL-12-EXPH-3.00				3.00								
CL-12-EXPH-4.00				4.00								

* 2:1 Safety Factor

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CABLE ASSEMBLIES

INFO+: SEE PAGES 69-70 FOR MATERIAL SPECIFICATIONS

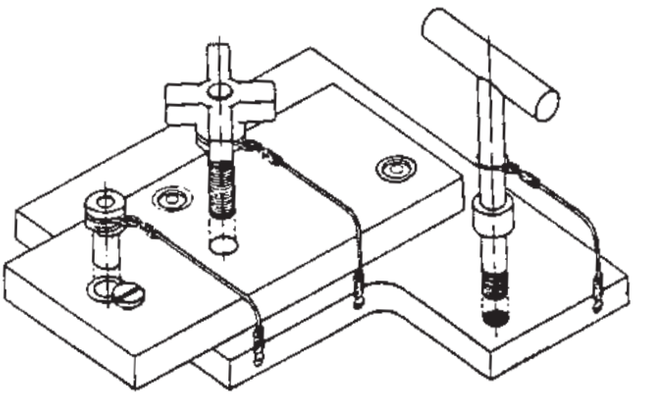


Cable Assemblies are ideal for attaching removable tooling components. High-strength stranded wire cable with a green nylon coating. These versatile attachment cables are available with various loops, Cable Rings, Terminals, and Cable Tabs (see page 61 for assembly drawings and example part numbers).

Cable Assemblies are available in four cable sizes, in steel or stainless steel (#1 cable is only available in stainless steel). Stainless Cable Assemblies with Cable Rings are furnished with stainless Cable Rings. Minimum assembly length is 3.0". Length tolerance is held to ± 1/4" up to 24" long. **INFO+**: See page 69-70 for dimensions and specifications of Ferrules, Cable Rings, Terminals, and Cable Tabs. Note: These Cable Assemblies should not be used for lifting and other high-tension applications.

To order Cable Assemblies with an uncrimped ferrule (for installation), add a suffix to the part number shown on the next page:

-L for uncrimped left end
-R for uncrimped right end
-LR for both ends uncrimped

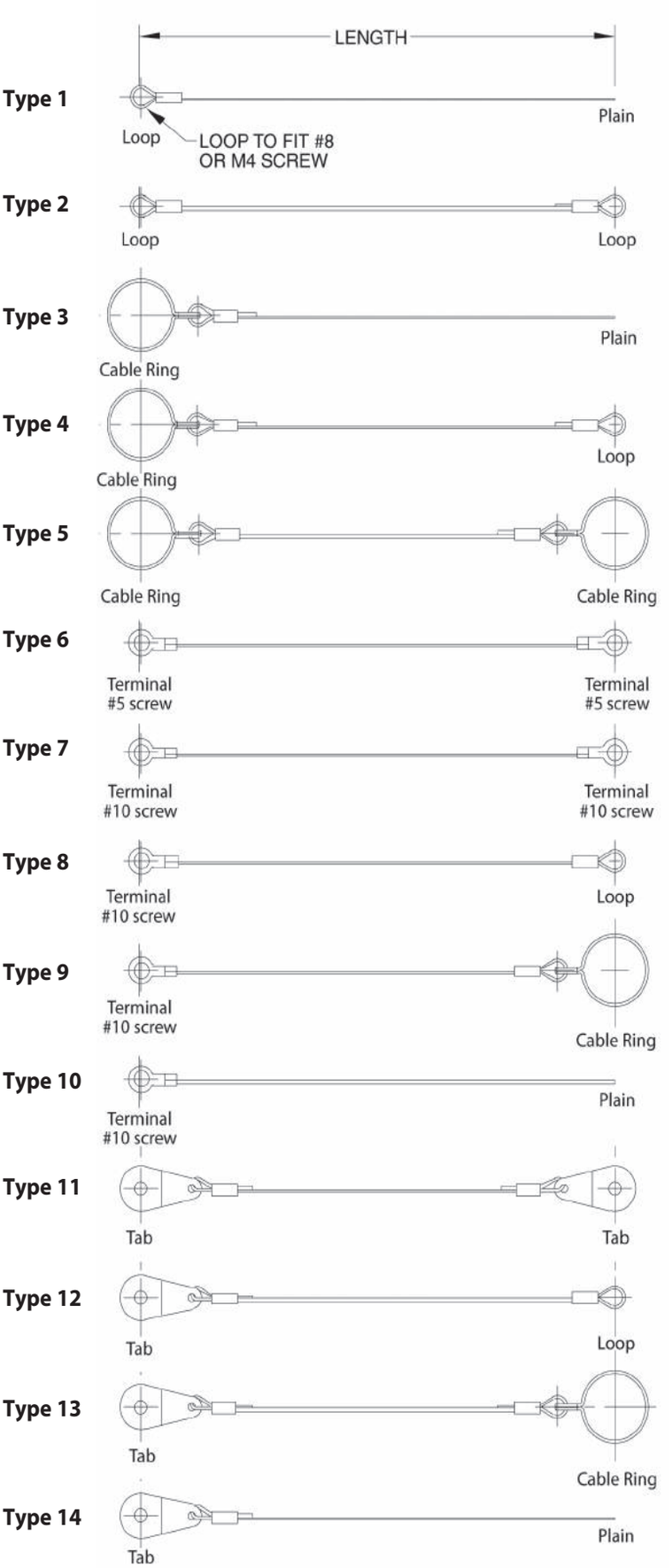




Cable Sizes

ASSEMBLY TYPE	LEFT END	RIGHT END	CABLE SIZES						
			1	2		3		4	
			STAINLESS	STEEL	STAINLESS	STEEL	STAINLESS	STEEL	STAINLESS
1	LOOP	PLAIN	CL-11-KA	CL-12-KA	CL-12-SKA	CL-13-KA	CL-13-SKA	CL-14-KA	CL-14-SKA
2	LOOP	LOOP	CL-21-KA	CL-22-KA	CL-22-SKA	CL-23-KA	CL-23-SKA	CL-24-KA	CL-24-SKA
3	CABLE RING	PLAIN	CL-31-KA	CL-32-KA	CL-32-SKA	CL-33-KA	CL-33-SKA	--	--
4	CABLE RING	LOOP	CL-41-KA	CL-42-KA	CL-42-SKA	CL-43-KA	CL-43-SKA	--	--
5	CABLE RING	CABLE RING	CL-51-KA	CL-52-KA	CL-52-SKA	CL-53-KA	CL-53-SKA	--	--
6	#5 TERMINAL	#5 TERMINAL	--	--	--	CL-63-KA	CL-63-SKA	--	--
7	#10 TERMINAL	#10 TERMINAL	--	CL-72-KA	CL-72-SKA	CL-73-KA	CL-73-SKA	--	--
8	#10 TERMINAL	LOOP	--	CL-82-KA	CL-82-SKA	--	--	--	--
9	#10 TERMINAL	CABLE RING	--	CL-92-KA	CL-92-SKA	--	--	--	--
10	#10 TERMINAL	PLAIN	--	CL-102-KA	CL-102-SKA	--	--	--	--
11	TAB	TAB	CL-111-KA	CL-112-KA	CL-112-SKA	CL-113-KA	CL-113-SKA	--	--
12	TAB	LOOP	CL-121-KA	CL-122-KA	CL-122-SKA	CL-123-KA	CL-123-SKA	--	--
13	TAB	CABLE RING	CL-131-KA	CL-132-KA	CL-132-SKA	CL-133-KA	CL-133-SKA	--	--
14	TAB	PLAIN	CL-141-KA	CL-142-KA	CL-142-SKA	CL-143-KA	CL-143-SKA	--	--

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CL-1 2 - KA -12.0
- Assembly Type (1)
- Cable Size (#2)
- Cable Length (12.0″)

CL -2 2 - KA-12.0
- Assembly Type (2)
- Cable Size (#2)
- Cable Length (12.0″)

CL- 3 2 -KA-12.0 -8
- Assembly Type (3)
- Cable Size (#2)
- Cable Length (12.0″)
- Cable Ring Dia in 16ths (CL-8-KR)

CL- 4 2 -KA-12.0- 8
- Assembly Type (4)
- Cable Size (#2)
- Cable Length (12.0″)
- Cable Ring Dia in 16ths (CL-8-KR)

CL- 5 2 -KA-12.0-8- 6
- Assembly Type (5)
- Cable Size (#2)
- Cable Length (12.0″)
- Left Cable Ring Dia in 16ths (CL-8-KR)
- Right Cable Ring Dia in 16ths (CL-6-KR)

CL-6 3 -KA-12.0
- Assembly Type (6)
- Cable Size (#3)
- Cable Length (12.0″)

CL- 7 2 - KA-12.0
- Assembly Type (7)
- Cable Size (#2)
- Cable Length (12.0″)

CL- 8 2 -KA-12.0
- Assembly Type (8)
- Cable Size (#2)
- Cable Length (12.0″)

CL- 9 2 - KA-12.0-8
- Assembly Type (9)
- Cable Size (#2)
- Cable Length (12.0″)
- Cable Ring Dia in 16ths (CL-8-KR)

CL- 10 2 -KA-12.0
- Assembly Type (10)
- Cable Size (#2)
- Cable Length (12.0″)

CL-11 2 -KA -12.0 - .194TABA -.281TABS
- Assembly Type (11)
- Cable Size (#2)
- Cable Length (12.0″)
- Left Cable Tab (CL-.194-TAB-A)
- Right Cable Tab (CL-.281-TAB-S)

CL- 12 2 -KA-12.0 - .194TABA
- Assembly Type (12)
- Cable Size (#2)
- Cable Length (12.0″)
- Cable Tab (CL-.194-TAB-A)

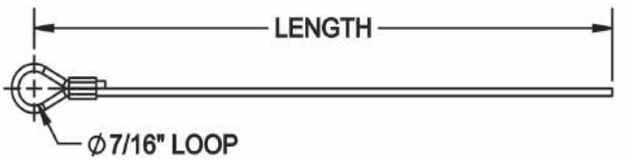
CL- 13 2 - KA-12.0 -.194TABA -8
- Assembly Type (13)
- Cable Size (#2)
- Cable Length (12.0″)
- Left Cable Tab (CL-.194-TAB-A)
- Right Cable Ring (CL-8-KR)

CL-14 2 - KA-12.0 -.194TABA
- Assembly Type (14)
- Cable Size (#2)
- Cable Length (12.0″)
- Cable Tab (CL-.194-TAB-A)

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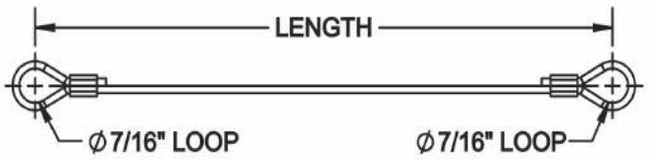
LOAD-RATED CABLE ASSEMBLIES

Type 1



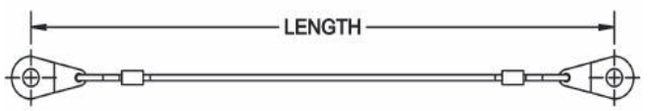
CL-1 2 - LKA -12.0
Assembly Type (1)
Cable Size (#2)
Cable Length (12.0")

Type 2



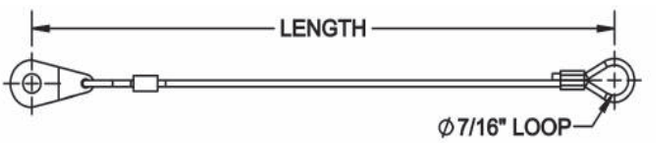
CL -2 2 - LKA-12.0
Assembly Type (2)
Cable Size (#2)
Cable Length (12.0")

Type 11



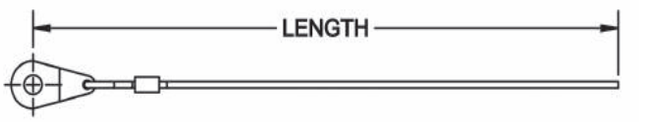
CL-11 2 -LKA -12.0 - .194TABA -.281TABS
Assembly Type (11)
Cable Size (#2)
Cable Length (12.0")
Left Cable Tab (CL-.194-TAB-A)
Right Cable Tab (CL-.281-TAB-S)

Type 12



CL- 12 2 -LKA-12.0 - .194TABA
Assembly Type (12)
Cable Size (#2)
Cable Length (12.0")
Cable Tab (CL-.194-TAB-A)

Type 14



CL-14 2 - LKA-12.0 -.194TABA
Assembly Type (14)
Cable Size (#2)
Cable Length (12.0")
Cable Tab (CL-.194-TAB-A)

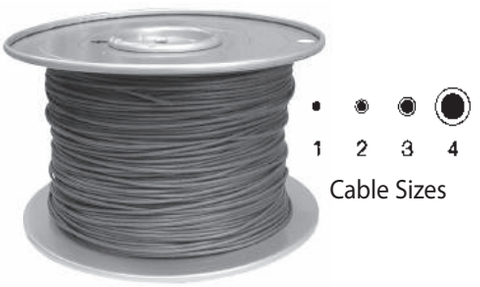
Load-Rated Cable Assemblies are ideal for applications with high pulling forces, where an extra-strong crimp is required. Please note that these cables are not designed for lifting applications, or where high impact forces occur. The high-strength stranded wire cable with a green nylon coating used for these assemblies is the same cable used for our standard cable assemblies. The difference is that Duplex Ferrules are used to achieve a stronger, precisely repeatable crimp. These ferrules require a specific crimping procedure, with a specific crimping tool and gauge to guarantee the assembly load rating **(INFO+**: see page 71 for crimping procedure). Load-Rated Cable Assemblies are available in two cable diameters, sizes #2 and #3.

BASIC PART NO.	CABLE SIZE (STEEL)	RATED LOAD (lbs)	ASSEMBLY TYPE	LEFT END	RIGHT END
CL-12-LKA	#2	100	1	LOOP	PLAIN
CL-22-LKA			2	LOOP	LOOP
CL-112-LKA			11	TAB	TAB
CL-122-LKA			12	TAB	LOOP
CL-142-LKA			14	TAB	PLAIN
CL-13-LKA	#3	175	1	LOOP	PLAIN
CL-23-LKA			2	LOOP	LOOP
CL-113-LKA			11	TAB	TAB
CL-123-LKA			12	TAB	LOOP
CL-143-LKA			14	TAB	PLAIN

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CABLE

GALVANIZED STEEL OR STAINLESS STEEL, NYLON COATED (GREEN)



High-strength stranded wire cable with a green nylon coating. Choice of four cable diameters. Cable size 1 is made of stainless steel. Sizes 2, 3, and 4 are available in either galvanized steel or stainless steel. Cable is available in cut pieces (inch or mm), in bulk lengths, (feet or meters, 10 ft/ 3m minimum), or in 1000-ft rolls. Cut pieces are held to a ±1/4" length tolerance up to 24" long. Examples:

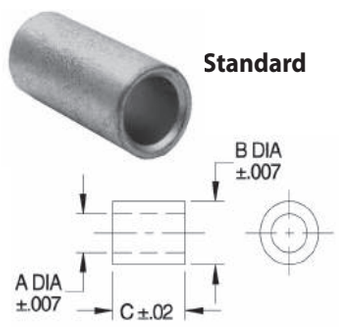
CL-2-C-12.0 (Cut piece, #2 cable, 12" long)

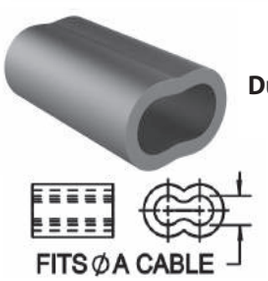


CABLE SIZE	MATERIAL	PART NO.	LENGTH	D DIA COATED	D DIA WIRE	CONSTRUCTION	BREAKING STRENGTH (LBS)
1	STAINLESS STEEL	CL-1-C-50FT	50 Feet	.044	.024	1x7	80
		CL-1-C-100FT	100 Feet				
		CL-1-C-250FT	250 Feet				
		CL-1-C-500FT	500 Feet				
		CL-1-C-1000FT	1000 Feet				
2	STEEL	CL-2-C-50FT	50 Feet	.062	.047	7x7	270
		CL-2-C-100FT	100 Feet				
		CL-2-C-250FT	250 Feet				
		CL-2-C-500FT	500 Feet				
		CL-2-C-1000FT	1000 Feet				
	STAINLESS STEEL	CL-2-SC-50FT	50 Feet				
		CL-2-SC-100FT	100 Feet				
		CL-2-SC-250FT	250 Feet				
		CL-2-SC-500FT	500 Feet				
		CL-2C-1000FT	1000 Feet				
3	STEEL	CL-3-C-50FT	50 Feet	.094	.062	7x7	480
		CL-3-C-100FT	100 Feet				
		CL-3-C-250FT	250 Feet				
		CL-3-C-500FT	500 Feet				
		CL-3-C-1000FT	1000 Feet				
	STAINLESS STEEL	CL-3-SC-50FT	50 Feet				
		CL-3-SC-100FT	100 Feet				
		CL-3-SC-250FT	250 Feet				
		CL-3-SC-500FT	500 Feet				
		CL-3-SC-1000FT	1000 Feet				
4	STEEL	CL-4-C-50FT	50 Feet	.187	.125	7x19	800
		CL-4-C-100FT	100 Feet				
		CL-4-C-250FT	250 Feet				
		CL-4-C-500FT	500 Feet				
		CL-4-C-1000FT	1000 Feet				
	STAINLESS STEEL	CL-4-SC-50FT	50 Feet				
		CL-4-SC-100FT	100 Feet				
		CL-4-SC-250FT	250 Feet				
		CL-4-SC-500FT	500 Feet				
		CL-4-SC-1000FT	1000 Feet				

FERRULES

COPPER, ELECTRO TIN PLATED





Ferrules are used to crimp a loop on the end of our nylon-coated cable. These standard round Ferrules are available in four diameters to fit our four standard cable sizes. An extra-long version is optionally available for #2 and #3 cable sizes, to allow double crimping. Ferrules may be slightly elliptical (partially crimped) at our option.

Duplex Ferrules are used exclusively to make our Load-Rated Cable Assemblies. These ferrules require a specific crimping procedure, with a specific crimping tool and gauge to guarantee the assembly load rating. Duplex Ferrules are available in two sizes, to fit #2 and #3 cable. **INFO+**: See page 68 for the five types of Load-Rated Cable Assemblies that can be made with these ferrules, and page 71 for the crimping procedure required.

STANDARD FERRULES

PART NO.	FITS CABLE	A	B	C
CL-1-F	SIZE 1	.094	.154	.315
CL-2-F	SIZE 2	.138	.213	.335
CL-4-F				.591
CL-3-F	SIZE 3	.185	.276	.374
CL-5-F				.827
CL-6-F	SIZE 4	.378	.520	1.260

DUPLEX FERRULES

PART NO.	FITS CABLE SIZE	FITS CABLE A DIA	B LENGTH
CL-2-DF	#2	.062	3/8
CL-3-DF	#3	.094	3/8

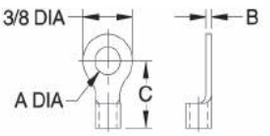
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TERMINALS

COPPER, ELECTRO TIN PLATED



Terminals are for crimping on our nylon-coated cable, to allow attaching the end with a screw. Available for #2 and #3 cable.



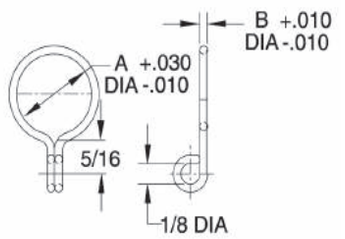
PART NO.	FITS CABLE	A DIA	A SCREW SIZE	B	C
CL-.194-TERM-2	SIZE 2	.21	#10 (or M5)	.03	15/32
CL-.129-TERM	SIZE 3	.13	#5 (or M3)	.04	19/32
CL-.194-TERM		.21	#10 (or M5)	.04	

CABLE RINGS

SPRING STEEL WIRE, BLACK OXIDE FINISH



Cable Rings allow attaching Cable Assemblies to a diameter or radial groove. Can be used with cable sizes #1, #2, and #3. Available in steel or stainless steel.



PART NO. STEEL	PART NO. STAINLESS	A DIA	B WIRE DIA STEEL	B WIRE DIA STAINLESS
CL-2-KR	CL-2-SKR	1/8 (also 3mm)	.045	.062
CL-3-KR	CL-3-SKR	3/16 (also 4&5mm)		
CL-4-KR	CL-4-SKR	1/4 (also 6&7mm)		
CL-5-KR	CL-5-SKR	5/16 (also 8mm)		
CL-6-KR	CL-6-SKR	3/8 (also 9&10mm)		
CL-7-KR	CL-7-SKR	7/16 (also 11mm)		
CL-8-KR	CL-8-SKR	1/2 (also 12&13mm)		
CL-9-KR	CL-9-SKR	9/16 (also 14&15mm)		
CL-10-KR	CL-10-SKR	5/8 (also 16mm)		
CL-11-KR	CL-11-SKR	11/16 (also 17&18mm)		
CL-12-KR	CL-12-SKR	3/4 (also 19&20mm)		
CL-13-KR	CL-13-SKR	13/16 (also 21mm)		
CL-14-KR	CL-14-SKR	7/8 (also 22 or 23mm)		
CL-15-KR	CL-15-SKR	15/16 (also 24mm)		
CL-16-KR	CL-16-SKR	1 (also 25&26mm)		
CL-17-KR	CL-17-SKR	1-1/16 (also 27mm)		
CL-18-KR	CL-18-SKR	1-1/8 (also 28&29mm)		
CL-19-KR	CL-19-SKR	1-3/16 (also 30&31mm)		
CL-20-KR	CL-20-SKR	1-1/4 (also 32mm)		
CL-21-KR	CL-21-SKR	1-5/16 (also 33&34mm)		
CL-22-KR	CL-22-SKR	1-3/8 (also 35 mm)		
CL-23-KR	CL-23-SKR	1-7/16 (also 36&37mm)		
CL-24-KR	CL-24-SKR	1-1/2 (also 38mm)		

CABLE TABS

ALUMINUM: 6061 ALUMINUM ALLOY, CLEAR ANODIZED. STAINLESS: 300-SERIES STAINLESS STEEL, PASSIVATED

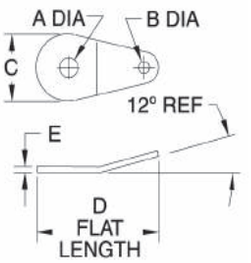


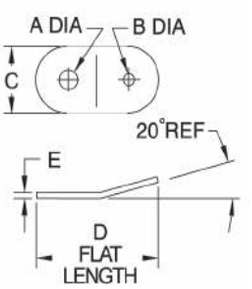
Teardrop



Rectangular

Cable Tabs attach to our nylon-coated cable, to allow attaching the end with a screw. Can be used with cable sizes #1, #2, and #3. Available in two shapes, teardrop and rectangular. Available in aluminum and stainless steel.





TEARDROP

PART NO. ALUMINUM	PART NO. STAINLESS STEEL	FITS CABLE	A DIA	A SCREW SIZE	B DIA	C	D	E
CL-.129-TAB-A	CL-.129-TAB-S	SIZES 1 TO 3	.13	#5 (or M3)	.13	.69	1.31	.06
CL-.194-TAB-A	CL-.194-TAB-S		.20	#10 (or M4)				
CL-.281-TAB-A	CL-.281-TAB-S		.28	1/4 (or M6)				

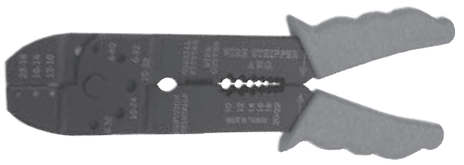
RECTANGULAR

PART NO. ALUMINUM	PART NO. STAINLESS STEEL	FITS CABLE	A DIA	A SCREW SIZE	B DIA	C	D	E
CL-.129-TABR-2-A	CL-.129-TABR-2-S	SIZES 1 TO 2	.13	#5 (or M3)	.09	1/2	1.14	.06
CL-.194-TABR-2-A	CL-.194-TABR-2-S		.20	#10 (or M4)				
CL-.281-TABR-2-A	CL-.281-TABR-2-S		.28	1/4 (or M6)				
CL-.194-TABR-3-A	CL-.194-TABR-3-S	SIZES 1 TO 3	.20	#10 (or M4)	.19	1/2	1.14	.06
CL-.281-TABR-3-A	CL-.281-TABR-3-S		.28	1/4 (or M6)				

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CRIMPING TOOLS

STEEL WITH PLASTIC HANDGRIPS



Standard

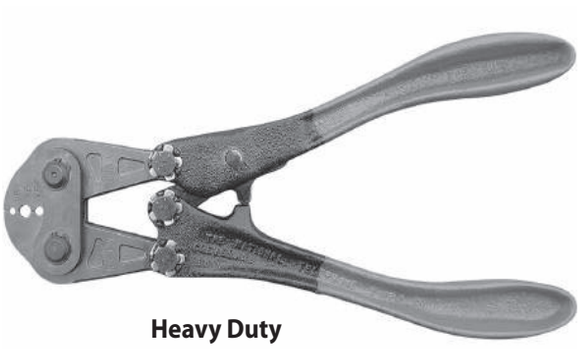
Plier tool for manually crimping ferrules on our nylon-coated cable. Crimps ferrules on either #1 or #2 cable. Heavier cable sizes require power crimping and should be ordered finish-crimped from the factory whenever possible.

STANDARD CRIMPING TOOL

PART NO.	FOR CABLE	FOR FERRULES
CL-1-CT	SIZE 1 SIZE 2	CL-1-F CL-2-F CL-4-F

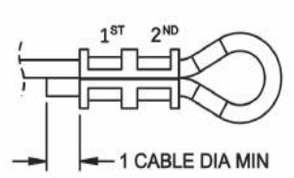
HEAVY-DUTY CRIMPING TOOLS

FORGED STEEL

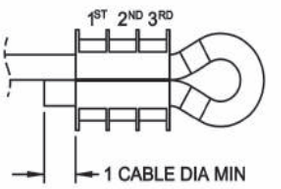


Heavy Duty

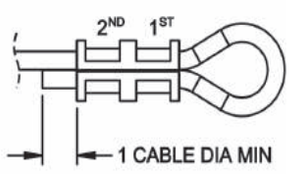
Heavy-Duty Crimping Tools are rugged hand tools engineered for the toughest field conditions. Manufactured from forged alloy steel with hardened working surfaces. These tools are designed to effectively crimp Duplex Ferrules by creating maximum holding around the wire, resulting in strong, reliable connections. Jaws have multiple marked pressing grooves to match the different ferrule sizes. CL-2-DF requires two crimps per ferrule, while CL-3-DF requires three crimps per ferrule.



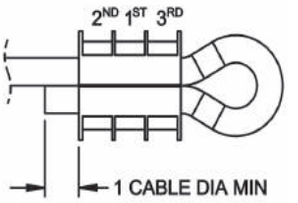
Cable #2
Two Crimps
(Sequence Option 1)



Cable #3
Three Crimps
(Sequence Option 1)



Cable #2
Two Crimps
(Sequence Option 2)



Cable #3
Three Crimps
(Sequence Option 2)



Crimp Gauge (Included with Crimping Tool)

HEAVY-DUTY CRIMPING TOOL

PART NO.	CRIMPING GROOVE IN JAWS
CL-2-CTDF	VB4 for Duplex Ferrule CL-2-DF VG for Duplex Ferrule CL-3-DF

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NYLON LANYARDS

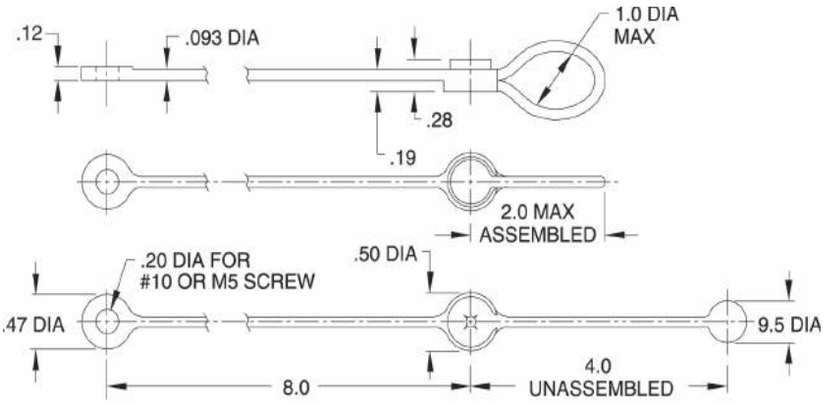
ZYTEL® HIGH-STRENGTH NYLON, BLACK

1



High-strength nylon lanyard with one eyelet end and one loop end. The eyelet end can be fastened with a screw. The loop end is supplied open – simply snap together to create a permanent assembly. Snap assembly allows on-site attachment without a crimping tool. These economical lanyards are ideal for applications where the attached item is occasionally removed, by cutting the lanyard, and replaced.

Available in one length (10" assembled). Eyelet accepts a #10 or M5 screw. A minimum pass-through diameter of 3/8" is required for attachment. Made in USA.



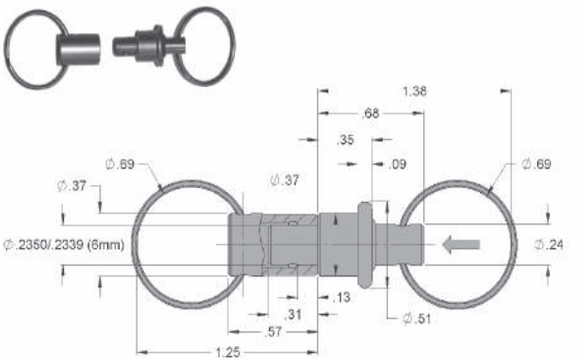
PART NO.	LANYARD DIA	LENGTH (ASSEMBLED)	EYELET	
			ID	FOR SCREW
CL-1-NL-10	.093	10	.20	#10 OR M5

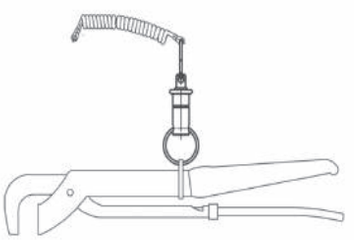
BALL LOCK COUPLING RINGS

PIN AND RECEIVER: 303 STAINLESS STEEL
RINGS, SPRING, AND BALLS: STAINLESS STEEL



This tiny quick-release coupling assembly incorporates a rugged, high-quality Ball Lock Pin mechanism. Allows quick, reliable connection and disconnection of items attached to a cable assembly. Simply press the button to release. One half of the coupling ring is essentially a small Ball Lock Pin with a split ring through the push button; the other half is a mating receiver, also with a split ring through it. The coupling is positive locking until released by pushing the button, which moves the center spindle forward to allow the locking balls to retract. Made of 300-series stainless steel for excellent corrosion resistance. Note: photo at left is shown actual size.





PART NO.	PIN DIA	RATED LOAD CAPACITY (LBS)	MAXIMUM OPERATING TEMPERATURE
CLM-6-BLCR-S	6MM	7	480°F

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HOIST RINGS



Swivel Hoist Rings



Side-Pull Hoist Rings



Pivoting Hoist Rings



Lifting Eyes



Hoist Eye 360®



Hoist Ring Accessories

Also see:



Lifting Pins
pp. 58-59

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HOIST RINGS

SELECTION CHART:

CAPACITY	SWIVEL			SIDE-PULL	PIVOTING	LIFTING EYES	HOIST EYE 360°
	STEEL	STAINLESS	NICKEL				
< 500 LBS	X	X				X	
500-999 LBS.	X		X	X		X	X
1,000-2,499 LBS.	X	X	X	X	X	X	X
2,500-4,999 LBS.	X	X	X	X	X	X	X
5,000-7,499 LBS.	X	X		X	X	X	X
7,500-9,999 LBS.	X	X		X	X	X	
10,000-24,999 LBS.	X	X		X	X	X	
>25,000 LBS.	X	X					

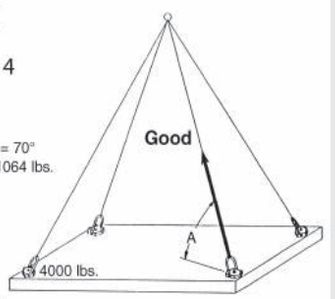
HOIST RING SAFETY PRECAUTIONS

INFO+: The following safety precautions apply to all lifting devices on pages 75, 76-90 and page 58. Also see these individual pages for additional precautions and installation guidelines.

1. IMPORTANT! The load on each hoist ring is not simply total weight divided by the number of hoist rings. The resultant force can be significantly greater at shallow lift angles and with unevenly distributed loads. See the example below:

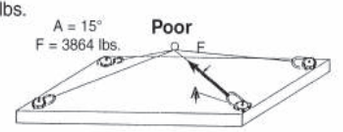
F = Force on each hoist ring
W = Total weight = 4000 lbs.
N = Number of hoist rings = 4
A = Lifting angle

$$F = \frac{W}{N \sin A}$$



If A = 70°, $F = \frac{4000}{4 \sin 70°} = 1064$ lbs.

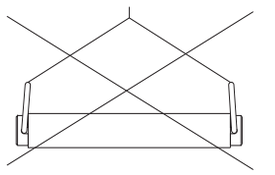
If A = 15°, $F = \frac{4000}{4 \sin 15°} = 3864$ lbs.

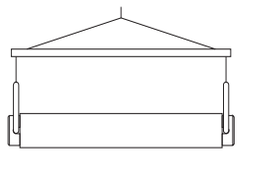


2. Despite the 5:1 safety factor on hoist rings, never exceed the rated load capacity. This safety margin is needed in case of misuse, which could drastically lower load capacity.

3. Tensile strength of parent material should be above 80,000 psi to achieve full load rating. For weaker material, consider through-hole mounting with a nut and washer on the other side.

4. Do not allow hoist rings to bind. Use a spreader bar, if necessary, to avoid binding.





5. Do not use spacers between the hoist ring and the mounting surface.

6. Mounting surface must be flat and smooth for full contact under hoist ring. Tapped mounting holes must be perpendicular to the mounting surface.

7. Tighten mounting screws to the torque recommended. Periodically check torque because screws could loosen in extended service. For hoist rings not furnished with screws, mount using only high-quality socket-head cap screws.

8. Never lift with a hook or other device that could deform the lifting ring. **INFO+:** Do not use cable assemblies on pages 66-67 for lifting.

9. Do not apply shock loads. Always lift gradually. Repeat magnaflux testing if shock loading ever occurs.

10. After installation, check that ring rotates and pivots freely in all directions.

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HOIST RINGS

TYPES



SWIVEL HOIST RINGS

The original, patented safety-engineered Hoist Ring, and the only one that has a production sample destructively pull tested to guarantee each production run meets or exceeds the 5:1 safety factor. Pivots 180 degrees and swivels 360 degrees simultaneously to allow lifting from any direction. Black oxide finish is standard, with cadmium plating available as a special. Also available in 300-series stainless steel, with a load rating equal to 50% of the steel version. Heavy duty versions are available in capacities up to 250,000 lbs. Some varieties available electroless nickel plated, for a less-hazardous corrosion-resistant finish. Made in USA. **INFO+:** Pages 76-83.



SIDE-PULL HOIST RINGS

Required for side mounting. Flip and turn loads without unhooking (use with a spreader bar). Forged alloy-steel ring pivots 180 degrees and swivels 360 degrees simultaneously to allow lifting from any direction. Large, weldless forged ring can accommodate larger lifting hooks. Meets OSHA standards and military specifications MIL-STD-209J and MIL-STD-1365(11). Safety factor = 5:1. Made in USA. **INFO+:** Pages 86-87.



PIVOTING HOIST RINGS

An economical lifting device ideal for permanent installation. Also has a low profile and high load capacity. Forged base and solid-loop forged ring. Pivots a full 180 degrees, but does not rotate. Safety factor = 5:1. Made in USA. **INFO+:** Page 88.



LIFTING EYES

Forged steel eyebolts with an integral shoulder for greater strength. These simple, economical products are suitable for vertical lifting in-line with the threaded bolt, such as when lifting from a single point or from two points with a spreader bar. For lifting at an angle, Swivel Hoist Rings should be used instead. Manufactured and tested according to ASTM A489 and ANSI B18.15 specifications. Safety factor = 5:1. Made in USA. **INFO+:** Page 89.



HOIST EYE 360®

Hoist Eye 360® is a forged lifting eye that can be rotated 360° after installation, to align with the pulling direction. This compact assembly features a specially designed shoulder bolt, which rotates freely in the precisely machined lifting-eye body and is held captive by a retaining ring. Unlike conventional lifting eyes, Hoist Eye 360® can be used at full rated load capacity when pulling at any angle 0 to 90° from the bolt axis. Safety factor = 5:1. Made in USA. **INFO+:** Page 90.

MATERIALS

STEEL

Alloy steel, heat treated, black oxide finish (cadmium plating available as a special). Every production lot of swivel Hoist Rings is subjected to testing, including the industry's most rigorous pull testing. We destructively pull test every production lot to ensure that they meet or exceed our 5:1 safety factor.

STAINLESS STEEL

The stainless steel version of our original, patented safety-engineered hoist ring comes with a load rating equal to 50% of the steel version. Useful for corrosive, cryogenic, or elevated-temperature environments.

NICKEL-PLATED STEEL

Alloy-steel Swivel Hoist Rings are available with electroless nickel plating. This optional finish offers excellent corrosion and wear resistance while still providing the full load capacity of our heat-treated alloy-steel hoist rings.

All hoist rings are made in the USA, and available DFARS and RoHS compliant.

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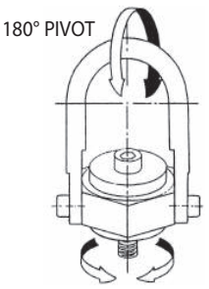
SWIVEL HOIST RINGS

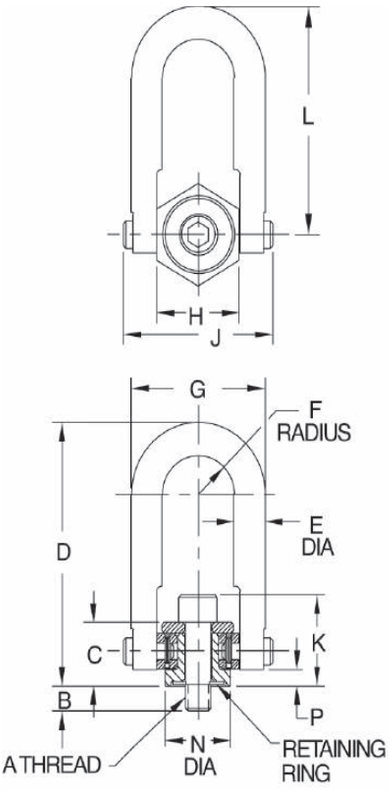
ALLOY STEEL, HEAT TREATED, BLACK OXIDE FINISH, 100% MAGNAFLUX INSPECTED



The original safety-engineered hoist ring. Pivots 180 degrees and swivels 360 degrees simultaneously to allow lifting from any direction. Safety factor = 5:1. Black oxide finish is standard, with cadmium plating available as a special (add -C to part number). Swivel Hoist Rings are also available in 300-series stainless steel, with a load rating equal to 50% of the steel version (**INFO+** see pages 79-80). **Patent no. 3,297,293 and 4,705,422.**

Fasten hoist rings using the installation torque specified in the dimension table. Always install so that the hoist ring can pivot and swivel freely. Some hoist rings are available with a choice of bolt lengths. Use the shortest bolt length only for steel plates, the other lengths for weaker materials and for through-hole mounting with a washer and nut. **INFO+:** See general Hoist Ring Safety Precautions on page 74.





STANDARD RING (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	H	J	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)	REPLACEMENT BOLT (WITH RETAINING RING)
CL-550-SHR-2	550	1/4-20	.54	.71	2.67	3/8	.43	1.61	1.00	1.84	.96	2.31	.75	.17	5	—
CL-800-SHR-1	800	5/16-18	.29	.72	2.63	3/8	.44	1.62	1.00	1.82	1.03	2.35	.75	.17	7	CL-800-SHRB-1
CL-800-SHR-2			.54													CL-800-SHRB-2
CL-1000-SHR-1	1000	3/8-16	.54	.72	2.63	3/8	.44	1.62	1.00	1.82	1.09	2.35	.75	.17	12	CL-1000-SHRB-1
CL-23301-SHR	2500	1/2-13	1.07	.93	3.77	1/2	.70	2.40	1.49	2.58	1.43	3.31	1.25	.20	28	CL-23318-SHRB-1
CL-2500-SHR-1	2500	1/2-13	.77	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.73	4.24	1.50	.16	28	CL-2500-SHRB-1
CL-2500-SHR-2			1.02													CL-2500-SHRB-2
CL-2500-SHR-3			1.27													CL-2500-SHRB-3
CL-4000-SHR-1	4000	5/8-11	.77	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.86	4.24	1.50	.16	60	CL-4000-SHRB-1
CL-4000-SHR-2			1.02													CL-4000-SHRB-2
CL-4000-SHR-3			1.27													CL-4000-SHRB-3
CL-5000-SHR-1	5000	3/4-10	1.02	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.98	4.24	1.50	.16	100	CL-5000-SHRB-1
CL-5000-SHR-2			1.52													CL-5000-SHRB-2
CL-7000-SHR-1	7000	3/4-10	1.03	1.72	6.55	1-1/16	1.40	4.94	3.00	5.06	2.47	5.80	2.37	.24	100	CL-7000-SHRB-1
CL-7000-SHR-2			1.53													CL-7000-SHRB-2
CL-8000-SHR-1	8000	7/8-9	1.03	1.72	6.55	1-1/16	1.40	4.94	3.00	5.06	2.60	5.80	2.37	.24	160	CL-8000-SHRB-1
CL-8000-SHR-2			1.53													CL-8000-SHRB-2
CL-10000-SHR-1	10000	1″-8	1.28	1.72	6.55	1-1/16	1.40	4.94	3.00	5.06	2.72	5.80	2.37	.24	230	CL-10000-SHRB-1
CL-10000-SHR-2			1.53													CL-10000-SHRB-2
CL-10000-SHR-3			2.28													CL-10000-SHRB-3
CL-15000-SHR-1	15000	1-1/4″-7	1.89	2.11	8.73	1-1/4	1.75	6.00	3.76	6.50	3.36	7.75	3.20	.35	470	CL-15000-SHRB-1
CL-24000-SHR-1	24000	1-1/2″-6	2.70	2.81	12.47	1-3/4	2.25	8.00	4.87	8.55	4.36	11.12	4.20	.47	800	CL-24000-SHRB-1
CL-23200-SHR	30000	2″-4-1/2	2.96	2.81	12.47	1-3/4	2.25	8.00	4.87	8.55	5.36	11.12	4.20	.47	1100	—
CL-23503-SHR	50000	2-1/2″-4	4.00	4.09	16.87	2-1/4	3.00	10.50	6.52	11.67	6.59	14.50	5.75	1.12	2100	—
CL-23501-SHR		2-1/2″-8														—
CL-23600-SHR	75000	3″-4	5.20	5.20	19.50	2-3/4	3.75	13.00	8.10	14.15	8.27	17.00	7.25	1.00	4300	—
CL-23701-SHR	100000	3-1/2″-4	7.00	7.00	22.09	3-1/4	4.00	14.50	8.60	15.90	9.56	19.25	7.75	1.09	6600	—

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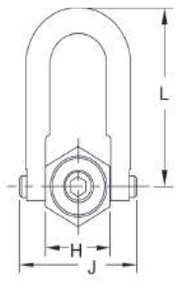
STANDARD RING (METRIC)

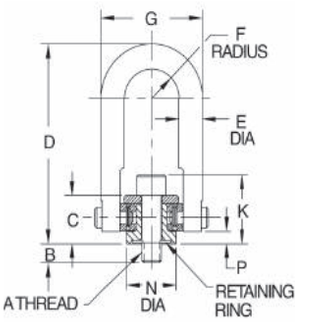
PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	H	J	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)	REPLACEMENT BOLT WITH (RETAINING RING)
CLM-800-SHR-2	880	M8	.66	.72	2.63	3/8	.44	1.62	1.00	1.82	1.02	2.35	.75	.17	7	CLM-800-SHRB-2
CLM-1000-SHR-1	1000	M10	.66	.72	2.63	3/8	.44	1.62	1.00	1.82	1.10	2.35	.75	.17	12	CLM-1000-SHRB-1
CLM-2500-SHR-1	2300	M12	.74	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.70	4.24	1.50	.16	27	CLM-2500-SHRB-1
CLM-4000-SHR-2	4000	M16	1.13	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.86	4.24	1.50	.16	59	CLM-4000-SHRB-2
CLM-24020-SHR	4800	M20	1.18	1.23	4.77	3/4	.88	3.25	2.00	3.52	2.01	4.25	1.50	.16	100	CLM-24220-SHRB
CLM-7000-SHR-2	6600	M20	1.26	1.72	6.55	1-1/16	1.40	4.94	3.00	5.06	2.51	5.80	2.31	.24	100	CLM-7000-SHRB-2
CLM-9000-SHR-2	9200	M24	1.46	1.72	6.55	1-1/16	1.40	4.94	3.00	5.06	2.66	5.80	2.31	.24	159	CLM-9000-SHRB-2
CLM-10000-SHR-1	10000	M30	2.12	1.71	6.52	1	1.40	4.80	3.00	5.14	2.72	5.80	2.31	.24	230	CLM-24230-SHRB
CLM-15000-SHR-1	15000	M30	1.81	2.11	8.73	1-1/4	1.75	6.00	3.76	6.50	3.36	7.75	3.20	.35	470	CLM-24421-SHRB
CLM-24042-SHR			2.60													CLM-24433-SHRB
CLM-24000-SHR-1	24000	M36	2.72	2.81	12.47	1-3/4	2.25	8.00	4.87	8.55	4.36	11.12	4.20	.47	800	CLM-24223-SHRB
CLM-27000-SHR-1	27000	M42	3.11	2.81	12.47	1-3/4	2.25	8.00	4.87	8.55	4.86	11.12	4.20	.47	800	CLM-24232-SHRB
CLM-30000-SHR-1	30000	M48	3.11	2.81	12.47	1-3/4	2.25	8.00	4.87	8.55	5.36	11.12	4.20	.47	800	CLM-24225-SHRB
CLM-24060-SHR	48000	M64	4.02	4.09	16.87	2-1/4	3.00	10.50	6.52	11.67	6.61	14.50	5.75	1.12	2100	CLM-24527-SHRB
CLM-24062-SHR	69000	M72	5.20	5.27	19.50	2-3/4	3.75	13.00	8.10	14.50	8.27	17.00	7.25	1.00	4200	CLM-24627-SHRB
CLM-24064-SHR	110000	M90	7.01	6.06	22.09	3-1/4	4.00	14.50	8.60	15.90	9.56	19.25	7.75	1.09	7100	CLM-24727-SHRB



Optional Long-Ring Version

Long-ring version provides extra reach and allows using larger lifting hooks.





LONG RING (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	H	J	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)	REPLACEMENT BOLT WITH (RETAINING RING)
CL-23322-SHR	2500	1/2-13	.78	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.72	6.19	1.50	.16	28	CL-23024-SHRB
CL-23323-SHR			1.03													CL-23025-SHRB
CL-23324-SHR			1.28													CL-23026-SHRB
CL-23320-SHR	4000	5/8-11	1.03	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.85	6.19	1.50	.16	60	CL-23022-SHRB
CL-23321-SHR			1.28													CL-23023-SHRB
CL-23325-SHR	5000	3/4-10	1.03	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.97	6.19	1.50	.16	100	CL-23027-SHRB
CL-23327-SHR			1.53													CL-23029-SHRB
CL-23329-SHR	7000	3/4-10	1.04	1.71	8.11	1	1.40	4.80	3.00	5.14	2.46	7.38	2.37	.24	100	CL-23122-SHRB
CL-23330-SHR			1.54													CL-23123-SHRB
CL-23328-SHR	8000	7/8-9	1.04	1.71	8.11	1	1.40	4.80	3.00	5.14	2.59	7.38	2.37	.24	160	CL-23121-SHRB
CL-23331-SHR	10000	1"-8	1.29	1.71	8.11	1	1.40	4.80	3.00	5.14	2.71	7.38	2.37	.24	230	CL-23125-SHRB
CL-23332-SHR			1.54													CL-23126-SHRB
CL-23333-SHR			2.29													CL-23127-SHRB

LONG RING (METRIC)

CLM-24014-SHR	2300	M12	.75	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.69	6.19	1.50	.16	27	CLM-24212-SHRB
CLM-24018-SHR	4000	M16	.94	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.85	6.19	1.50	.16	59	CLM-24216-SHRB
CLM-24021-SHR	4800	M20	1.18	1.22	6.72	3/4	.88	3.25	1.99	3.52	2.01	6.19	1.50	.16	100	CLM-24220-SHRB
CLM-24023-SHR	6600	M20	1.14	1.71	8.11	1	1.40	4.80	3.00	5.14	2.50	7.38	2.37	.24	100	CLM-24222-SHRB
CLM-24026-SHR	9200	M24	1.34	1.71	8.11	1	1.40	4.80	3.00	5.14	2.65	7.38	2.37	.24	230	CLM-24224-SHRB
CLM-24032-SHR	10000	M30	2.13	1.71	8.11	1	1.40	4.80	3.00	5.14	2.89	7.38	2.37	.24	230	CLM-24230-SHRB

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NICKEL-PLATED SWIVEL HOIST RINGS

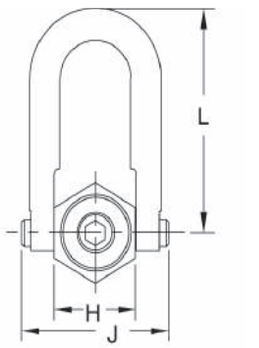
ALLOY STEEL, HEAT TREATED, ELECTROLESS NICKEL PLATED, 100% MAGNAFLUX INSPECTED

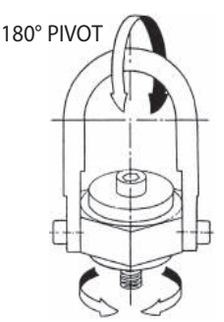


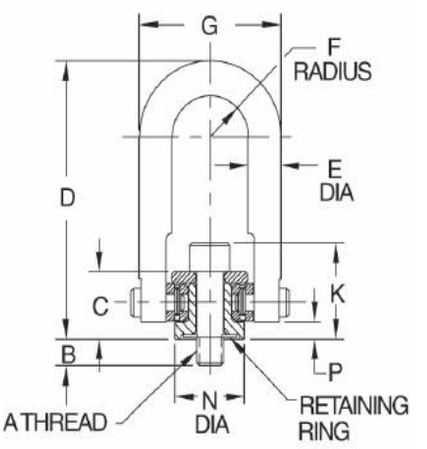
Nickel Plated

Our original alloy-steel Swivel Hoist Rings are now available with electroless nickel plating. These hoist rings offer excellent corrosion and wear resistance while still providing the full load capacity of our heat-treated alloy-steel hoist rings. Electroless nickel is a hard, uniform coating that is very resistant to a wide range of chemicals, which makes these hoist rings suitable for many corrosive and marine environments. Swivel Hoist Rings pivot 180 degrees and swivel 360 degrees simultaneously to allow lifting from any direction. Safety factor = 5:1. **Patent no. 3,297,293 and 4,705,422.**

Fasten hoist rings using the installation torque specified in the dimension table. Always install so that the hoist ring can pivot and swivel freely. Some hoist rings are available with a choice of bolt lengths. Use the shortest bolt length only for steel plates, the other lengths for weaker materials and for through-hole mounting with a washer and nut. **INFO+:** See general Hoist Ring Safety Precautions on page 74.







STANDARD RING, ELECTROLESS NICKEL PLATED (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	H	J	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)	REPLACEMENT BOLT (WITH RETAINING RING)
CL-800-SHR-2-N	800	5/16-18	.54	.72	2.63	3/8	.44	1.62	1.00	1.82	1.03	2.35	.75	.17	7	CL-800-SHRB-2-N
CL-1000-SHR-1-N	1000	3/8-16	.54	.72	2.63	3/8	.44	1.62	1.00	1.82	1.09	2.35	.75	.17	12	CL-1000-SHRB-1-N
CL-2500-SHR-1-N	2500	1/2-13	.77	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.73	4.24	1.50	.16	28	CL-2500-SHRB-1-N
CL-2500-SHR-2-N			1.02													CL-2500-SHRB-2-N
CL-2500-SHR-3-N			1.27													CL-2500-SHRB-3-N
CL-4000-SHR-1-N	4000	5/8-11	.77	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.86	4.24	1.50	.16	60	CL-4000-SHRB-1-N
CL-4000-SHR-2-N			1.02													CL-4000-SHRB-2-N
CL-4000-SHR-3-N			1.27													CL-4000-SHRB-3-N
CL-5000-SHR-1-N	5000	3/4-10	1.02	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.98	4.24	1.50	.16	100	CL-5000-SHRB-1-N
CL-5000-SHR-2-N			1.52													CL-5000-SHRB-2-N

STANDARD RING, ELECTROLESS NICKEL PLATED (METRIC)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	H	J	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)	REPLACEMENT BOLT (WITH RETAINING RING)
CLM-800-SHR-2-N	800	M8	.66	.72	2.63	3/8	.44	1.62	1.00	1.82	1.02	2.35	.75	.17	7	—
CLM-1000-SHR-1-N	1000	M10	.66	.72	2.63	3/8	.44	1.62	1.00	1.82	1.10	2.35	.75	.17	12	—
CLM-2500-SHR-1-N	2300	M12	.74	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.70	4.24	1.50	.16	27	—
CLM-4000-SHR-2-N	4000	M16	1.13	1.23	4.77	3/4	.88	3.25	2.00	3.52	1.86	4.24	1.50	.16	59	—

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STAINLESS SWIVEL HOIST RINGS

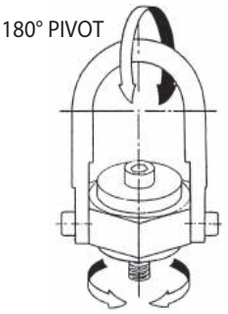
300-SERIES STAINLESS STEEL, PASSIVATED, 100% LIQUID-PENETRANT INSPECTED



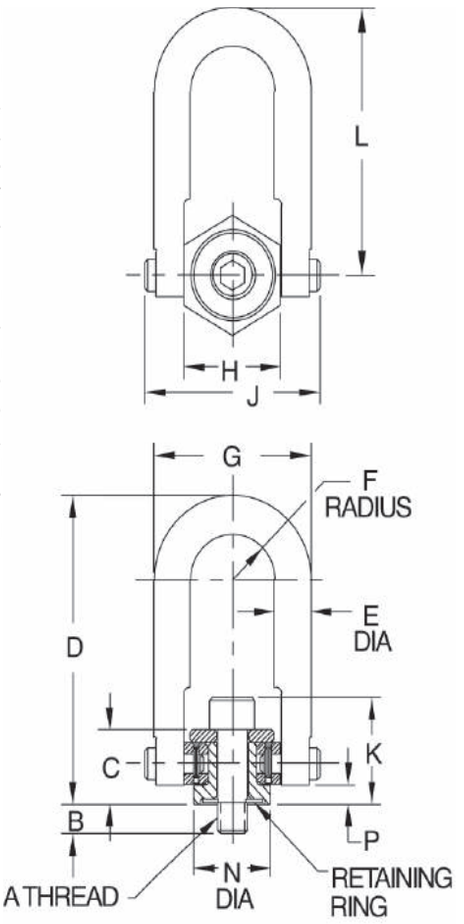
Stainless Steel

Stainless steel version of our original safety-engineered hoist ring, with a load rating equal to 50% of the alloy steel version. Useful for corrosive, cryogenic, or elevated-temperature environments. Pivots 180 degrees and swivels 360 degrees simultaneously to allow lifting from any direction. Safety factor = 5:1. **Patent no. 3,297,293 and 4,705,422.**

Fasten hoist rings using the installation torque specified in the dimension table. Always install so that the hoist ring can pivot and swivel freely. Some hoist rings are available with a choice of bolt lengths. Use the shortest bolt length only for steel plates, the other lengths for weaker materials and for through-hole mounting with a washer and nut. **INFO+:** See general Hoist Ring Safety Precautions on page 74.



360° ROTATION



STANDARD RING — STAINLESS STEEL (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	H	J	K	L	N DIA	P	INSTALLTION TORQUE (FT-LBS)
CL-275-SHR-1-S	275	1/4-20	.54	.71	2.67	3/8	.43	1.61	1.00	1.84	.96	2.31	.75	.17	2.5
CL-400-SHR-2-S	400	5/16-18	.54	.71	2.67	3/8	.43	1.61	1.00	1.84	.96	2.31	.75	.17	3.5
CL-500-SHR-1-S	500	3/8-16	.54	.71	2.67	3/8	.43	1.61	1.00	1.84	1.09	2.31	.75	.17	6
CL-29301-SHR-S	1250	1/2-13	1.07	.93	3.77	1/2	.70	2.40	1.49	2.58	1.43	3.31	1.25	.20	4
CL-1250-SHR-1-S	1250	1/2-13	.78	1.22	4.78	3/4	.88	3.25	1.99	3.52	1.72	4.25	1.50	.16	14
CL-1250-SHR-2-S			1.03												
CL-1250-SHR-3-S			1.28												
CL-2000-SHR-1-S	2000	5/8-11	.78	1.22	4.78	3/4	.88	3.25	1.99	3.52	1.85	4.25	1.50	.16	30
CL-2500-SHR-1-S	2500	3/4-10	1.03	1.22	4.78	3/4	.88	3.25	1.99	3.52	1.97	4.25	1.50	.16	50
CL-29102-SHR-S	3500	3/4-10	1.04	1.71	6.52	1	1.40	4.80	3.00	5.14	2.46	5.78	2.37	.24	50
CL-29103-SHR-S			1.54												
CL-29101-SHR-S	4000	7/8-9	1.04	1.71	6.52	1	1.40	4.80	3.00	5.14	2.59	5.78	2.37	.24	80
CL-29105-SHR-S	5000	1"-8	1.29	1.71	6.52	1	1.40	4.80	3.00	5.14	2.71	5.78	2.37	.24	115
CL-29106-SHR-S			1.54												
CL-29107-SHR-S			2.29												
CL-29401-SHR-S	7500	1-1/4"-7	1.89	2.11	8.73	1-1/4	1.75	6.00	3.76	6.50	3.36	7.75	3.20	.35	235
CL-29202-SHR-S	12000	1-1/2"-6	2.70	2.81	12.47	1-3/4	2.25	8.00	4.87	8.55	4.31	11.12	4.20	.47	400
CL-29200-SHR-S	15000	2"-4-1/2	2.96	2.81	12.47	1-3/4	2.25	8.00	4.87	8.55	5.31	11.12	4.20	.47	550
CL-29503-SHR-S	25000	2-1/2"-4	4.00	4.09	16.87	2-1/4	3.00	10.50	6.52	11.67	6.59	14.50	5.75	1.12	1050
CL-29501-SHR-S		2-1/2"-8													
CL-29600-SHR-S	37500	3"-4	5.20	5.27	19.50	2-3/4	3.75	13.00	8.10	14.15	8.27	17.00	7.25	1.00	2150
CL-29701-SHR-S	50000	3-1/2"-4	7.00	6.06	22.09	3-1/4	4.00	14.50	8.60	15.90	9.56	19.25	7.75	1.09	3300

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STAINLESS SWIVEL HOIST RINGS

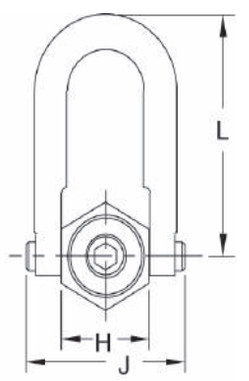
STANDARD RING — STAINLESS STEEL (METRIC)

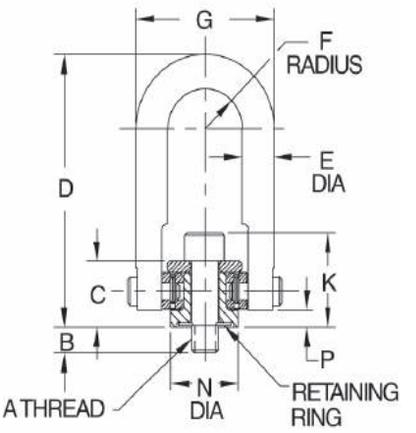
PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA.	F	G	H	J	K	L	N DIA.	P	INSTALLATION TORQUE (FT-LBS)
CLM-440-SHR-2-S	440	M8	.67	.71	2.67	3/8	.43	1.61	1.00	1.84	1.03	2.31	.75	.17	3.5
CLM-500-SHR-1-S	500	M10	.67	.71	2.67	3/8	.43	1.61	1.00	1.84	1.11	2.31	.75	.17	6
CLM-1150-SHR-1-S	1150	M12	.75	1.22	4.78	3/4	.88	3.25	2.00	3.52	1.69	4.25	1.50	.16	14
CLM-2000-SHR-2-S	2000	M16	.94	1.22	4.78	3/4	.88	3.25	2.00	3.52	1.85	4.25	1.50	.16	30
CLM-2400-SHR-2-S	2400	M20	1.18	1.22	4.78	3/4	.88	3.25	2.00	3.52	2.01	4.25	1.50	.16	50
CLM-29822-SHR-S	3300	M20	1.14	1.71	6.53	1	1.40	4.77	3.00	5.14	2.50	5.78	2.31	.24	50
CLM-29824-SHR-S	4600	M24	1.34	1.71	6.53	1	1.40	4.77	3.00	5.14	2.65	5.78	2.31	.24	115
CLM-29830-SHR-S	5000	M30	2.13	1.71	6.53	1	1.40	4.77	3.00	5.14	2.89	5.78	2.31	.24	115
CLM-29840-SHR-S	7500	M30	1.81	2.11	8.73	1.25	1.75	6.00	3.76	6.50	3.29	7.75	3.20	.35	235
CLM-29842-SHR-S			2.60												
CLM-29850-SHR-S	12000	M36	2.72	2.81	12.47	1.75	2.25	8.00	4.87	8.55	4.23	11.12	4.20	.47	400
CLM-29852-SHR-S	13500	M42	3.11	2.81	12.47	1.75	2.25	8.00	4.87	8.55	4.46	11.12	4.20	.47	400
CLM-29854-SHR-S	15000	M48	3.11	2.81	12.47	1.75	2.25	8.00	4.87	8.55	4.70	11.12	4.20	.47	400
CLM-29860-SHR-S	24000	M64	4.02	4.09	16.87	2.25	3.00	10.50	6.52	11.67	6.61	14.50	5.75	1.12	1050



Optional Long-Ring Version

Long-ring version provides extra reach and allows using larger lifting hooks.





LONG RING — STAINLESS STEEL (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	H	J	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)
CL-29322-SHR-S	1250	1/2-13	.78	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.72	6.19	1.50	.16	14
CL-29323-SHR-S			1.03												
CL-29324-SHR-S			1.28												
CL-29320-SHR-S	2000	5/8-11	1.03	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.85	6.19	1.50	.16	30
CL-29321-SHR-S			1.28												
CL-29325-SHR-S	2500	3/4-10	1.03	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.97	6.19	1.50	.16	50
CL-29327-SHR-S			1.53												
CL-29329-SHR-S	3500	3/4-10	1.04	1.71	8.11	1	1.40	4.80	3.00	5.14	2.46	7.38	2.37	.24	50
CL-29330-SHR-S			1.54												
CL-29328-SHR-S	4000	7/8-9	1.04	1.71	8.11	1	1.40	4.80	3.00	5.14	2.59	7.38	2.37	.24	80
CL-29331-SHR-S	5000	1"-8	1.29	1.71	8.11	1	1.40	4.80	3.00	5.14	2.71	7.38	2.37	.24	115
CL-29332-SHR-S			1.54												
CL-29333-SHR-S			2.29												

LONG RING — STAINLESS STEEL (METRIC)

CLM-29814-SHR-S	1150	M12	.75	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.69	6.19	1.50	.16	14
CLM-29818-SHR-S	2000	M16	.94	1.22	6.72	3/4	.88	3.25	1.99	3.52	1.85	6.19	1.50	.16	30
CLM-29821-SHR-S	2400	M20	1.18	1.22	6.72	3/4	.88	3.25	1.99	3.52	2.01	6.19	1.50	.16	50
CLM-29823-SHR-S	3300	M20	1.14	1.71	8.11	1	1.40	4.80	3.00	5.14	2.50	7.38	2.37	.24	50
CLM-29826-SHR-S	4600	M24	1.34	1.71	8.11	1	1.40	4.80	3.00	5.14	2.65	7.38	2.37	.24	115
Please contact factory	5000	M30	2.13	1.71	8.11	1	1.40	4.80	3.00	5.14	2.89	7.38	2.37	.24	235

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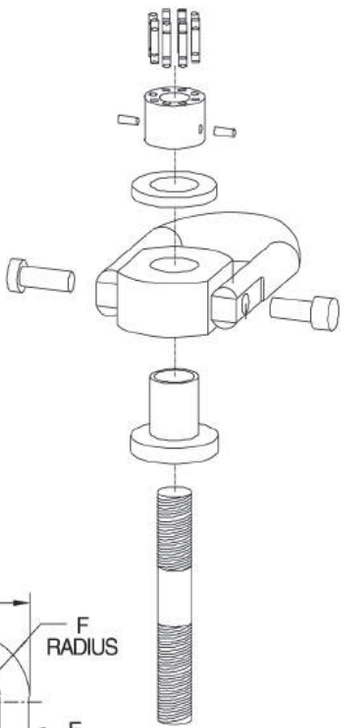
EZ-TORQUE® SWIVEL HOIST RINGS

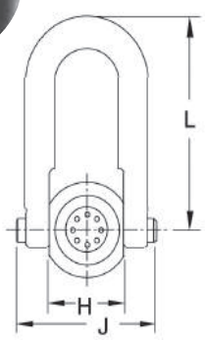
ALLOY STEEL, HEAT TREATED, BLACK OXIDE FINISH, 100% MAGNAFLUX INSPECTED

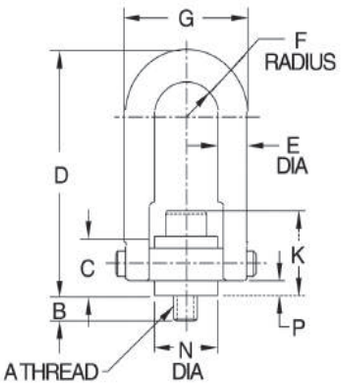


E-Z Torque®
Swivel Hoist Rings

Extra-large Swivel Hoist Rings with our patented system that allows tightening several smaller bolt heads with a standard torque wrench instead of tightening one large bolt with a special tool. Swivel Hoist Rings pivot 180 degrees and swivel 360 degrees simultaneously to allow lifting from any direction. Safety factor = 5:1. Black oxide finish is standard, with cadmium plating available as a special. Available in load capacities up to 250000 lbs. **Patent no. 3,297,293, 4,705,422, and 6,199,925.** Fasten hoist rings using the installation torque specified in the dimension table. Always install so that the hoist ring can pivot and swivel freely. **INFO+:** See general Hoist Ring Safety Precautions on page 74.







INCH

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	H	J	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)
CL-23490-SHR	15000	1-1/4"-7	1.89	2.11	8.73	1-1/4	1.75	6.0	3.76	6.50	3.60	7.75	3.20	.35	10
CL-23494-SHR	24000	1-1/2"-6	2.70	2.81	12.47	1-3/4	2.25	8.0	4.87	8.55	4.60	11.12	4.20	.47	18
CL-23290-SHR	30000	2"-4-1/2	2.96	2.81	12.47	1-3/4	2.25	8.0	4.87	8.55	4.60	11.12	4.20	.47	26
CL-23592-SHR	50000	2-1/2"-4	4.00	4.09	16.87	2-1/4	3.00	10.5	6.52	11.67	6.89	14.50	5.75	1.12	49
CL-23590-SHR		2-1/2"-8													
CL-23690-SHR	75000	3"-4	5.20	5.27	19.50	2-3/4	3.75	13.0	8.10	14.15	8.72	17.00	7.25	1.00	92
CL-23790-SHR	100000	3-1/2"-4	7.00	6.06	22.09	3-1/4	4.00	14.5	8.60	15.90	9.56	19.25	7.75	1.09	98
CL-23792-SHR	150000	4-1/4"-4	8.50	7.50	27.38	4	5.00	18.0	10.75	19.69	10.45	23.81	9.87	1.33	123
CL-23794-SHR	200000	5"-4	9.00	9.00	33.00	5	6.00	22.0	13.00	24.00	13.00	28.50	12.38	1.88	193
CL-23798-SHR	250000	6"-4	9.00	9.00	33.00	5	6.00	22.0	13.00	24.00	13.00	28.50	12.38	1.88	207

METRIC

PART NO.	LOAD RATING (kg)	A THREAD	THREAD PITCH (mm)	B (mm)	C (mm)	D (mm)	E DIA (mm)	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	L (mm)	N DIA (mm)	P (mm)	INSTALLATION TORQUE (N-m)
CLM-24490-SHR	7000	M30	3.5	66	53.5	222	32	44.5	152.5	95.5	165	83.5	197	81.5	8.9	13.5
CLM-24494-SHR	11000	M36	4	69	71.5	317	44.5	57	203	123.5	217	107.5	282	106.5	11.9	20.8
CLM-24498-SHR	12500	M42	4.5	79	71.5	317	44.5	57	203	123.5	217	113.5	282	106.5	11.9	21.6
CLM-24290-SHR	13500	M48	5	79	71.5	317	44.5	57	203	123.5	217	119.5	282	106.5	11.9	21.3
CLM-24592-SHR	22000	M64	6	102	104	428	57	76	267	165.5	296	168	368	146	28.4	54
CLM-24690-SHR	31500	M72	6	132	134	495	70	95	330	206	368	210	432	184	25.4	125
CLM-24790-SHR	51000	M90	6	178	154	561	82.5	101.5	368	218	404	243	489	197	27.7	133

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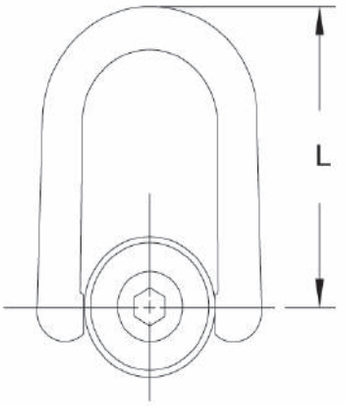
HEAVY-DUTY® SWIVEL HOIST RINGS

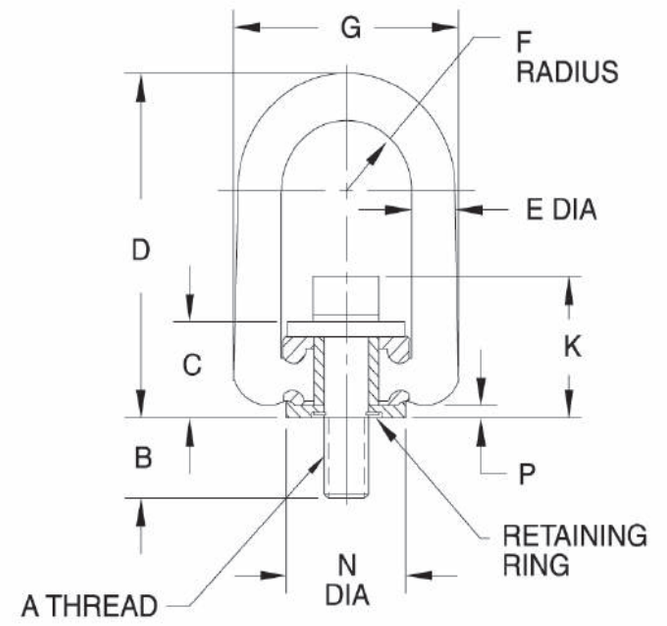
ALLOY STEEL, HEAT TREATED, BLACK OXIDE FINISH, 100% MAGNAFLUX INSPECTED



The next generation of Swivel Hoist Rings, with a heavy-duty forged steel ring. Pivots 180 degrees and swivels 360 degrees simultaneously to allow lifting from any direction. Safety factor = 5:1. Meets OSHA standards and Military Specification MIL-STD-1365(11) or MIL-STD-209C. **Patent no. 4,570,987 and 4,641,986, and other patents pending.**

Fasten hoist rings using the installation torque specified in the dimension table. Always install so that the hoist ring can pivot and swivel freely. Some hoist rings are available with a choice of bolt lengths. Use the shortest bolt length only for steel plates, the other lengths for weaker materials and for through-hole mounting with a washer and nut. **INFO+:** See general Hoist Ring Safety Precautions on page 74.





STANDARD RING (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)	REPLACEMENT BOLT (WITH RETAINING RING)
CL-33106-SHR	10000	1″-8	1.20	2.05	7.37	1.00	1.40	5.10	3.05	6.62	2.81	.18	230	CL-33126-SHRB
CL-33105-SHR			1.45											CL-33125-SHRB
CL-33107-SHR			2.20											CL-33127-SHRB
CL-33402-SHR	15000	1-1/4″-7	1.88	2.87	9.22	1.25	2.00	6.75	4.23	8.12	3.88	.32	470	CL-33419-SHRB
CL-33401-SHR			2.63											CL-33421-SHRB
CL-33420-SHR	20000	1-3/8″-6	2.63	2.87	9.22	1.25	2.00	6.75	4.35	8.12	3.88	.32	670	CL-33429-SHRB
CL-33424-SHR	24000	1-1/2″-6	2.63	2.87	9.22	1.25	2.00	6.75	4.48	8.12	3.88	.32	800	CL-33422-SHRB
CL-33427-SHR	30000	2″-4-1/2	2.96	2.87	9.22	1.25	2.00	6.75	4.48	8.12	3.88	.32	1100	—
CL-33432-SHR		2″-8												—

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HEAVY-DUTY® SWIVEL HOIST RINGS

STANDARD RING (METRIC)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)	REPLACEMENT BOLT (WITH RETAINING RING)
CLM-34102-SHR	9200	M24	1.10	2.05	7.37	1.00	1.40	5.10	3.00	6.62	2.81	.18	230	CLM-34121-SHRB
CLM-34103-SHR			1.50											CLM-34123-SHRB
CLM-34105-SHR	10000	M30	1.50	2.05	7.37	1.00	1.40	5.10	3.23	6.62	2.81	.18	230	CLM-34126-SHRB
CLM-34107-SHR			1.89											CLM-34127-SHRB
CLM-34401-SHR	15000	M30	2.64	2.87	9.22	1.25	2.00	6.75	4.23	8.12	3.88	.32	470	CLM-34421-SHRB
CLM-34402-SHR	24000	M36	2.64	2.87	9.22	1.25	2.00	6.75	4.48	8.12	3.88	.32	800	CLM-34422-SHRB
CLM-34403-SHR	27000	M42	3.15	2.87	9.22	1.25	2.00	6.75	4.48	8.12	3.88	.32	800	CLM-24232-SHRB
CLM-34404-SHR	30000	M48	3.15	2.87	9.22	1.25	2.00	6.75	4.48	8.12	3.88	.32	800	CLM-24225-SHRB



Optional Long-Ring Version

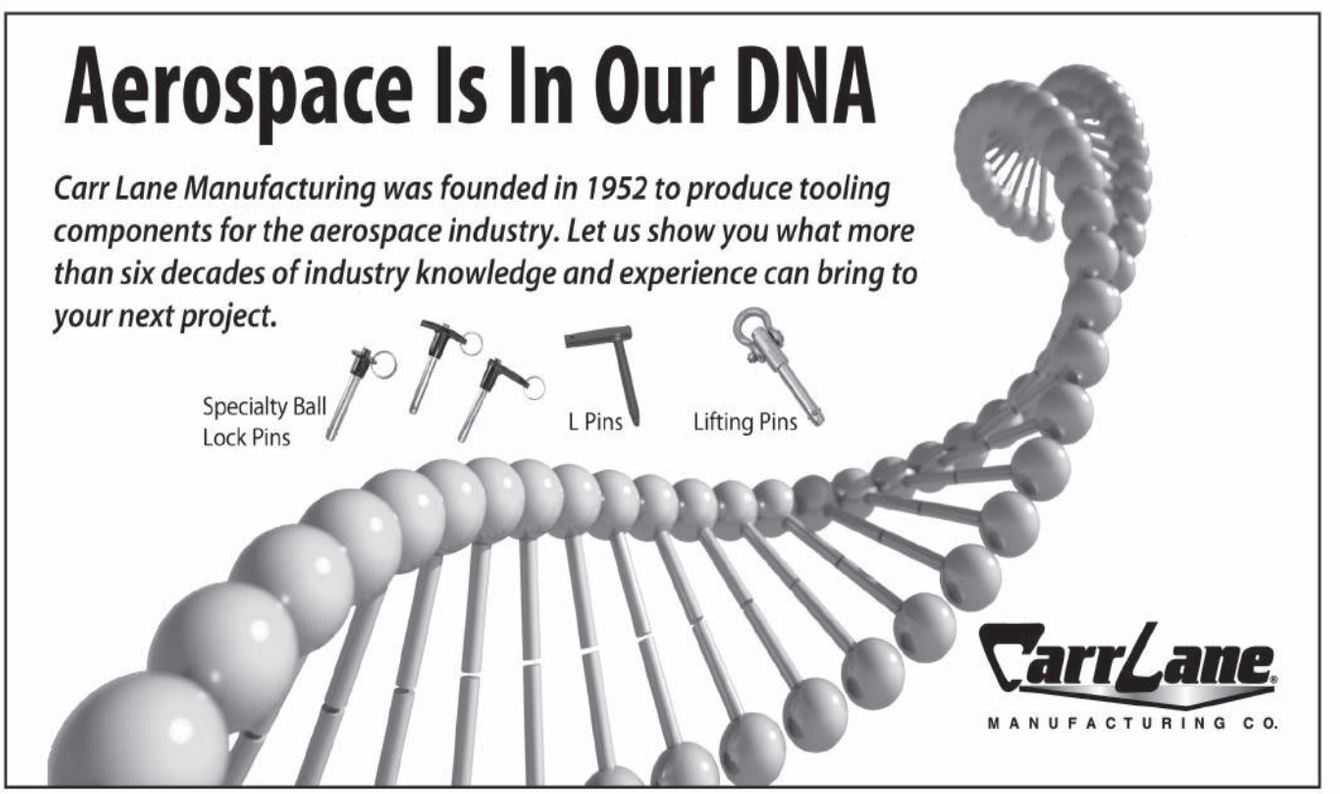
Long-ring version provides extra reach and allows using larger lifting hooks.

LONG RING (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E DIA	F	G	K	L	N DIA	P	INSTALLATION TORQUE (FT-LBS)	REPLACEMENT BOLT (WITH RETAINING RING)
CL-33166-SHR	10000	1"-8	1.20	2.05	9.00	1.00	1.40	5.10	3.05	8.25	2.81	.18	230	CL-33126-SHRB
CL-33165-SHR			1.45											CL-33125-SHRB
CL-33167-SHR			2.20											CL-33127-SHRB

LONG RING (METRIC)

CLM-34162-SHR	9200	M24	1.10	2.05	9.00	1.00	1.40	5.10	3.00	8.25	2.81	.18	230	CLM-34121-SHRB
CLM-34163-SHR			1.50											CLM-34123-SHRB
CLM-34165-SHR	10000	M30	1.50	2.05	9.00	1.00	1.40	5.10	3.23	8.25	2.81	.18	230	CLM-34126-SHRB
CLM-34167-SHR			1.89											CLM-34127-SHRB



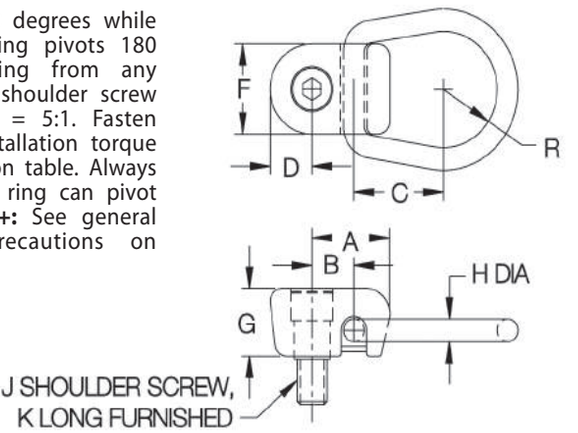
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SAFETY HOIST RINGS

RING: FORGED 4130 STEEL, HEAT TREATED, BLACK OXIDE FINISH, 100% MAGNAFLUX INSPECTED
BASE: FORGED 1045 STEEL, BLACK OXIDE FINISH



Forged base rotates 360 degrees while the solid-loop forged ring pivots 180 degrees, to allow lifting from any direction. High-strength shoulder screw furnished. Safety factor = 5:1. Fasten hoist ring using the installation torque specified in the dimension table. Always install so that the hoist ring can pivot and swivel freely. **INFO+:** See general Hoist Ring Safety Precautions on page 74.



INCH

PART NO.	LOAD RATING (LBS)	A	B	C	D	F	G	H DIA	J	K	R	INSTALLTION TORQUE (FT-LBS)	REPLACEMENT SHOULDER SCREW
CL-10-SHR	1000	1-1/8	5/8	1-1/2	5/8	1-1/4	7/8	5/16	3/8-16	5/8	13/16	7-10	CL-10-SHRB
CL-25-SHR	2500	1-5/8	7/8	1-7/8	7/8	1-3/4	1-5/16	7/16	5/8-11	7/8	1-1/8	42-50	CL-25-SHRB

METRIC

CLM-10-SHR	1000	1-1/8	5/8	1-1/2	5/8	1-1/4	7/8	5/16	M10	.59	13/16	7-10	CLM-10-SHRB
CLM-25-SHR	2500	1-5/8	7/8	1-7/8	7/8	1-3/4	1-5/16	7/16	M16	.79	1-1/8	42-50	CLM-25-SHRB



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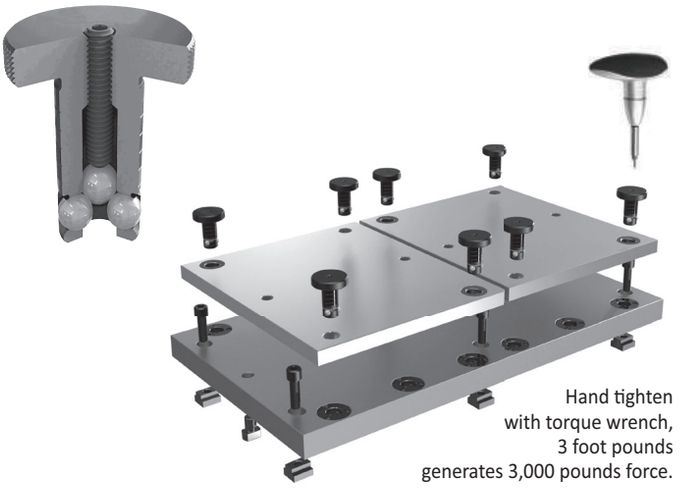
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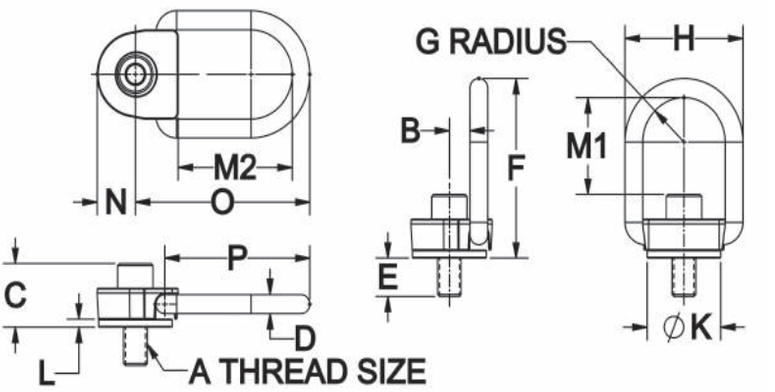
HEAVY-DUTY® SIDE-PULL HOIST RINGS

ALLOY STEEL, BLACK OXIDE FINISH, 100% MAGNAFLUX INSPECTED



D-Ring Type

Heavy-Duty version of our Side-Pull Hoist Rings offers greater load capacity in a given mounting-thread size. D-Ring type shown here is ideal for working with web slings. Side-Pull Hoist Rings are ideal for side mounting. Flip and turn loads without unhooking (use with a spreader bar). Forged alloy-steel ring pivots and swivels 360 degrees simultaneously to allow lifting from any direction. Safety factor = 5:1. **Patent no. 6,267,422.** Fasten hoist ring using the installation torque specified in the dimension table. Always install so that the hoist ring can pivot and swivel freely. **INFO+:** See general Hoist Ring Safety Precautions on page 74.



D-RING TYPE (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E	F	G	H	K DIA	L	M1	M2	N	O	P	INSTALLTION TORQUE (FT-LBS)
CL-37305-SPHR	800	5/16-18	.88	1.33	.50	.48	5.12	1.44	3.88	2.19	.23	3.18	3.43	1.25	5.48	4.61	7
CL-37310-SPHR	1000	3/8-16		1.40								3.12					12
CL-37315-SPHR	2500	1/2-13		1.52		.98						2.99					28
CL-37320-SPHR	4000	5/8-11		1.65								2.87					60
CL-37325-SPHR	5000	3/4-10		1.77		1.23						2.74					100
CL-37330-SPHR	7000	3/4-10	1.25	2.22	.75	1.28	6.88	1.75	5.00	3.13	.31	3.76	4.34	1.62	7.40	6.15	100
CL-37335-SPHR	8000	7/8-9		2.35								3.63					160
CL-37340-SPHR	10000	1"-8		2.47		1.53						3.51					230

D-RING TYPE (METRIC)

PART NO.	LOAD RATING (kg)	A THREAD	THREAD PITCH (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	K DIA (mm)	L (mm)	M1 (mm)	M2 (mm)	N (mm)	O (mm)	P (mm)	INSTALLTION TORQUE (N-m)
CLM-37805-SPHR	400	M8	1.25	22	34	13	14	130	37	99	56	6	81	87	32	139	117	9.5
CLM-37810-SPHR	450	M10	1.5		36		24						79					16
CLM-37815-SPHR	1050	M12	1.75		38		39						77					37
CLM-37820-SPHR	1900	M16	2		42		39						73					80
CLM-37825-SPHR	2200	M20	2.5		46		39						69					135
CLM-37830-SPHR	3000	M20	2.5	32	57	19	38	175	44	127	79	8	94	110	41	188	156	135
CLM-37835-SPHR	4200	M24	3		61		43						90					311

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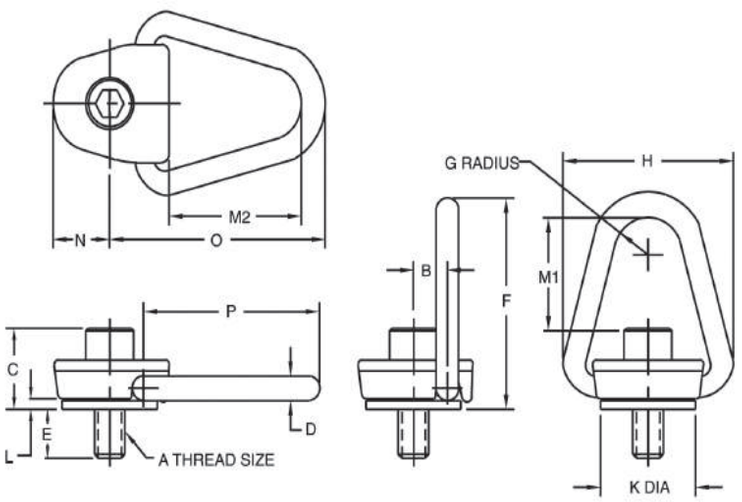
HEAVY-DUTY® SIDE-PULL HOIST RINGS

ALLOY STEEL, BLACK OXIDE FINISH, 100% MAGNAFLUX INSPECTED



Triangular-Ring Type

Heavy-Duty version of our Side-Pull Hoist Rings offers greater load capacity in a given mounting-thread size. Side-Pull Hoist Rings are ideal for side mounting. Flip and turn loads without unhooking (use with a spreader bar). Forged alloy-steel ring pivots and swivels 360 degrees simultaneously to allow lifting from any direction. Safety factor = 5:1. **Patent no. 6,267,422.** Fasten hoist ring using the installation torque specified in the dimension table. Always install so that the hoist ring can pivot and swivel freely. **INFO+:** See general Hoist Ring Safety Precautions on page 74.



TRIANGULAR-RING TYPE (INCH)

PART NO.	LOAD RATING (LBS)	A	B	C	D	E	F	G	H	K DIA	L	M1	M2	N	O	P	INSTALLATION TORQUE (FT-LBS)
CL-36305-SPHR	800	5/16-18	.88	1.33	.50	.48	4.72	.75	3.88	2.19	.22	2.89	3.19	1.25	5.12	4.25	7
CL-36310-SPHR	1000	3/8-16		1.39								2.84					12
CL-36315-SPHR	2500	1/2-13		1.53		.98						2.70					28
CL-36320-SPHR	4000	5/8-11		1.64								2.92					60
CL-36325-SPHR	5000	3/4-10		1.78		1.23						2.94					100
CL-36330-SPHR	7000	3/4-10	1.25	2.12	.75	1.25	6.25	.88	5.25	3.25	.25	4.00	4.19	1.62	6.75	5.62	100
CL-36340-SPHR	10000	1"-8		2.38		1.50						3.75					230

TRIANGULAR-RING TYPE (METRIC)

PART NO.	LOAD RATING (kg)	A THREAD	THREAD PITCH (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	K DIA (mm)	L (mm)	M1 (mm)	M2 (mm)	N (mm)	O (mm)	P (mm)	INSTALLATION TORQUE (N-m)
CLM-36805-SPHR	400	M8	1.25	22	34	13	14	121	19	98	56	6	74	81	32	130	108	9.5
CLM-36810-SPHR	450	M10	1.5		36		24						72					16
CLM-36815-SPHR	1050	M12	1.75		38		39						70					37
CLM-36820-SPHR	1900	M16	2		42		39						66					80

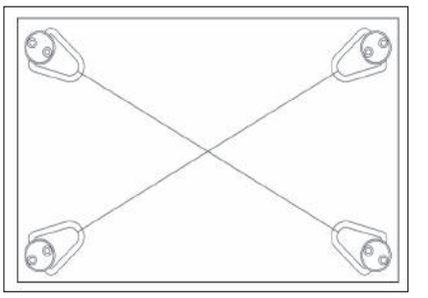
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PIVOTING HOIST RINGS

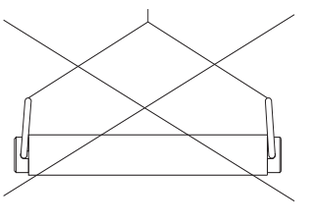
RING: FORGED 4130 STEEL, HEAT TREATED, BLACK OXIDE FINISH, 100% MAGNAFLUX INSPECTED PER ASTM E-1444
BASE: FORGED 1045 STEEL, BLACK OXIDE FINISH

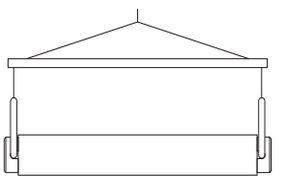


Economical hoist ring with a low profile and high load capacity. Forged base and solid-loop forged ring. Pivots a full 180 degrees, but does not rotate (install so that lifting force is applied in the pivoting direction). Safety factor = 5:1. Fasten hoist ring with grade-8 Socket-Head Cap Screws, using the installation torque specified in the dimension table. The smallest three sizes have two mounting holes, the largest two sizes have four. **INFO+:** See general Hoist Ring Safety Precautions on page 74.

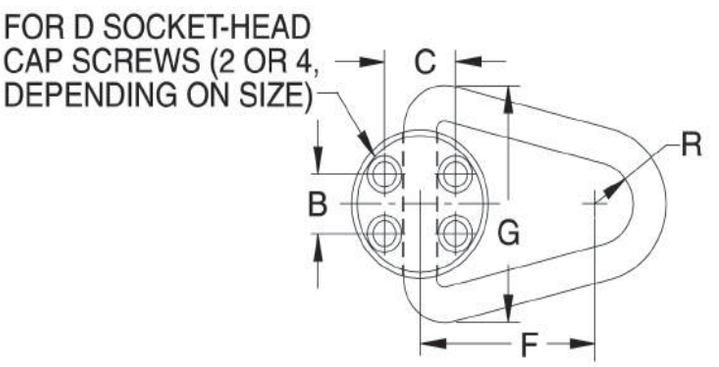


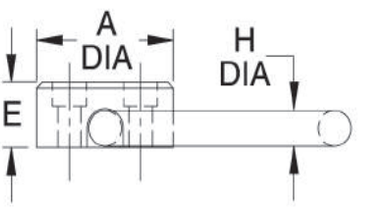
Install hoist rings so that lifting force is applied in the pivoting direction.





Do not allow hoist rings to bind. Use a spreader bar, if necessary, to avoid binding.



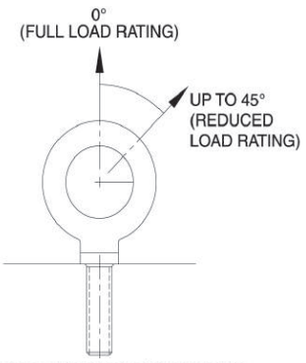


PART NO.	LOAD RATING (LBS)	A DIA	B	C	D THREAD X MIN. LENGTH	E DIA	F	G	H DIA	R	INSTALLATION TORQUE (FT-LBS)	SCREW EXTENSION BELOW BASE
CL-20-HR	2000	1-3/4	0	1	5/16-18x1.00 (or M8x25mm)	3/4	2	2-1/2	5/16	1/2	4-7	.58 (or 14mm)
CL-25-HR	2500	2-1/4		1-1/8	3/8-16x1.25 (or M10x30mm)	7/8	2-1/2	3-3/16	3/8	5/8	7-10	.79 (or 18mm)
CL-50-HR	5000	2-5/8		1-1/2	1/2-13x1.50 (or M12x40mm)	1-1/8	3	3-7/8	1/2	3/4	20-25	.90 (or 25mm)
CL-120-HR	12000	3-1/8	1-1/4	1-5/8	1/2-13x1.75 (or M12x45mm)	1-3/8	4	5	3/4	7/8	20-25	.90 (or 23mm)
CL-200-HR	20000	3-5/8		2-1/16	5/8-11x2.50 (or M16x65mm)	1-7/8	5	6-3/16	1	1	42-50	1.25 (or 33mm)

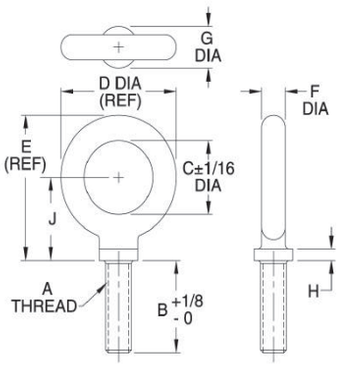
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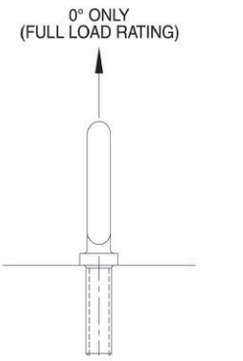
STEEL: FORGED CARBON STEEL, QUENCHED AND DRAWN, PLAIN FINISH
STAINLESS STEEL: FORGED 316 STAINLESS STEEL, PASSIVATED AND ELECTROPOLISHED





Angular lifting at up to 45° is allowable in this direction (plane of the eye) but load rating is reduced.





Only straight lifting is allowable in this direction.

Lifting Eyes are forged steel eyebolts with an integral shoulder for greater strength. These simple, economical lifting devices are suitable for vertical lifting in-line with the threaded bolt, such as when lifting from a single point or from two points with a spreader bar. For lifting at an angle, Swivel Hoist Rings should be used instead. Manufactured and tested according to ASTM A489 and ANSI B18.15 specifications. Safety factor = 5:1. Made in USA.

Lifting Eyes should be inspected before each use for possible defects and installed by a person trained in the installation of lifting devices. The tapped receiving hole should be countersunk, free of any debris, and deep enough to ensure proper shoulder seating. Firm hand tightening is recommended for installation; do not use wrenches or bars. Angular lifting should be avoided, because angular lifts significantly reduce rated capacity. Any angular loads must be radial in the plane of the eye, never at an angle to that plane. A steel washer or shim may be used under the shoulder to achieve proper eye orientation, but its thickness should not exceed one thread pitch. A washer may also be required to ensure flush seating on rough mounting surfaces.

Do not exceed rated load capacity. Maximum load rating applies to straight vertical lifting only. Lifting at an angle reduces load rating significantly – see table below for reduced load rating at 45° (this reduced rating should be used for any lift other than at 0° vertical). Do not work, stand, or crawl near the load of a Lifting Eye. Do not use a Lifting Eye to lift a load that can rotate; Swivel Hoist Rings should be used for such loads. Do not shock load Lifting Eyes; instead gradually increase lifting of the load to minimize load shock. Do not force hooks or any other fittings into the eye; they must fit freely. Do not weld or machine Lifting Eyes, or perform any repair. Do not expose Lifting Eyes to extreme temperatures or environmental conditions, as this may permanently reduce load capacity. Periodic inspection of installed Lifting Eyes is highly recommended. **INFO+:** Also see general Hoist Ring Safety Precautions on page 74.

STEEL (INCH)

PART NO.	A THREAD	B	C DIA	D DIA	E	F DIA	G DIA	H	J	LOAD RATING (lbs) 0°	LOAD RATING (lbs) 45°
CL-4-LE	1/4-20	1	3/4	1-3/16	1-11/32	7/32	17/32	5/32	3/4	500	125
CL-5-LE	5/16-18	1-1/8	7/8	1-7/16	1-21/32	9/32	19/32	5/32	15/16	900	225
CL-6-LE	3/8-16	1-1/4	1	1-11/16	1-31/32	11/32	21/32	5/32	1-1/8	1300	325
CL-8-LE	1/2-13	1-1/2	1-3/16	2-1/8	2-7/16	15/32	29/32	7/32	1-3/8	2400	600
CL-10-LE	5/8-11	1-3/4	1-3/8	2-9/16	2-15/16	19/32	1-1/32	9/32	1-21/32	4000	1000
CL-12-LE	3/4-10	2	1-1/2	2-13/16	3-7/32	21/32	1-3/16	9/32	1-13/16	5000	1250
CL-16-LE	1"-8	2-1/2	1-3/4	3-19/16	4-3/32	29/32	1-9/16	13/32	2-5/16	9000	2250

STAINLESS STEEL (INCH)

CL-4-LE-316S	1/4-20	1	3/4	1-3/16	1-11/32	7/32	17/32	5/32	3/4	500	125
CL-5-LE-316S	5/16-18	1-1/8	7/8	1-7/16	1-21/32	9/32	19/32	5/32	15/16	900	225
CL-6-LE-316S	3/8-16	1-1/4	1	1-11/16	1-31/32	11/32	21/32	5/32	1-1/8	1300	325
CL-8-LE-316S	1/2-13	1-1/2	1-3/16	2-1/8	2-7/16	15/32	29/32	7/32	1-3/8	2400	600
CL-10-LE-316S	5/8-11	1/3/4	1-3/8	2-9/16	2-15/16	19/32	1-1/32	9/32	1-21/32	4000	1000

STEEL (METRIC)

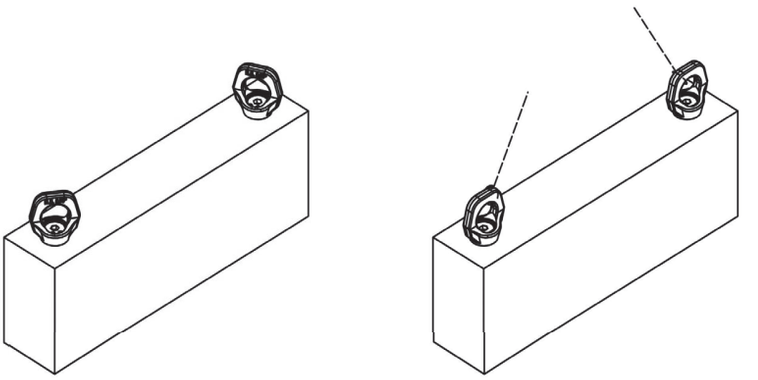
PART NO.	A THREAD	THREAD PITCH (mm)	B (mm)	C DIA (mm)	D DIA (mm)	E (mm)	F DIA (mm)	G DIA (mm)	H (mm)	J (mm)	LOAD RATING (kg) 0°	LOAD RATING (kg) 45°
CLM-6-LE	M6	1	25.4	19	30	34	5.5	14	4	19	210	50
CLM-8-LE	M8	1.25	31.5	25	43	48	9	17	4	26	500	125
CLM-10-LE	M10	1.5	35	27	46	55	9.5	20	4	32	740	185
CLM-12-LE	M12	1.75	38	30	54	62	12	23	5.5	35	1030	255
CLM-16-LE	M16	2	44.5	35	65	76	15	26	7	44	1600	400

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HOIST EYE 360°

BODY: HIGH-STRENGTH FORGED ALLOY STEEL, HIGH-VISIBILITY POWDER-COAT FINISH
BOLT: HIGH-STRENGTH ALLOY STEEL, CORROSION-RESISTANT PLATING
RETAINING RING: SPRING STEEL



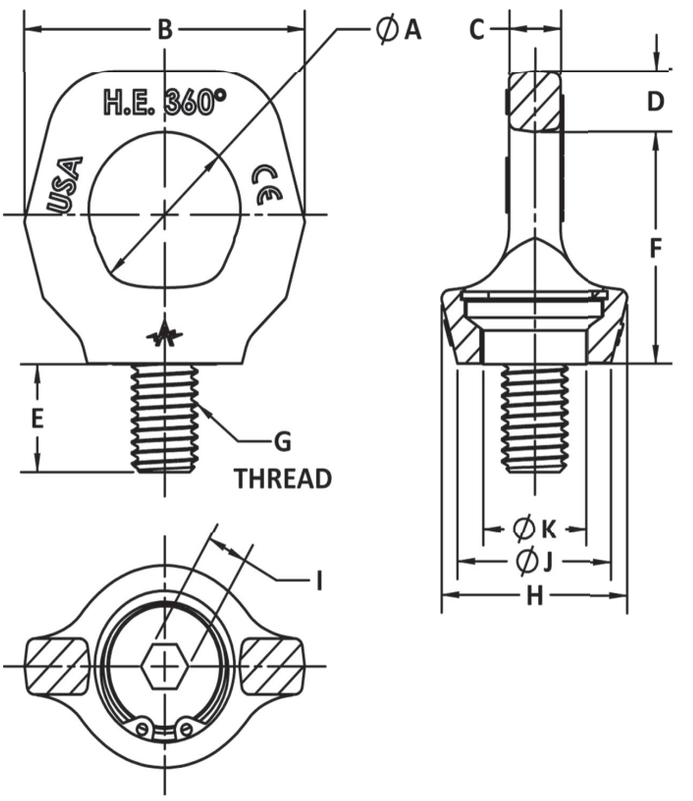


These unique lifting-eye assemblies can be rotated freely after installation, to align with the pulling direction.

New item!

Hoist Eye 360® is a forged lifting eye that can be rotated 360° after installation, to align with the pulling direction. This compact assembly features a specially designed shoulder bolt, which rotates freely in the precisely machined lifting-eye body and is held captive by a retaining ring. Unlike conventional lifting eyes, Hoist Eye 360® can be used at full rated load capacity when pulling at any angle 0 to 90° from the bolt axis. Available with thread sizes from 3/8-16 to 1"-8. Complies with ASME B30.26 specifications. 200% proof load tested and individually serialized. Safety factor = 5:1. Made in USA.

Please note, Hoist Eye 360® is suitable only for applications where all lifting-eye rotation takes place before lifting begins, with no swivel action occurring while under load. For applications that require swiveling under load, use a Swivel Hoist Ring instead. An installation key is provided to allow firm tightening by hand, which is allowable for one-time temporary lifting. For permanent installation, tighten by hex wrench to the installation torque listed in the tables below.



PART NO.	LOAD RATING (lbs)	G THREAD	A DIA	B	C	D	E	F	H	I HEX	J DIA	K DIA	INSTALLATION TORQUE (ft-lbs)
CL-71120-HE	880	3/8-16	.96	1.81	.36	.37	.61	1.40	1.19	7/32	1.00	.59	12
CL-71146-HE	1650	1/2-13	1.16	2.14	.39	.44	.76	1.64	1.42	5/16	1.18	.79	28
CL-71160-HE	3000	5/8-11	1.30	2.55	.55	.50	.94	1.94	1.69	3/8	1.38	.94	47
CL-71174-HE	4500	3/4-10	1.50	2.95	.63	.59	1.18	2.30	2.00	1/2	1.65	1.14	84
CL-71198-HE	7050	1"-8	1.84	3.53	.75	.72	1.5	2.82	2.35	5/8	1.97	1.34	230

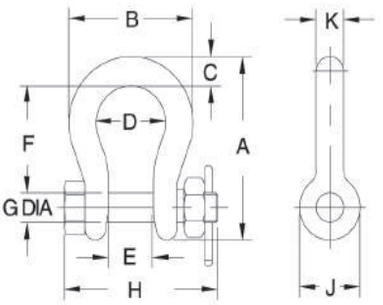
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HOIST RING ACCESSORIES



Forged Anchor Shackles

High-strength forged alloy-steel anchor shackle. Supplied with thin-head bolt and nut with cotter pin. Meets Federal Specification RR-C 271D, Type IVA, Grade A, Class 3. Safety factor = 6:1. Heat treated with black oxide finish. **INFO+**: See general Hoist Ring Safety Precautions on page 74.

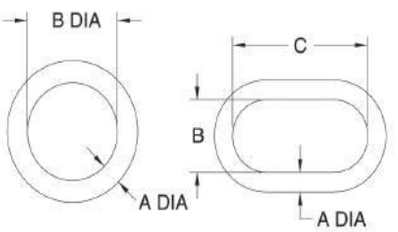


FORGED ANCHOR SHACKLES (INCH)

PART NO.	LOAD RATING (LBS)	NOMINAL SHACKLE SIZE	A	B	C	D	E	F	G DIA.	H	J	K
CL-36511-FAS	2000	3/8	2.49	1.78	.38	1.03	.66	1.44	.44	2.17	.91	3/8
CL-36521-FAS	3000	7/16	2.91	2.03	.44	1.16	.75	1.69	.50	2.51	1.06	7/16
CL-36531-FAS	4000	1/2	3.28	2.31	.50	1.31	.81	1.88	.63	2.80	1.19	1/2
CL-36541-FAS	6500	5/8	4.19	2.94	.69	1.69	1.06	2.38	.75	3.53	1.50	5/8
CL-36551-FAS	13000	7/8	5.83	4.03	.97	2.28	1.44	3.31	1.00	4.71	2.09	7/8
CL-36561-FAS	19000	1-1/8	7.47	5.16	1.25	2.91	1.81	4.25	1.25	5.09	2.69	1-1/8
CL-36571-FAS	24000	1-1/4	8.25	5.75	1.38	3.25	2.03	4.69	1.38	6.51	3.00	1-1/4



Forged Rings



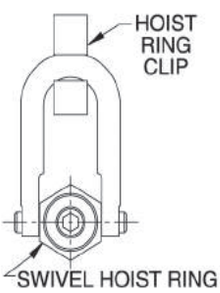
High-strength weldless forged alloy-steel ring. Safety factor = 6:1. Heat treated with black oxide finish. **INFO+:** See general Hoist Ring Safety Precautions on page 74.

FORGED RINGS

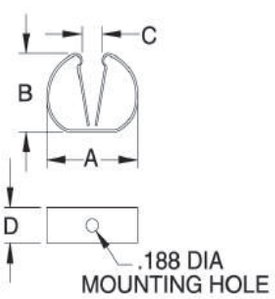
PART NO.	LOAD RATING (LBS)	A DIA.	B DIA.	C
CL-36111-FR	3800	3/8	2	—
CL-36121-FR	6100	5/8	3	—



Hoist-Ring Clips



Handy holddown clip to keep Swivel Hoist Rings and Side-Pull Hoist Rings from rotating when not in use. Spring steel, zinc plated. Available in two sizes, one fitting ring diameters from 3/8" to 5/8", the other fitting ring diameters from 3/4" to 1-1/16".



HOIST-RING CLIPS

PART NO.	FITS RING DIAMETER	A	B	C	D
CL-1-HRC	3/8, 7/16, 5/8	1-3/8	15/16	5/16	1/2
CL-2-HRC	3/4, 1-1/16	1-5/8	1-1/4	3/4	5/8

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HOIST RINGS

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The following hoist ring selections may be found online in the product catalog at carrlane.com



FORGED ROAD-PLATE SWIVEL HOIST RINGS*
These hoist rings have a shorter, larger-diameter bolt, ideal for lifting heavy plates. Patent no. 4,570,987, no. 4,641,986, no. 5,405,210 and others pending.



FORGED BAR-TITE™ SWIVEL HOIST RINGS*
These hoist rings have a steel bar knob for tightening with a level bar instead of a wrench. Patent no. 4,570,987, no. 4,641,986, no. 5,405,210 and others pending.



FORGED SPIN-N-LOK™ SWIVEL HOIST RINGS*
These hoist rings have a spoked lug nut for tightening without a wrench. Patent no. 4,570,987, 4,641,986, 5,405,210 and other patents pending.



FORGED WELD-MOUNT SWIVEL HOIST RINGS*
These hoist rings mounted by welding. Patent no. 4,570,987, no. 4,641,986, no. 5,405,210 and others pending.



HEAVY-DUTY SUPER-COIL™ SWIVEL HOIST RINGS*
These hoist rings are furnished with a coil bolt, and are ideal for temporary attachment to steel structures and construction material. Patent no. 4,570,987, 4,641,986, 5,405,210, 5,732,991, and others pending.



FORGED SWIVEL LIFT PLATES
These swivel hoist rings have a center through-hole instead of a bolt, for mounting with a custom anchoring system. Patent no. 4,570,987, no. 4,641,986, no. 5,405,210 and others pending.



SHACKLE HOIST RINGS*
These swivel hoist rings are designed for permanent mounting on tooling and equipment. Forged alloy-steel shackle pivots 180 degrees and swivels 360 degrees simultaneously to allow lifting from any direction. Patent no. 5,823,588.



FAST-LOK™ PLATE LIFTING SYSTEM
Plate-lifting system with a weld-on base and totally removable shackle assembly, allowing the plate surface to remain totally free of obstructions. Patent pending. FEATURES: Fast-Lok™ Clevis, Fast-Lok™ Base, Forged Anchor Shackle, Fast-Lok™ Detent Pin.

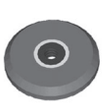


SCISSOR-LOK™ PLATE LIFTING SYSTEM
Plate-lifting system with a weld-on base and totally removable shackle assembly, allowing the plate surface to remain total free of obstructions. Patent pending, FEATURES: Scissor-Lok™ Tool, Fast-Lok™ Base, Forged Anchor Shackle, and Fast-Lok™ Detent Pin.



UNIVERSAL LIFTING RINGS
Removable hoist rings with a forged alloy-steel shackle. Each Universal Lifting Ring fits three different thread sizes. Designed for straight vertical lifting only. Patent no. 4,557,513.

HOIST RING ACCESSORIES — AVAILABLE EXCLUSIVELY ONLINE:



RENEWAL ROAD PLATES ROUND



RENEWAL ROAD PLATES SQUARE

*Forged alloy-steel shackle pivots 180 degrees and swivels 360 degrees simultaneously to allow lifting from any direction.

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HANDLES, KNOBS & SCREW CLAMPS



Fluted Knobs



Four-Prong Knobs & Screw Clamps



Three-Prong Knobs



T-Handle Knobs



Bar-Handle Knobs & Screw Clamps



Knurled Knobs & Screw Clamps



Socket-Head Screw Clamps



Feet for Swivel Screws



Latch Screws



Hand Wheels



Solid Handles



Revolving Handles



Lever Handles & Crank Handles



Adjustable Lever Handles



Knob Handles



Pull Handles

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HAND KNOBS

TYPES	MADE IN THE USA	ALUMINUM	STEEL	CAST IRON	STAINLESS STEEL	PLASTIC
 **PALM-GRIP HAND KNOBS** Polished full-grip hand knob. Choose from two sizes, each available blank, tapped, or reamed.	X	X				
 **FLUTED KNOBS** Large easy-grip knob that is excellent for either fine adjustment or high-torque applications.	X					X
 **STAR KNOBS** Five lobes provide a firm, sure grip for applications requiring quick tightening and high torque.	X					X
 **HAND KNOBS – CAST IRON** Classic easy-to-grip clamping knob. Choose from five sizes, each available blank, tapped, tapped through, or reamed.	X			X		
 **HAND KNOBS – ALUMINUM** Classic easy-to-grip clamping knob. Choose from five sizes, each available blank, tapped, tapped through, or reamed.	X	X				
 **HAND KNOBS – STAINLESS STEEL** High-quality beautiful polished finish. Four-prong design provides a firm grip for applications requiring quick tightening and high torque.	X				X	
 **HAND KNOB ASSEMBLIES** Classic, easy-to-grip aluminum knob with an integral steel clamping screw.	X	X				

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HAND KNOBS

TYPES	MADE IN THE USA	ALUMINUM	STEEL	CAST IRON	STAINLESS STEEL	PLASTIC
 **SWIVEL-WASHER HAND KNOB ASSEMBLIES** Hand-knob assembly with a captive, freely rotating washer to prevent marring in clamping applications. Now available with a choice of steel or nylon washer.	X	X				
 **KNOB SHOE ASSEMBLIES** Features an integral steel clamping screw with a removable swivel foot. Uses our patented left-hand-thread swivel foot system.	X	X				
 **FOUR PRONG KNOBS** Design provides a strong grip for clamping and other applications requiring quick tightening and high torque.	X					X
 **QUICK-ACTING KNOBS** Slides in and out of clamping position quickly; ideal when the knob must be completely removed for loading.	X			X		
 **BAR KNOBS** Heavy-duty knob that can be turned easily by hand, then tightened by inserting a bar between the prongs.	X				X	
 **THREE-PRONG KNOBS** Modern design provides quick tightening and high torque. Textured non-slip, non-glare finish.	X					X
 **T-HANDLE KNOBS** Provides maximum leverage for heavy-duty clamping.	X					

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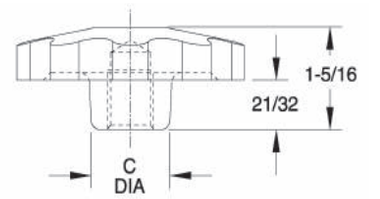
PALM-GRIP HAND KNOBS

319 ALUMINUM ALLOY



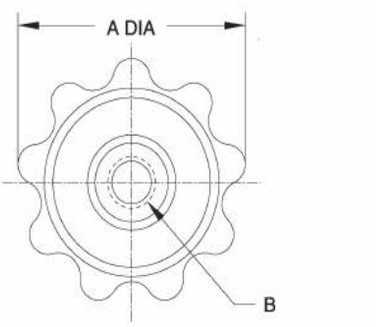
1/2-13
5/8-11
M12
M16

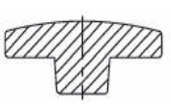
Polished full-grip hand knob. Choose from two knob sizes, each available blank, tapped or reamed.
Note: Catalog photos are actual size.





3/8-16
1/2-13
M10
M12





Blank



Tapped



Reamed

INCH & METRIC

PART NO.	A DIA	C DIA	HOLE TYPE	B
CL-11-PHK	2-3/4	1	BLANK	—
CL-13-PHK			TAPPED	3/8-16 X 3/4 DEEP
CL-14-PHK				1/2-13 X 3/4 DEEP
CLM-13-PHK				M10 X 3/4 DEEP
CLM-14-PHK				M12 X 3/4 DEEP
CL-12-PHK			REAMED	3/8 X 7/8 DEEP
CL-15-PHK				1/2 X 7/8 DEEP
CLM-12-PHK				10mm X 7/8 DEEP
CLM-15-PHK				12mm X 7/8 DEEP
CL-21-PHK	3-1/8	1	BLANK	—
CL-23-PHK			TAPPED	1/2-13 X 3/4 DEEP
CL-24-PHK				5/8-11 X 3/4 DEEP
CLM-23-PHK				M12 X 3/4 DEEP
CLM-24-PHK				M16 X 3/4 DEEP
CL-22-PHK			REAMED	1/2 X 7/8 DEEP
CL-25-PHK				5/8 X 1 DEEP
CLM-22-PHK				12mm X 7/8 DEEP
CLM-25-PHK				16mm X 1 DEEP

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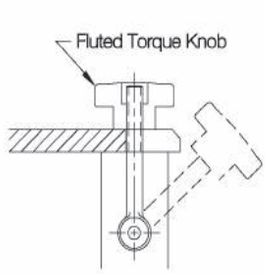
FLUTED KNOBS

BLACK PHENOLIC PLASTIC OR THERMOPLASTIC
WITH BRASS INSERT



1/2-13 CL-88-PFK
5/8-11 CL-810-PFK

Large easy-grip knob that is excellent for either fine-adjustment or high-torque applications. Molded-in brass insert provides superior thread strength. Choice of four knob sizes. Non-standard thread sizes, reamed holes, or molded-in studs are available in quantities of 500 and above. Note: Catalog photos are actual size.





3/8-16 CL-66-PFK
1/2-13 CL-68-PFK
M12 CLM-612-PFK

Phenolic — Tapped Through Hole



3/8-16 CL-660-PFK

Phenolic — Tapped Short Hub



3/8-16 CL-666-PFK



3/8-16 CL-466-PFK



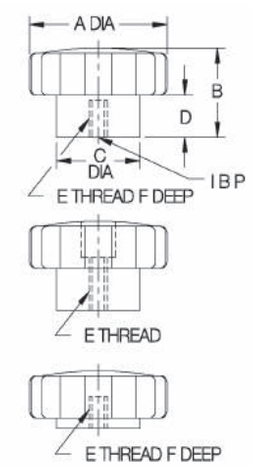
5/16-18 CL-450-PFK



1/4-20 CL-44-PFK
5/16-18 CL-45-PFK
3/8-16 CL-46-PFK
M8 CLM-48-PFK
M10 CLM-410-PFK



#10-32 CL-23-PFK
1/4-20 CL-24-PFK
5/16-18 CL-25-PFK
M6 CLM-26-PFK



PHENOLIC — TAPPED (INCH & METRIC)

PART NO.	A DIA	B	C DIA	D	E	F
CL-23-PFK	1-3/8	27/32	27/32	25/64	#10-32	5/16
CL-24-PFK					1/4-20	7/16
CL-25-PFK					5/16-18	
CLM-26-PFK					M6	
CL-44-PFK	1-3/4	1-1/16	1-1/16	1/2	1/4-20	
CL-45-PFK					5/16-18	
CL-46-PFK					3/8-16	1/2
CLM-48-PFK					M8	7/16
CLM-410-PFK					M10	1/2
CL-66-PFK	2-3/8	1-5/16	1-1/4	5/8	3/8-16	
CL-68-PFK					1/2-13	
CLM-612-PFK					M12	5/8
CL-88-PFK	3-1/4	1-25/32	2	7/8	1/2-13	
CL-810-PFK					5/8-11	3/4

PHENOLIC — TAPPED THROUGH HOLE (INCH)

CL-450-PFK	1-3/4	61/64	1-1/16	1/2	5/16-18	5/8
CL-660-PFK	2-3/8	1-9/32	1-1/4	5/8	3/8-16	5/8

PHENOLIC — TAPPED, SHORT HUB (INCH)

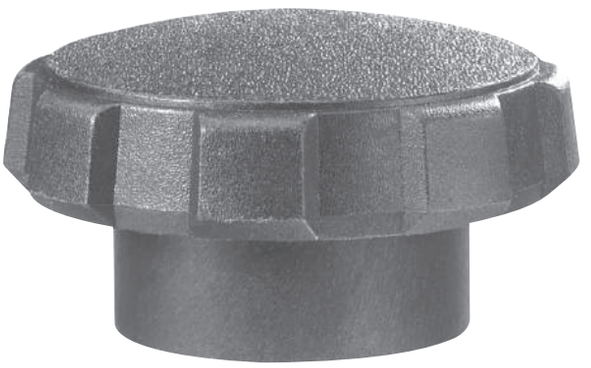
CL-466-PFK	1-3/4	11/16	3/4	1/8	3/8-16	3/8
CL-666-PFK	2-3/8	13/16	3/4	1/8	3/8-16	1/2

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FLUTED KNOBS

BLACK THERMOPLASTIC OR PHENOLIC PLASTIC WITH BRASS INSERT

Thermoplastic — Tapped



5/16-18 CL-750-PFK
3/8-16 CL-760-PFK



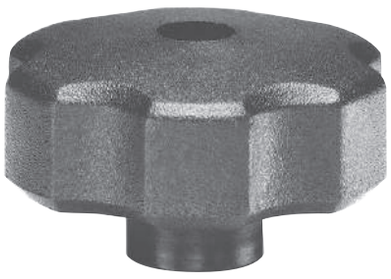
5/16-18 CL-550-PFK
3/8-16 CL-560-PFK



1/4-20 CL-340-PFK
5/16-18 CL-350-PFK

INFO+: Thermoplastic version of the Fluted Knobs on page 97, with a textured non-slip, non-glare finish. Choice of three knob sizes. Molded-in brass insert provides superior thread strength. Non-standard thread sizes, reamed holes, molded-in studs, or special colors are available in quantities of 500 and above. Note: Catalog photos are actual size.

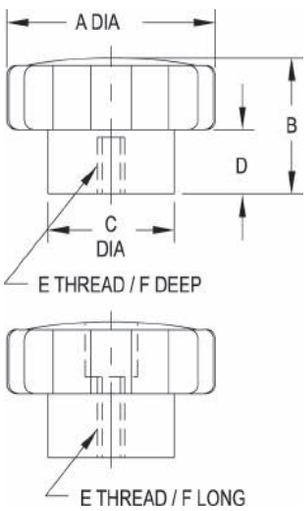
Thermoplastic — Tapped Through Hole



5/16-18 CL-551-PFK
3/8-16 CL-561-PFK



1/4-20 CL-341-PFK
5/16-18 CL-351-PFK



THERMOPLASTIC — TAPPED

PART NO.	A DIA	B	C DIA	D	E	F
CL-340-PFK	1-1/2	1	3/4	3/8	1/4-20	5/8
CL-350-PFK					5/16-18	
CL-550-PFK	2-5/32	1-1/8	3/4	3/8	5/16-18	3/4
CL-560-PFK					3/8-16	
CL-750-PFK	3-1/4	1-5/8	2	3/4	5/16-18	3/4
CL-760-PFK					3/8-16	7/8

THERMOPLASTIC — TAPPED THROUGH HOLE

CL-341-PFK	1-1/2	1	3/4	3/8	1/4-20	5/8
CL-351-PFK					5/16-18	
CL-551-PFK	2-5/32	1-1/8	3/4	3/8	5/16-18	7/8
CL-561-PFK					3/8-16	

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BLACK THERMOPLASTIC OR CUSHION-GRIP PLASTIC
WITH BRASS INSERT

Thermoplastic — Tapped

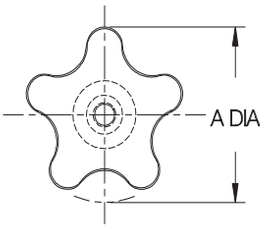


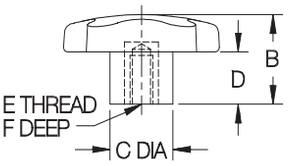
1/4-20 CL-632-SK
5/16-18 CL-642-SK
3/8-16 CL-652-SK

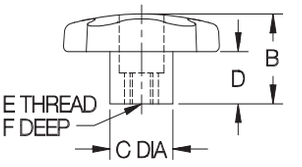
Thermoplastic — Tapped Through Hole



1/4-20 CL-636-SK
5/16-18 CL-646-SK
3/8-16 CL-656-SK







Star Knobs have five lobes to provide a firm, sure grip for applications requiring quick tightening and high torque. Smooth, rounded lobes prevent snagging. Thermoplastic version has a textured, non-slip, non-glare finish. Cushion-Grip version is made from a unique material that feels soft to the touch, comfortable yet rugged. Molded-in brass insert provides superior thread strength. Non-standard thread sizes, reamed holes, molded-in studs, or special colors are available in quanitities of 500 and above. Note: Catalog photos are actual size.

Cushion Grip — Tapped



5/16-18 CL-755-SK
3/8-16 CL-765-SK



1/4-20 CL-545-SK
5/16-18 CL-555-SK
3/8-16 CL-565-SK



1/4-20 CL-345-SK
5/16-18 CL-355-SK

THERMOPLASTIC — TAPPED

PART NO.	A DIA	B	C DIA	D	E	F
CL-632-SK	2-1/4	1	7/8	1/2	1/4-20	1/2
CL-642-SK					5/16-18	5/8
CL-652-SK					3/8-16	1/2

THERMOPLASTIC — TAPPED THROUGH HOLE

PART NO.	A DIA	B	C DIA	D	E	F
CL-636-SK	2-1/4	1	7/8	1/2	1/4-20	5/8
CL-646-SK					5/16-18	
CL-656-SK					3/8-16	

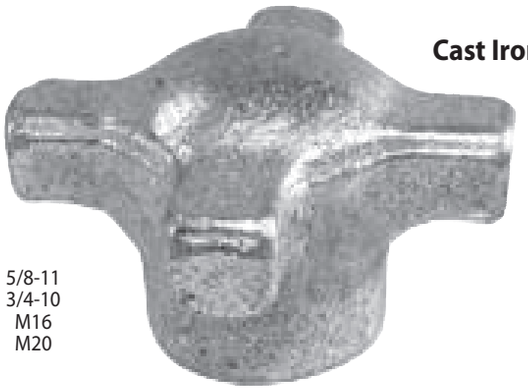
CUSHION GRIP — TAPPED

PART NO.	A DIA	B	C DIA	D	E	F
CL-345-SK	1-1/2	1-3/32	11/16	15/64	1/4-20	5/8
CL-355-SK					5/16-18	
CL-545-SK	2	1-3/8	3/4	33/64	1/4-20	5/8
CL-555-SK					5/16-18	
CL-565-SK					3/8-16	
CL-755-SK	2-3/8	1-5/8	3/4	11/16	5/16-18	5/8
CL-765-SK					3/8-16	

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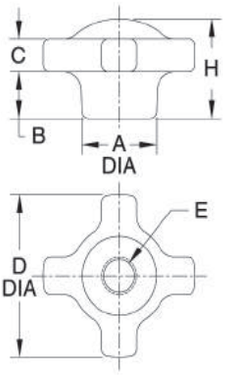
HAND KNOBS

CAST IRON, ZINC PLATED CLEAR CHROMATE



Cast Iron

5/8-11
3/4-10
M16
M20



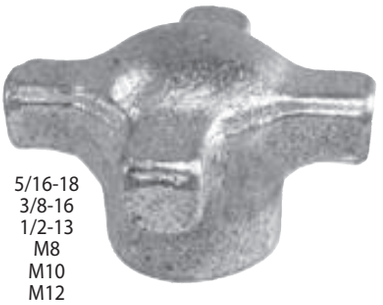


Blank **Tapped** **Tapped Through**

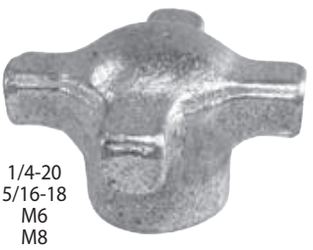
Classic easy-to-grip clamping knob, available in cast iron (shown here) or aluminum. Choose from five cast iron knob sizes, available blank, tapped, or tapped through. Note: catalog photos are actual size.



1/2-13
5/8-11
M12
M16



5/16-18
3/8-16
1/2-13
M8
M10
M12



1/4-20
5/16-18
M6
M8



1/4-20
M6

CAST IRON (INCH & METRIC)

PART NO. CAST IRON	D DIA	A DIA	B	C	H	HOLE TYPE	E
CL-85-HK-8	1-1/8	9/16	5/16	5/16	7/8	BLANK	—
CL-80-HK-8						TAPPED	1/4-20 x 1/2 DEEP
CLM-80-HK-8							M6 x 1/2 DEEP
CL-8-HK-8						TAPPED THROUGH	1/4-20
CLM-8-HK-8							M6
CL-25-HK-2	1-3/4	3/4	1/2	3/8	1-1/8	BLANK	—
CL-10-HK-2						TAPPED	1/4-20 x 7/8 DEEP
CL-20-HK-2							5/16-18 x 7/8 DEEP
CLM-10-HK-2							M6 x 7/8 DEEP
CLM-20-HK-2							M8 x 7/8 DEEP
CL-1-HK-2						TAPPED THROUGH	1/4-20
CL-2-HK-2							5/16-18
CLM-1-HK-2							M6
CLM-2-HK-2							M8
CL-45-HK-4	2-1/8	1	5/8	7/16	1-3/8	BLANK	—
CL-20-HK-4						TAPPED	5/16-18 x 1 DEEP
CL-30-HK-4							3/8-16 x 1 DEEP
CL-40-HK-4							1/2-13 x 1 DEEP
CLM-20-HK-4							M8 x 1 DEEP
CLM-30-HK-4							M10 x 1 DEEP
CLM-40-HK-4							M12 x 1 DEEP
CL-2-HK-4						TAPPED THROUGH	5/16-18
CL-3-HK-4							3/8-16
CL-4-HK-4							1/2-13
CLM-2-HK-4							M8
CLM-3-HK-4							M10
CLM-4-HK-4							M12
CL-105-HK-10	2-1/2	1-1/8	1	1/2	1-5/8	BLANK	—
CL-90-HK-9						TAPPED	1/2-13 x 1-1/4 DEEP
CL-100-HK-10							5/8-11 x 1-1/4 DEEP
CLM-90-HK-9							M12 x 1-1/4 DEEP
CL-9-HK-9						TAPPED THROUGH	1/2-13
CL-10-HK-10							5/8-11
CLM-9-HK-9							M12
CLM-10-HK-10							M16
CL-65-HK-6	2-3/4	1-3/8	3/4	1/2	1-1/2	BLANK	—
CL-50-HK-6						TAPPED	5/8-11 x 1-1/8 DEEP
CL-60-HK-6							3/4-10 x 1-1/8 DEEP
CLM-50-HK-6							M16 x 1-1/8 DEEP
CLM-60-HK-6							M20 x 1-1/8 DEEP
CL-5-HK-6						TAPPED THROUGH	5/8-11
CL-6-HK-6							3/4-10
CLM-5-HK-6							M16
CLM-6-HK-6							M20

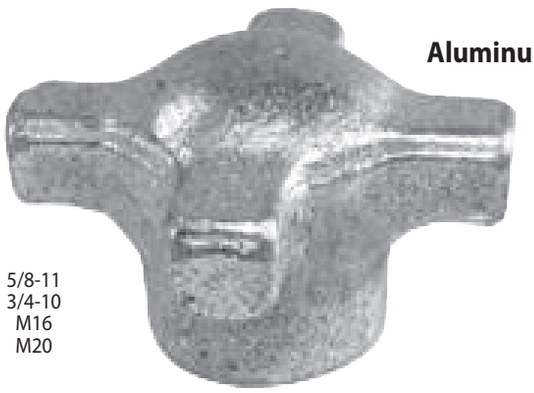
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319 ALUMINUM ALLOY

Aluminum



5/8-11
3/4-10
M16
M20



1/2-13
5/8-11
M12
M16



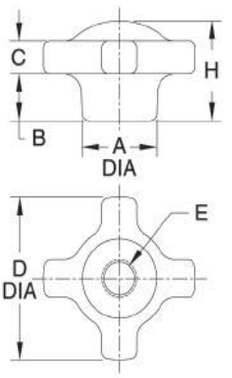
5/16-18
3/8-16
1/2-13
M8
M10
M12



1/4-20
5/16-18
M6
M8



1/4-20
M6



Classic easy-to-grip clamping knob, available in aluminum (shown here) or cast iron. Choose from five knob sizes, each available blank, tapped, tapped through, or reamed. Note: catalog photos are actual size.



Blank **Tapped** **Tapped Through** **Reamed**

ALUMINUM (INCH & METRIC)

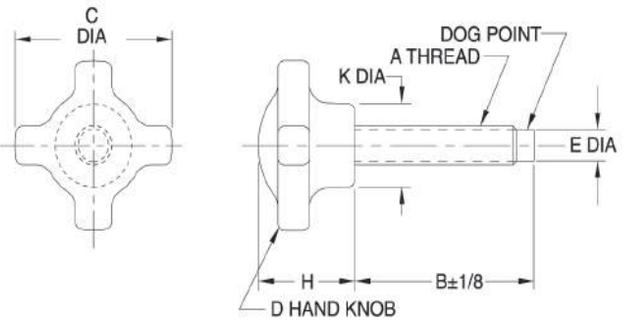
PART NO. ALUMINUM	D DIA	A DIA	B	C	H	HOLE TYPE	E
CL-85-HK-8A	1-1/8	9/16	5/16	5/16	7/8	BLANK	—
CL-80-HK-8A						TAPPED	1/4-20 x 1/2 DEEP
CLM-80-HK-8A							M6 x 1/2 DEEP
CL-8-HK-8A						TAPPED THROUGH	1/4-20
CLM-8-HK-8A							M6
CL-28-HK-8A						REAMED	1/4 x 1/2 DEEP
CLM-28-HK-8A							6mm x 1/2 DEEP
CL-25-HK-2A	1-3/4	3/4	1/2	3/8	1-1/8	BLANK	—
CL-10-HK-2A						TAPPED	1/4-20 x 7/8 DEEP
CL-20-HK-2A							5/16-18 x 7/8 DEEP
CLM-10-HK-2A							M6 x 7/8 DEEP
CLM-20-HK-2A							M8 x 7/8 DEEP
CL-1-HK-2A						TAPPED THROUGH	1/4-20
CL-2-HK-2A							5/16-18
CLM-1-HK-2A							M6
CLM-2-HK-2A							M8
CL-21-HK-2A						REAMED	1/4 x 7/8 DEEP
CL-22-HK-2A							5/16 x 7/8 DEEP
CLM-21-HK-2A							6mm x 7/8 DEEP
CLM-22-HK-2A							8mm x 7/8 DEEP
CL-45-HK-4A	2-1/8	1	5/8	7/16	1-3/8	BLANK	—
CL-20-HK-4A						TAPPED	5/16-18 x 1 DEEP
CL-30-HK-4A							3/8-16 x 1 DEEP
CL-40-HK-4A							1/2-13 x 1 DEEP
CLM-20-HK-4A							M8 x 1 DEEP
CLM-30-HK-4A							M10 x 1 DEEP
CLM-40-HK-4A							M12 x 1 DEEP
CL-2-HK-4A						TAPPED THROUGH	5/16-18
CL-3-HK-4A							3/8-16
CL-4-HK-4A							1/2-13
CLM-2-HK-4A							M8
CLM-3-HK-4A							M10
CLM-4-HK-4A							M12
CL-23-HK-4A						REAMED	3/8 x 1 DEEP
CL-24-HK-4A							1/2 x 1 DEEP
CLM-23-HK-4A							10mm x 1 DEEP
CLM-24-HK-4A							12mm x 1 DEEP
CL-105-HK-10A	2-1/2	1-1/8	1	1/2	1-5/8	BLANK	—
CL-90-HK-9A						TAPPED	1/2-13 x 1-1/4 DEEP
CL-100-HK-10A							5/8-11 x 1-1/4 DEEP
CLM-90-HK-9A							M12 x 1-1/4 DEEP
CLM-100-HK-10A							M16 x 1-1/4 DEEP
CL-9-HK-9A						TAPPED THROUGH	1/2-13
CL-10-HK-10A							5/8-11
CLM-9-HK-9A							M12
CLM-10-HK-10A							M16
CL-29-HK-9A						REAMED	1/2 x 1-1/4 DEEP
CL-31-HK-10A							5/8 x 1-1/4 DEEP
CLM-29-HK-9A							12mm x 1-1/4 DEEP
CLM-31-HK-10A							16mm x 1-1/4 DEEP
CL-65-HK-6A	2-3/4	1-3/8	3/4	1/2	1-1/2	BLANK	—
CL-50-HK-6A						TAPPED	5/8-11 x 1-1/8 DEEP
CL-60-HK-6A							3/4-10 x 1-1/8 DEEP
CLM-50-HK-6A							M16 x 1-1/8 DEEP
CLM-60-HK-6A							M20 x 1-1/8 DEEP
CL-5-HK-6A						TAPPED THROUGH	5/8-11
CL-6-HK-6A							3/4-10
CLM-5-HK-6A							M16
CLM-6-HK-6A							M20
CL-25-HK-6A						REAMED	5/8 x 1-1/8 DEEP
CL-26-HK-6A							3/4 x 1-1/8 DEEP
CLM-25-HK-6A							16mm x 1-1/8 DEEP
CLM-26-HK-6A							20mm x 1-1/8 DEEP

HAND KNOB ASSEMBLIES

KNOB: 319 ALUMINUM ALLOY
SCREW: 12L14 STEEL, ZINC PLATED CLEAR CHROMATE



Classic, easy-to-grip aluminum knob with an integral steel clamping screw. Four-prong design provides a firm grip for applications requiring quick tightening and high torque. Choice of three knob sizes. Available in thread sizes from 1/4-20 to 3/4-10 (M6 to M20 in metric), most in a choice of several thread lengths. **INFO+**: See page 101 for additional hand-knob dimensions.



INCH

PART NO.	A	B	C DIA	D	E DIA	H	K DIA
CL-1-HK2T	1/4-20	1	1-3/4	CL-25-HK-2A	.15	1-1/8	3/4
CL-2-HK2T		1-1/2					
CL-2A-HK2T		2					
CL-2B-HK2T		3					
CL-3A-HK2T	5/16-18	1			.20		
CL-3-HK2T		1-3/4					
CL-4-HK2T		2-1/2					
CL-4A-HK2T		3					
CL-5A-HK4T	3/8-16	1	2-1/8	CL-45-HK-4A	.25	1-3/8	1
CL-5B-HK4T		1-1/2					
CL-5-HK4T		2					
CL-6-HK4T		2-1/2					
CL-6A-HK4T		3					
CL-7A-HK4T	1/2-13	1			.34		
CL-7B-HK4T		1-1/2					
CL-7C-HK4T		2					
CL-7-HK4T		2-1/2					
CL-8-HK4T		3					
CL-9-HK6T	5/8-11	1-3/4	2-3/4	CL-65-HK-6A	.46	1-1/2	1-3/8
CL-10-HK6T		3					
CL-12-HK6T	3/4-10	3			.56		

METRIC

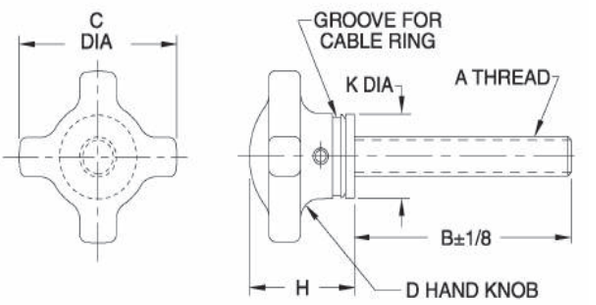
PART NO.	A	B	C DIA	D	E DIA	H	K DIA
CLM-1-HK2T	M6	.98	1-3/4	CL-25-HK-2A	.17	1-1/8	3/4
CLM-2-HK2T		1.57					
CLM-3A-HK2T	M8	.98			.23		
CLM-3-HK2T		1.77					
CLM-4-HK2T		2.56					
CLM-5A-HK4T	M10	.98	2-1/8	CL-45-HK-4A	.27	1-3/8	1
CLM-5B-HK4T		1.57					
CLM-5-HK4T		1.97					
CLM-6-HK4T		2.56					
CLM-7A-HK4T	M12	.98			.35		
CLM-7B-HK4T		1.57					
CLM-7C-HK4T		1.97					
CLM-7-HK4T		2.56					
CLM-8-HK4T		2.95					
CLM-9-HK6T	M16	1.77	2-3/4	CL-65-HK-6A	.47	1-1/2	1-3/8
CLM-10-HK6T		2.95					
CLM-12-HK6T	M20	2.95			.59		

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SWIVEL-WASHER HAND KNOB ASSEMBLIES

KNOB: 319 ALUMINUM ALLOY
SCREW: 12L14 STEEL, BLACK OXIDE FINISH.
WASHER: MILD STEEL





Hand-knob assembly with a captive, freely rotating washer to prevent marring in clamping applications. Four-prong design provides a firm grip for applications requiring quick tightening and high torque. Plain-end screw with no dogpoint. Choice of three knob sizes. Available in thread sizes from 1/4-20 to 3/4-10, most in a choice of several thread lengths. **INFO+**: See page 101 for additional hand-knob dimensions.

ASSEMBLY WITH STEEL WASHER (INCH)

PART NO.	A	B	C DIA	D	H	K DIA	CABLE RING SIZE
CL-1-SHK2T	1/4-20	1	1-3/4	CL-25-HK-2A	1.33	3/4	CL-11-KR
CL-2-SHK2T		1-1/2					
CL-2A-SHK2T		2					
CL-2B-SHK2T		3					
CL-3A-SHK2T	5/16-18	1			1.34		
CL-3-SHK2T		1-3/4					
CL-4-SHK2T		2-1/2					
CL-4A-SHK2T		3					
CL-5A-SHK4T	3/8-16	1	2-1/8	CL-45-HK-4A	1.47	1	CL-14-KR
CL-5B-SHK4T		1-1/2					
CL-5-SHK4T		2					
CL-6-SHK4T		2-1/2					
CL-6A-SHK4T		3					
CL-7A-SHK4T	1/2-13	1			1.53		
CL-7B-SHK4T		1-1/2					
CL-7C-SHK4T		2					
CL-7-SHK4T		2-1/2					
CL-8-SHK4T		3					
CL-9-SHK6T	5/8-11	1-3/4	2-3/4	CL-65-HK-6A	1.66	1-3/8	CL-19-KR
CL-10-SHK6T		3					
CL-12-SHK6T	3/4-10	3			1.77		

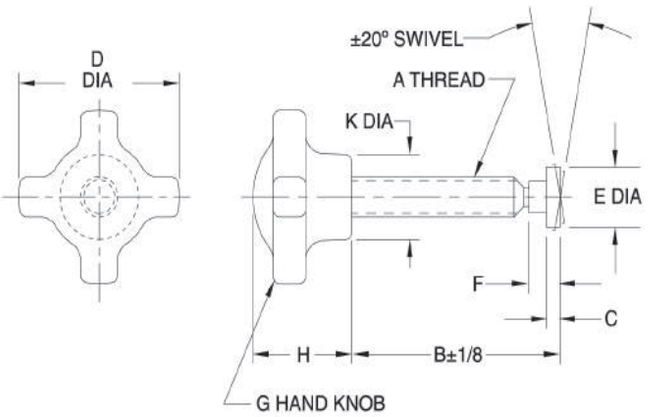
ASSEMBLY WITH NYLON WASHER (INCH)

PART NO.	A	B	C DIA	D	H	K DIA	CABLE RING SIZE
CL-1-SHK2TN	1/4-20	1	1-3/4	CL-25-HK-2A	1.33	3/4	CL-11-KR
CL-2-SHK2TN		1-1/2					
CL-3-SHK2TN	5/16-18	1-3/4			1.34		
CL-5A-SHK4TN	3/8-16	1	2-1/8	CL-45-HK-4A	1.47	1	CL-14-KR
CL-7A-SHK4TN	1/2-13	1			1.53		
CL-7B-SHK4TN		1-1/2					

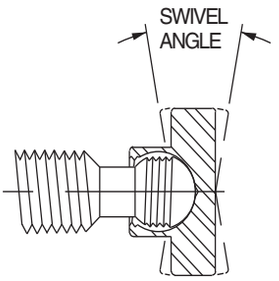
KNOB SHOE ASSEMBLIES

KNOB: 319 ALUMINUM ALLOY
SCREW: 12L14 STEEL, BLACK OXIDE FINISH OR ZINC PLATED CLEAR CHROMATE
FOOT: 12L14 STEEL, BLACK OXIDE FINISH OR ZINC PLATED YELLOW CHROMATE (OR DELRIN®)





This hand-knob assembly features an integral steel clamping screw with a removable swivel foot. Four-prong design provides a firm grip for applications requiring quick tightening and high torque. Choice of four knob sizes. Available in thread sizes from 1/4-20 to 3/4-10 (M6 to M20 in metric), most in a choice of several thread lengths. **INFO+**: See page 101 for additional hand-knob dimensions.



Knob Shoe Assemblies use our patented left-hand-thread swivel-foot system. The ball end of the body screws into the foot for easy installation and removal. Once the ball threads pass beyond the foot threads, the foot can rotate and pivot freely (20° total angle). Foot threads are left-hand to positively prevent accidental backout during use. Delrin® feet are optional. To order with a Delrin® foot, add "N" to the part number, e.g. CL-1-KSAN. Note: Delrin® feet are not threaded – they snap on and off. **INFO+**: For other foot types, see Feet for Swivel Screws on page 119 (order separately).

INCH

PART NO.	A	B	C	D DIA	E DIA	F	G	H	K DIA
CL-1-KSA	1/4-20	1-1/4	1/8	1-1/8	3/8	5/16	CL-85-HK-8A	7/8	9/16
CL-2-KSA		2							
CL-2A-KSA	1/4-20	2	1/8	1-3/4	3/8	5/16	CL-25-HK-2A	1-1/8	3/4
CL-3-KSA	5/16-18	1-1/2	5/32	1-3/4	1/2	11/32	CL-25-HK-2A	1-1/8	3/4
CL-4-KSA		2-1/4							
CL-4A-KSA		2							
CL-5-KSA	3/8-16	2-1/16	3/16	2-1/8	9/16	7/16	CL-45-HK-4A	1-3/8	1
CL-6-KSA		2-13/16							
CL-7-KSA		3-9/16							
CL-8-KSA	1/2-13	2-13/16			3/4	27/64			
CL-9-KSA		3-9/16							
CL-10-KSA		4-5/16							
CL-11-KSA	5/8-11	3-5/16	7/32	2-3/4	15/16	33/64	CL-65-HK-6A	1-1/2	1-3/8
CL-13-KSA		4-13/16							
CL-14-KSA	3/4-10	3-5/16							
CL-16-KSA		4-13/16							

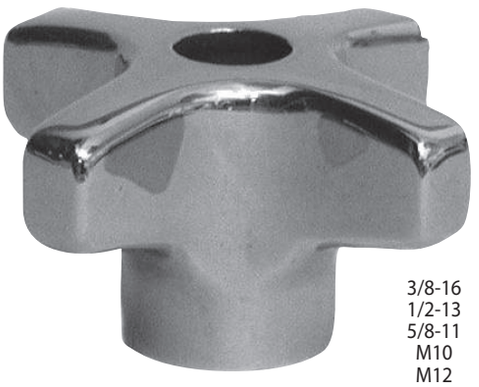
METRIC

PART NO.	A	B	C	D DIA	E DIA	F	G	H	K DIA
CLM-1-KSA	M6	.98	1/8	1-1/8	3/8	5/16	CL-85-HK-8A	7/8	9/16
CLM-2-KSA		1.97							
CLM-3-KSA	M8	1.57	5/32	1-3/4	1/2	11/32	CL-25-HK-2A	1-1/8	3/4
CLM-4-KSA		2.36							
CLM-5-KSA	M10	1.97	3/16	2-1/8	9/16	7/16	CL-45-HK-4A	1-3/8	1
CLM-6-KSA		3.54							
CLM-7-KSA	M12	2.76			3/4	27/64			
CLM-8-KSA		4.33							
CLM-9-KSA	M16	3.15	7/32	2-3/4	5/16	33/64	CL-65-HK-6A	1-1/2	1-3/8
CLM-10-KSA		4.72							

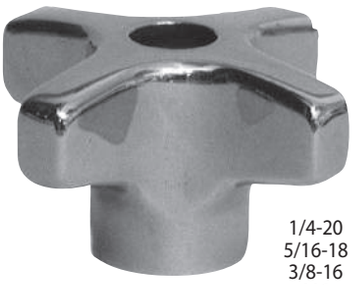
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HAND KNOBS – STAINLESS STEEL

300-SERIES STAINLESS STEEL



3/8-16
1/2-13
5/8-11
M10
M12
M16



1/4-20
5/16-18
3/8-16
M6
M8
M10

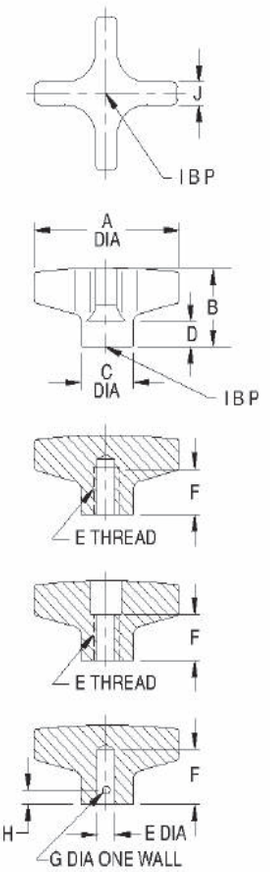
High-quality, stainless steel knob with a beautiful polished finish. Four-prong design provides a firm grip for applications requiring quick tightening and high torque. Choose from two knob sizes, each available blank, tapped, tapped through, or reamed. Note: Catalog photos are actual size.

Blank

Tapped

Tapped Through Hole

Reamed



INCH & METRIC

PART NO.	A DIA	B	C DIA	D	HOLE TYPE	E	F	G	H	J
CL-200-HK-S	2	1.02	.78	.34	BLANK	—	—	—	—	.33
CL-240-HK-S					TAPPED	1/4-20	11/16	—	—	
CL-250-HK-S						5/16-18				
CL-260-HK-S						3/8-16				
CLM-260-HK-S						M6				
CLM-280-HK-S						M8				
CLM-2100-HK-S						M10				
CL-241-HK-S					TAPPED THROUGH	1/4-20	1/2	—	—	
CL-251-HK-S						5/16-18	5/8			
CL-261-HK-S						3/8-16	3/4			
CLM-261-HK-S						M6	1/2			
CLM-281-HK-S						M8	5/8			
CLM-2101-HK-S						M10	3/4			
CL-255-HK-S					REAMED	5/16	11/16	1/8	3/16	
CL-265-HK-S						3/8		5/32		
CL-600-HK-S	3	1.50	1.14	.50	BLANK	—	—	—	—	.47
CL-660-HK-S					TAPPED	3/8-16	1	—	—	
CL-680-HK-S						1/2-13				
CL-6100-HK-S						5/8-11				
CLM-6100-HK-S						M10				
CLM-6120-HK-S						M12				
CLM-6160-HK-S						M16				
CL-661-HK-S					TAPPED THROUGH	3/8-16	3/4	—	—	
CL-681-HK-S						1/2-13	1			
CL-6101-HK-S						5/8-11	1-1/4			
CLM-6101-HK-S						M10	1			
CLM-6121-HK-S						M12				
CLM-6161-HK-S						M16				
CL-665-HK-S					REAMED	3/8	1	5/32	1/4	
CL-685-HK-S						1/2		3/16		

FOUR-PRONG KNOBS

KNOB: BLACK PHENOLIC PLASTIC WITH BRASS INSERT
STUD: MILD STEEL, ZINC PLATED CLEAR CHROMATE

Phenolic —Tapped



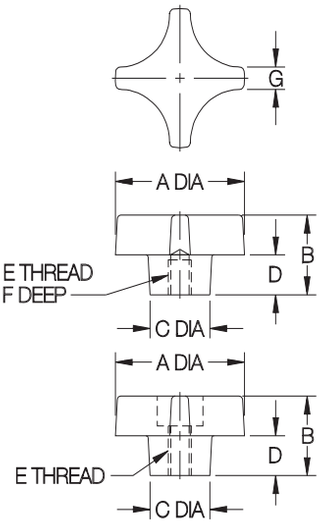
5/16-18	CL-20-PPK-4
3/8-16	CL-30-PPK-4
1/2-13	CL-40-PPK-4
M10	CLM-10-PPK-4



1/4-20	CL-10-PPK-2
5/16-18	CL-20-PPK-2
3/8-16	CL-30-PPK-2
M8	CLM-8-PPK-2



#10-24	CL-10B-PPK-1
#10-32	CL-10A-PPK-1
1/4-20	CL-10-PPK-1
5/16-18	CL-20-PPK-1
M6	CLM-6-PPK-1



Phenolic —Tapped Through Hole



5/16-18	CL-2-PPK-4
3/8-16	CL-3-PPK-4
1/2-13	CL-4-PPK-4



1/4-20	CL-1-PPK-2
5/16-18	CL-2-PPK-2
3/8-16	CL-3-PPK-2



#10-24	CL-1B-PPK-1
#10-32	CL-1A-PPK-1
1/4-20	CL-1-PPK-1

PHENOLIC — TAPPED (INCH & METRIC)

PART NO.	A	B	C DIA	D	E	F	G
CL-10B-PPK-1	1-1/4	7/8	5/8	3/8	#10-24	5/16	1/4
CL-10A-PPK-1					#10-32		
CL-10-PPK-1					1/4-20	7/16	
CL-20-PPK-1					5/16-18		
CLM-6-PPK-1					M6		
CL-10-PPK-2	1-3/4	1	13/16	1/2	1/4-20		9/32
CL-20-PPK-2					5/16-18		
CL-30-PPK-2					3/8-16	1/2	
CLM-8-PPK-2					M8		
CL-20-PPK-4	2-1/4	1-1/8	1	9/16	5/16-18	7/16	5/16
CL-30-PPK-4					3/8-16	1/2	
CL-40-PPK-4					1/2-13	5/8	
CLM-10-PPK-4					M10		

PHENOLIC — TAPPED THROUGH HOLE (INCH)

CL-1B-PPK-1	1-1/4	7/8	5/8	3/8	#10-24	5/16	1/4
CL-1A-PPK-1					#10-32		
CL-1-PPK-1					1/4-20	1/2	
CL-1-PPK-2	1-3/4	1	13/16	1/2	1/4-20	5/8	9/32
CL-2-PPK-2					5/16-18		
CL-3-PPK-2					3/8-16		
CL-2-PPK-4	2-1/4	1-1/8	1	9/16	5/16-18	5/8	5/16
CL-3-PPK-4					3/8-16		
CL-4-PPK-4					1/2-13		

Four-prong design provides a strong grip for clamping and other applications requiring quick tightening and high torque. Choice of three knob sizes. Molded-in brass insert provides superior thread strength. **INFO+**: Also available with a molded-in clamping stud (page 107). Non-standard thread sizes, reamed holes, or other lengths of molded-in studs are available in quantities of 500 and above. Note: Catalog photos are actual size.

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FOUR-PRONG KNOBS



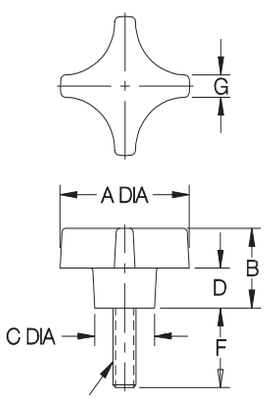
3/8-16 x 1 CL-5A-PPK4T
3/8-16 x 1-1/2 CL-5B-PPK4T
3/8-16 x 2 CL-5-PPK4T
3/8-16 x 2-1/2 CL-6-PPK4T
1/2-13 x 1-1/2 CL-7B-PPK4T
1/2-13 x 2 CL-7C-PPK4T
1/2-13 x 2-1/2 CL-7-PPK4T
M10 x 40mm CLM-1040-PPK4T



1/4-20 x 1 CL-1-PPK2T
5/16-18 x 1 CL-3A-PPK2T
5/16-18 x 1-1/2 CL-4A-PPK2T
5/16-18 x 2 CL-4B-PPK2T
M8 x 30mm CLM-830-PPK-2T



#10-24 x 3/4 CL-1B-PPK1T
#10-32 x 3/4 CL-1A-PPK1T
1/4-20 x 1 CL-1-PPK1T
M6 x 20mm CLM-620-PPK1T



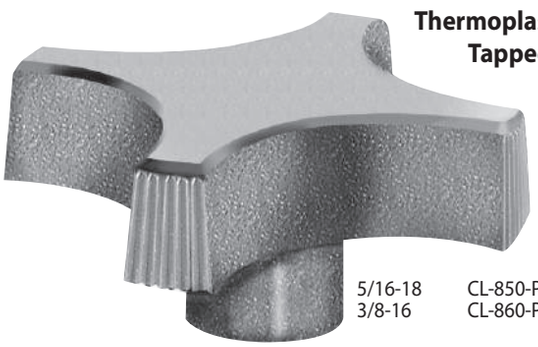
PHENOLIC — STUD TYPE (INCH & METRIC)

PART NO.	A	B	C DIA	D	E	F	G
CL-1B-PPK1T	1-1/4	7/8	5/8	3/8	#10-24	3/4	1/4
CL-1A-PPK1T					#10-32	3/4	
CL-1-PPK1T					1/4-20	1	
CLM-620-PPK1T					M6	.79	
CL-1-PPK2T	1-3/4	1	13/16	1/2	1/4-20	1	9/32
CL-3A-PPK2T					5/16-18	1	
CL-4A-PPK2T						1-1/2	
CL-4B-PPK2T						2	
CLM-830-PPK2T					M8	1.18	
CL-5A-PPK4T	2-1/4	1-1/8	1	9/16	3/8-16	1	5/16
CL-5B-PPK4T						1-1/2	
CL-5-PPK4T						2	
CL-6-PPK4T						2-1/2	
CL-7B-PPK4T					1/2-13	1-1/2	
CL-7C-PPK4T						2	
CL-7-PPK4T						2-1/2	
CLM-1040-PPK4T					M10	1.57	

FOUR-PRONG KNOBS

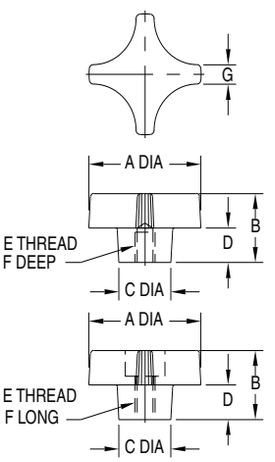
BLACK THERMOPLASTIC WITH BRASS INSERT

Thermoplastic — Tapped

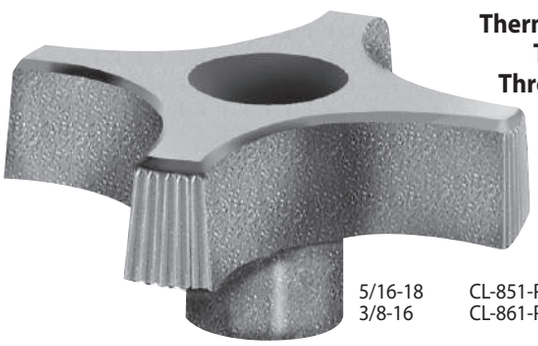


5/16-18 CL-850-PPK
3/8-16 CL-860-PPK

Four-prong design in thermoplastic, with a textured non-slip, non-glare finish. Molded-in brass insert provides superior thread strength. Non-standard thread sizes, reamed holes, molded-in studs, or special colors are available in quantities of 500 and above. Note: Catalog photos are actual size.



Thermoplastic — Tapped Through Hole



5/16-18 CL-851-PPK
3/8-16 CL-861-PPK

THERMOPLASTIC — TAPPED (INCH)

PART NO.	A	B	C DIA	D	E	F	G
CL-850-PPK	3	1-1/4	7/8	9/16	5/16-18	5/8	1/2
CL-860-PPK					3/8-16		

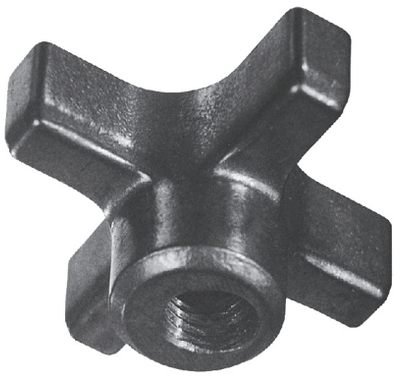
THERMOPLASTIC — TAPPED THROUGH HOLE (INCH)

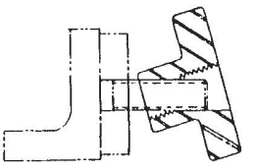
CL-851-PPK	3	1-1/4	7/8	9/16	5/16-18	5/8	1/2
CL-861-PPK					3/8-16		

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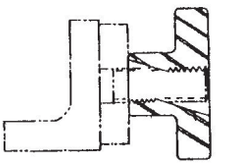
QUICK-ACTING KNOBS

SINTERED IRON

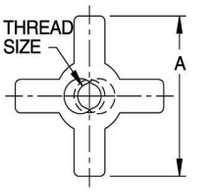


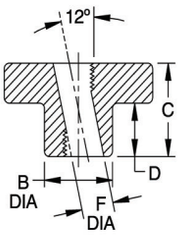


Tilt knob to slide in and out.



Straighten knob to engage threads for clamping.





Quick-acting four-prong knob that slides in and out of clamping position, ideal when the knob must be completely removed for loading. Tilt knob to slide in, then straighten to engage threads and tighten. To remove, loosen knob, then tilt to slide out. Four-prong design provides a firm grip for applications requiring quick tightening and high torque. For full strength, use a stud that extends slightly beyond the knob, to engage all threads.

INCH

PART NO.	THREAD SIZE	A	B DIA	C	D	F DIA
CL-1-QAK	1/4-20	1-1/8	9/16	5/8	5/16	17/64
CL-2-QAK	5/16-18	1-1/2	11/16	7/8	1/2	21/64
CL-3-QAK	3/8-16	2	13/16	1		25/64
CL-4-QAK	1/2-13	2-1/2	1	1-1/8	9/16	33/64
CL-5-QAK	5/8-11	3	1-1/4	1-1/4	5/8	41/64

METRIC

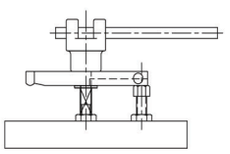
CLM-6-QAK	M6	1-1/8	9/16	5/8	5/16	.25
CLM-8-QAK	M8	1-1/2	11/16	7/8	1/2	.33
CLM-10-QAK	M10	2	13/16	1		.41
CLM-12-QAK	M12	2-1/2	1	1-1/8	9/16	.49
CLM-16-QAK	M16	3	1-1/4	1-1/4	5/8	.65

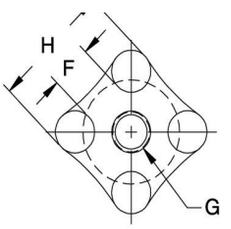
BAR KNOBS

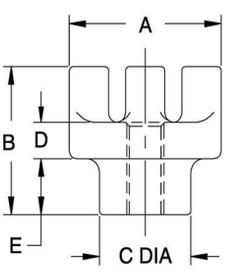
CAST IRON, ZINC PLATED CLEAR CHROMATE



Heavy-duty knob that can be turned easily by hand, then tightened by inserting a bar between the prongs. Choose from three knob sizes, each available blank or with a choice of tapped holes.







INCH & METRIC

PART NO.	A	B	C DIA	D	E	F	G	H
CL-1-BK	2	2-1/8	1-1/4	1/2	7/8	7/16	BLANK	1-5/8
CL-2-BK							3/8-16	
CL-4-BK							1/2-13	
CL-6-BK							5/8-11	
CLM-2-BK							M10	
CLM-4-BK							M12	
CLM-6-BK							M16	
CL-8-BK	2-1/2	2-3/8	1-1/2	9/16	15/16	11/16	BLANK	2
CL-9-BK							1/2-13	
CL-11-BK							5/8-11	
CL-13-BK							3/4-10	
CLM-9-BK							M12	
CLM-11-BK							M16	
CLM-13-BK							M20	
CL-15-BK	3-1/2	2-3/8	2-1/8	9/16	15/16	1-5/16	BLANK	2-7/8
CL-16-BK							3/4-10	
CL-18-BK							7/8-9	
CL-20-BK							1"-8	
CLM-16-BK							M20	
CLM-20-BK							M24	

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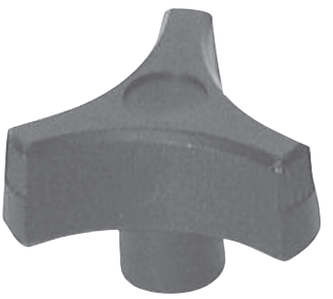
THREE-PRONG KNOBS

BLACK THERMOPLASTIC WITH BRASS INSERT



5/16-18 CL-850-TPK
3/8-16 CL-860-TPK

Thermoplastic — Tapped



1/4-20 CL-640-TPK
5/16-18 CL-650-TPK
3/8-16 CL-660-TPK

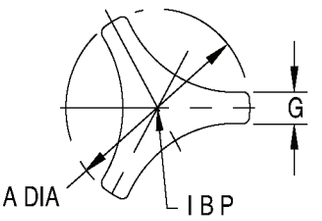


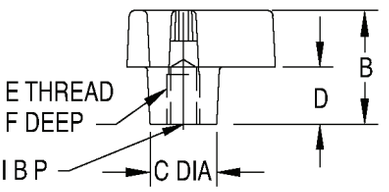
1/4-20 CL-440-TPK
5/16-18 CL-450-TPK

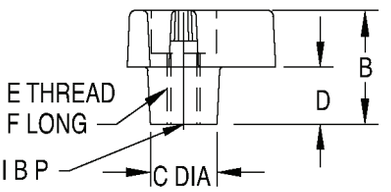


5/16-18 CL-851-TPK
3/8-16 CL-861-TPK

Thermoplastic — Tapped Through Hole







Modern three-prong design provides quick tightening and high torque. Textured non-slip, non-glare finish. Choice of three knob sizes. Molded-in brass insert provides superior thread strength. Non-standard thread sizes, reamed holes, molded-in studs, or special colors are available in quantities of 500 and above.

THERMOPLASTIC — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D	E	F	G
CL-440-TPK	1-1/2	7/8	1/2	3/8	1/4-20	7/16	9/32
CL-450-TPK					5/16-18		
CL-640-TPK	2	1-1/16	5/8	1/2	1/4-20	7/16	3/8
CL-650-TPK					5/16-18		
CL-660-TPK					3/8-16		
CL-850-TPK	2-1/2	1-1/8	3/4	1/2	5/16-18	7/16	1/2
CL-860-TPK					3/8-16	1/2	

THERMOPLASTIC — TAPPED THROUGH HOLE (INCH)

PART NO.	A DIA	B	C DIA	D	E	F	G
CL-851-TPK	2-1/2	1-1/8	3/4	1/2	5/16-18	5/8	1/2
CL-861-TPK					3/8-16		

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T-HANDLE KNOBS

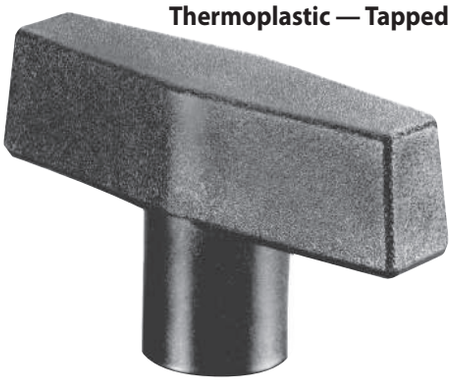
BLACK PHENOLIC PLASTIC OR THERMOPLASTIC
WITH BRASS INSERT

Phenolic — Tapped



1/4-20	CL-632-TK
5/16-18	CL-642-TK
3/8-16	CL-652-TK
3/8-24	CL-654-TK
M8	CLM-642-TK
M10	CLM-652-TK

Thermoplastic — Tapped



1/4-20	CL-6320-TK
5/16-18	CL-6420-TK
3/8-16	CL-6520-TK
M8	CLM-6420-TK
M10	CLM-6520-TK

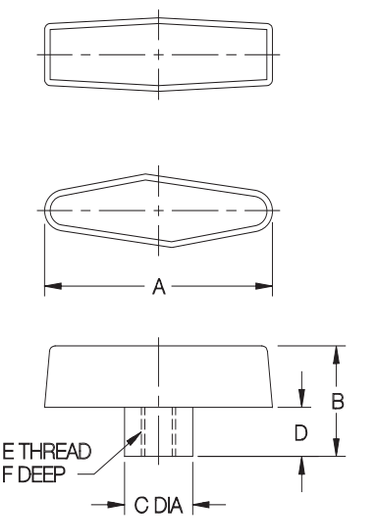


1/4-20	CL-432-TK
5/16-18	CL-442-TK
3/8-16	CL-452-TK
M6	CLM-432-TK
M8	CLM-442-TK



1/4-20	CL-232-TK
M6	CLM-232-TK

T-Handle Knobs provide maximum leverage for heavy-duty clamping. Ideal for fastening fold-down handles and stands. Available in phenolic plastic (one knob size) for a shiny polished finish, or in thermoplastic (three knob sizes) for a textured non-slip, non-glare finish. Molded-in brass insert provides superior thread strength. Non-standard thread sizes, reamed holes, molded-in studs, or special colors (thermoplastic only) are available in quantities of 500 and above. Note: Catalog photos are actual size.



PHENOLIC — TAPPED (INCH & METRIC)

PART NO.	A	B	C DIA	D	E	F
CL-632-TK	2-1/2	2-1/2	2-1/2	2-1/2	1/4-20	5/8
CL-642-TK					5/16-18	
CL-652-TK					3/8-16	1/2
CL-654-TK					3/8-24	
CLM-642-TK					M8	5/8
CLM-652-TK					M10	1/2

THERMOPLASTIC — TAPPED (INCH & METRIC)

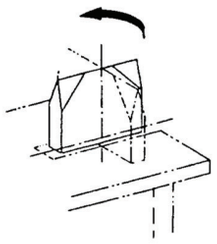
PART NO.	A	B	C DIA	D	E	F
CL-232-TK	1	7/8	1/2	3/8	1/4-20	7/16
CLM-232-TK					M6	
CL-432-TK	2	1-1/8	3/4	1/2	1/4-20	5/8
CL-442-TK					5/16-18	
CL-452-TK					3/8-16	1/2
CLM-432-TK					M6	5/8
CLM-442-TK					M8	
CL-6320-TK	2-1/2	1-1/4	3/4	5/8	1/4-20	5/8
CL-6420-TK					5/16-18	
CL-6520-TK					3/8-16	1/2
CLM-6420-TK					M8	5/8
CLM-6520-TK					M10	1/2

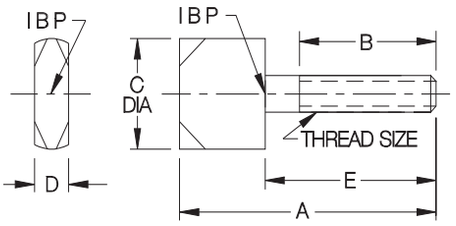
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QUARTER-TURN SCREWS

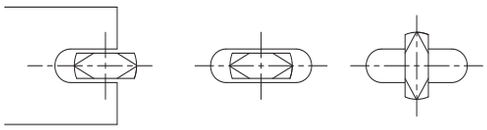
12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH







Rotate screw 90 degrees (1/4 turn) to latch. Ideal for swing-away lids and jig plates. Beveled edges allow easy insertion into a slot. Also available soft (not carburized-hardened) for customizing as desired.



Use quarter-turn screws in either open or closed slots.

INCH

PART NO. HARDENED	PART NO. SOFT	THREAD SIZE	A	B	C DIA	D	E
CL-1-QTS	CL-10-QTS	#10-24	1-1/2	7/8	5/8	3/16	1
CL-2-QTS	CL-20-QTS	#10-32			1/2		
CL-3-QTS	CL-30-QTS	1/4-20	1-7/8	1	3/4	1/4	1-1/4
CL-4-QTS	CL-40-QTS	5/16-18	2-1/4	1-1/4	1	5/16	1-1/2
CL-5-QTS	CL-50-QTS	3/8-16	2-1/2			3/8	
CL-6-QTS	CL-60-QTS	1/2-13	2-3/4	1-1/2	1-1/4	1/2	1-3/4

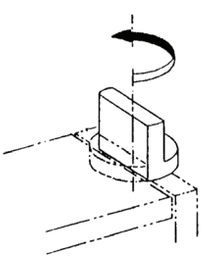
METRIC

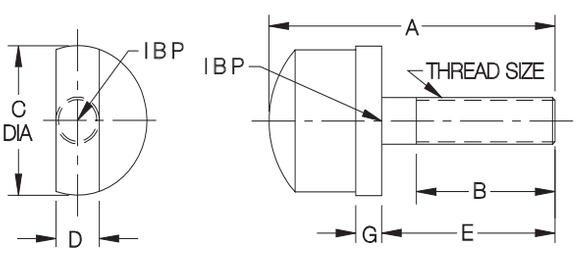
CLM-5-QTS	—	M5	1.57	.79	.63	.20	.98
CLM-6-QTS	—	M6	1.97	.98	.75	.24	1.18
CLM-8-QTS	—	M8	2.36	1.38	1.00	.31	1.57
CLM-10-QTS	—	M10	2.56		1.00	.39	
CLM-12-QTS	—	M12	2.76	1.57	1.26	.47	1.77

HALF-TURN SCREWS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH







Rotate screw 180 degrees (1/2 turn) to latch. Allows latching swing-away lids and jig plates without machining a slot.

INCH

PART NO. HARDENED	THREAD SIZE	A	B	C DIA	D	E	G
CL-1-HTS	#10-32	1-11/16	7/8	3/4	3/16	1	3/16
CL-2-HTS	1/4-20	2	1	3/4	1/4	1-1/4	
CL-3-HTS	5/16-18	2-1/16		1	5/16		
CL-4-HTS	3/8-16	2-11/16	1-1/2	1-1/16	3/8	1-3/4	1/4
CL-5-HTS	1/2-13	2-3/4		1-1/4	1/2		

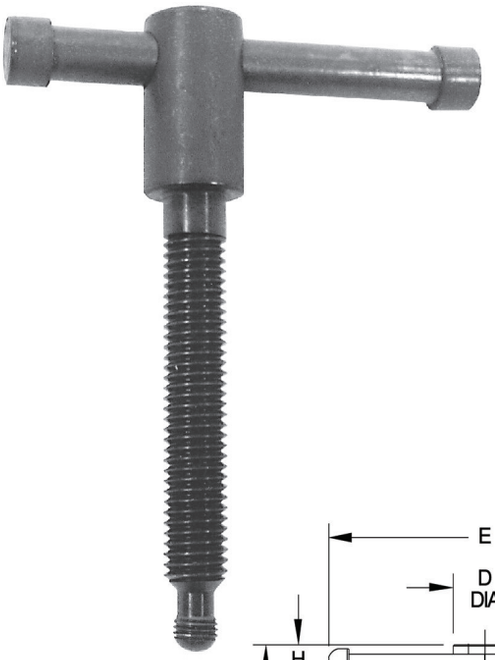
METRIC

CLM-5-HTS	M5	1.69	.87	.75	.20	.98	.20
CLM-6-HTS	M6	1.93	.94	.75	.24	1.18	
CLM-8-HTS	M8	1.97		1.00	.31		
CLM-10-HTS	M10	2.72	1.54	1.06	.39	1.77	.24

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BAR-HANDLE SCREW CLAMPS

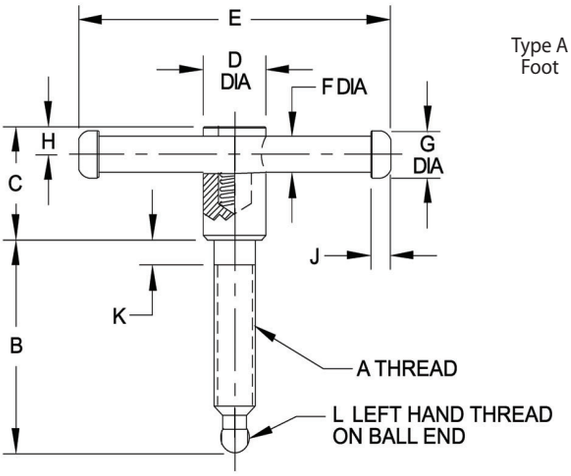
STEEL: 12L14 STEEL BODY, CARBURIZED HARDENED, BLACK OXIDE FINISH. 12L14 STEEL HANDLE, BLACK OXIDE FINISH. 300-SERIES STAINLESS STEEL SPRING. STAINLESS: 300-SERIES STAINLESS STEEL.

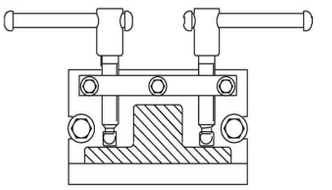


Screw clamp with a sliding bar handle for excellent leverage. The bar can be moved to any position, for convenient tightening, and is held in place by light spring force. These screw clamps accept all standard feet for swivel screws (**INFO+**: see page 119 for foot dimensions and specifications). Type A and B feet are also available in Delrin®, by adding "N" to the part number (examples: CL-620-BHSAN, CL-620-BHSA-SN). Available in screw sizes from 5/16-18 to 5/8-11 (M8 to M16 in metric), each in several lengths.



Type A Foot | Type B Foot | Type D Foot | Type E Foot





Sliding bar can be moved to any position for convenient tightening, such as when two clamps are close to each other.

GENERAL DIMENSIONS

A THREAD SIZE	C	D DIA	E	F DIA	G DIA	H	J	K	L
5/16-18 or M8	1-1/8	5/8	2-3/8	1/4	3/8	1/4	1/4	5/16	#12-28 LH
3/8-16 or M10	1-1/4	3/4	3-1/8	5/16	7/16	9/32	9/32	3/8	1/4-28 LH
1/2-13 or M12	1-3/8	13/16	3-15/16	3/8	1/2	11/32	11/32	3/8	5/16-24 LH
5/8-11 or M16	1-5/8	1	4-3/4	1/2	5/8	13/32	13/32	3/8	7/16-20 LH

STEEL (INCH)

A THREAD SIZE	B LENGTH	PART NO. WITHOUT FOOT	PART NO. WITH TYPE A SMALL FOOT	PART NO. WITH TYPE B LARGE FOOT	PART NO. WITH TYPE C VEE FOOT	PART NO. WITH TYPE D BALL FOOT	PART NO. WITH TYPE E EXTRA-LARGE FOOT
5/16-18	2	CL-520-BHS	CL-520-BHSA	CL-520-BHSB	CL-520-BHSC	CL-520-BHSD	—
	3	CL-530-BHS	CL-530-BHSA	CL-530-BHSB	CL-530-BHSC	CL-530-BHSD	—
3/8-16	2	CL-620-BHS	CL-620-BHSA	CL-620-BHSB	CL-620-BHSC	CL-620-BHSD	—
	3	CL-630-BHS	CL-630-BHSA	CL-630-BHSB	CL-630-BHSC	CL-630-BHSD	—
	4	CL-640-BHS	CL-640-BHSA	CL-640-BHSB	CL-640-BHSC	CL-640-BHSD	—
1/2-13	2	CL-820-BHS	CL-820-BHSA	CL-820-BHSB	CL-820-BHSC	CL-820-BHSD	CL-820-BHSE
	3	CL-830-BHS	CL-830-BHSA	CL-830-BHSB	CL-830-BHSC	CL-830-BHSD	CL-830-BHSE
	4	CL-840-BHS	CL-840-BHSA	CL-840-BHSB	CL-840-BHSC	CL-840-BHSD	CL-840-BHSE
5/8-11	3	CL-1030-BHS	CL-1030-BHSA	CL-1030-BHSB	CL-1030-BHSC	CL-1030-BHSD	CL-1030-BHSE
	4	CL-1040-BHS	CL-1040-BHSA	CL-1040-BHSB	CL-1040-BHSC	CL-1040-BHSD	CL-1040-BHSE

CONTINUED ON NEXT PAGE

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BAR-HANDLE SCREW CLAMPS

CONTINUED FROM PREVIOUS PAGE

STAINLESS STEEL (INCH)

5/16-18	2	CL-520-BHS	CL-520-BHSA	CL-520-BHSB	—	—	—
	3	CL-530-BHS	CL-530-BHSA	CL-530-BHSB	—	—	—
3/8-16	2	CL-620-BHS	CL-620-BHSA	CL-620-BHSB	—	—	—
	3	CL-630-BHS	CL-630-BHSA	CL-630-BHSB	—	—	—
	4	CL-640-BHS	CL-640-BHSA	CL-640-BHSB	—	—	—
1/2-13	2	CL-820-BHS	CL-820-BHSA	CL-820-BHSB	—	—	—
	3	CL-830-BHS	CL-830-BHSA	CL-830-BHSB	—	—	—
	4	CL-840-BHS	CL-840-BHSA	CL-840-BHSB	—	—	—
5/8-11	3	CL-1030-BHS	CL-1030-BHSA	CL-1030-BHSB	—	—	—
	4	CL-1040-BHS	CL-1040-BHSA	CL-1040-BHSB	—	—	—

STEEL (METRIC)

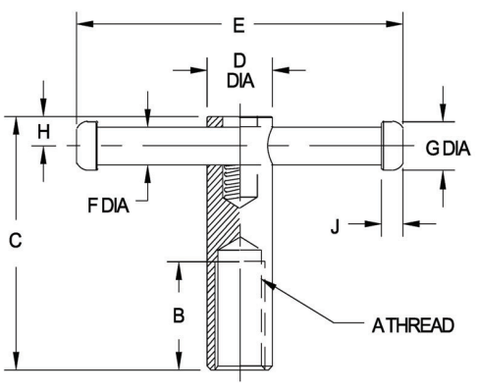
M8	1.97 (50mm)	CLM-850-BHS	CLM-850-BHSA	CLM-850-BHSB	CLM-850-BHSC	CLM-850-BHSD	—
	2.95 (75mm)	CLM-875-BHS	CLM-875-BHSA	CLM-875-BHSB	CLM-875-BHSC	CLM-875-BHSD	—
M10	1.97 (50mm)	CLM-1050-BHS	CLM-1050-BHSA	CLM-1050-BHSB	CLM-1050-BHSC	CLM-1050-BHSD	—
	3.94 (100mm)	CLM-10100-BHS	CLM-10100-BHSA	CLM-10100-BHSB	CLM-10100-BHSC	CLM-10100-BHSD	—
M12	1.97 (50mm)	CLM-1250-BHS	CLM-1250-BHSA	CLM-1250-BHSB	CLM-1250-BHSC	CLM-1250-BHSD	CLM-1250-BHSE
	3.94 (100mm)	CLM-12100-BHS	CLM-12100-BHSA	CLM-12100-BHSB	CLM-12100-BHSC	CLM-12100-BHSD	CLM-12100-BHSE
M16	2.76 (70mm)	CLM-1670-BHS	CLM-1670-BHSA	CLM-1670-BHSB	CLM-1670-BHSC	CLM-1670-BHSD	CLM-1670-BHSE
	4.33 (110mm)	CLM-16110-BHS	CLM-16110-BHSA	CLM-16110-BHSB	CLM-16110-BHSC	CLM-16110-BHSD	CLM-16110-BHSE

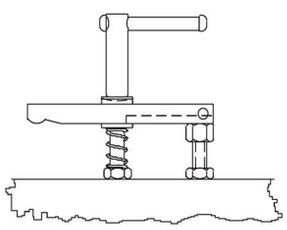
BAR-HANDLE NUTS

STEEL: 12L14 STEEL BODY, CARBURIZED HARDENED, BLACK OXIDE FINISH. 12L14 STEEL HANDLE, BLACK OXIDE FINISH. 300-SERIES STAINLESS STEEL SPRING. STAINLESS: 300-SERIES STAINLESS STEEL.



Extension nut with a sliding bar handle for excellent leverage. The bar can be moved to any position, for convenient tightening, and is held in place by light spring force. Available in thread sizes from 3/8-16 to 5/8-11 (M10 to M16 in metric).





STEEL (INCH)

PART NO.	A	B	C	D DIA	E	F DIA	G DIA	H	J
CL-6-BHN	3/8-16	7/8	2-3/8	3/4	3-1/8	5/16	7/16	9/32	9/32
CL-8-BHN	1/2-13	1-1/8	2-3/4	13/16	3-15/16	3/8	1/2	11/32	5/16
CL-10-BHN	5/8-11	1-3/8	3-3/8	1	4-3/4	1/2	5/8	13/32	3/8

STAINLESS STEEL (INCH)

CL-6-BHN-S	3/8-16	7/8	2-3/8	3/4	3-1/8	5/16	7/16	9/32	9/32
CL-8-BHN-S	1/2-13	1-1/8	2-3/4	13/16	3-15/16	3/8	1/2	11/32	5/16
CL-10-BHN-S	5/8-11	1-3/8	3-3/8	1	4-3/4	1/2	5/8	13/32	3/8

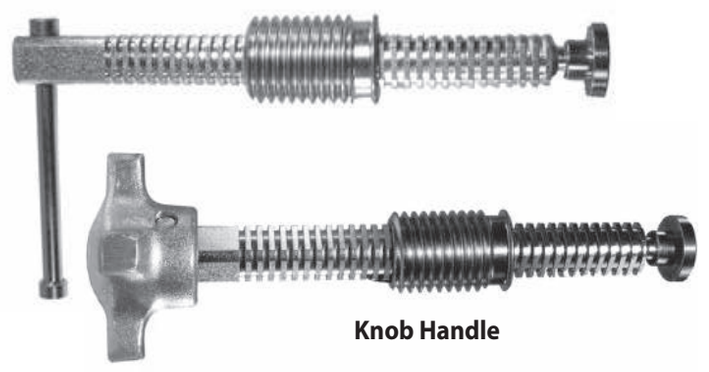
STEEL (METRIC)

CLM-10-BHN	M10	.79	2.36	3/4	3-1/8	5/16	7/16	9/32	9/32
CLM-12-BHN	M12	.98	2.76	13/16	3-15/16	3/8	1/2	11/32	5/16
CLM-16-BHN	M16	1.38	3.35	1	4-3/4	1/2	5/8	13/32	3/8

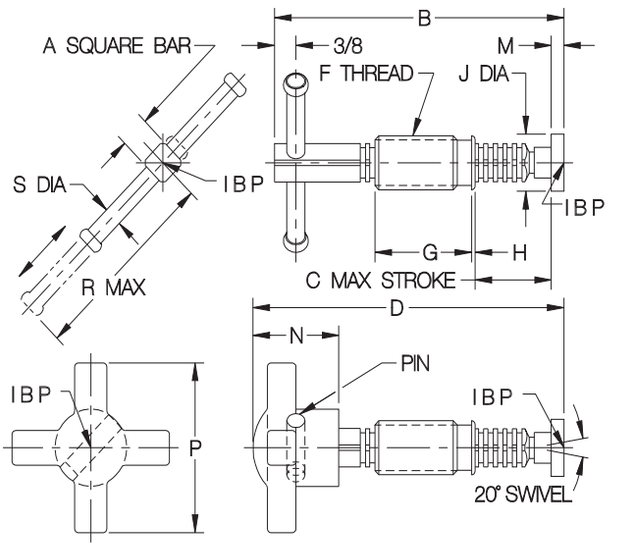
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BAR-LOK QUICK-ACTING SCREW CLAMPS

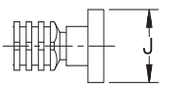
12L14 STEEL, CARBURIZED-HARDENED, ZINC PLATED YELLOW CHROMATE
KNOB HANDLE: 319 ALUMINUM ALLOY



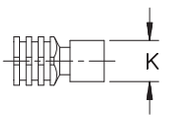
Knob Handle



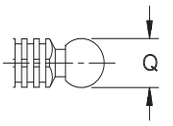
Definitely the best quick-acting screw clamp available anywhere! This patented sliding-bar design works smoothly and positively – just slide the bar forward, then twist to apply force. As strong as a standard screw clamp, but much faster. Choose either a comfortable knob handle or a sliding handle for extra leverage. Available in 3/8", 1/2", and 5/8" bar sizes, each in a choice of several lengths and foot styles. Ball and foot are threaded to allow easy installation and removal, a lefthand thread to positively prevent backout when turning the screw counterclockwise. Once the threads clear during installation, the foot rotates and pivots freely (20° included angle).



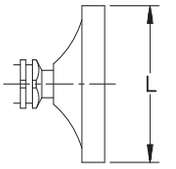
With standard foot:
CL-14-BLK
CL-14-BLKN (Delrin®)



With small foot, add A:
CL-14-BLKA
CL-14-BLKAN (Delrin®)



With ball foot, add -D:
CL-14-BLKD



With large foot, add E:
CL-14-BLKE

SLIDING HANDLE (INCH)

PART NO.	A	B	C	D	F THREAD	G	H	J DIA	K DIA	L DIA	M	N	P	Q	R	S DIA	OLD BAR-LOK NUMBER
CL-14-BLT		4	1-9/16														S-204-T
CL-15-BLT	3/8	5	2-9/16	---	3/4-10	1-3/8	1/8	.750	.390	1.50	.187	---	---	.500	2-15/16	1/4	S-205-T
CL-16-BLT		6	3-9/16														S-206-T
CL-25-BLT		5	2-3/16														M-205-T
CL-26-BLT		6	3-3/16														M-206-T
CL-28-BLT	1/2	8	5-3/16	---	7/8-9	1-11/16	1/16	.930	.500	2.00	.218	---	---	.625	3-5/16	5/16	M-208-T
CL-210-BLT		10	7-3/16														M-210-T
CL-212-BLT		12	9-3/16														M-212-T
CL-35-BLT		5	2-3/16														H-205-T
CL-36-BLT		6	3-3/16														H-206-T
CL-38-BLT	5/8	8	5-3/16	---	1-1/8-7	1-11/16	1/16	.930	.500	2.00	.218	---	---	.625	3-1/4	5/16	H-208-T
CL-310-BLT		10	7-3/16														H-210-T
CL-312-BLT		12	9-3/16														H-212-T

KNOB HANDLE (INCH)

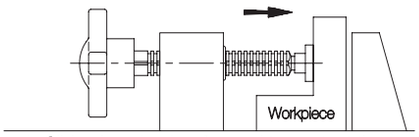
CL-14-BLK			1-5/16	4-11/16													
CL-15-BLK	3/8	---	2-5/16	5-11/16	3/4-10	1-3/8	1/8	3/4	.390	1.50	.187	1-7/16	2-1/8	.500	---	---	---
CL-16-BLK			3-5/16	6-11/16													
CL-25-BLK			1-5/8	5-3/8													
CL-26-BLK			2-5/8	6-3/8													
CL-28-BLK	1/2	---	4-5/8	8-3/8	7/8-9	1-11/16	1/16	15/16	.500	2.00	.218	1-1/2	2-3/4	.625	---	---	---
CL-210-BLK			6-5/8	10-3/8													
CL-212-BLK			8-5/8	12-3/8													
CL-35-BLK			1-5/8	5-3/8													
CL-36-BLK			2-5/8	6-3/8													
CL-38-BLK	5/8	---	4-5/8	8-3/8	1-1/8-7	1-11/16	1/16	15/16	.500	2.00	.218	1-1/2	2-3/4	.625	---	---	---
CL-310-BLK			6-5/8	10-3/8													
CL-312-BLK			8-5/8	12-3/8													

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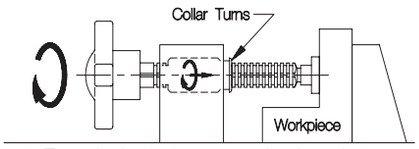
BAR-LOK QUICK-ACTING SCREW CLAMPS

12L14 STEEL, CARBURIZED-HARDENED, ZINC PLATED YELLOW CHROMATE
KNOB HANDLE: 319 ALUMINUM ALLOY

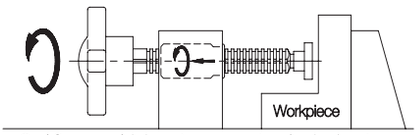
CLAMPING ACTION



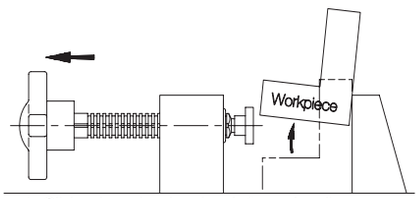
1. Slide clamping bar forward to contact the workpiece.



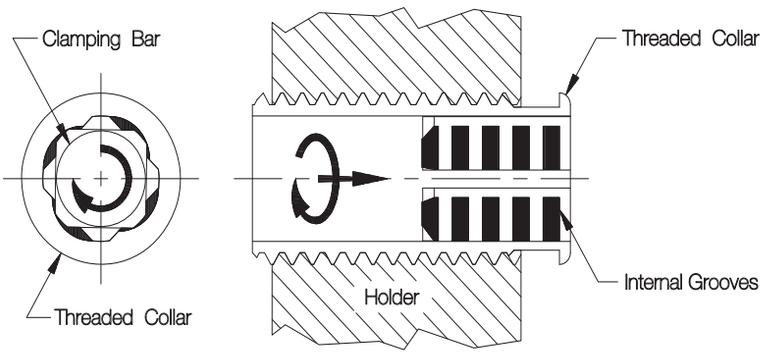
2. Turn clockwise to engage the threaded collar and apply clamping force.



3. After machining, turn counterclockwise to unclamp and disengage the collar.

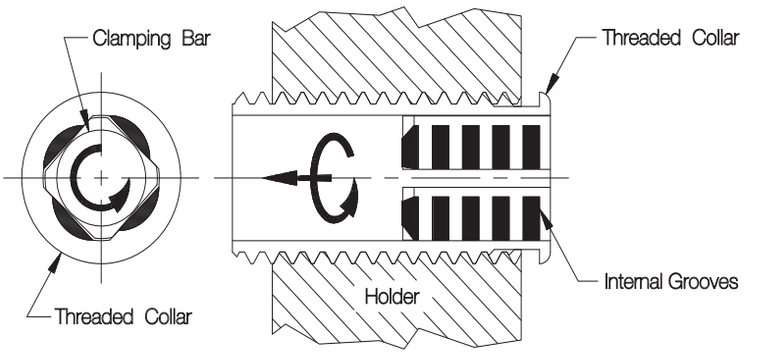


4. Slide clamping bar back for unloading.



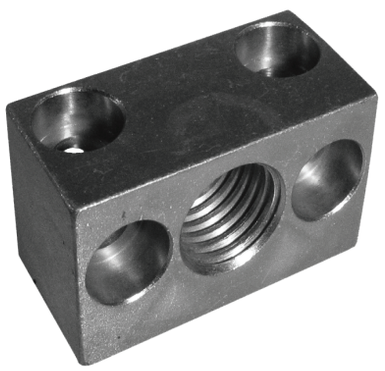
Clockwise

Turning the clamping bar clockwise engages internal grooves in the threaded collar. Both components then turn together as a single unit to apply screw force.

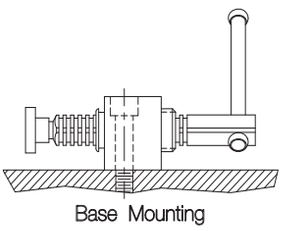


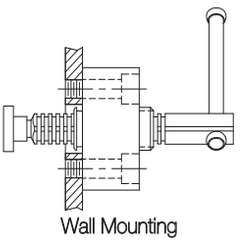
Counterclockwise

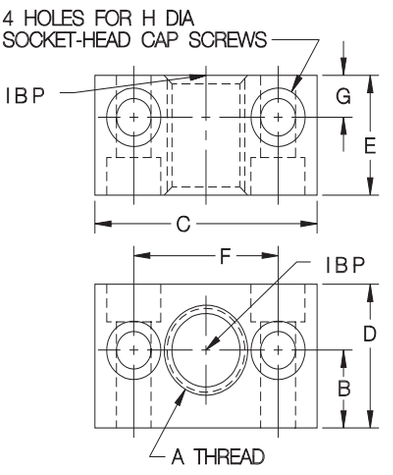
Turning the clamping bar counterclockwise loosens the screw clamp and disengages the collar, allowing the bar to slide back and forth.



Mounting Block







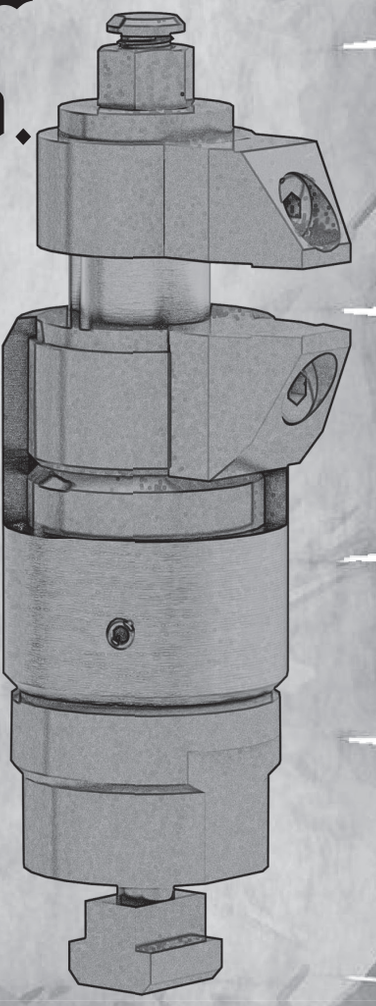
Versatile mounting base made especially for Bar-Lok screw clamps. Attach with two Socket-Head Cap Screws. Two sets of mounting holes allow either base mounting or through-hole wall mounting.

MOUNTING BLOCKS

PART NO.	A THREAD	B	C	D	E	F	G	H DIA
CL-1-BLM	3/4-10	13/16	2-1/8	1-3/8	1-1/4	1-3/8	7/16	5/16 OR M8
CL-2-BLM	7/8-9		2-1/2	1-1/2		1-5/8		3/8 OR M10
CL-3-BLM	1-1/8-7	1	3-1/8	1-3/4	1-1/2	2-1/8	1/2	1/2 OR M12

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Once there was a clamp.

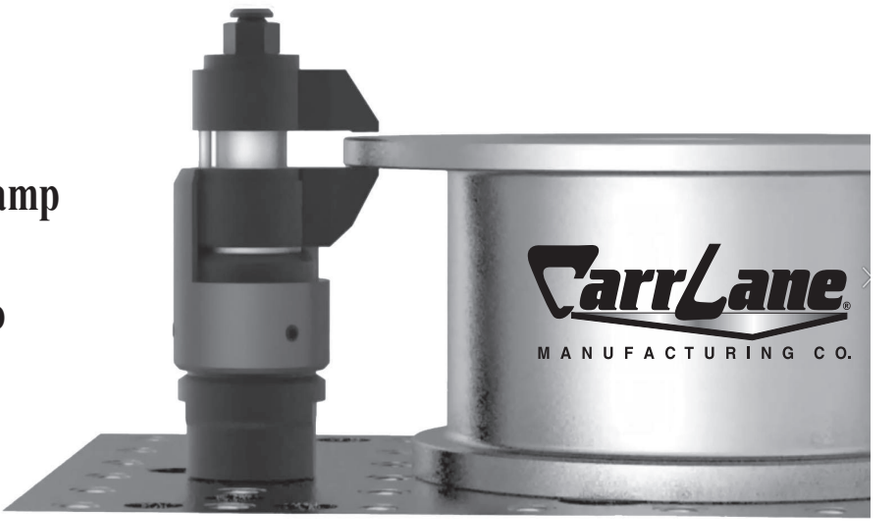


Not an ordinary clamp. A new floating clamp.
Where the bottom and top jaws work independently
to clamp AND support your workpiece.
Floating from piece to piece regardless of size.
Working on a variety of plates.
Perfect for lighter weight materials like aluminum.
Ideal for clamping forgings, ribbed or flanged castings.
Saving you time, which saves your company money.

Which makes you a hero.

See the Floating Clamp in action at:

carrlane.com/hero



See Page 305

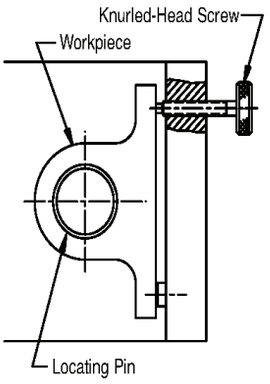
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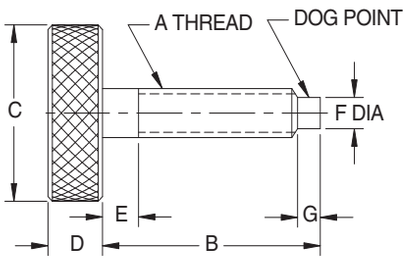
KNURLED HEAD SCREWS

STEEL: 12L14, CARBURIZED-HARDENED, BLACK OXIDE FINISH.
STAINLESS STEEL: 300-SERIES, PASSIVATED



Handy thumb screw. Knurled head provides a positive grip for finger tightening in light clamping applications.





STEEL (INCH)

PART NO.	A	B	C DIA	D	E	F DIA	G
CL-1-KHS	#10-24	1	3/4	1/4	1/4	.12	.09
CL-2-KHS		1-1/2					
CL-3-KHS		2					
CL-1A-KHS	#10-32	1					
CL-2A-KHS		1-1/2					
CL-3A-KHS		2					
CL-4-KHS	1/4-20	1-1/2	1	5/16	1/4	.15	.12
CL-5-KHS		2					
CL-6-KHS		2-1/2					
CL-7-KHS	5/16-18	1-1/2	1-1/8	3/8	1/4	.20	.16
CL-8-KHS		2					
CL-9-KHS		2-1/2					
CL-10-KHS	3/8-16	2	1-1/4	7/16	1/4	.25	.19
CL-11-KHS		2-1/2					
CL-12-KHS		3					
CL-13-KHS	1/2-13	3	1-1/4	1/2	1/4	.34	.25
CL-14-KHS		3-1/2					

STAINLESS STEEL (INCH)

PART NO.	A	B	C DIA	D	E	F DIA	G
CL-23207	#10-32	3/4	1/2	3/16	1/8	.12	.09
CL-23210		1					
CL-23212		1-1/4					
CL-23215		1-1/2					
CL-23507	1/4-20	3/4	1	5/16	1/8	.15	.12
CL-23510		1					
CL-23512		1-1/4					
CL-23515		1-1/2					
CL-23520		2					
CL-23615	5/16-18	1-1/2	1-1/8	3/8	3/16	.20	.16
CL-23620		2					
CL-23625		2-1/2					
CL-23820	3/8-16	2	1-1/4	7/16	3/16	.25	.19
CL-23825		2-1/2					
CL-23830		3					

STEEL (METRIC)

PART NO.	A	B	C DIA	D	E	F DIA	G
CLM-1-KHS	M5	.98	3/4	1/4	1/4	.13	.11
CLM-2-KHS		1.57					
CLM-3-KHS		1.97					
CLM-4-KHS	M6	1.57	1	5/16	1/4	.17	.13
CLM-5-KHS		1.97					
CLM-6-KHS		2.56					
CLM-7-KHS	M8	1.57	1-1/8	3/8	1/4	.23	.18
CLM-8-KHS		1.97					
CLM-9-KHS		2.56					
CLM-10-KHS	M10	1.97	1-1/4	7/16	1/4	.27	.19
CLM-11-KHS		2.56					
CLM-12-KHS		2.95					
CLM-13-KHS	M12	2.95	1-1/4	1/2	1/4	.35	.25
CLM-14-KHS		3.54					

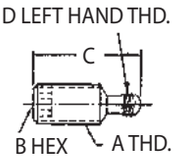
BODIES FOR SWIVEL SCREWS

STEEL: 12L14 OR 1144, HEAT TREATED, ZINC PLATED YELLOW CHROMATE OR BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES



Socket Head

Swivel-screw bodies that accept any of the feet shown on the opposite page. Socket-head version allows applying strong clamping force using a hex wrench. **Patent no. 2,531,892.**

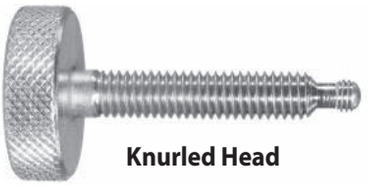


SOCKET HEAD (INCH)

PART NO. STEEL ZINC PLATED	PART NO. STEEL BLACK OXIDE	PART NO. STAINLESS STEEL	A	B	C	D
CL-1-BSS	CL-1-BSS-BO	—	1/4-20	1/8	15/32	#8-36 L.H.
CL-2-BSS	CL-2-BSS-BO	CL-2-BSS-S			23/32	
CL-3-BSS	CL-3-BSS-BO	CL-3-BSS-S			31/32	
CL-4-BSS	CL-4-BSS-BO	CL-4-BSS-S			1-15/32	
CL-5-BSS	CL-5-BSS-BO	—	5/16-18	5/32	23/32	#12-28 L.H.
CL-6-BSS	CL-6-BSS-BO	CL-6-BSS-S			31/32	
CL-7-BSS	CL-7-BSS-BO	CL-7-BSS-S			1-15/32	
CL-8-BSS	CL-8-BSS-BO	CL-8-BSS-S			1-31/32	
CL-9-BSS	CL-9-BSS-BO	—	3/8-16	3/16	11/16	1/4-28 L.H
CL-10-BSS	CL-10-BSS-BO	—			15/16	
CL-11-BSS	CL-11-BSS-BO	CL-11-BSS-S			1-7/16	
CL-12-BSS	CL-12-BSS-BO	CL-12-BSS-S			1-15/16	
CL-13-BSS	CL-13-BSS-BO	CL-13-BSS-S			2-15/16	
CL-15-BSS	CL-15-BSS-BO	—	1/2-13	1/4	1-7/16	5/16-24 L.H.
CL-16-BSS	CL-16-BSS-BO	CL-16-BSS-S			1-15/16	
CL-17-BSS	CL-17-BSS-BO	CL-17-BSS-S			2-15/16	
CL-18-BSS	CL-18-BSS-BO	CL-18-BSS-S			3-15/16	
CL-20-BSS	CL-20-BSS-BO	—	5/8-11	5/16	1-15/16	7/16-20 L.H.
CL-21-BSS	CL-21-BSS-BO	—			2-15/16	
CL-22-BSS	CL-22-BSS-BO	—			3-15/16	
CL-23-BSS	CL-23-BSS-BO	—			4-15/16	

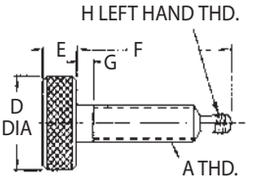
SOCKET HEAD (METRIC)

PART NO. STEEL BLACK OXIDE	A	B	C	D
CLM-1-BSS-BO	M6	3mm	.56	#8-36 L.H.
CLM-2-BSS-BO			.76	
CLM-3-BSS-BO			.95	
CLM-4-BSS-BO			1.54	
CLM-5-BSS-BO	M8	4mm	.74	#12-28 L.H.
CLM-6-BSS-BO			.94	
CLM-7-BSS-BO			1.53	
CLM-8-BSS-BO			1.92	
CLM-9-BSS-BO	M10	5mm	.73	1/4-28 L.H
CLM-10-BSS-BO			.93	
CLM-11-BSS-BO			1.52	
CLM-12-BSS-BO			1.92	
CLM-13-BSS-BO			2.90	
CLM-15-BSS-BO	M12	6mm	1.52	5/16-24 L.H.
CLM-16-BSS-BO			1.91	
CLM-17-BSS-BO			2.89	
CLM-18-BSS-BO			3.88	
CLM-20-BSS-BO	M16	8mm	1.89	7/16-20 L.H.
CLM-21-BSS-BO			2.87	
CLM-22-BSS-BO			3.86	
CLM-23-BSS-BO			4.85	



Knurled Head

Similar to the above screws, except with a knurled head for finger tightening.



KNURLED HEAD (INCH)

PART NO. STEEL ZINC PLATED	PART NO. STEEL BLACK OXIDE	PART NO. STAINLESS STEEL	A	D DIA	E	F	G	H
CL-24-BSS	CL-24-BSS-BO	CL-24-BSS-S	1/4-20	1	5/16	31/32	1/8	#8-36 L.H.
CL-25-BSS	CL-25-BSS-BO	CL-25-BSS-S				1-15/32		
CL-26-BSS	CL-26-BSS-BO	CL-26-BSS-S				1-31/32		
CL-27-BSS	CL-27-BSS-BO	CL-27-BSS-S				2-31/32		
CL-28-BSS	CL-28-BSS-BO	—	5/16-18	1-1/8	3/8	31/32	3/16	#12-28 L.H.
CL-29-BSS	CL-29-BSS-BO	CL-29-BSS-S				1-15/32		
CL-30-BSS	CL-30-BSS-BO	CL-30-BSS-S				1-31/32		
CL-31-BSS	CL-31-BSS-BO	CL-31-BSS-S				2-31/32		
CL-33-BSS	CL-33-BSS-BO	—	3/8-16	1-1/4	7/16	1-7/16	3/16	1/4-28 L.H
CL-34-BSS	CL-34-BSS-BO	CL-34-BSS-S				1-15/16		
CL-35-BSS	CL-35-BSS-BO	CL-35-BSS-S				2-15/16		
CL-36-BSS	CL-36-BSS-BO	CL-36-BSS-S				3-15/16		
CL-38-BSS	CL-38-BSS-BO	—	1/2-13	1-1/4	1/2	1-7/16	3/16	5/16-24 L.H.
CL-39-BSS	CL-39-BSS-BO	—				1-15/16		
CL-40-BSS	CL-40-BSS-BO	CL-40-BSS-S				2-15/16		
CL-41-BSS	CL-41-BSS-BO	CL-41-BSS-S				3-15/16		
CL-43-BSS	CL-43-BSS-BO	—	5/8-11	1-1/4	1/2	1-15/16	3/16	7/16-20 L.H.
CL-44-BSS	CL-44-BSS-BO	—				2-15/16		
CL-45-BSS	CL-45-BSS-BO	—				3-15/16		
CL-46-BSS	CL-46-BSS-BO	—				4-15/16		

KNURLED HEAD (METRIC)

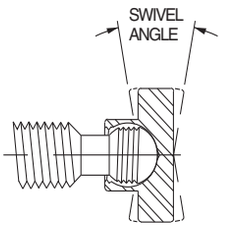
PART NO. STEEL BLACK OXIDE	A	D DIA	E	F	G	H
CLM-24-BSS-BO	M6	1	5/16	.95	1/8	#8-36 L.H.
CLM-25-BSS-BO				1.54		
CLM-26-BSS-BO				1.94		
CLM-27-BSS-BO				2.92		
CLM-28-BSS-BO	M8	1-1/8	3/8	.94	3/16	#12-28 L.H.
CLM-29-BSS-BO				1.53		
CLM-30-BSS-BO				1.92		
CLM-31-BSS-BO				2.91		
CLM-33-BSS-BO	M10	1-1/4	7/16	1.52	3/16	1/4-28 L.H
CLM-34-BSS-BO				1.92		
CLM-35-BSS-BO				2.90		
CLM-36-BSS-BO				3.88		
CLM-38-BSS-BO	M12	1-1/4	1/2	1.52	3/16	5/16-24 L.H.
CLM-39-BSS-BO				1.91		
CLM-40-BSS-BO				2.89		
CLM-41-BSS-BO				3.88		
CLM-43-BSS-BO	M16	1-1/4	1/2	1.89	3/16	7/16-20 L.H.
CLM-44-BSS-BO				2.88		
CLM-45-BSS-BO				3.86		
CLM-46-BSS-BO				4.85		

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FEET FOR SWIVEL SCREWS

STEEL: (TYPES A, B, D, E), 12L14 STEEL, ZINC PLATED YELLOW CHROMATE (BLACK OXIDE OPTIONAL)
STEEL (TYPE C): 1018 STEEL, CARBURIZED HARDENED, ZINC PLATED YELLOW CHROMATE (BLACK OXIDE OPTIONAL)
STAINLESS: 300-SERIES STAINLESS STEEL
DELRIN®: WHITE DELRIN® 500

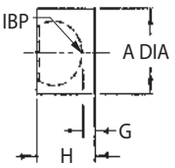
Matching feet for the swivel-screw bodies on the opposite page. Types A, B, and D can be used with any body-thread size. Type E can be used with the largest two sizes.



Ball and foot are threaded to allow easy installation and removal, a lefthand thread to positively prevent backout when turning the screw counterclockwise. Once the threads clear during installation, the foot rotates and pivots freely (20° included angle). Note: Delrin® feet are not threaded — they snap on and off.



Type A
Small Foot

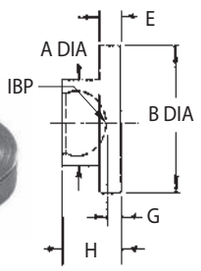


TYPE A — SMALL FOOT

PART NO. STEEL ZINC PLATED	PART NO. STEEL BLACK OXIDE	PART NO. STAINLESS STEEL	PART NO. DELRIN®	FITS BODY THREAD SIZE	A DIA	G	H
CL-1A-FSS	CL-1A-FSS-BO	CL-1A-FSS-S	CL-1A-FSSN	1/4-20 and M6	.187	.031	.200
CL-2A-FSS	CL-2A-FSS-BO	CL-2A-FSS-S	CL-2A-FSSN	5/16-18 and M8	.250	.046	.255
CL-3A-FSS	CL-3A-FSS-BO	CL-3A-FSS-S	CL-3A-FSSN	3/8-16 and M10	.298	.053	.315
CL-4A-FSS	CL-4A-FSS-BO	CL-4A-FSS-S	CL-4A-FSSN	1/2-13 and M12	.390	.058	.359
CL-5A-FSS	CL-5A-FSS-BO	CL-5A-FSS-S	CL-5A-FSSN	5/8-11 and M16	.500	.076	.470



Type B
Large Foot

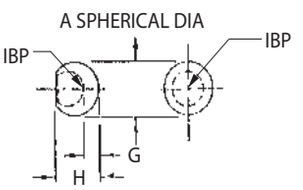


TYPE B — LARGE FOOT

PART NO. STEEL ZINC PLATED	PART NO. STEEL BLACK OXIDE	PART NO. STAINLESS STEEL	PART NO. DELRIN®	FITS BODY THREAD SIZE	A DIA	B DIA	E	G	H
CL-1B-FSS	CL-1B-FSS-BO	CL-1B-FSS-S	CL-1B-FSSN	1/4-20 and M6	.187	.375	.125	.131	.300
CL-2B-FSS	CL-2B-FSS-BO	CL-2B-FSS-S	CL-2B-FSSN	5/16-18 and M8	.250	.500	.156	.141	.350
CL-3B-FSS	CL-3B-FSS-BO	CL-3B-FSS-S	CL-3B-FSSN	3/8-16 and M10	.298	.562	.187	.177	.437
CL-4B-FSS	CL-4B-FSS-BO	CL-4B-FSS-S	CL-4B-FSSN	1/2-13 and M12	.390	.750	.187	.119	.420
CL-5B-FSS	CL-5B-FSS-BO	CL-5B-FSS-S	CL-5B-FSSN	5/8-11 and M16	.500	.930	.218	.121	.515



Type D
Ball Foot

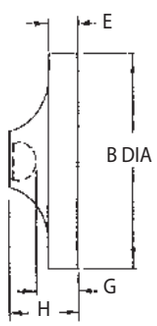


TYPE D — BALL FOOT

PART NO. STEEL ZINC PLATED	PART NO. STEEL BLACK OXIDE	FITS BODY THREAD SIZE	A DIA	G	H
CL-1D-FSS	CL-1D-FSS-BO	1/4-20 and M6	.250	.051	.220
CL-2D-FSS	CL-2D-FSS-BO	5/16-18 and M8	.312	.071	.280
CL-3D-FSS	CL-3D-FSS-BO	3/8-16 and M10	.375	.064	.325
CL-4D-FSS	CL-4D-FSS-BO	1/2-13 and M12	.500	.144	.443
CL-5D-FSS	CL-5D-FSS-BO	5/8-11 and M16	.620	.137	.531



Type E
Extra-Large Foot



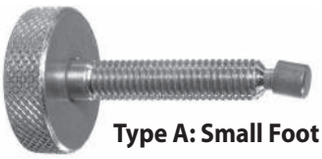
TYPE E — EXTRA-LARGE FOOT

PART NO. STEEL ZINC PLATED	PART NO. STEEL BLACK OXIDE	FITS BODY THREAD SIZE	B DIA	E	G	H
CL-4E-FSS	CL-4E-FSS-BO	1/2-13 and M12	1.50	1/4	.26	.56
CL-5E-FSS	CL-5E-FSS-BO	5/8-11 and M16	2.00	5/16	.31	.70

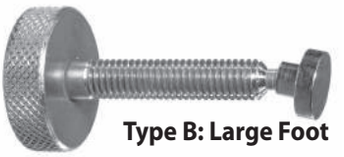
SWIVEL HEAD SCREWS

BODY: 12L14 STEEL, CARBURIZED-HARDENED, ZINC PLATED YELLOW CHROMATE (OR 300-SERIES STAINLESS STEEL)
FOOT: 12L14 STEEL, ZINC PLATED YELLOW CHROMATE (OR 300-SERIES STAINLESS STEEL, OR DELRIN®)

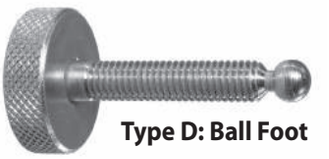
INFO+: Knurled-head swivel-screw assemblies that combine the bodies on page 118 with the feet on page 119. The steel version is optionally available with a black oxide finish by adding "-BO" to the part number (example: CL-1-SHS-BO). Type A and B feet are optionally available in Delrin® by adding "N" to the part number (examples: CL-1-SHSN, CL-1-SHS-BON, CL-1-SHS-SN).



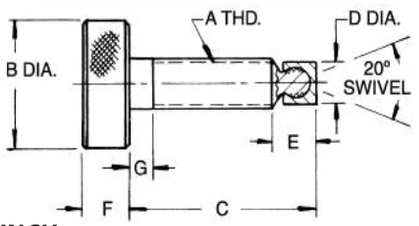
Type A: Small Foot

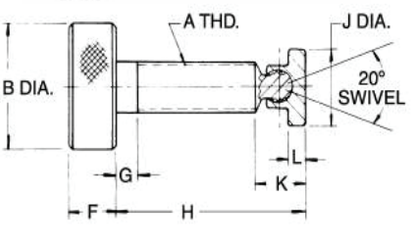


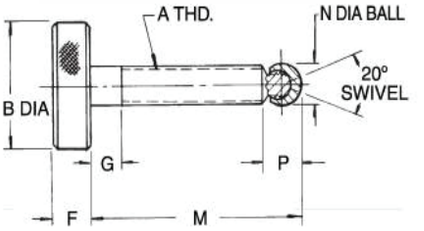
Type B: Large Foot



Type D: Ball Foot







INCH

TYPE A STEEL PART NO.*	TYPE A STAINLESS PART NO.	TYPE B STEEL PART NO.*	TYPE B STAINLESS PART NO.	TYPE D STEEL PART NO.*	A	B DIA	C	D DIA	E	F	G	H	J DIA	K	L	M	N	P
CL-1-SHS	CL-1-SHS-S	CL-17-SHS	CL-17-SHS-S	CL-47-SHS	1/4-20	1	1	3/16	9/32	5/16	1/8	1-3/32	3/8	23/64	1/8	1-1/32	1/4	5/16
CL-2-SHS	CL-2-SHS-S	CL-18-SHS	CL-18-SHS-S	CL-48-SHS			1-1/2					1-19/32				1-17/32		
CL-3-SHS	CL-3-SHS-S	CL-19-SHS	CL-19-SHS-S	CL-49-SHS			2					2-3/32				2-1/32		
CL-33-SHS	CL-33-SHS-S	CL-40-SHS	CL-40-SHS-S	CL-50-SHS			3					3-3/32				3-1/32		
CL-4-SHS	—	CL-20-SHS	—	CL-51-SHS	5/16-18	1-1/8	1	1/4	11/32	3/8	3/16	1-3/32	1/2	27/64	5/32	1-1/64	5/16	23/64
CL-5-SHS	CL-5-SHS-S	CL-21-SHS	CL-21-SHS-S	CL-52-SHS			1-1/2					1-19/32				1-33/64		
CL-6-SHS	CL-6-SHS-S	CL-22-SHS	CL-22-SHS-S	CL-53-SHS			2					2-3/32				2-1/64		
CL-34-SHS	CL-34-SHS-S	CL-41-SHS	CL-41-SHS-S	CL-54-SHS			3					3-3/32				3-1/64		
CL-8-SHS	—	CL-24-SHS	—	CL-56-SHS	3/8-16	1-1/4	1-1/2	19/64	3/8	7/16	3/16	1-5/8	9/16	5/8	3/16	1-9/16	3/8	7/16
CL-9-SHS	CL-9-SHS-S	CL-25-SHS	CL-25-SHS-S	CL-57-SHS			2					2-1/8				2-1/16		
CL-35-SHS	CL-35-SHS-S	CL-42-SHS	CL-42-SHS-S	CL-58-SHS			3					3-1/8				3-1/16		
CL-36-SHS	CL-36-SHS-S	CL-43-SHS	CL-43-SHS-S	CL-59-SHS			4					4-1/8				4-1/16		
CL-11-SHS	—	CL-27-SHS	—	CL-61-SHS	1/2-13	1-1/4	1-1/2	13/32	15/32	1/2	3/16	1-9/16	3/4	17/32	3/16	1-19/32	1/2	9/16
CL-12-SHS	—	CL-28-SHS	—	CL-62-SHS			2					2-1/16				2-3/32		
CL-13-SHS	CL-13-SHS-S	CL-29-SHS	CL-29-SHS-S	CL-63-SHS			3					3-1/16				3-3/32		
CL-37-SHS	CL-37-SHS-S	CL-44-SHS	CL-44-SHS-S	CL-64-SHS			4					4-1/16				4-3/32		
CL-15-SHS	—	CL-31-SHS	—	CL-66-SHS	5/8-11	1-1/4	2	1/2	5/8	1/2	3/16	2-3/64	15/16	21/32	7/32	2-1/8	5/8	11/16
CL-16-SHS	—	CL-32-SHS	—	CL-67-SHS			3					3-3/64				3-1/8		
CL-38-SHS	—	CL-45-SHS	—	CL-68-SHS			4					4-3/64				4-1/8		
CL-39-SHS	—	CL-46-SHS	—	CL-69-SHS			5					5-3/64				5-1/8		

METRIC

CLM-1-SHS-BO	—	CLM-17A-SHS-BO	—	CLM-47-SHS-BO	M6	1	.98	3/16	9/32	5/16	1/8	1.08	3/8	23/64	1/8	1.03	1/4	5/16
CLM-2-SHS-BO	—	CLM-18A-SHS-BO	—	CLM-48-SHS-BO			1.57					1.67				1.62		
CLM-3-SHS-BO	—	CLM-19-SHS-BO	—	CLM-49-SHS-BO			1.97					2.07				2.02		
CLM-4-SHS-BO	—	CLM-40-SHS-BO	—	CLM-50-SHS-BO			2.95					3.05				3.00		
CLM-5-SHS-BO	—	CLM-20-SHS-BO	—	CLM-51-SHS-BO	M8	1-1/8	.98	1/4	11/32	3/8	3/16	1.08	1/2	27/64	5/32	1.05	5/16	23/64
CLM-6-SHS-BO	—	CLM-21-SHS-BO	—	CLM-52-SHS-BO			1.57					1.67				1.64		
CLM-7-SHS-BO	—	CLM-22-SHS-BO	—	CLM-53-SHS-BO			1.97					2.06				2.03		
CLM-8-SHS-BO	—	CLM-41-SHS-BO	—	CLM-54-SHS-BO			2.95					3.05				3.02		
CLM-9-SHS-BO	—	CLM-24-SHS-BO	—	CLM-56-SHS-BO	M10	1-1/4	1.57	19/64	3/8	7/16	3/16	1.70	9/16	5/8	3/16	1.61	3/8	7/16
CLM-10-SHS-BO	—	CLM-25-SHS-BO	—	CLM-57-SHS-BO			1.97					2.10				2.01		
CLM-11-SHS-BO	—	CLM-42-SHS-BO	—	CLM-58-SHS-BO			2.95					3.08				2.99		
CLM-12-SHS-BO	—	CLM-43-SHS-BO	—	CLM-59-SHS-BO			3.94					4.06				3.97		
CLM-11A-SHS-BO	—	CLM-27-SHS-BO	—	CLM-61-SHS-BO	M12	1-1/4	1.57	13/32	15/32	1/2	3/16	1.64	3/4	17/32	3/16	1.69	1/2	9/16
CLM-12A-SHS-BO	—	CLM-28-SHS-BO	—	CLM-62-SHS-BO			1.97					2.03				2.08		
CLM-13-SHS-BO	—	CLM-29-SHS-BO	—	CLM-63-SHS-BO			2.95					3.01				3.06		
CLM-14-SHS-BO	—	CLM-44-SHS-BO	—	CLM-64-SHS-BO			3.94					4.00				4.05		
CLM-15-SHS-BO	—	CLM-31-SHS-BO	—	CLM-66-SHS-BO	M16	1-1/4	1.97	1/2	5/8	1/2	3/16	2.01	15/16	21/32	7/32	2.06	5/8	11/16
CLM-16-SHS-BO	—	CLM-32-SHS-BO	—	CLM-67-SHS-BO			2.95					3.00				3.05		
CLM-17-SHS-BO	—	CLM-45-SHS-BO	—	CLM-68-SHS-BO			3.94					3.98				4.03		
CLM-18-SHS-BO	—	CLM-46-SHS-BO	—	CLM-69-SHS-BO			4.92					4.97				5.02		

* Inch sizes are available zinc plated or with black oxide finish. Metric sizes are available only with black oxide finish (-BO only).

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SWIVEL SCREW CLAMPS

BODY: 12L14 OR 1144 STEEL, HEAT TREATED, ZINC PLATED YELLOW CHROMATE (OR 300-SERIES STAINLESS STEEL)
FOOT: 12L14 STEEL, ZINC PLATED YELLOW CHROMATE (OR 300-SERIES STAINLESS STEEL, OR DELRIN®)

INFO+: Socket-head swivel-screw assemblies that combine the bodies on page 118 with the feet on page 119. The steel version is optionally available with black oxide finish by adding "-BO" to the part number (example: CL-2-SSC-BO). Type A and B feet are optionally available in Delrin® by adding "N" to the part number (examples: CL-2-SSCN, CL-2-SSC-BON, CL-2-SSC-SN).



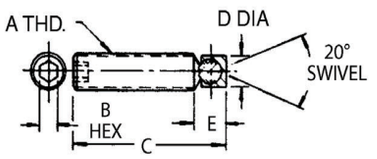
Type A: Small Foot

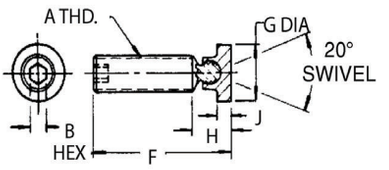


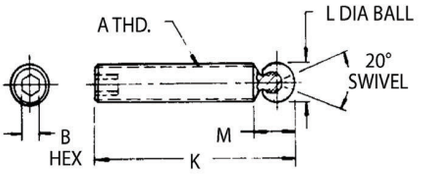
Type B: Large Foot



Type D: Ball Foot







INCH

TYPE A STEEL PART NO.*	TYPE A STAINLESS PART NO.	TYPE B STEEL PART NO.*	TYPE B STAINLESS PART NO.	TYPE D STEEL PART NO.*	A	B	C	D DIA	E	F	G DIA	H	J	K	L DIA	M
CL-1-SSC	—	CL-20-SSC	—	CL-47-SSC	1/4-20	1/8	1/2	3/16	9/32	19/32	3/8	23/64	1/8	.69	1/4	5/16
CL-2-SSC	CL-2-SSC-S	CL-21-SSC	CL-21-SSC-S	CL-48-SSC			3/4			27/32				.89		
CL-3-SSC	CL-3-SSC-S	CL-22-SSC	CL-22-SSC-S	CL-49-SSC			1			1-3/32				1.08		
CL-4-SSC	CL-4-SSC-S	CL-23-SSC	CL-23-SSC-S	CL-50-SSC			1-1/2			1-19/32				1.67		
CL-5-SSC	—	CL-24-SSC	—	CL-51-SSC	5/16-18	5/32	3/4	1/4	11/32	27/32	1/2	27/64	5/32	.88	5/16	23/64
CL-6-SSC	CL-6-SSC-S	CL-25-SSC	CL-25-SSC-S	CL-52-SSC			1			1-3/32				1.08		
CL-7-SSC	CL-7-SSC-S	CL-26-SSC	CL-26-SSC-S	CL-53-SSC			1-1/2			1-19/32				1.67		
CL-8-SSC	CL-8-SSC-S	CL-27-SSC	CL-27-SSC-S	CL-54-SSC			2			2-3/32				2.06		
CL-9-SSC	—	CL-28-SSC	—	CL-55-SSC	3/8-16	3/16	3/4	19/64	3/8	7/8	9/16	5/8	3/16	.91	3/8	7/16
CL-10-SSC	—	CL-29-SSC	—	CL-56-SSC			1			1-1/8				1.11		
CL-11-SSC	CL-11-SSC-S	CL-30-SSC	CL-30-SSC-S	CL-57-SSC			1-1/2			1-5/8				1.70		
CL-12-SSC	CL-12-SSC-S	CL-31-SSC	CL-31-SSC-S	CL-58-SSC			2			2-1/8				2.10		
CL-39-SSC	CL-39-SSC-S	CL-43-SSC	CL-43-SSC-S	CL-59-SSC			3			3-1/8				3.08		
CL-14-SSC	—	CL-33-SSC	—	CL-61-SSC	1/2-13	1/4	1-1/2	13/32	15/32	1-9/16	3/4	17/32	3/16	1.64	1/2	9/16
CL-15-SSC	CL-15-SSC-S	CL-34-SSC	CL-34-SSC-S	CL-62-SSC			2			2-1/16				2.03		
CL-16-SSC	CL-16-SSC-S	CL-35-SSC	CL-35-SSC-S	CL-63-SSC			3			3-1/16				3.01		
CL-40-SSC	CL-40-SSC-S	CL-44-SSC	CL-44-SSC-S	CL-64-SSC			4			4-1/16				4.00		
CL-18-SSC	—	CL-37-SSC	—	CL-66-SSC	5/8-11	5/16	2	1/2	5/8	2-3/64	15/16	21/32	7/32	2.01	5/8	11/16
CL-19-SSC	—	CL-38-SSC	—	CL-67-SSC			3			3-3/64				2.99		
CL-41-SSC	—	CL-45-SSC	—	CL-68-SSC			4			4-3/64				3.98		
CL-42-SSC	—	CL-46-SSC	—	CL-69-SSC			5			5-3/64				4.97		

METRIC

CLM-1-SSC-BO	—	CLM-20A-SSC-BO	—	CLM-47-SSC-BO	M6	3mm	.59	3/16	9/32	.69	3/8	23/64	1/8	.69	1/4	5/16
CLM-2-SSC-BO	—	CLM-21A-SSC-BO	—	CLM-48-SSC-BO			.79			.89				.89		
CLM-3-SSC-BO	—	CLM-22-SSC-BO	—	CLM-49-SSC-BO			.98			1.08				1.08		
CLM-4-SSC-BO	—	CLM-23-SSC-BO	—	CLM-50-SSC-BO			1.57			1.67				1.67		
CLM-5-SSC-BO	—	CLM-24-SSC-BO	—	CLM-51-SSC-BO	M8	4mm	.79	1/4	11/32	.88	1/2	27/64	5/32	.88	5/16	23/64
CLM-6-SSC-BO	—	CLM-25-SSC-BO	—	CLM-52-SSC-BO			.98			1.08				1.08		
CLM-7-SSC-BO	—	CLM-26-SSC-BO	—	CLM-53-SSC-BO			1.57			1.67				1.67		
CLM-8-SSC-BO	—	CLM-27-SSC-BO	—	CLM-54-SSC-BO			1.97			2.06				2.06		
CLM-9-SSC-BO	—	CLM-28-SSC-BO	—	CLM-55-SSC-BO	M10	5mm	.79	19/64	3/8	.91	9/16	5/8	3/16	.91	3/8	7/16
CLM-10-SSC-BO	—	CLM-29-SSC-BO	—	CLM-56-SSC-BO			.98			1.11				1.11		
CLM-11-SSC-BO	—	CLM-30-SSC-BO	—	CLM-57-SSC-BO			1.57			1.70				1.70		
CLM-12-SSC-BO	—	CLM-31-SSC-BO	—	CLM-58-SSC-BO			1.97			2.10				2.10		
CLM-13-SSC-BO	—	CLM-32-SSC-BO	—	CLM-59-SSC-BO			2.95			3.08				3.08		
CLM-14-SSC-BO	—	CLM-33-SSC-BO	—	CLM-61-SSC-BO	M12	6mm	1.57	13/32	15/32	1.64	3/4	17/32	3/16	1.64	1/2	9/16
CLM-15-SSC-BO	—	CLM-34-SSC-BO	—	CLM-62-SSC-BO			1.97			2.03				2.03		
CLM-16-SSC-BO	—	CLM-35-SSC-BO	—	CLM-63-SSC-BO			2.95			3.01				3.01		
CLM-17-SSC-BO	—	CLM-36-SSC-BO	—	CLM-64-SSC-BO			3.94			4.00				4.00		
CLM-18-SSC-BO	—	CLM-37-SSC-BO	—	CLM-66-SSC-BO	M16	8mm	1.97	1/2	5/8	2.01	15/16	21/32	7/32	2.01	5/8	11/16
CLM-19-SSC-BO	—	CLM-38-SSC-BO	—	CLM-67-SSC-BO			2.95			2.99				2.99		
CLM-20-SSC-BO	—	CLM-39-SSC-BO	—	CLM-68-SSC-BO			3.94			3.98				3.98		
CLM-21-SSC-BO	—	CLM-40-SSC-BO	—	CLM-69-SSC-BO			4.92			4.97				4.97		

* Inch sizes are available zinc plated or with black oxide finish. Metric sizes are available only with black oxide finish (-BO only).

BALL-END THRUST SCREWS

BODY: ALLOY STEEL, BLACK OXIDE FINISH
BALL: 440C STAINLESS STEEL OR WHITE DELRIN® 500



Rolling Ball (Stainless Steel)

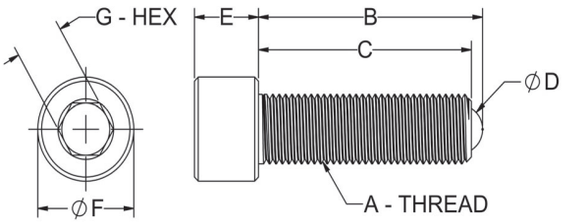


Rolling Ball (Delrin)

New item!

Ball-End Thrust Screws are heavy-duty screw clamps with a hardened stainless-steel ball contained in the end. Available with either a spherical rolling ball or a swivel ball with a flat contact surface. Both ball options are optionally available in Delrin material. These thrust screws have a large head and large hex-socket for excellent strength.

The rolling-ball version shown above is available in thread sizes from 1/4-20 to 5/8-11 (M6 to M16 in metric), each in a choice of two lengths.

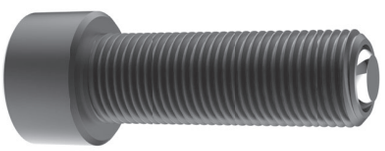


ROLLING BALL (INCH)

PART NO.		A	B	C	D	E	F	G
STAINLESS STEEL BALL	DELRIN BALL	THREAD			DIA		DIA	
CL-4-BTS-1.00	CL-4-BTSN-1.00	1/4-20	1.03	1	5/32	.25	.38	3/16
CL-4-BTS-2.00	CL-4-BTSN-2.00	1/4-20	2.03	2	5/32	.25	.38	3/16
CL-6-BTS-2.00	CL-6-BTSN-2.00	3/8-16	2.06	2	1/4	.38	.56	5/16
CL-6-BTS-3.00	CL-6-BTSN-3.00	3/8-16	3.06	3	1/4	.38	.56	5/16
CL-8-BTS-3.00	CL-8-BTSN-3.00	1/2-13	3.12	3	11/32	.50	.75	3/8
CL-8-BTS-4.00	CL-8-BTSN-4.00	1/2-13	4.12	4	11/32	.50	.75	3/8
CL-80-BTS-1.75	CL-80-BTSN-1.75	1/2-20 Fine	1.87	1-3/4	11/32	.50	.75	3/8
CL-10-BTS-4.00	CL-10-BTSN-4.00	5/8-11	4.15	4	7/16	.63	.94	1/2
CL-10-BTS-5.00	CL-10-BTSN-5.00	5/8-11	5.15	5	7/16	.63	.94	1/2

ROLLING BALL (METRIC)

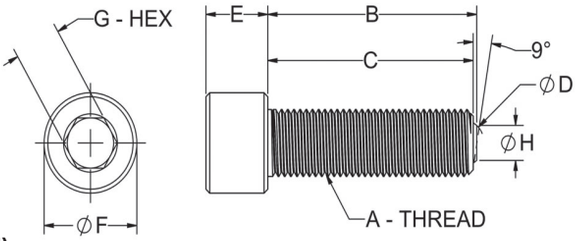
PART NO.		A	THREAD PITCH	B	C	D	E	F	G
STAINLESS STEEL BALL	DELRIN BALL	THREAD	(mm)	(mm)	(mm)	DIA (mm)	(mm)	DIA (mm)	(mm)
CLM-6-BTS-25	CLM-6-BTSN-25	M6	1	26	25	4.37	6	10	5
CLM-6-BTS-50	CLM-6-BTSN-50	M6	1	51	50	4.37	6	10	5
CLM-10-BTS-50	CLM-10-BTSN-50	M10	1.5	52.4	50	7.14	10	16	8
CLM-10-BTS-75	CLM-10-BTSN-75	M10	1.5	77.4	75	7.14	10	16	8
CLM-12-BTS-75	CLM-12-BTSN-75	M12	1.75	77.7	75	8.73	12	18	10
CLM-12-BTS-100	CLM-12-BTSN-100	M12	1.75	102.7	100	8.73	12	18	10
CLM-16-BTS-100	CLM-16-BTSN-100	M16	2	103.9	100	11.11	16	24	14
CLM-16-BTS-125	CLM-16-BTSN-125	M16	2	128.9	125	11.11	16	24	14



Swivel Ball with Flat (Stainless Steel)



Swivel Ball with Flat (Delrin)



SWIVEL BALL WITH FLAT (INCH)

PART NO.		A	B	C	D	E	F	G	H
STAINLESS STEEL BALL	DELRIN BALL	THREAD			DIA		DIA		DIA
CL-6-BTSF-2.00	CL-6-BTSFN-2.00	3/8-16	2.03	2	1/4	.38	.56	5/16	.16
CL-6-BTSF-3.00	CL-6-BTSFN-3.00	3/8-16	2.03	3	1/4	.38	.56	5/16	.16
CL-8-BTSF-3.00	CL-8-BTSFN-3.00	1/2-13	3.06	3	11/32	.50	.75	3/8	.24
CL-8-BTSF-4.00	CL-8-BTSFN-4.00	1/2-13	4.06	4	11/32	.50	.75	3/8	.24
CL-80-BTSF-1.75	CL-80-BTSFN-1.75	1/2-20 Fine	1.81	1-3/4	11/32	.50	.75	3/8	.24
CL-10-BTSF-4.00	CL-10-BTSFN-4.00	5/8-11	4.06	4	7/16	.63	.94	1/2	.35
CL-10-BTSF-5.00	CL-10-BTSFN-5.00	5/8-11	5.06	5	7/16	.63	.94	1/2	.35

The swivel-ball version shown here is available in thread sizes from 3/8-16 to 5/8-11 (M10 to M16 in metric), each in a choice of two lengths.

SWIVEL BALL WITH FLAT (METRIC)

PART NO.		A	THREAD PITCH	B	C	D	E	F	G	H
STAINLESS STEEL BALL	DELRIN BALL	THREAD	(mm)	(mm)	(mm)	DIA (mm)	(mm)	DIA (mm)	(mm)	DIA (mm)
CLM-10-BTSF-50	CLM-10-BTSFN-50	M10	1.5	51.1	50	7.14	10	16	8	5.5
CLM-10-BTSF-75	CLM-10-BTSFN-75	M10	1.5	76.1	75	7.14	10	16	8	5.5
CLM-12-BTSF-75	CLM-12-BTSFN-75	M12	1.75	76.5	75	8.73	12	18	10	6.1
CLM-12-BTSF-100	CLM-12-BTSFN-100	M12	1.75	101.5	100	8.73	12	18	10	6.1
CLM-16-BTSF-100	CLM-16-BTSFN-100	M16	2	101.6	100	11.11	16	24	14	9
CLM-16-BTSF-125	CLM-16-BTSFN-125	M16	2	126.6	125	11.11	16	24	14	9

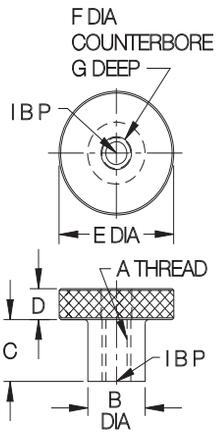
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KNURLED KNOBS

STEEL: 12L14, CARBURIZED-HARDENED, BLACK OXIDE FINISH.
STAINLESS STEEL: 300-SERIES, PASSIVATED



High-quality knurled-head knob provides a positive grip for quick finger tightening in light clamping applications. Available in steel with a black oxide finish or stainless steel.



STEEL (INCH)

PART NO.	A	B DIA	C	D	E DIA	F DIA	G
CL-4-KK	1/4-20	5/8	1/2	1/4	1	NONE	NONE
CL-5-KK	5/16-18	5/8	1/2	5/16	1-1/4		
CL-6-KK	3/8-16	3/4	5/8	1/2	1-1/4		
CL-8-KK	1/2-13	1	3/4	1/2	1-1/2		

STAINLESS STEEL (INCH)

PART NO.	A	B DIA	C	D	E DIA	F DIA	G
CL-16312	#10-24	3/8	1/4	3/16	1/2	NONE	NONE
CL-16322			1/2			13/64	1/4
CL-16314			1/4	3/16	1	NONE	NONE
CL-16324			1/2			13/64	1/4
CL-16412	#10-32	3/8	1/4	3/16	1/2	NONE	NONE
CL-16422			1/2			13/64	1/4
CL-16414			1/4	3/16	1	NONE	NONE
CL-16424			1/2			13/64	1/4
CL-16513	1/4-20	1/2	1/4	1/4	3/4	NONE	NONE
CL-16514			1/4	1/4	1	NONE	NONE
CL-16524			1/2			17/64	1/4
CL-16534			3/4				1/2
CL-16625	5/16-18	5/8	1/2	5/16	1-1/4	21/64	1/4
CL-16635			3/4				1/2
CL-16725	3/8-16	3/4	1/2	3/8	1-1/4	25/64	1/4
CL-16735			3/4				1/2
CL-8-KK-S	1/2-13	1	3/4	1/2	1-1/2	NONE	NONE

STEEL (METRIC)

PART NO.	A	B DIA	C	D	E DIA	F DIA	G
CLM-5-KK	M5	.39	.30	.16	.79	NONE	NONE
CLM-6-KK	M6	.47	.39	.20	.94		
CLM-8-KK	M8	.63	.47	.24	1.18		
CLM-10-KK	M10	.79	.59	.31	1.42		
CLM-12-KK	M12	.79	.59	.31	1.57		

STAINLESS STEEL (METRIC)

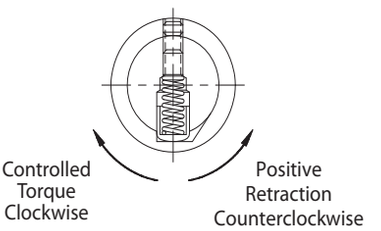
PART NO.	A	B DIA	C	D	E DIA	F DIA	G
CLM-5-KK-S	M5	.39	.30	.16	.79	NONE	NONE
CLM-6-KK-S	M6	.47	.39	.20	.94		
CLM-8-KK-S	M8	.63	.47	.24	1.18		
CLM-10-KK-S	M10	.79	.59	.31	1.42		
CLM-12-KK-S	M12	.79	.59	.31	1.57		

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ADJUSTABLE-TORQUE THUMB SCREWS

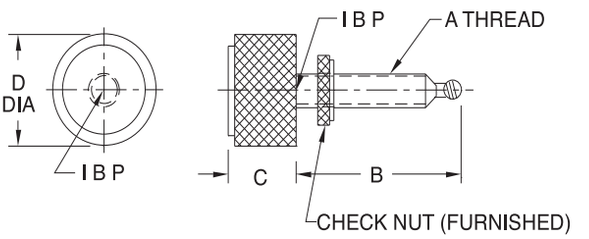
SCREW: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
KNOB: 12L14 STEEL, BLACK OXIDE FINISH
SPRING: MUSIC WIRE





Knurled-head thumb screw that exerts positive, repeatable force. Clockwise, the knob declutches and turns freely when you reach the desired torque. Counterclockwise, the knob locks for positive retraction. Adjustable-Torque Thumb Screws are furnished with your choice of swivel foot, and a Knurled Check Nut.

To set desired force, first remove the outer cover screw at the side of the knob, to expose the adjustment screw. Next, insert a hex wrench to turn the adjustment screw until desired torque is achieved. Reinstall the outer cover screw when finished. Torque can be adjusted from 3 to 6 inch-lbs, resulting in a contact force of 10 to 125 lbs, but these values are approximate. Force can vary +/- 30% depending on lubrication and other operating conditions.



Choice of four foot types. Adjustable-Torque Thumb Screws use our patented left-hand-thread swivel-foot system. The ball end of the body screws into the foot for easy installation and removal. Once the ball threads pass beyond the foot threads, the foot can rotate and pivot freely (20° total angle). Foot threads are left-hand to positively prevent accidental backout during use. Delrin® feet are optional for types A and B. To order with a Delrin® foot, add "N" to the part number, e.g. CL-415-TSAN. Note: Delrin® feet are not threaded – they snap on and off.



INCH

PART NO.				A	B	C	D DIA	ADJUSTMENT RANGE	
DOG POINT	A FOOT	B FOOT	D FOOT					TORQUE (IN.-LBS)	END FORCE (LBS)*
CL-312-TS	—	—	—	#10-24	1-1/4	21/32	15/16	3-6	10-125
CL-312A-TS	—	—	—	#10-32					
—	CL-415-TSA	CL-415-TSB	CL-415-TSD	1/4-20	1-1/2				
—	CL-425-TSA	CL-425-TSB	CL-425-TSD		2-1/2				
—	CL-517-TSA	CL-517-TSB	CL-517-TSD	5/16-18	1-3/4				
—	CL-527-TSA	CL-527-TSB	CL-527-TSD		2-3/4				
—	CL-620-TSA	CL-620-TSB	CL-620-TSD	3/8-16	2	21/32	1-3/16	3-6	10-125
—	CL-630-TSA	CL-630-TSB	CL-630-TSD		3				
—	CL-820-TSA	CL-820-TSB	CL-820-TSD	1/2-13	2				
—	CL-830-TSA	CL-830-TSB	CL-830-TSD		3				
—	CL-1020-TSA	CL-1020-TSB	CL-1020-TSD	5/8-11	2				
—	CL-1030-TSA	CL-1030-TSB	CL-1030-TSD		3				

METRIC

PART NO.				A	B	C	D DIA	ADJUSTMENT RANGE	
DOG POINT	A FOOT	B FOOT	D FOOT					TORQUE (IN.-LBS)	END FORCE (LBS)*
CLM-5-TS	—	—	—	M5	1.18	21/32	15/16	3-6	10-125
—	CLM-6-TSA	CLM-6-TSB	CLM-6-TSD	M6	2.53				
—	CLM-8-TSA	CLM-8-TSB	CLM-8-TSD	M8	2.71				
—	CLM-10-TSA	CLM-10-TSB	CLM-10-TSD	M10	2.90	21/32	1-3/16	3-6	10-125
—	CLM-12-TSA	CLM-12-TSB	CLM-12-TSD	M12	2.89				
—	CLM-16-TSA	CLM-16-TSB	CLM-16-TSD	M16	2.88				

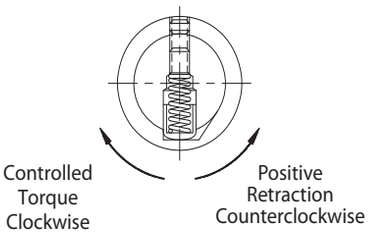
* End force can vary +/-30% depending on lubrication and other operating conditions.

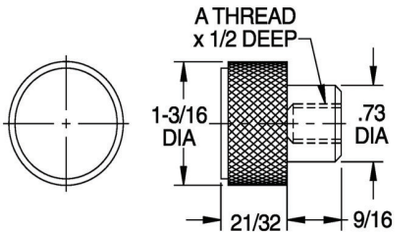
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ADJUSTABLE-TORQUE KNOBS

KNOB: 12L14 STEEL, BLACK OXIDE FINISH
SPRING: 17-7 PH STAINLESS STEEL







Knurled knob that exerts positive, repeatable force. Clockwise, the knob declutches and turns freely when you reach the desired torque. Counterclockwise, the knob locks for positive retraction. Can be used as a controlled-torque nut, or as a thumb screw by installing a custom-made screw in the tapped hole.

To set desired force, first remove the outer cover screw at the side of the knob, to expose the adjustment screw. Next, insert a hex wrench to turn the adjustment screw until desired torque is achieved. Reinstall the outer cover screw when finished. Torque can be adjusted from 3 to 6 inch-lbs, resulting in a contact force of 10 to 125 lbs, but these values are approximate. Force can vary +/- 30% depending on lubrication and other operating conditions.

INCH

PART NO.	A	ADJUSTMENT RANGE	
		TORQUE (IN.-LBS)	END FORCE (LBS)*
CL-4-ATK	1/4-20	3-6	10-125
CL-5-ATK	5/16-18		10-125
CL-6-ATK	3/8-16		10-125
CL-8-ATK	1/2-13		10-125

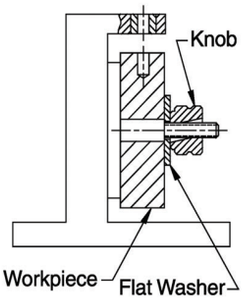
METRIC

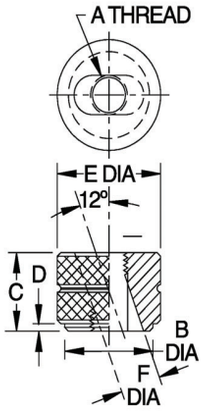
CLM-6-ATK	M6	3-6	10-125
CLM-8-ATK	M8		10-125
CLM-10-ATK	M10		10-125
CLM-12-ATK	M12		10-125

QUICK-ACTING KNURLED KNOBS

12L14 STEEL, BLACK OXIDE FINISH







Quick-acting knob that slides in and out of clamping position, ideal when the knob must be completely removed for loading. Tilt knob to slide in, then straighten to engage threads and tighten. To remove, loosen knob, then tilt to slide out. For full strength, use a stud that extends slightly beyond the knob, to engage all threads.

INCH

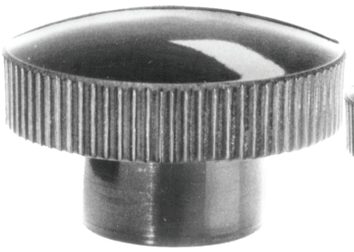
PART NO.	A	B DIA	C	D	E DIA	F DIA
CL-1-QKK	#10-24	1/2	7/16	1/16	5/8	7/32
CL-2-QKK	1/4-20	5/8	9/16		3/4	9/32
CL-3-QKK	5/16-18	3/4	5/8		7/8	11/32
CL-4-QKK	3/8-16	7/8	3/4	1/8	1	13/32
CL-5-QKK	1/2-13	1			1-1/8	17/32

METRIC

CLM-5-QKK	M5	.51	.43	.08	5/8	.23
CLM-6-QKK	M6	.63	.55		3/4	.27
CLM-8-QKK	M8	.75	.63		7/8	.35
CLM-10-QKK	M10	.87		.12	1	.42
CLM-12-QKK	M12	.98	.75	.12	1-1/8	.50

KNURLED KNOBS

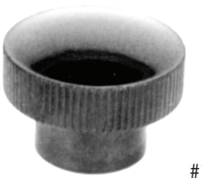
KNOB: BLACK PHENOLIC PLASTIC OR THERMOPLASTIC, WITH BRASS INSERT
STUD: MILD STEEL, ZINC PLATED CLEAR CHROMATE



5/16-18 CL-642-KTK
3/8-16 CL-652-KTK
M8 CLM-642-KTK
M10 CLM-652-KTK



1/4-20 CL-532-KTK
5/16-18 CL-542-KTK
M6 CLM-532-KTK
M8 CLM-542-KTK



#10-32 CL-424-KTK
1/4-20 CL-432-KTK
M5 CLM-422-KTK
M6 CLM-432-KTK



#10-32 CL-324-KTK
1/4-20 CL-332-KTK
M5 CLM-322-KTK



#10-32 CL-124-KTK



#6-32 CL-202-KTK
#8-32 CL-212-KTK

Thermoplastic — Tapped

Phenolic — Tapped









#8-32 X 1/2 CL-312-KTK-8
#10-32 X 1/2 CL-324-KTK-8
#10-32 X 1 CL-324-KTK-16
1/4-20 X 1/2 CL-332 KTK-8
M5 X 20mm CLM-322-KTK-20

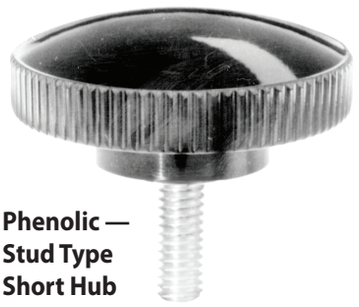
1/4-20 X 1 CL-432-KTK-16
M6 X 25mm CLM-432-KTK-25

1/4-20 X 1/2 CL-532-KTK-8
5/16-18 X 1 CL-542-KTK-16
M8 X 25mm CLM-542-KTK-25

Phenolic — Stud Type



3/8-16 X 1 CL-652-KTK-16
M10 X 25mm CLM-652-KTK-25

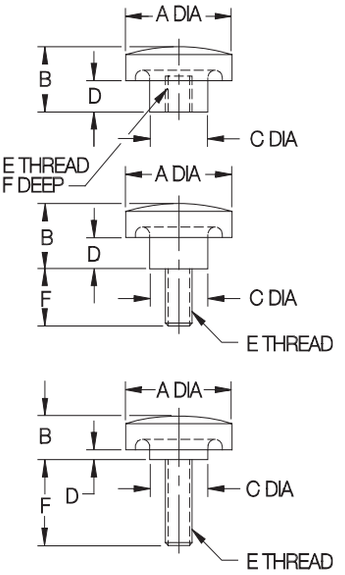




#6-32 X 3/4 CL-406-KTK-12
1/4-20 X 3/4 CL-436-KTK-12

Phenolic — Stud Type Short Hub

3/8-16 X 1 CL-656-KTK-16



Knurled head provides a positive grip for finger tightening in light clamping applications. Choice of six knob sizes. Molded-in brass insert provides superior thread strength. Also available with a molded-in clamping stud. Non-standard thread sizes, or other lengths of molded-in studs are available in quantities of 500 and above. Note: Catalog photos are actual size.

THERMOPLASTIC — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D	E	F
CL-202-KTK	3/4	15/32	5/8	1/4	#6-32	5/16
CL-212-KTK					#8-32	

PHENOLIC — TAPPED (INCH & METRIC)

CL-124-KTK	5/8	9/16	1/2	—	#10-32	5/16
CL-324-KTK					#10-32	
CL-332-KTK	3/4	17/32	7/16	1/16	1/4-20	5/16
CLM-322-KTK					M5	
CL-424-KTK	1	21/32	5/8	5/16	#10-32	5/16
CL-432-KTK					1/4-20	
CLM-422-KTK					M5	
CLM-432-KTK					M6	3/8
CL-532-KTK	1-3/8	25/32	3/4	3/8	1/4-20	7/16
CL-542-KTK					5/16-18	
CLM-532-KTK					M6	
CLM-542-KTK					M8	
CL-642-KTK	1-7/8	1	1	1/2	5/16-18	7/16
CL-652-KTK					3/8-16	1/2
CLM-642-KTK					M8	7/16
CLM-652-KTK					M10	1/2

PHENOLIC — STUD TYPE (INCH & METRIC)

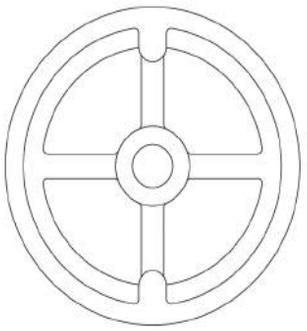
CL-312-KTK-8	3/4	17/32	7/16	1/16	#8-32	1/2
CL-324-KTK-8					#10-32	
CL-324-KTK-16						1
CL-332-KTK-8					1/4-20	1/2
CLM-322-KTK-20					M5	.79
CL-432-KTK-16	1	21/32	5/8	5/16	1/4-20	1
CLM-432-KTK-25					M6	.98
CL-532-KTK-8	1-3/8	25/32	3/4	3/8	1/4-20	1/2
CL-542-KTK-16					5/16-18	1
CLM-542-KTK-25					M8	.98
CL-652-KTK-16	1-7/8	1	1	1/2	3/8-16	1
CLM-652-KTK-25					M10	.98

PHENOLIC — STUD TYPE, SHORT HUB (INCH)

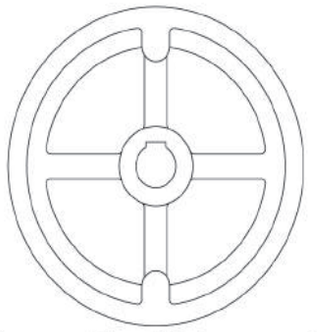
CL-406-KTK-12	1	13/32	1/2	1/16	#6-32	3/4
CL-436-KTK-12					1/4-20	
CL-656-KTK-16	1-7/8	3/4	1	1/4	3/8-16	1

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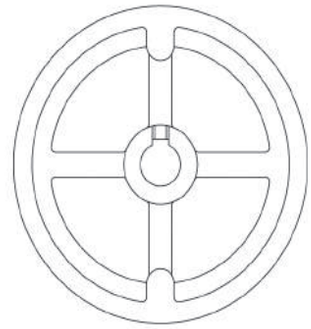
HAND-WHEEL MODIFICATIONS



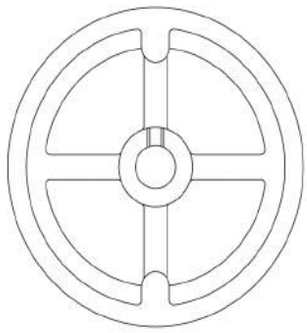
Bored Hole



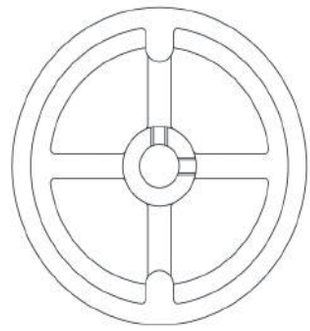
Bored Hole
with Keyway



Bored Hole
with Setscrew Hole
over Keyway



Bored Hole
with Setscrew Hole



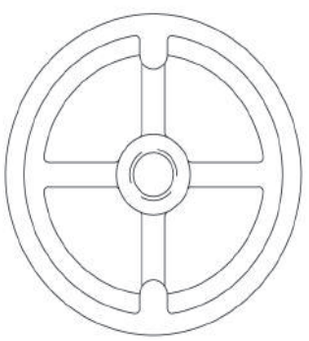
Bored Hole
with 2 Setscrew Holes at 90°

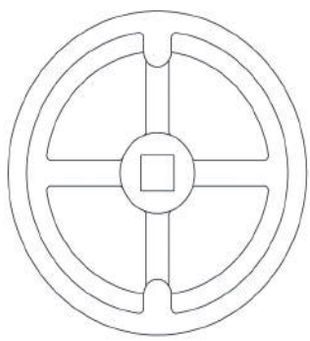
BORE SIZE

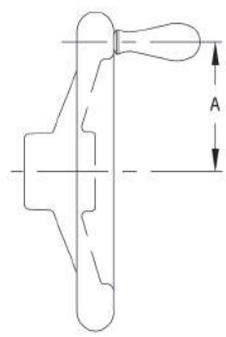
HAND WHEEL DIA	STANDARD BORE SIZE (+0/+.002)	MAXIMUM BORE SIZE
4	.375	.750
5	.375	1.000
6	.500	1.125
8	.625	1.375
10	.625	1.500
12	.750	2.000

KEYWAYS & SETSCREWS

BORE SIZE	STANDARD SQUARE KEYWAY	STANDARD SETSCREW HOLE
.375-.438	3/32	#10-32
.439-.562	1/8	#10-32
.563-.875	3/16	1/4-20
.876-1.250	1/4	5/16-18
1.251-1.375	5/16	3/8-16
1.376-1.750	3/8	3/8-16
1.751-2.000	1/2	1/2-13







TAPPED HOLE

HAND WHEEL DIA	AVAILABLE THREAD SIZES
4	3/8 to 3/4, M10 to M20
5	3/8 TO 1, M10 to M24
6	1/2 to 1-1/4, M12 to M30
8	1/2 to 1-3/8, M12 to M36
10	5/8 to 1-1/2, M16 to M36
12	3/4 to 2, M20 to M48

SQUARE HOLE

HAND WHEEL DIA	AVAILABLE SQUARE HOLE SIZES
4	1/2
5	1/2, 5/8
6	1/2, 5/8
8	1/2, 5/8
10	1/2, 5/8
12	1/2, 5/8

HANDLE INSTALLATION

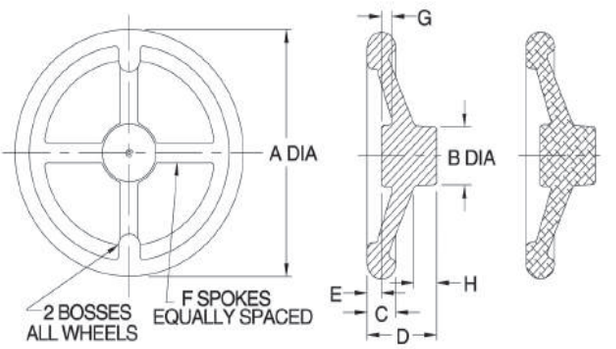
HAND WHEEL DIA	A
4	1-9/16
5	2
6	2-1/2
8	3-1/4
10	4-3/16
12	5-1/8

HAND WHEELS

CAST IRON PER ASTM-A48 CLASS 30 OR 319 ALUMINUM ALLOY



Angled-Spoke
Rounded Design
Cast Iron or Aluminum



Cast Iron HWAF **Aluminum HWAFA**

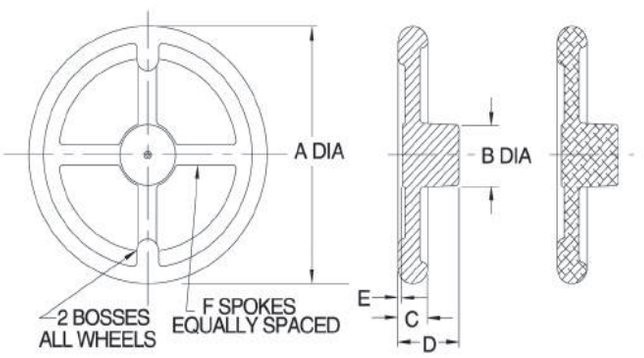
Utility-grade Hand Wheels that can be easily customized for any application. **INFO+**: See page 127 for factory modifications available. Wide range of sizes from 4 to 12" in diameter. Choose either cast iron for maximum strength, or aluminum for light weight.

ANGLED SPOKES

PART NO. CAST IRON	PART NO. ALUMINUM	A DIA	B DIA	C	D	E	F	G	H	J DIA	HANDLE SIZE	HANDLE SOLID	HANDLE REVOLVING
CL-4-HWAF	CL-4-HWAFA	4	1-1/4	5/8	1-11/16	1/8	4	9/32	3/4	11/16	SIZE 2	**INFO+**: SEE PAGE 138	**INFO+**: SEE PAGES 139-141
CL-5-HWAF	CL-5-HWAFA	5	1-1/2	3/4	1-7/8	3/8		5/16		1			
CL-6-HWAF	CL-6-HWAFA	6	1-5/8		2	13/32		3/8	13/16	1	SIZE 4		
CL-8-HWAF	CL-8-HWAFA	8	1-7/8	1	2-7/16	1/2				1-3/8			
CL-10-HWAF	CL-10-HWAFA	10	2-1/4		3-1/32	11/16	8	7/16	1-1/16	1-3/4	SIZE 5		
CL-12-HWAF	CL-12-HWAFA	12	1		4-3/32	1-1/16			1-3/4	2-1/2			



Straight-Spoke
Rounded Design
Cast Iron or Aluminum



Cast Iron HWSF **Aluminum HWSFA**

Same as the Hand Wheels shown above, except with straight spokes for a flatter profile.

STRAIGHT SPOKES

PART NO. CAST IRON	PART NO. ALUMINUM	A DIA	B DIA	C	D	E	F	J DIA	HANDLE SIZE	HANDLE SOLID	HANDLE REVOLVING
CL-4-HWSF	CL-4-HWSFA	4	1-1/4	5/8	1-11/16	1/8	4	11/16	SIZE 2	**INFO+**: SEE PAGE 138	**INFO+**: SEE PAGES 139-141
CL-5-HWSF	CL-5-HWSFA	5	1-1/2	3/4				1			
CL-6-HWSF	CL-6-HWSFA	6	1-5/8		1-13/16			1	SIZE 4		
CL-8-HWSF	CL-8-HWSFA	8	1-7/8	1	2-1/16	5/32	8	1-3/8			
CL-10-HWSF	CL-10-HWSFA	10	2-1/4		2-1/2			1-3/4	SIZE 5		
CL-12-HWSF	CL-12-HWSFA	12	3		3-1/4	1/8		2-1/2			

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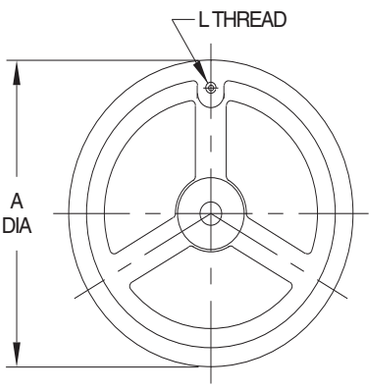
HAND WHEELS

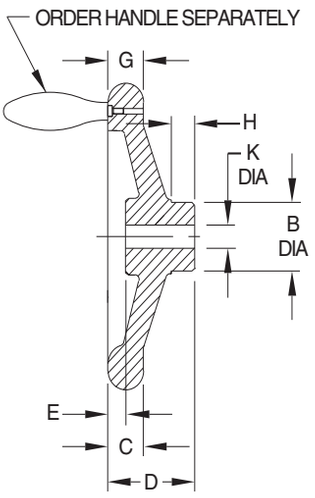
CAST IRON, CHROME PLATED



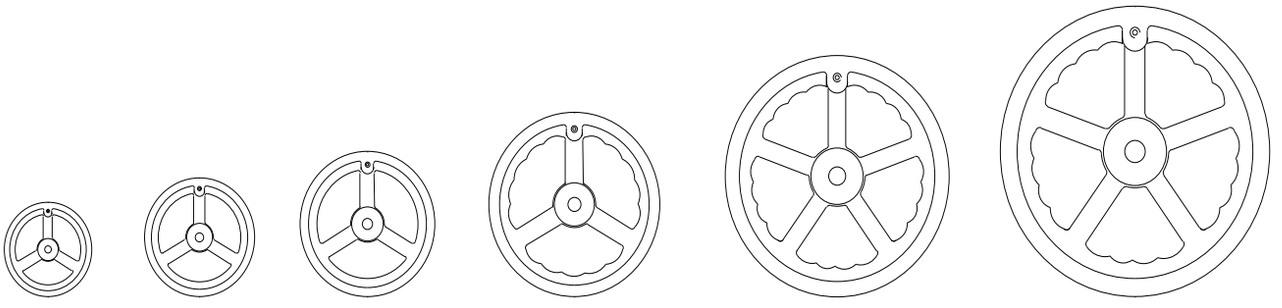
High-quality Hand Wheel with contemporary design. Beautiful chrome-plated finish with a polished rim. Hand Wheel is bored to the standard shaft diameter for its size, and is also tapped for a standard Solid or Revolving Handle. Order handle separately. **INFO+**: See table below for matching rounded-design handle (stainless steel), or pages 138-141 for additional styles. To use without a handle, see table below to order a matching Handle Plug, for the tapped hole (chrome-plated steel).

Angled-Spoke Rounded Design
Cast Iron
Chrome Plated with Polished Rim





Hand wheels up through 8" diameter have three spokes; sizes 10" and larger have five spokes. Sizes 8" and larger have a wavy inside rim for better gripping.



4" 5" 6" 8" 10" 12"

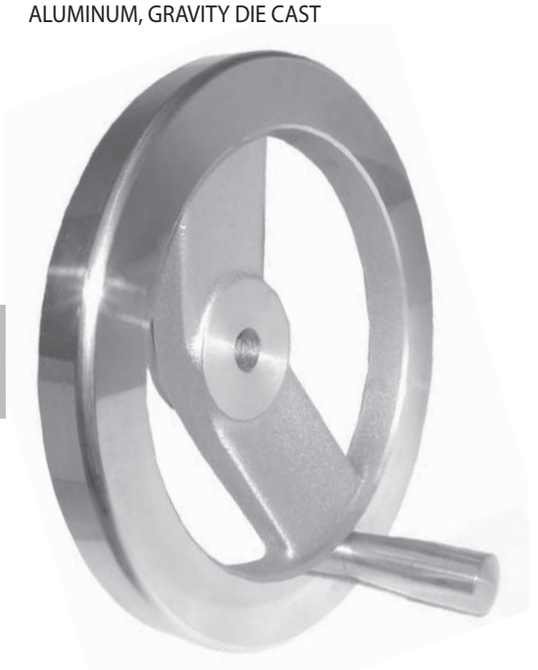
ORDER HAND WHEEL AND SOLID/REVOLVING HANDLE SEPARATELY

PART NO. WITH TAPPED HOLE FOR HANDLE	A DIA	B DIA	C	D	E	H	K DIA	L	MATCHING HANDLE			HANDLE PLUG
									SIZE	SOLID	REVOLVING	
CL-40-HWAR	4	1-1/8	9/16	1-1/2	7/16	1/2	3/8	1/4-20	SIZE 2	CL-250-SH-S	CL-250-RH-S	CL-2-HW-PLUG
CL-50-HWAR	5	1-1/4	19/32	1-5/8								
CL-60-HWAR	6	1-3/8	21/32	1-13/16	9/16	9/16	1/2	5/16-18	SIZE 3	CL-350-SH-S	CL-350-RH-S	CL-3-HW-PLUG
CL-80-HWAR	8	1-21/32	7/8	2-3/16	11/16	5/8	5/8	3/8-16	SIZE 4	CL-450-SH-S	CL-450-RH-S	CL-4-HW-PLUG
CL-100-HWAR	10	1-7/8	15/16	2-3/8	23/32	3/4						
CL-120-HWAR	12	2-5/32	1	2-1/2	23/32	7/8	3/4	1/2-13	SIZE 5	CL-550-SH-S	CL-550-RH-S	CL-5-HW-PLUG

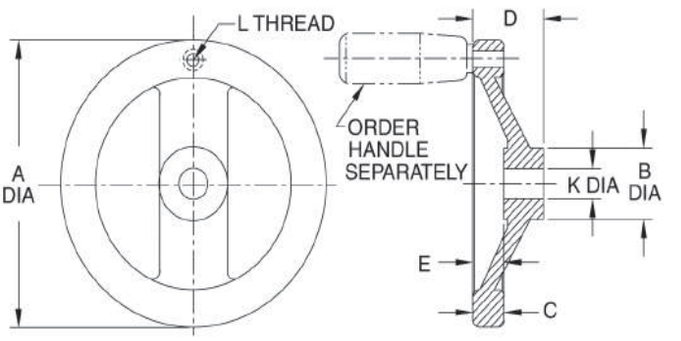
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HAND WHEELS

ALUMINUM, GRAVITY DIE CAST



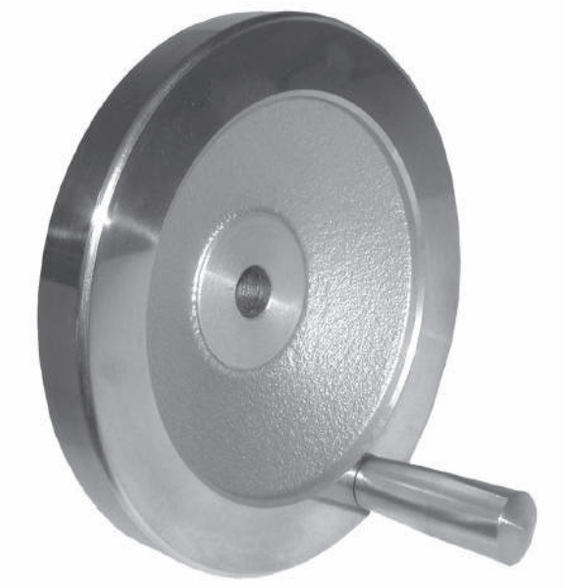
High-quality Hand Wheel with two spokes, with contemporary design. Rim is machined and highly polished on all sides. Spokes are shot blasted to a satin finish. These Hand Wheels are bored to the standard shaft diameter for their size, and are tapped for a Solid or Revolving Handle (also available without tapped hole for handle). Rim is concentric and square to the bore. Order Solid or Revolving Handle separately. Matching square-design stainless steel handles are recommended.



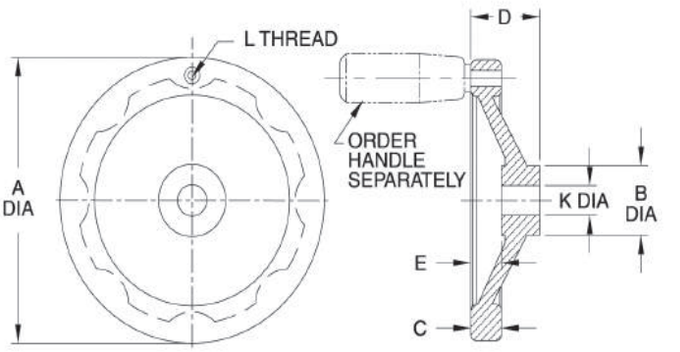
TWO-SPOKE SQUARE DESIGN — ALUMINUM

PART NO. WITH TAPPED HOLE FOR HANDLE	PART NO. WITHOUT TAPPED HOLE FOR HANDLE	A DIA	B DIA	C	D	E	K DIA	L	HANDLE		
									SIZE	SOLID	REVOLVING
CL-50-HWTS-A	CL-5-HWTS-A	4.92	1.22	.59	1.30	.59	.375	1/4-20	SIZE 2	SEE PAGE 138	SEE PAGES 139-141
CL-60-HWTS-A	CL-6-HWTS-A	6.30	1.42	.71	1.54	.75	.500	5/16-18	SIZE 3		
CL-80-HWTS-A	CL-8-HWTS-A	7.87	1.65	.81	1.77	.83	.625	3/8-16	SIZE 4		
CL-100-HWTS-A	CL-10-HWTS-A	9.84	1.89	.91	2.01	.91					

INFO+



High-quality aluminum Hand Wheel, with contemporary design. Rim is machined and highly polished on all sides. Solid inner dish is shot-blasted to a satin finish. These Hand Wheels are bored to the standard shaft diameter for their size, and are tapped for a Solid or Revolving Handle (also available without tapped hole for handle). Rim is concentric and square to the bore. Order Solid or Revolving Handle separately. Matching square-design stainless steel handles are recommended.

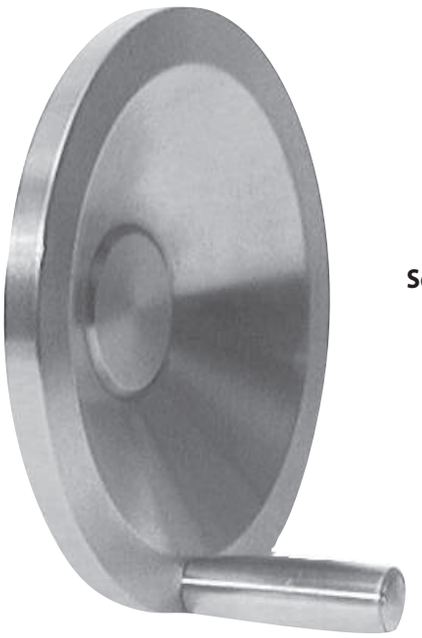


SOLID SQUARE DESIGN — ALUMINUM

PART NO. WITH TAPPED HOLE FOR HANDLE	PART NO. WITHOUT TAPPED HOLE FOR HANDLE	A DIA	B DIA	C	D	E	K DIA	L	HANDLE		
									SIZE	SOLID	REVOLVING
CL-40-HWSS-A	CL-4-HWSS-A	3.94	1.10	.55	1.18	.51	.375	1/4-20	SIZE 2	SEE PAGE 138	SEE PAGES 139-141
CL-50-HWSS-A	CL-5-HWSS-A	4.92	1.22	.59	1.30	.59					
CL-60-HWSS-A	CL-6-HWSS-A	6.30	1.42	.71	1.54	.75	.500	5/16-18	SIZE 3		
CL-80-HWSS-A	CL-8-HWSS-A	7.87	1.65	.81	1.77	.83	.625	3/8-16	SIZE 4		
CL-100-HWSS-A	CL-10-HWSS-A	9.84	1.89	.91	2.01	.91					

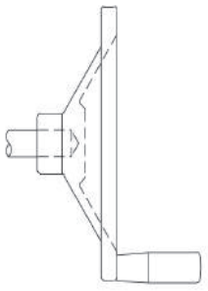
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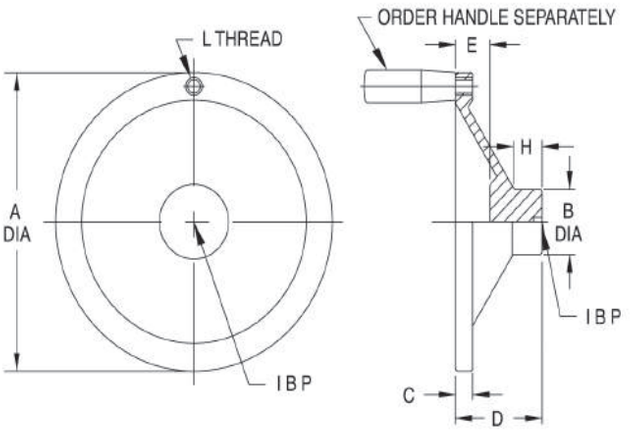
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Solid Square Design
Stainless Steel

High-quality, stainless steel Hand Wheel. Contemporary square design, completely machined to a fine finish from solid 300-series stainless steel. This precision Hand Wheel is extremely strong, yet light weight. Stainless steel Hand Wheels are center drilled, and also tapped for a standard Solid or Revolving Handle. Order handle separately. **INFO+**: See table below for matching square-design handle (stainless steel), or pages 138-141 for additional styles.





These Hand Wheels can be bored with a blind hole to hide the shaft, for an extremely attractive finished appearance.

ORDER HAND WHEEL AND SOLID/REVOLVING HANDLE SEPARATELY

PART NO. WITH TAPPED HOLE FOR HANDLE	A DIA	B DIA	C	D	E	H	L	MATCHING HANDLE		
								SIZE	SOLID	REVOLVING
CL-30-HWSS-S	3	.87	1/4	1.10	.43	3/8	1/4-20	SIZE 1	CL-100-SH-S	CL-100-RH-S
CL-40-HWSS-S	4	1.02	5/16	1.25	.54	7/16				
CL-60-HWSS-S	6	1.50	1/2	1.50	.63	1/2	1/4-20	SIZE 2	CL-200-SH-S	CL-200-RH-S
CL-80-HWSS-S	8	1.80	9/16	1.80	.85	5/8	5/16-18	SIZE 3	CL-300-SH-S	CL-300-RH-S
CL-100-HWSS-S	10	2	5/8	2	.95	3/4	3/8-16	SIZE 4	CL-400-SH-S	CL-400-RH-S

HAND WHEELS

BODY: BLACK FIBER-REINFORCED NYLON THERMOPLASTIC
HUB: MILD STEEL, ZINC PLATED CLEAR CHROMATE

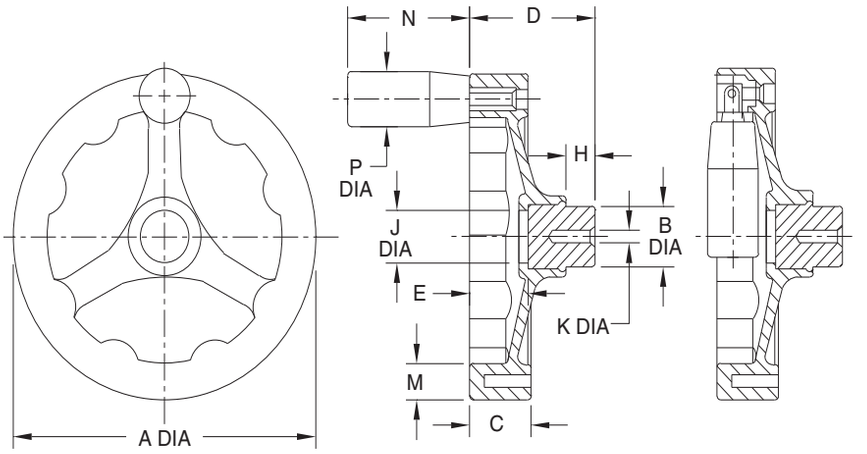


Angled-Spoke Square Design Thermoplastic with Revolving Handle



Angled-Spoke Square Design Thermoplastic with Foldable Revolving Handle

High-quality, thermoplastic Hand Wheel with three spokes, with contemporary design. Molded-in steel hub, blank with a pilot hole. Available with either a Revolving Handle, a Foldable Revolving Handle, or a plain rim without a handle. Matte black fiber-reinforced nylon thermoplastic (textured surface for secure gripping, excellent impact resistance, operating temperatures to 230°F).



PART NO. WITH REVOLVING HANDLE	PART NO. WITH FOLDABLE REVOLVING HANDLE	PART NO. WITHOUT HANDLE (NOT TAPPED)	A DIA	B DIA	C	D	E	H	J DIA	K DIA	M	N	P DIA
CL-41-HWAS-P	CL-42-HWAS-P	CL-4-HWAS-P	3.94	.94	.79	1.69	.75	.47	.71	.157	.59	1.97	.83
CL-51-HWAS-P	CL-52-HWAS-P	CL-5-HWAS-P	4.92		.94	2.01	.91		.79	.236	.67		
CL-61-HWAS-P	CL-62-HWAS-P	CL-6-HWAS-P	6.30	1.26	1.10	2.40	1.18	.59	1.18	.236	.79	2.76	.91
CL-81-HWAS-P	CL-82-HWAS-P	CL-8-HWAS-P	7.87	1.57	1.26	2.87	1.30		1.38		.91	3.54	1.02

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HAND WHEELS

BODY: MATTE BLACK HIGH-IMPACT THERMOPLASTIC
HUB: MILD STEEL, BLACK OXIDE FINISH
CENTER TRIM COVER: ALUMINUM, ANODIZED



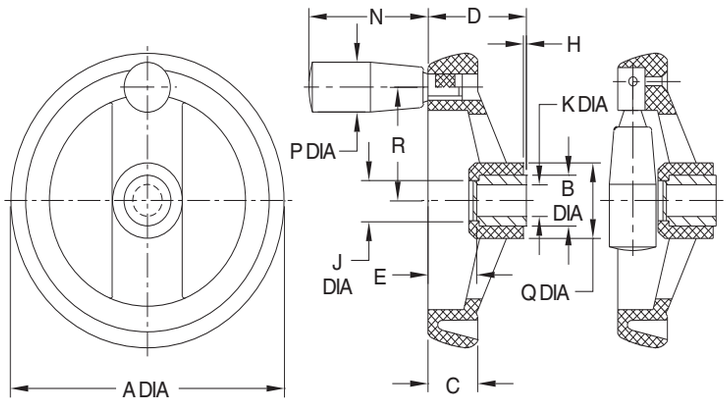
**Two-Spoke Rounded Design
Thermoplastic
with Revolving Handle**



**Two-Spoke Rounded Design
Thermoplastic
with Foldable Revolving Handle**

**ELESA
ORIGINAL
DESIGN**

High-quality, thermoplastic Hand Wheel with two spokes, with contemporary design. Molded-in steel hub. These Hand Wheels are bored to the standard shaft diameter for their size. Available with either a Revolving Handle, a Foldable Revolving Handle, or a plain rim without a handle. Matte black high-impact thermoplastic (textured surface for secure gripping, excellent impact resistance, operating temperatures to 230°F).



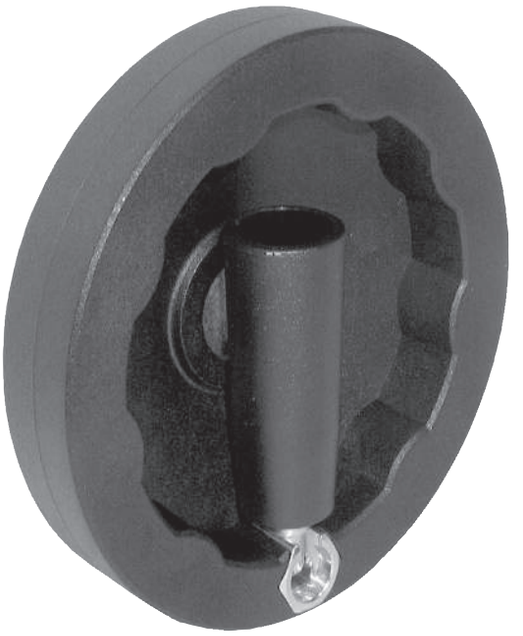
PART NO. WITH REVOLVING HANDLE	PART NO. WITH FOLDABLE REVOLVING HANDLE	PART NO. WITHOUT HANDLE (NOT TAPPED)	A DIA	B HUB DIA	C	D	E	H	J DIA	K BORE DIA	N	P DIA	Q DIA	R
CL-41-HWTR-P	CL-42-HWTR-P	CL-4-HWTR-P	3.90	.71	.79	1.46	.79	.01	.67	.375	1.97	.83	.98	1.45
CL-51-HWTR-P	CL-52-HWTR-P	CL-5-HWTR-P	4.88	.87	.87	1.73	.87		.83	.375	2.56	.91	1.22	1.83
CL-61-HWTR-P	CL-62-HWTR-P	CL-6-HWTR-P	6.30	1.02	.98	2.01	.94		.98	.500			1.57	2.56
CL-81-HWTR-P	CL-82-HWTR-P	CL-8-HWTR-P	7.87	1.18	1.10	2.40	1.06		1.22	.625	3.15	1.02	1.97	3.30

HAND WHEELS

BODY: MATTE BLACK FIBER-REINFORCED NYLON THERMOPLASTIC
HUB: MILD STEEL, ZINC PLATED CLEAR CHROMATE

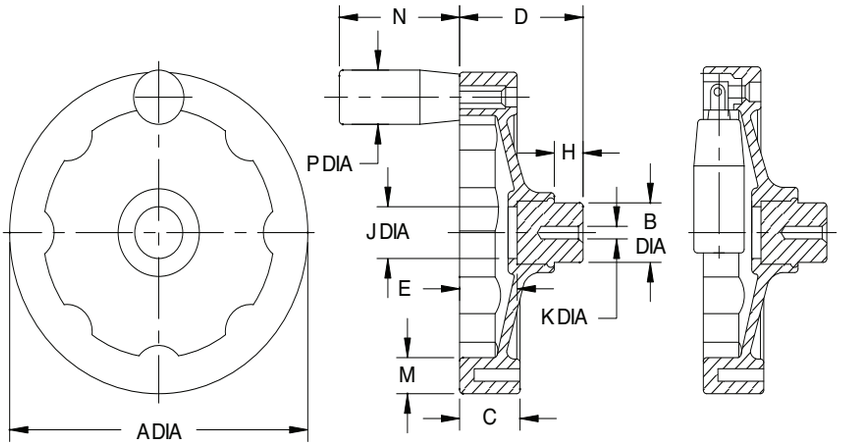


Solid Square Design Thermoplastic with Revolving Handle



Solid Square Design Thermoplastic with Foldable Revolving Handle

High-quality, thermoplastic Hand Wheel with two spokes, with contemporary design. Molded-in steel hub. These Hand Wheels are bored to the standard shaft diameter for their size. Available with either a Revolving Handle, a Foldable Revolving Handle, or a plain rim without a handle. Matte black high-impact thermoplastic (textured surface for secure gripping, excellent impact resistance, operating temperatures to 230°F).



PART NO. WITH REVOLVING HANDLE	PART NO. WITH FOLDABLE REVOLVING HANDLE	PART NO. WITHOUT HANDLE (NOT TAPPED)	A DIA	B DIA	C	D	E	H	J DIA	K DIA	M	N	P DIA
CL-41-HWSS-P	CL-42-HWSS-P	CL-4-HWSS-P	3.94	.94	.79	1.81	.87	.47	.71	.157	.59	1.97	.83
CL-51-HWSS-P	CL-52-HWSS-P	CL-5-HWSS-P	4.92		.94	2.01	.91		.79	.236	.67		
CL-61-HWSS-P	CL-62-HWSS-P	CL-6-HWSS-P	6.30	1.26	1.10	2.40	1.18	.59	1.18	.236	.79	2.76	.91
CL-81-HWSS-P	CL-82-HWSS-P	CL-8-HWSS-P	7.87	1.57	1.26	2.91	1.34		1.38		.94	3.54	1.02

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HAND WHEELS

BODY: MATTE BLACK HIGH-IMPACT THERMOPLASTIC
HUB: MILD STEEL, BLACK OXIDE FINISH
CENTER TRIM COVER: GRAY THERMOPLASTIC, PUSH FIT



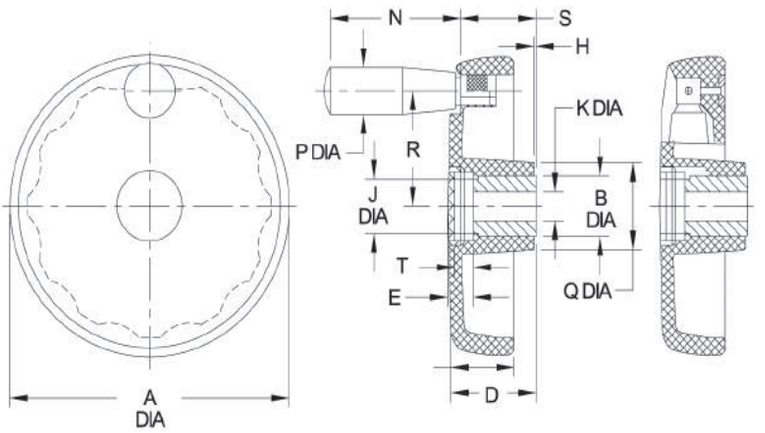
**Solid Disk Design
Thermoplastic
with Revolving Handle**



**ELESA
ORIGINAL
DESIGN**

**Solid Disk Design
Thermoplastic
with Foldable Revolving Handle**

High-quality, solid-disk thermoplastic Hand Wheel, with contemporary design. Molded-in steel hub. These Hand Wheels are bored to the standard shaft diameter for their size. Available with either a Revolving Handle, a Foldable Revolving Handle, or a plain rim without a handle. Matte black high-impact thermoplastic (textured surface for secure gripping, excellent impact resistance, operating temperatures to 230°F).



PART NO. WITH REVOLVING HANDLE	PART NO. WITH FOLDABLE REVOLVING HANDLE	A DIA	B HUB DIA	C	D	E	H	J DIA	K BORE DIA	N	P DIA	Q DIA	R	S	T
CL-41-HWSD-P	CL-42-HWSD-P	4.02	.87	.94	1.34	.47	.01	.79	.375	1.97	.83	1.18	1.53	1.18	.35
CL-51-HWSD-P	CL-52-HWSD-P	4.92	1.02	1.10	1.54	.47		.94	.375	2.20	.87	1.38	1.93	1.38	.31
CL-61-HWSD-P	CL-62-HWSD-P	5.91		1.26	1.73	.55			.500	2.56	.91	1.50	2.28	1.57	.39
CL-81-HWSD-P	CL-82-HWSD-P	7.87	1.57	1.54	2.09	.67		1.50	.625	3.54	1.10	1.97	3.19	1.89	.51

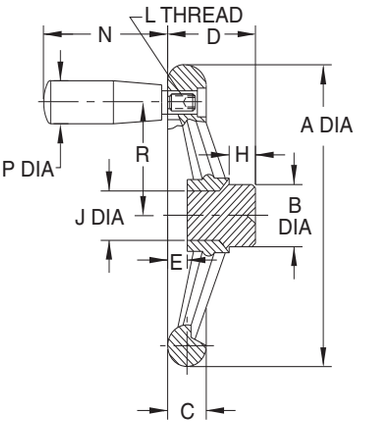
HAND WHEELS

BODY: BLACK PHENOLIC PLASTIC
HUB (ANGLED SPOKE): MILD STEEL, BLACK OXIDE FINISH
HUB (SOLID): MILD STEEL, ZINC PLATED CLEAR CHROMATE



High-quality, phenolic Hand Wheel with three spokes, with contemporary design. Molded-in steel hub, blank without a pilot hole. Available with either a Revolving Handle or a plain rim without a handle. Black phenolic plastic (glossy smooth finish, extremely hard, electrical insulator, operating temperatures to 300°F, resistant to oils and most common chemicals).

ELESA ORIGINAL DESIGN

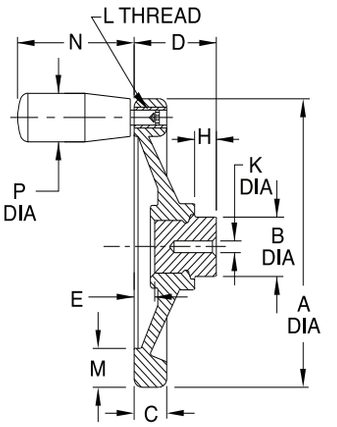


ANGLED-SPOKE ROUNDED DESIGN — PHENOLIC

PART NO. WITH REVOLVING HANDLE	PART NO. WITHOUT HANDLE (NOT TAPPED)	A DIA	B DIA	C	D	E	H	J DIA	L	N	P DIA
CL-41-HWAR-F	CL-4-HWAR-F	3.86	.94	.55	1.57	.16	.47	.79	M6	1.57	.71
CL-51-HWAR-F	CL-5-HWAR-F	4.88		.71	1.38	.35			M8	1.97	.83
CL-61-HWAR-F	CL-6-HWAR-F	6.18	1.26	.87	1.57	.47	.59	.94	M8	2.56	.91
CL-81-HWAR-F	CL-8-HWAR-F	7.80	1.57	.94	2.20	.51		1.22	M10	3.15	1.02



High-quality, phenolic Hand Wheel, with contemporary design. Molded-in steel hub, blank with a pilot hole. Available with either a Revolving Handle or a plain rim without a handle. Black phenolic plastic (glossy smooth finish, extremely hard, electrical insulator, operating temperatures to 300°F, resistant to oils and most common chemicals).



SOLID SQUARE DESIGN — PHENOLIC

PART NO. WITH REVOLVING HANDLE	PART NO. WITHOUT HANDLE (NOT TAPPED)	A DIA	B DIA	C	D	E	H	K DIA	L	M	N	P DIA
CL-31-HWSS-F	CL-3-HWSS-F	3.15	.79	.55	1.22	.16	.39	.157	M6	.59	1.57	.71
CL-41-HWSS-F	CL-4-HWSS-F	3.94	.94		1.38	.24	.43		M8	.63	1.97	.83
CL-51-HWSS-F	CL-5-HWSS-F	4.92	1.26	.63	1.73	.35	.51	.236	M8	.71	2.17	.91
CL-61-HWSS-F	CL-6-HWSS-F	5.91	1.26	.71	1.89	.43	.51		M10	.79	2.56	1.02
CL-81-HWSS-F	CL-8-HWSS-F	7.87	1.57	.83	2.28	.55	.63			.94		

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FLUTED HAND WHEELS

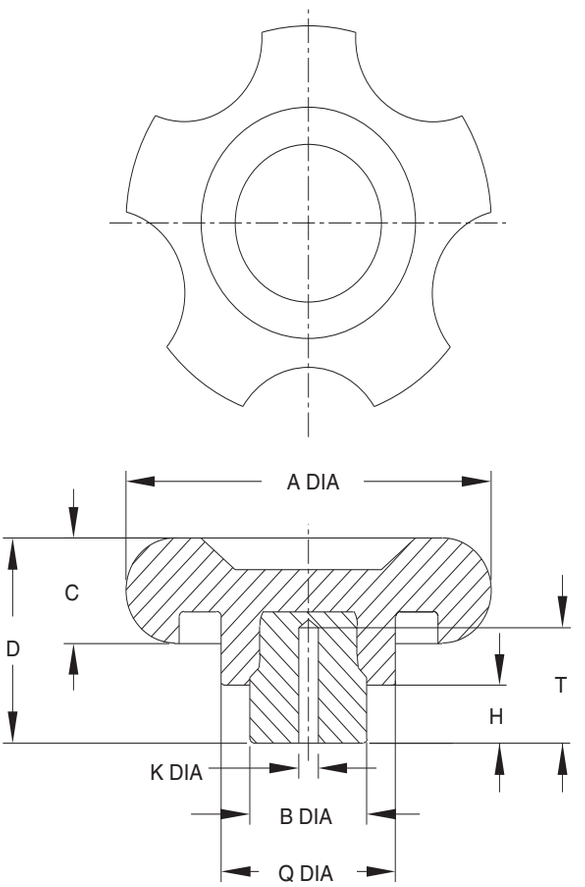
BODY: BLACK PHENOLIC PLASTIC
HUB: MILD STEEL, ZINC PLATED CLEAR CHROMATE



CL-4-FHW



CL-3-FHW



Small five-lobed phenolic hand wheels that are useful as control knobs or clamping knobs. Available in two diameters. Molded-in steel hub, blank with a pilot hole. Black phenolic plastic (glossy smooth finish, extremely hard, electrical insulator, operating temperatures to 300°F, resistant to oils and most common chemicals).
Note: Catalog photos are actual size.

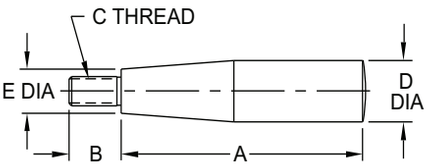
PART NO.	A DIA	B DIA	C	D	H	K DIA	Q DIA	T
CL-3-FHW	2.95	.94	.79	1.54	.43	.157	1.34	.87
CL-4-FHW	3.54	1.26		1.65	.47	.236	1.73	.98

SOLID HANDLES

STEEL: 12L14, BLACK OXIDE FINISH. STAINLESS STEEL: 300 SERIES.

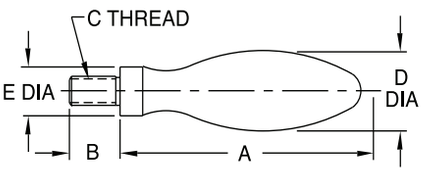


Square Design Threaded Stainless Steel



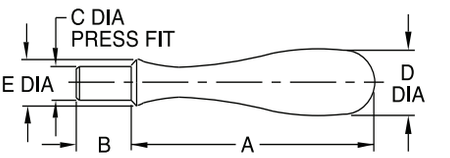


Rounded Design Threaded Stainless Steel





Rounded Design Press Fit Steel, Black Oxide Finish



SQUARE DESIGN, THREADED — STAINLESS (INCH)

PART NO.	SIZE	A	B	C	D DIA	E DIA
CL-100-SH-S	1	1-1/2	9/32	1/4-20	1/2	13/32
CL-200-SH-S	2	2	7/16			
CL-300-SH-S	3	2-1/2	9/16	5/16-18	5/8	15/32
CL-400-SH-S	4	3-1/4	11/16	3/8-16	3/4	19/32

ROUNDED DESIGN, THREADED — STAINLESS (INCH)

CL-250-SH-S	2	2	1/2	1/4-20	5/8	.44
CL-350-SH-S	3	2-5/8	9/16	5/16-18	13/16	.53
CL-450-SH-S	4	3-3/16	11/16	3/8-16	1	.63
CL-550-SH-S	5	3-3/4	13/16	1/2-13	1-1/4	.75

ROUNDED DESIGN, PRESS FIT — STEEL (INCH)

CL-1-SH	2	2	9/16	3/8	11/16	5/8
CL-2-SH	4	3-1/4	3/4	7/16	1	11/16
CL-3-SH	5	3-7/8	1	1/2	1-3/16	7/8

Attractive fixed handles available in steel with a black oxide finish, or stainless steel with a polished finish. Available in square or rounded designs, each in several sizes. Choice of threaded type or press-fit type (do not use press-fit handles on aluminum hand wheels).

SQUARE DESIGN, THREADED — STAINLESS (METRIC)

PART NO.	SIZE	A	B	C	D DIA	E DIA
CLM-100-SH-S	1	1-1/2	9/32	M6	1/2	13/32
CLM-200-SH-S	2	2	7/16			
CLM-300-SH-S	3	2-1/2	9/16	M8	5/8	15/32
CLM-400-SH-S	4	3-1/4	11/16	M10	3/4	19/32

ROUNDED DESIGN, THREADED — STAINLESS (METRIC)

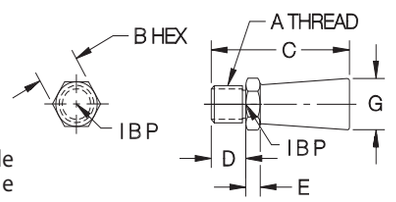
CLM-250-SH-S	2	2	1/2	M6	5/8	.44
CLM-350-SH-S	3	2-5/8	9/16	M8	13/16	.53
CLM-450-SH-S	4	3-3/16	11/16	M10	1	.63
CLM-550-SH-S	5	3-3/4	13/16	M12	1-1/4	.75

FINGER PINS

12L14 STEEL, BLACK OXIDE FINISH



Miniature, fixed finger handle in steel, with a black oxide finish.



INCH

PART NO.	A	B	C	D	E	G DIA
CL-0-FP	#10-32	1/4	3/4	1/4	7/64	1/4
CL-1-FP	#10-24					
CL-2-FP	5/16-18	3/8	1-1/4	5/16	5/32	3/8

METRIC

CLM-5-FP	M5	6mm	.75	M6	.12	.24
CLM-8-FP	M8	10mm	1.26	M8	.16	.39

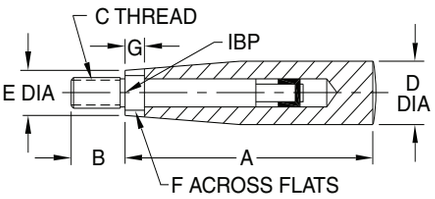
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REVOLVING HANDLES

STEEL: 12L14, BLACK OXIDE FINISH. STAINLESS STEEL: 300 SERIES

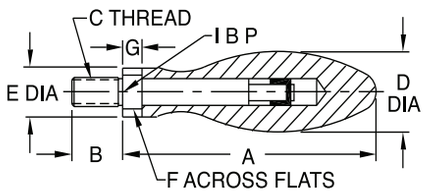


Square Design
Threaded
Stainless Steel



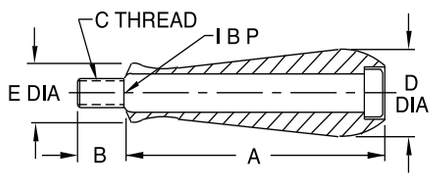


Rounded Design
Threaded
Stainless Steel



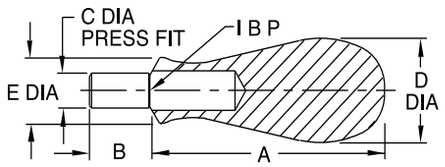


Rounded Design
Shoulder Screw
Steel, Black Oxide Finish





Rounded Design
Press Fit
Steel, Black Oxide Finish



Revolving Handles have an internal bearing that allows the handle to remain fixed in your hand, for firm gripping, while turning a hand wheel or crank. These attractive handles are available in steel with a black oxide finish, or stainless steel with a polished finish. Available in square or rounded designs, each in several sizes. Choice of threaded type or press-fit type (do not use press-fit handles on aluminum hand wheels).

SQUARE DESIGN, THREADED — STAINLESS (INCH)

PART NO.	SIZE	A	B	C	D DIA	E DIA	F	G
CL-100-RH-S	1	1-1/2	9/32	1/4-20	1/2	13/32	5/16	.25
CL-200-RH-S	2	2	1/2					.28
CL-300-RH-S	3	2-1/2	9/16	5/16-18	5/8	15/32	3/8	.32
CL-400-RH-S	4	3-1/4	5/8	3/8-16	3/4	19/32	7/16	.39

ROUNDED DESIGN, THREADED — STAINLESS (INCH)

CL-250-RH-S	2	2-1/4	1/2	1/4-20	5/8	.44	5/16	.25
CL-350-RH-S	3	2-13/16	9/16	5/16-18	13/16	.53	3/8	.28
CL-450-RH-S	4	3-3/8	5/8	3/8-16	1	.63	7/16	.32
CL-550-RH-S	5	4	3/4	1/2-13	1-1/4	.75	5/8	.39

ROUNDED DESIGN, SHOULDER SCREW — STEEL (INCH)

CL-1-RH	2	2	7/16	1/4-20	11/16	5/8	—	—
CL-2-RH	4	3-3/8	11/16	3/8-16	1	11/16	—	—
CL-3-RH	5	3-7/8	3/4	1/2-13	1-3/16	7/8	—	—

ROUNDED DESIGN, PRESS FIT — STEEL (INCH)

CL-4-RH	2	2-3/8	19/32	3/8	11/16	5/8	—	—

SQUARE DESIGN, THREADED — STAINLESS (METRIC)

PART NO.	SIZE	A	B	C	D DIA	E DIA	F	G
CLM-100-RH-S	1	1-1/2	9/32	M6	5/8	15/32	5/16	.20
CLM-200-RH-S	2	2	1/2			7/16		.25
CLM-300-RH-S	3	2-1/2	9/16	M8	3/4	15/32	3/8	.28
CLM-400-RH-S	4	3-1/4	5/8	M10	7/8	19/32	7/16	.32

ROUNDED DESIGN, THREADED — STAINLESS (INCH)

CLM-250-RH-S	2	2-1/4	1/2	M6	5/8	.44	5/16	.25
CLM-350-RH-S	3	2-13/16	9/16	M8	13/16	.53	3/8	.28
CLM-450-RH-S	4	3-3/8	5/8	M10	1	.63	7/16	.32
CLM-550-RH-S	5	4	3/4	M12	1-1/4	.75	5/8	.39

ROUNDED DESIGN, SHOULDER SCREW — STEEL (INCH)

CLM-1-RH	2	2	7/16	M6	13/16	3/4	—	—
CLM-2-RH	4	3-1/4	9/16	M10	1-1/4	15/16	—	—
CLM-3-RH	5	3-7/8	3/4	M12	1-1/2	1-1/8	—	—

REVOLVING HANDLES

BODY: BLACK PHENOLIC PLASTIC OR NYLON THERMOPLASTIC
THREADED SPINDLE: MILD STEEL, ZINC PLATED CLEAR CHROMATE

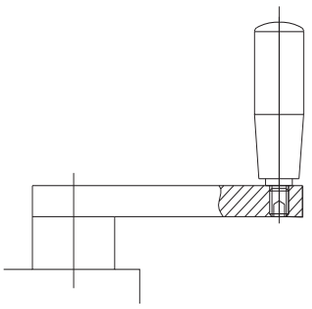


Phenolic with Steel Body

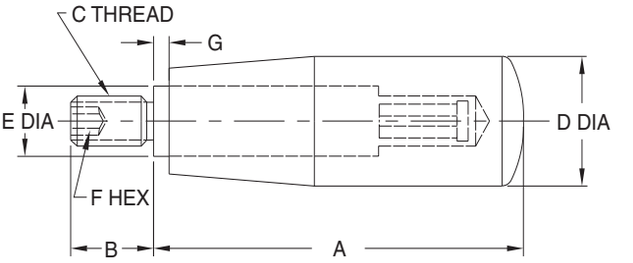


Thermoplastic with Steel Body

Modern square-design handle with a threaded steel spindle. Revolving Handles have an internal bearing that allows the handle to remain fixed in your hand, for firm gripping while turning a Hand Wheel or crank. Threaded spindle has a hex socket for easy installation. Available in two handle materials: Black phenolic plastic (glossy smooth finish, extremely hard, electrical insulator, operating temperatures to 300°F, resistant to oils and most common chemicals) or matte black nylon thermoplastic (textured surface for secure gripping, excellent impact resistance, operating temperatures to 230°F).



Revolving Handles can be used to make custom crank handles.



INCH

PART NO. PHENOLIC	PART NO. THERMOPLASTIC	SIZE	A	B	C	D DIA	E DIA	F	G
CL-100-RH-F	CL-100-RH-P	1	1.67	.47	1/4-20	.71	.39	3mm	.10
CL-200-RH-F	CL-200-RH-P	2	2.07	.51		.83			
CL-300-RH-F	CL-300-RH-P	3	2.66	.55	5/16-18	.91	.51	4mm	
CL-400-RH-F	CL-400-RH-P	4	3.25	.63	3/8-16	1.02		5mm	
CL-500-RH-F	—	5	4.12	.79	1/2-13	1.22	.55	6mm	

METRIC

CLM-100-RH-F	CLM-100-RH-P	1	1.67	.47	M6	.71	.39	3mm	.10
CLM-200-RH-F	CLM-200-RH-P	2	2.07	.51	M6	.83		3mm	
CLM-201-RH-F	—				M8			4mm	
CLM-300-RH-F	CLM-300-RH-P	3	2.66	.55	M8	.91	.51	4mm	
CLM-400-RH-F	CLM-400-RH-P	4	3.25	.63	M10	1.02		5mm	
CLM-500-RH-F	—	5	4.12	.79	M12	1.22	.55	6mm	

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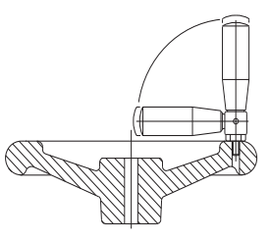
FOLDABLE REVOLVING HANDLES

BODY: 300-SERIES STAINLESS STEEL. HANDLE: BLACK THERMOPLASTIC

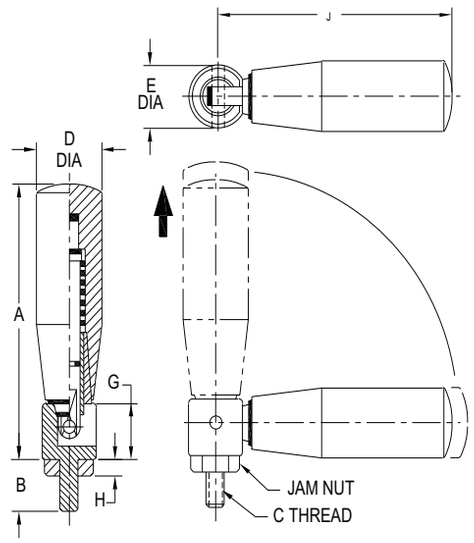


Thermoplastic with Stainless Steel Body

Unique revolving handle that can fold away when not in use. Handle is positively locked in extended position. Like other revolving handles, this foldable handle has an internal bearing that allows it to remain fixed in your hand, for firm gripping, while turning a hand wheel or crank. To allow folding, the handle must first be pulled outward, against a spring force, then moved 90°. Once folded, the handle is held in that position also by spring force.



To install handle in tapped hole, screw in as far as possible, then back off until the handle is at the desired orientation. Tighten Jam Nut to secure at that orientation.



INCH

PART NO.	SIZE	A	B	C	D DIA	E DIA	G	H	J
CL-200-FRH-S	2	2-1/2	5/8	1/4-20	7/8	.63	1/2	11/64	2-3/8
CL-300-FRH-S	3	3-1/4	3/4	5/16-18	15/16	.78	5/8	13/64	3-1/8
CL-400-FRH-S	4	3-3/4	7/8	3/8-16	1	.78	5/8	15/64	3-5/8

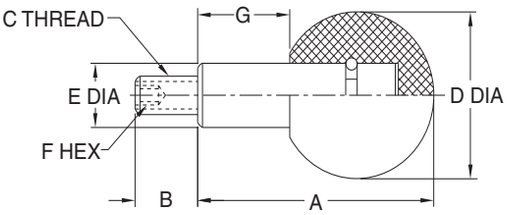
REVOLVING BALL HANDLES

BALL KNOB: BLACK PHENOLIC PLASTIC
THREADED SPINDLE: MILD STEEL, BLACK OXIDE FINISH OR ZINC PLATED CLEAR CHROMATE



Phenolic with Steel Body

Revolving handle with a ball knob made of phenolic plastic and a threaded steel spindle. This version is especially useful for hand wheels or cranks mounted horizontally with the handle used as a hand rest. Revolving Ball Handles have an internal bearing that allows the handle to remain fixed in your hand, for firm gripping. Threaded spindle has a hex socket for easy installation.



INCH

PART NO.	SIZE	A	B	C	D DIA	E DIA	F	G
CL-200-RBH	2	1.48	.43	1/4-20	.98	.39	3mm	.59
CL-300-RBH	3	1.89	.51	5/16-18	1.26	.51	4mm	.75
CL-400-RBH	4	2.40	.55	3/8-16	1.57	.63	5mm	.94
CL-500-RBH	5	3.07	.83	1/2-13	1.97	.79	6mm	1.22

METRIC

CLM-200-RBH	2	1.48	.43	M6	.98	.39	3mm	.59
CLM-300-RBH	3	1.89	.51	M8	1.26	.51	4mm	.75
CLM-400-RBH	4	2.40	.55	M10	1.57	.63	5mm	.94
CLM-500-RBH	5	3.07	.83	M12	1.97	.79	6mm	1.22

LEVER HANDLES

300-SERIES STAINLESS STEEL



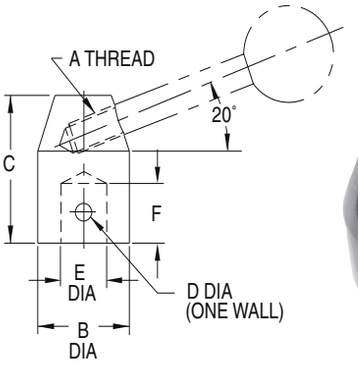
Single Lever Handle



Triple Lever Handle

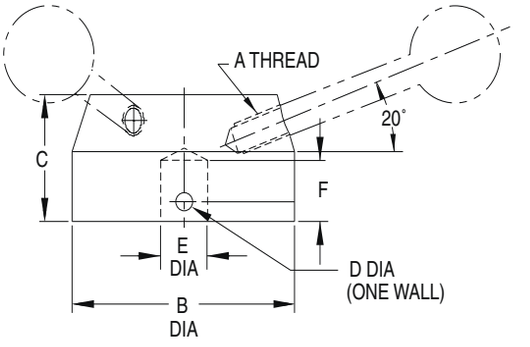
Fast, efficient levers that provide high torque. These attractive Lever Handles are made of 300-series stainless steel, polished to a beautiful finish. Hubs are available in single-handle or triple-handle versions, each in two sizes. Lever Handles can be totally customized by choosing Lever Bar length (**INFO+**: see page 143) and Knob type (**INFO+**: see pages 152-159).





Single Hub





Triple Hub

SINGLE LEVER HANDLE — ORDER HUB, LEVER BAR, AND KNOB SEPARATELY (INCH)

PART NO. HUB ONLY	A	B DIA	C	D DIA	E	F	PART NO. LEVER BAR	PART NO. KNOB
CL-116-LHH-S	5/16-18	1	1-1/2	1/8	3/8 DIA REAMED	5/8	**INFO+**: SEE PAGE 143	**INFO+**: SEE PAGES 152-159
CL-1160-LHH-S				—	3/8-16 TAPPED	9/16		
CL-128-LHH-S	3/8-16	1-1/4	1-7/8	5/32	1/2 DIA REAMED	3/4		
CL-1280-LHH-S				—	1/2-13 TAPPED	11/16		

TRIPLE LEVER HANDLE — ORDER HUB, LEVER BARS, AND KNOBS SEPARATELY (INCH)

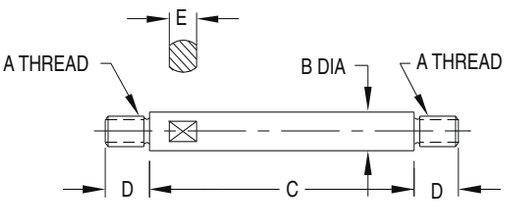
CL-316-LHH-S	5/16-18	2	1	3/16	3/8 DIA REAMED	3/4	**INFO+**: SEE PAGE 143	**INFO+**: SEE PAGES 152-159
CL-328-LHH-S	3/8-16	2-3/8	1-3/16	3/16	1/2 DIA REAMED	7/8		

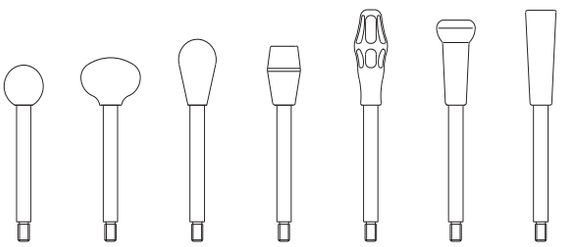
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300-SERIES STAINLESS STEEL



Versatile Lever Bars available in three diameters, each in several lengths. 300-series stainless steel polished to a beautiful finish. **INFO+**: Can be used with the hubs on page 142 to make lever handles. Wrench flat allows firm tightening.





INCH

PART NO.	A	B DIA	C	D	E
CL-515-LVB-S	5/16-18	.39	1.5	7/16	5/16
CL-522-LVB-S			2.2		
CL-530-LVB-S			3.0		
CL-540-LVB-S			4.0		
CL-555-LVB-S			5.5		
CL-620-LVB-S	3/8-16	.47	2.0	1/2	3/8
CL-627-LVB-S			2.7		
CL-637-LVB-S			3.7		
CL-647-LVB-S			4.7		
CL-660-LVB-S			6.0		
CL-837-LVB-S	1/2-13	.55	3.7	5/8	7/16
CL-847-LVB-S			4.7		
CL-857-LVB-S			5.7		
CL-867-LVB-S			6.7		

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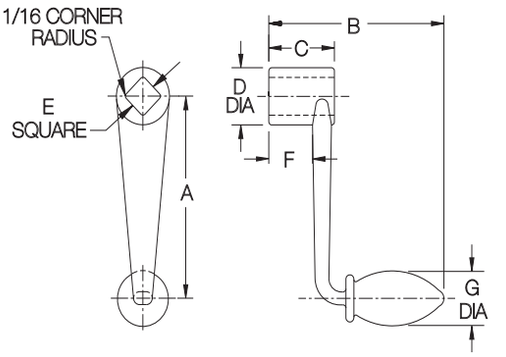
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CRANK HANDLES

NODULAR IRON PER ASTM A536 CLASS 65-45-12, ZINC PLATED CLEAR CHROMATE



Rugged crank handle with a comfortable grip. Choice of three sizes that fit all common square drives.



PART NO.	SQUARE DRIVE SIZE	A	B	C	D DIA	E	F	G DIA
CL-0-H	3/8 or 10mm	2-1/4	3	1	7/8	13/32	5/8	5/8
CL-1-H	1/2 or 12mm	3-3/4	4-3/16	1-5/16	1-1/16	17/32	7/8	7/8
CL-2-H	5/8 or 16mm	5-1/4	5-1/2	2-1/2	1-3/8	21/32	1-3/4	1

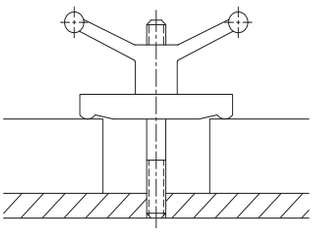
SPEED BALL HANDLES

NODULAR IRON PER ASTM-A536 CLASS 65-45-12, ZINC PLATED CLEAR CHROMATE



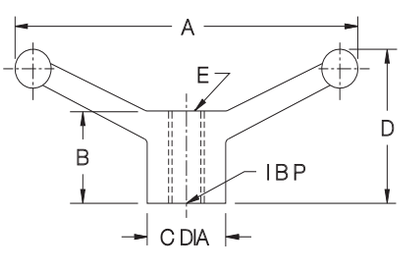
Double Arm

Speed handles that are weighted for quick turning. Long arm extensions provide excellent leverage for hand tightening.



DOUBLE ARM (INCH & METRIC)

PART NO.	A	B	C DIA	D	E
CL-4-SBH	4-7/8	1-5/8	1-1/8	2-1/4	BLANK
CL-44-SBH					1/2-13
CLM-44-SBH					M12
CL-6-SBH	6	1-5/8	1-3/8	2-3/8	BLANK
CL-64-SBH					5/8-11
CLM-64-SBH					M16
CL-8-SBH	8	1-13/16	1-3/4	2-7/8	BLANK
CL-84-SBH					3/4-10
CLM-84-SBH					M20

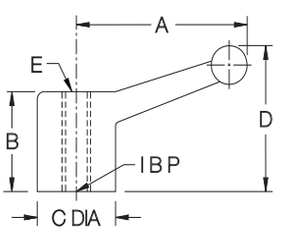




Single Arm

SINGLE ARM (INCH & METRIC)

PART NO.	A	B	C DIA	D	E
CL-5-SBH	3	1-5/8	1-3/8	2-3/8	BLANK
CL-55-SBH					1/2-13
CL-59-SBH					5/8-11
CLM-55-SBH					M12
CLM-59-SBH					M16
CL-7-SBH	4-3/8	2	1-5/8	3-1/2	BLANK
CL-75-SBH					3/4-10
CLM-75-SBH					M20



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BALANCED CRANK HANDLES

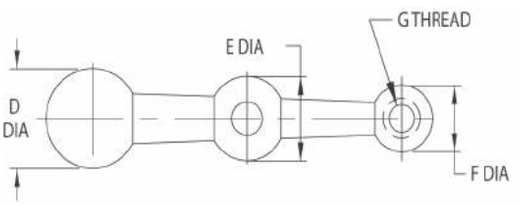
300-SERIES STAINLESS STEEL

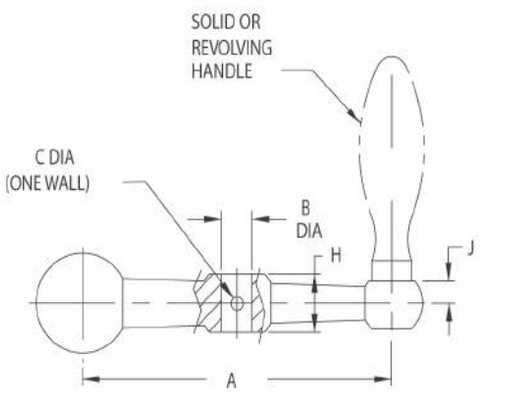


Rounded Handle
(Solid or Revolving)
Stainless Steel



Square Handle
(Solid or Revolving)
Stainless Steel





High-quality, stainless steel crank handle with a beautiful polished finish. Handle is balanced for smooth operation, and so that no rotation occurs due to handle weight. The reamed center hole is cross-drilled in one wall for easy installation by pinning. Order body and handle separately, with a choice of four handle types:

INFO+:
Rounded-design Solid Handle (page 138)
Rounded-design Revolving Handle (page 139)
Square-design Solid Handle (page 138)
Square-design Revolving Handle (page 139)

ORDER BODY AND SOLID/REVOLVING HANDLE SEPARATELY

PART NO. BODY ONLY	A	B DIA	C DIA	D DIA	E DIA	F DIA	G	H	J	PART NO. — SOLID OR REVOLVING HANDLE			
										ROUNDED SOLID	ROUNDED REVOLVING	SQUARE SOLID	SQUARE REVOLVING
CL-20-CHB-S	2-1/2	5/16	1/8	1	3/4	5/8	1/4-20	9/16	1/4	CL-250-SH-S	CL-250-RH-S	CL-200-SH-S	CL-200-RH-S
CL-30-CHB-S	3-1/8	3/8	5/32	1-1/4	1	3/4	5/16-18	11/16	5/16	CL-350-SH-S	CL-350-RH-S	CL-300-SH-S	CL-300-RH-S
CL-40-CHB-S	4												
CL-50-CHB-S	5	1/2	3/16	1-1/2	1-1/4	1	3/8-16	7/8	3/8	CL-450-SH-S	CL-450-RH-S	CL-400-SH-S	CL-400-RH-S
CL-51-CHB-S		5/8*											

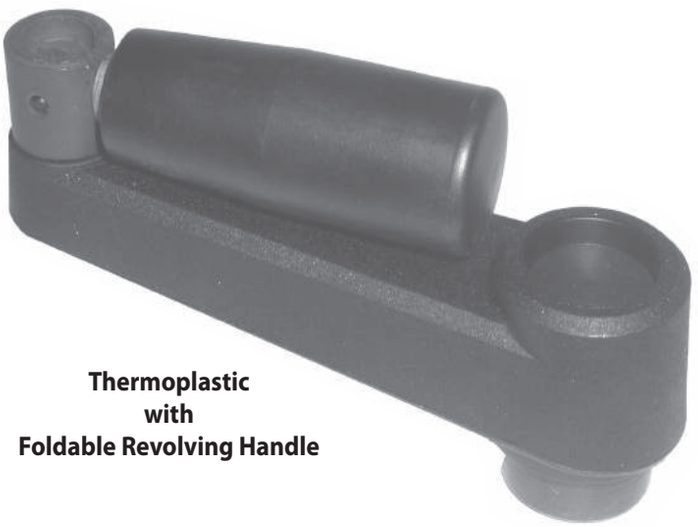
*1/8" Square keyway on this size only.

CRANK HANDLES

CRANK BODY & REVOLVING HANDLE: MATTE BLACK THERMOPLASTIC
HUB: MILD STEEL, BLACK OXIDE FINISH
CENTER TRIM COVER: ALUMINUM, MATTE ANODIZED
REVOLVING HANDLE SPINDLE: MILD STEEL, ZINC PLATED CLEAR CHROMATE



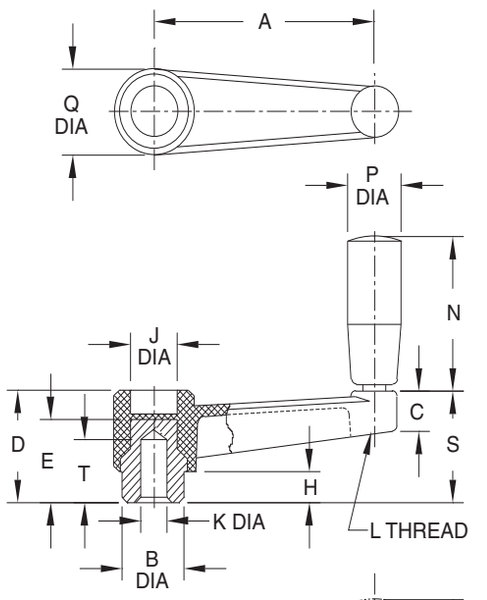
Thermoplastic with Revolving Handle

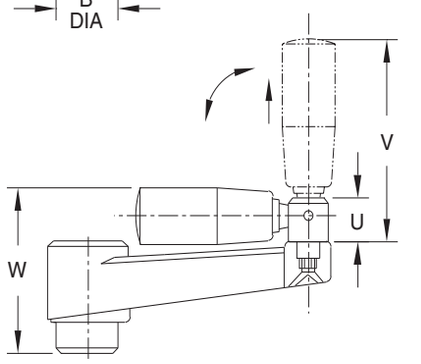


Thermoplastic with Foldable Revolving Handle

ELESA ORIGINAL DESIGN

High-quality, fiber-reinforced technopolymer Crank Handle, available in five sizes. High-strength design suitable for heavy-duty applications. Matte black high-strength thermoplastic (resistant to oils, solvents, and grease; excellent impact resistance, operating temperatures to 230°F). Molded-in steel hub, blank with a pilot hole. Center trim cover is self-adhesive (apply after modifying hub). Furnished with a Revolving Handle or a Foldable Revolving Handle. Foldable handle is positively locked in extended position. To allow folding, the handle must first be pulled outward, against a spring force, then folded 90°. Once folded, the handle is held in that position also by spring force.





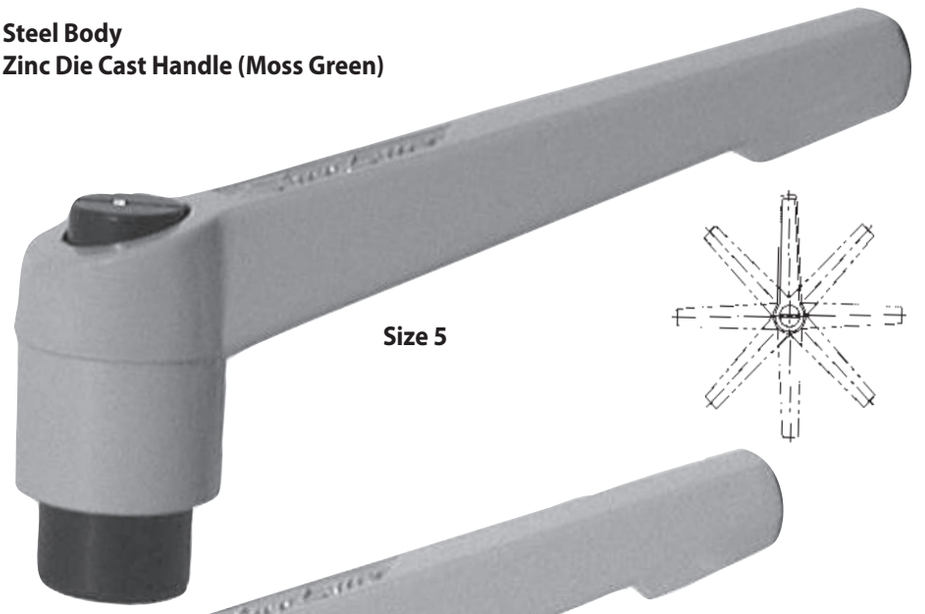
PART NO. WITH REVOLVING HANDLE	PART NO. WITH FOLDABLE REVOLVING HANDLE	A	B DIA	C	D	E	H	J DIA	K DIA	L	N	P DIA	Q DIA	S	T	U	V	W
CL-21-CHP	—	2.52	.71	.51	1.30	1.14	.39	.63	.236	M6	1.57	.71	1.06	1.30	.71	—	—	—
CL-31-CHP	CL-32-CHP	3.15	.87		1.42	1.26		.67			1.97	.83	1.18	1.42	1.02	.59	2.95	2.20
CL-41-CHP	CL-42-CHP	3.94	.94	.63	1.57	1.46	.39	.83	.315	M8	2.56	.91	1.34	1.61	1.10	.79	3.43	2.48
CL-51-CHP	CL-52-CHP	5.12	1.10		1.93	1.73	.55	.98	.394	M10	3.15	1.02	1.57	1.97	1.18	.79	3.43	2.80
CL-61-CHP	CL-62-CHP	6.30	1.34	.71	2.17	1.93	.59	1.06	.394	M10	3.54	1.10	1.77	2.20	1.18	.79	4.09	3.11

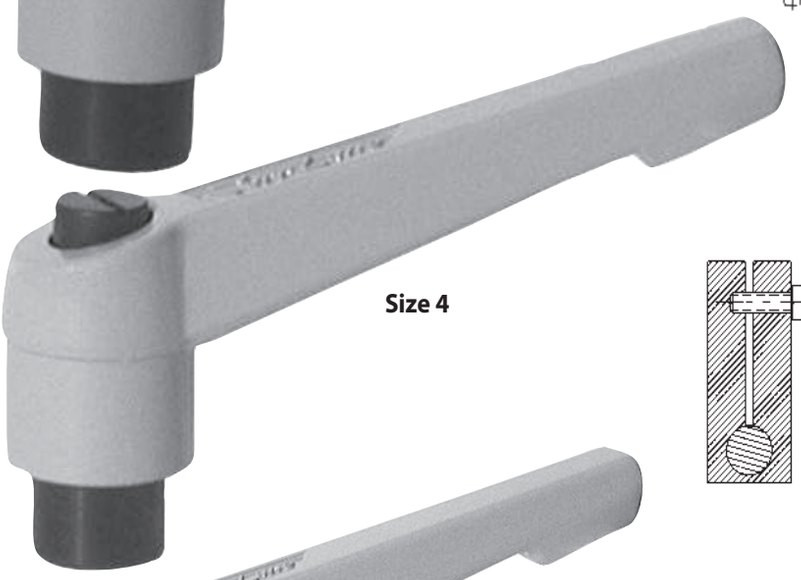
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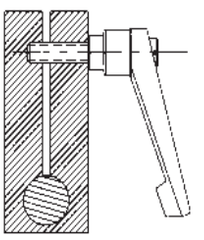
ADJUSTABLE HANDLES

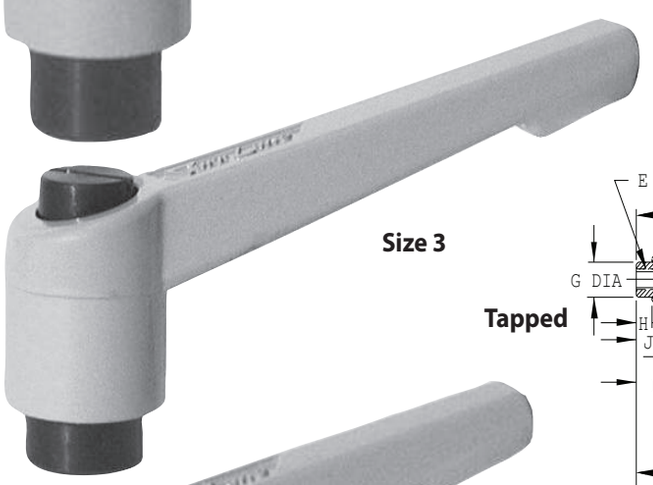
HANDLE: ZINC DIE CASTING; ENAMEL PAINT
BODY: 12L14 STEEL, BLACK OXIDE FINISH. SPRING: MUSIC WIRE

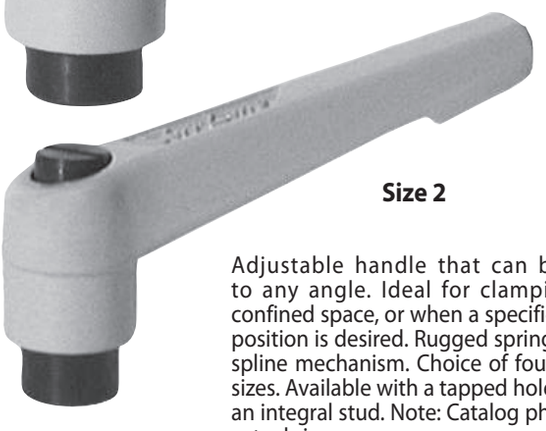
Steel Body
Zinc Die Cast Handle (Moss Green)



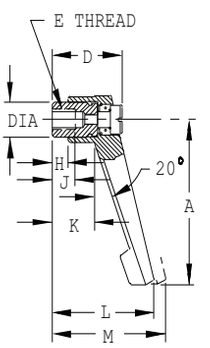




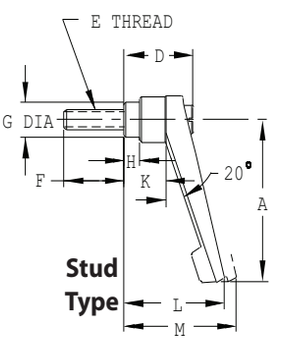


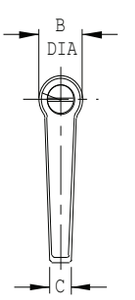


Tapped



Stud Type





TAPPED (INCH)

PART NO.	SIZE	E	J
CL-4-AH-2	2	1/4-20	1/2
CL-5-AH-2		5/16-18	
CL-5-AH-3	3	5/16-18	9/16
CL-6-AH-3		3/8-16	
CL-6-AH-4	4	3/8-16	5/8
CL-8-AH-4		1/2-13	
CL-8-AH-5	5	1/2-13	7/8
CL-10-AH-5		5/8-11	

TAPPED (METRIC)

CLM-8-AH-2	2	M8	1/2
CLM-10-AH-3	3	M10	9/16
CLM-12-AH-4	4	M12	5/8
CLM-16-AH-5	5	M16	7/8

STUD TYPE (INCH)

PART NO.	SIZE	E	F
CL-510-AH-2	2	5/16-18	1
CL-515-AH-2			1-1/2
CL-520-AH-2			2
CL-610-AH-3	3	3/8-16	1
CL-615-AH-3			1-1/2
CL-620-AH-3			2
CL-810-AH-4	4	1/2-13	1
CL-815-AH-4			1-1/2
CL-820-AH-4			2
CL-830-AH-4			3
CL-1015-AH-5	5	5/8-11	1-1/2
CL-1020-AH-5			2
CL-1030-AH-5			3

Adjustable handle that can be reset to any angle. Ideal for clamping in a confined space, or when a specific handle position is desired. Rugged spring-loaded spline mechanism. Choice of four handle sizes. Available with a tapped hole or with an integral stud. Note: Catalog photos are actual size.

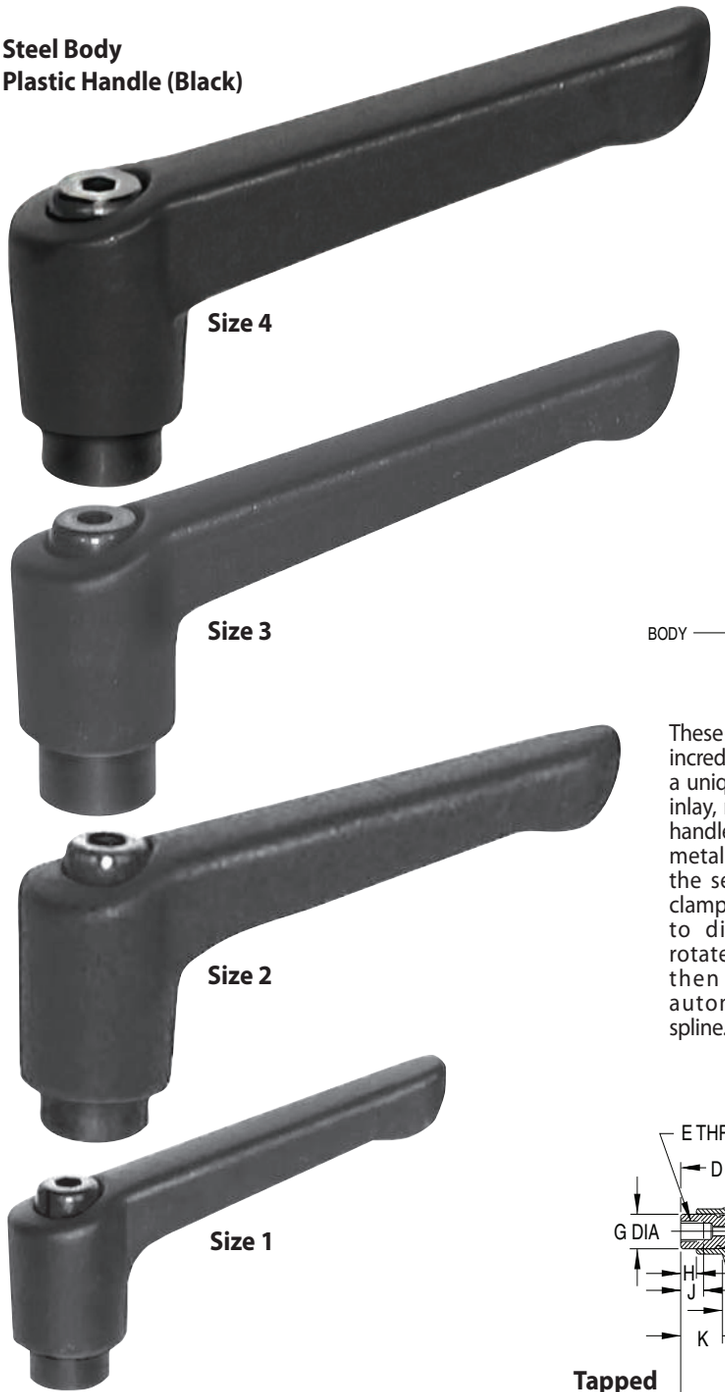
GENERAL DIMENSIONS

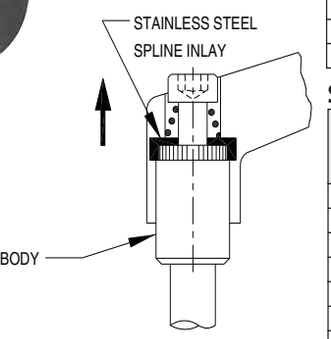
SIZE	A	B DIA	C	D	G DIA	H	K	L	M
2	2-9/16	3/4	3/8	1-1/8	17/32	1/4	11/16	1-11/16	1-7/8
3	3-1/8	7/8	7/16	1-1/2	5/8	13/32	15/16	2-3/16	2-5/16
4	3-3/4	1	1/2	1-11/16	3/4	13/32	1-1/16	2-1/2	2-11/16
5	4-5/16	1-1/4	5/8	2	15/16	15/32	1-5/16	2-15/16	3-1/8

ADJUSTABLE HANDLES

HANDLE: FIBER-REINFORCED THERMOPLASTIC WITH STAINLESS STEEL INSERT
BODY, SCREW, AND SPRING: STEEL, BLACK OXIDE FINISH

Steel Body
Plastic Handle (Black)





These Adjustable Handles are incredibly strong! They feature a unique stainless steel spline inlay, molded into the plastic handle. This provides positive metal-to-metal mating with the serrated body, for high clamping torque. Lift handle to disengage serrations, rotate to desired position, then release handle to automatically re-engage spline.

TAPPED (INCH)

PART NO. STEEL BLACK	SIZE	E	J
CL-3-AHP-1	1	#10-32	.31
CL-4-AHP-1		1/4-20	
CL-4-AHP-2	2	1/4-20	.39
CL-5-AHP-2		5/16-18	
CL-5-AHP-3	3	5/16-18	.55
CL-6-AHP-3		3/8-16	
CL-6-AHP-4	4	3/8-16	.67
CL-8-AHP-4		1/2-13	

TAPPED (METRIC)

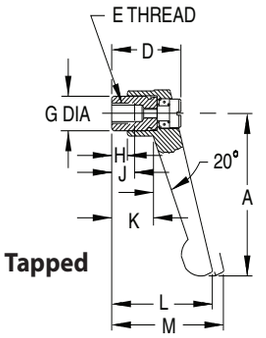
CLM-6-AHP-1	1	M6	.31
CLM-8-AHP-2	2	M8	.39
CLM-10-AHP-3	3	M10	.55
CLM-12-AHP-4	4	M12	.67

STUD TYPE (INCH)

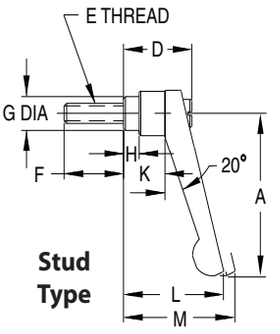
PART NO. STEEL BLACK	SIZE	E	F
CL-408-AHP-1	1	1/4-20	.78
CL-416-AHP-1			1.57
CL-508-AHP-2	2	5/16-18	.78
CL-516-AHP-2			1.57
CL-525-AHP-2			2.48
CL-610-AHP-3	3	3/8-16	.98
CL-616-AHP-3			1.57
CL-625-AHP-3			2.48
CL-813-AHP-4	4	1/2-13	1.26
CL-816-AHP-4			1.57
CL-825-AHP-4			2.48

STUD TYPE (METRIC)

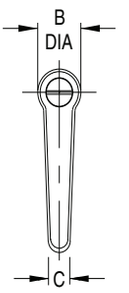
CLM-620-AHP-1	1	M6	.78
CLM-640-AHP-1			1.57
CLM-820-AHP-2	2	M8	.78
CLM-840-AHP-2			1.57
CLM-1030-AHP-3	3	M10	1.26
CLM-1050-AHP-3			1.97
CLM-1230-AHP-4	4	M12	1.26
CLM-1250-AHP-4			1.97



Tapped



Stud Type



Adjustable handle that can be reset to any angle. Ideal for clamping in a confined space, or when a specific handle position is desired. Available in steel (with a black plastic handle) or stainless steel (with a metallic-gray plastic handle, **INFO+** see page 149). Rugged spring-loaded spline mechanism. Choice of four handle sizes. Available with a tapped hole or with an integral stud. Note: Catalog photos above are actual size.



Stud Type

GENERAL DIMENSIONS

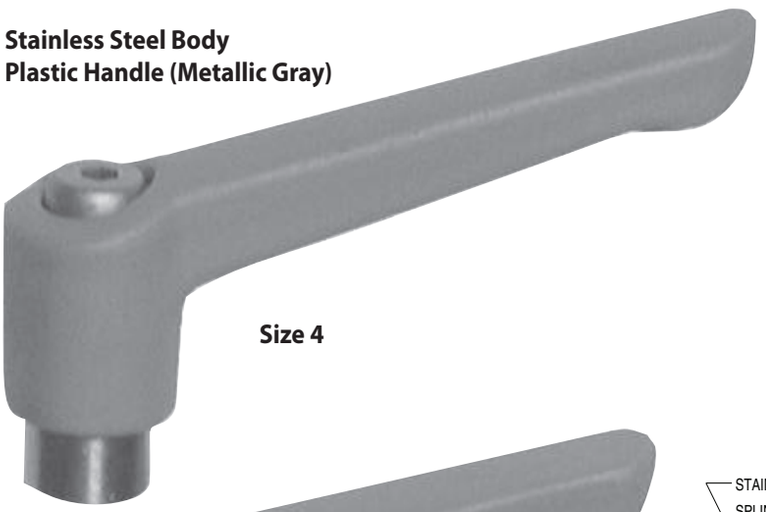
SIZE	A	B DIA	C	D	G DIA	H	K	L	M
1	1-3/4	19/32	5/16	31/32	3/8	5/32	7/16	1-3/8	1-1/2
2	2-1/2	3/4	13/32	1-7/32	17/32	1/4	13/16	1-25/32	1-15/16
3	3-1/16	7/8	17/32	1-7/16	5/8	5/16	7/8	2-5/32	2-5/16
4	3-5/8	1	9/16	1-11/16	3/4	7/16	1-3/16	2-9/16	2-23/32

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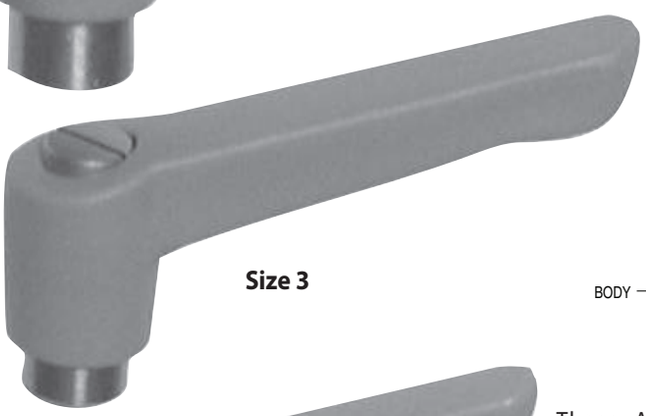
ADJUSTABLE HANDLES

HANDLE: FIBER-REINFORCED THERMOPLASTIC WITH STAINLESS STEEL INSERT
BODY, SCREW, AND SPRING: 300-SERIES STAINLESS STEEL

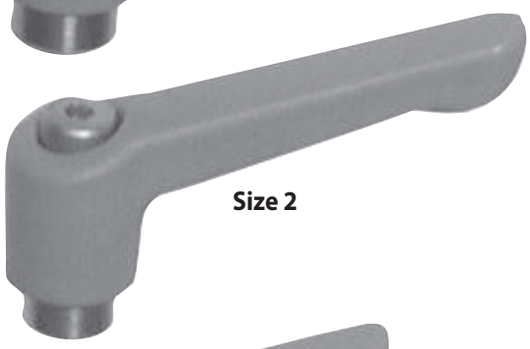
Stainless Steel Body
Plastic Handle (Metallic Gray)



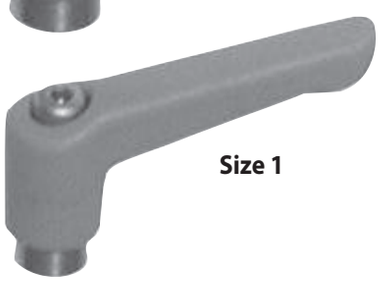
Size 4



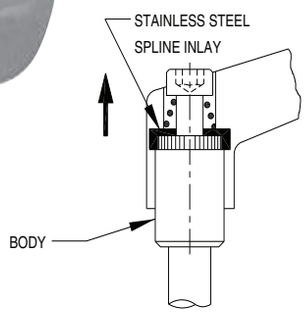
Size 3



Size 2



Size 1



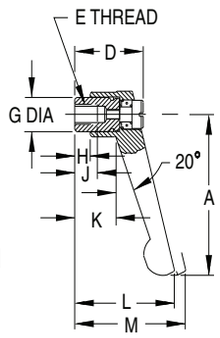
These Adjustable Handles are incredibly strong! They feature a unique stainless steel spline inlay, molded into the plastic handle. This provides positive metal-to-metal mating with the serrated body, for high clamping torque. Lift handle to disengage serrations, rotate to desired position, then release handle to automatically re-engage spline.

Adjustable handle that can be reset to any angle. Ideal for clamping in a confined space, or when a specific handle position is desired. Available in stainless steel (with a metallic-gray plastic handle), or steel (with a black plastic handle, **INFO+**: see page 148). Rugged spring-loaded spline mechanism. Choice of four handle sizes. Available with a tapped hole or with an integral stud. Note: Catalog photos above are actual size.

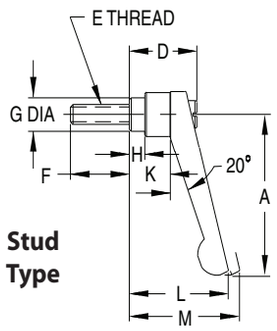


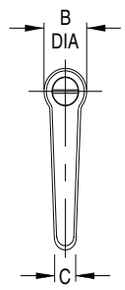
Stud Type

Tapped



Stud Type





TAPPED (INCH)

PART NO. STAINLESS METALLIC GRAY	SIZE	E	J
CL-3-AHP-1-S	1	#10-32	.31
CL-4-AHP-1-S		1/4-20	
CL-4-AHP-2-S	2	1/4-20	.39
CL-5-AHP-2-S		5/16-18	
CL-5-AHP-3-S	3	5/16-18	.55
CL-6-AHP-3-S		3/8-16	
CL-6-AHP-4-S	4	3/8-16	.67
CL-8-AHP-4-S		1/2-13	

TAPPED (METRIC)

CLM-6-AHP-1-S	1	M6	.31
CLM-8-AHP-2-S	2	M8	.39
CLM-10-AHP-3-S	3	M10	.55
CLM-12-AHP-4-S	4	M12	.67

STUD TYPE (INCH)

PART NO. STAINLESS METALLIC GRAY	SIZE	E	F
CL-408-AHP-1-S	1	1/4-20	.78
CL-416-AHP-1-S			1.57
CL-508-AHP-2-S	2	5/16-18	.78
CL-516-AHP-2-S			1.57
CL-525-AHP-2-S			2.48
CL-610-AHP-3-S	3	3/8-16	.98
CL-616-AHP-3-S			1.57
CL-625-AHP-3-S			2.48
CL-813-AHP-4-S	4	1/2-13	1.26
CL-816-AHP-4-S			1.57
CL-825-AHP-4-S			2.48

STUD TYPE (METRIC)

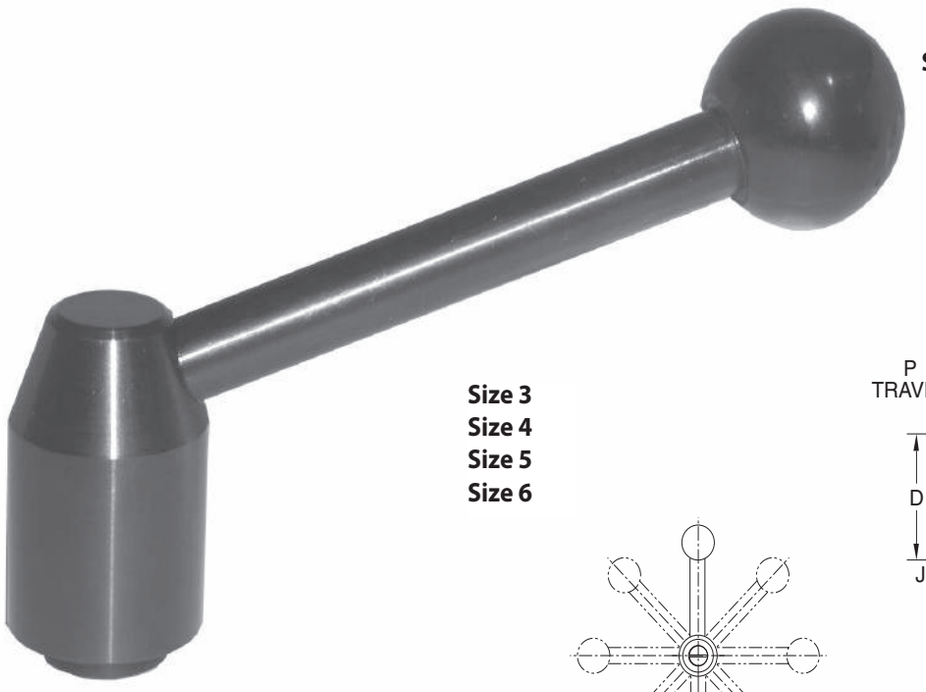
CLM-620-AHP-1-S	1	M6	.78
CLM-640-AHP-1-S			1.57
CLM-820-AHP-2-S	2	M8	.78
CLM-840-AHP-2-S			1.57
CLM-1030-AHP-3-S	3	M10	1.26
CLM-1050-AHP-3-S			1.97
CLM-1230-AHP-4-S	4	M12	1.26
CLM-1250-AHP-4-S			1.97

GENERAL DIMENSIONS

SIZE	A	B DIA	C	D	G DIA	H	K	L	M
1	1-3/4	19/32	5/16	31/32	3/8	5/32	7/16	1-3/8	1-1/2
2	2-1/2	3/4	13/32	1-7/32	17/32	1/4	13/16	1-25/32	1-15/16
3	3-1/16	7/8	17/32	1-7/16	5/8	5/16	7/8	2-5/32	2-5/16
4	3-5/8	1	9/16	1-11/16	3/4	7/16	1-3/16	2-9/16	2-23/32

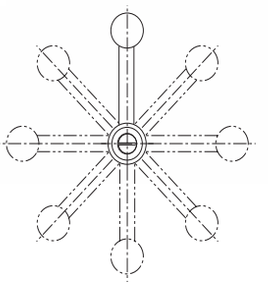
ADJUSTABLE LEVER HANDLES

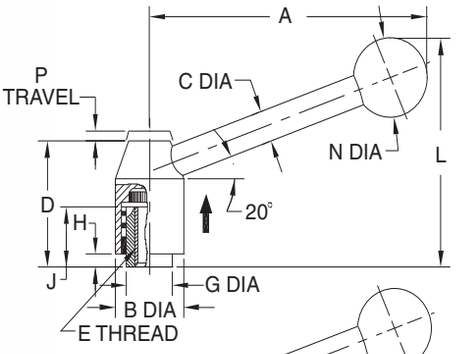
LEVER ARM, HUB, INSERT, AND SPRING: MILD STEEL, BLACK OXIDE FINISH
BALL KNOB: BLACK PHENOLIC PLASTIC

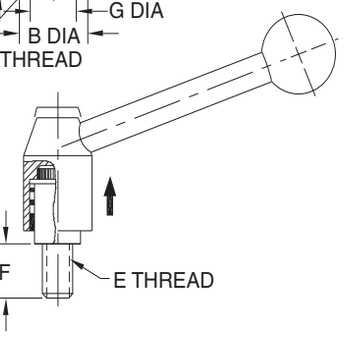


Steel

Size 3
Size 4
Size 5
Size 6







Heavy-duty adjustable handle that can be reset to any angle. Ideal for clamping in a confined space, or when a specific handle position is desired. Rugged spring-loaded spline mechanism. Lift handle to disengage serrations, rotate to desired position, then release handle to automatically re-engage spline. Available with a tapped hole or an integral stud.

STEEL — TAPPED (INCH)

PART NO.	SIZE	A	B DIA	C DIA	D	E	F	G	H	J	L	N DIA	P
CL-6-AHL-3	3	3.94	.94	.39	1.57	3/8-16	—	.63	.10	.55	2.95	.98	.18
CL-8-AHL-4	4	4.53	1.10	.47	1.91	1/2-13	—	.75	.18	.67	3.54	1.18	
CL-10-AHL-5	5	5.12	1.30	.47	2.17	5/8-11	—	.91	.24	.91	3.94	1.26	.22
CL-12-AHL-6	6	5.71	1.57	.55	2.68	3/4-10	—	1.10		1.42	4.33	1.38	

STEEL — TAPPED (METRIC)

CLM-10-AHL-3	3	3.94	.94	.39	1.57	M10	—	.63	.10	.55	2.95	.98	.18
CLM-12-AHL-4	4	4.53	1.10	.47	1.91	M12	—	.75	.18	.67	3.54	1.18	
CLM-16-AHL-5	5	5.12	1.30	.47	2.17	M16	—	.91	.24	.91	3.94	1.26	.22
CLM-20-AHL-6	6	5.71	1.57	.55	2.68	M20	—	1.10		1.42	4.33	1.38	

STEEL — STUD TYPE (INCH)

CL-613-AHL-3	3	3.94	.94	.39	1.57	3/8-16	1.26	.63	.10	—	2.95	.98	.18
CL-625-AHL-3							2.48						
CL-813-AHL-4	4	4.53	1.10	.47	1.91	1/2-13	1.26	.75	.18	—	3.54	1.18	
CL-825-AHL-4							2.48						
CL-1016-AHL-5	5	5.12	1.30	.47	2.17	5/8-11	1.57	.91	.24	—	3.94	1.26	.22
CL-1025-AHL-5							2.48						

STEEL — STUD TYPE (METRIC)

CLM-1050-AHL-3	3	3.94	.94	.39	1.57	M10	1.97	.63	.10	—	2.95	.98	.18
CLM-1250-AHL-4	4	4.53	1.10	.47	1.91	M12	1.97	.75	.18	—	3.54	1.18	
CLM-1650-AHL-5	5	5.12	1.30	.47	2.17	M16	1.97	.91	.24	—	3.94	1.26	.22

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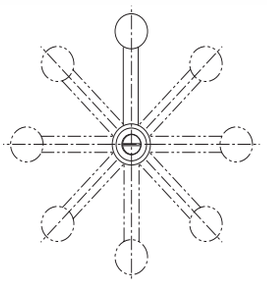
ADJUSTABLE LEVER HANDLES

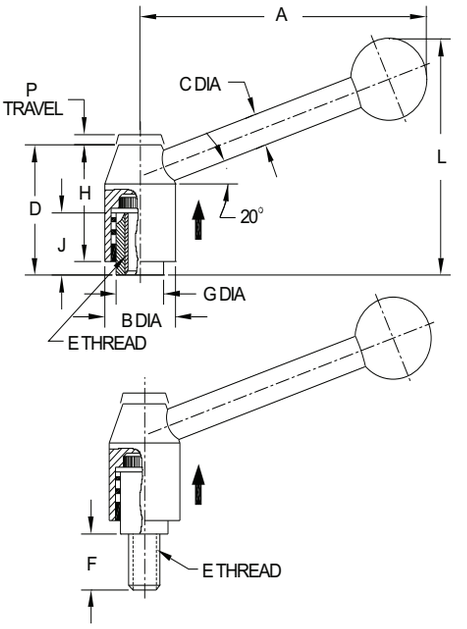
LEVER ARM, HUB, INSERT, AND SPRING: STAINLESS STEEL
BALL KNOB: PHENOLIC PLASTIC



Stainless Steel

Size 3
Size 4





Heavy-duty stainless steel adjustable handle that can be reset to any angle. Ideal for clamping in a confined space, or when a specific handle position is desired. Rugged spring-loaded spline mechanism. Lift handle to disengage serrations, rotate to desired position, then release handle to automatically re-engage spline. Available with a tapped hole or an integral stud.

STAINLESS STEEL — TAPPED (INCH)

PART NO.	SIZE	A	B DIA	C DIA	D	E	F	G	H	J	L	N DIA	P
CL-6-AHL-3-S	3	3.94	.94	.39	1.57	3/8-16	—	.63	.10	.55	2.95	.98	.18
CL-8-AHL-4-S	4	4.53	1.10	.47	1.91	1/2-13	—	.75	.18	.67	3.54	1.18	

STAINLESS STEEL — TAPPED (METRIC)

CLM-10-AHL-3-S	3	3.94	.94	.39	1.57	M10	—	.63	.10	.55	2.95	.98	.18
CLM-12-AHL-4-S	4	4.53	1.10	.47	1.91	M12	—	.75	.18	.67	3.54	1.18	

STAINLESS STEEL — STUD TYPE (INCH)

CL-613-AHL-3-S	3	3.94	.94	.39	1.57	3/8-16	1.26	.63	.10	—	2.95	.98	.18
CL-625-AHL-3-S							2.48						
CL-813-AHL-4-S	4	4.53	1.10	.47	1.91	1/2-13	1.26	.75	.18	—	3.54	1.18	
CL-825-AHL-4-S							2.48						

STAINLESS STEEL — STUD TYPE (METRIC)

CLM-1050-AHL-3-S	3	3.94	.94	.39	1.57	M10	1.97	.63	.10	—	2.95	.98	.18
CLM-1250-AHL-4-S	4	4.53	1.10	.47	1.91	M12	1.97	.75	.18	—	3.54	1.18	

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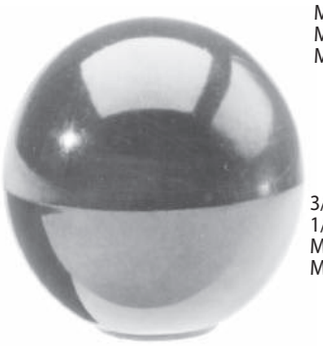
BALL KNOBS

BLACK PHENOLIC, THERMOPLASTIC, OR CUSHION GRIP PLASTIC WITH BRASS INSERT

Phenolic — Tapped



3/8-16 CL-852-PB
3/8-24 CL-854-PB
1/2-13 CL-872-PB
5/8-18 CL-882-PB
M10 CLM-852-PB
M12 CLM-872-PB
M16 CLM-882-PB



3/8-16 CL-752-PB
1/2-13 CL-772-PB
M10 CLM-752-PB
M12 CLM-772-PB



1/4-20 CL-632-PB
5/16-18 CL-642-PB
3/8-16 CL-652-PB
3/8-24 CL-654-PB
1/2-13 CL-672-PB
1/2-20 CL-674-PB
M10 CLM-652-PB
M12 CLM-672-PB



1/4-20 CL-532-PB
5/16-18 CL-542-PB
3/8-16 CL-552-PB
3/8-24 CL-554-PB
M8 CLM-542-PB
M10 CLM-552-PB



#10-32 CL-424-PB
1/4-20 CL-432-PB
1/4-28 CL-234-PB
5/16-18 CL-442-PB
5/16-24 CL-444-PB
3/8-16 CL-452-PB
M6 CLM-432-PB
M8 CLM-442-PB



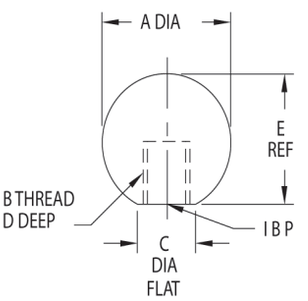
#8-32 CL-212-PB
#10-32 CL-224-PB
1/4-20 CL-232-PB
M5 CLM-222-PB
M6 CLM-232-PB

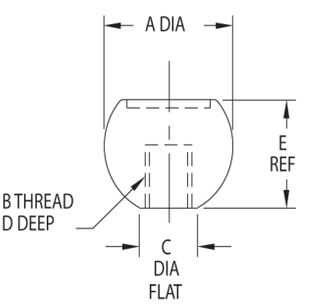
Phenolic — Tapped Recessed Top



3/8-16 CL-856-PB
3/8-24 CL-858-PB
1/2-13 CL-876-PB

* This size is solid plastic, without a brass insert.





Durable multi-purpose knob, suitable for many applications. Molded-in brass insert provides superior thread strength. Choice of seven ball sizes. The largest size is available with a recessed top (1-1/4" dia) for adding custom decals or inlays. Non-standard thread sizes, molded-in studs, or special colors (thermoplastic and cushion grip only) are available in quantities of 500 and above. Note: Catalog photos are actual size.

Choose From Three Materials

1. Phenolic plastic — glossy smooth finish, extremely hard, electrical insulator, operating temperatures to 300°F, resistant to oils and most common chemicals.
2. Thermoplastic — textured surface for improved gripping, excellent impact resistance, operating temperatures to 150°F.
3. Cushion Grip — unique plastic that feels soft to the touch, matte finish, comfortable yet rugged, excellent impact resistance, operating temperatures to 150°F, excellent gripability even when wet or oily, absorbs vibration.

PHENOLIC — TAPPED (INCH & METRIC)

PART NO.	A DIA	B	C DIA	D	E
CL-212-PB	3/4	#8-32	3/8	5/16	45/64
CL-224-PB		#10-32			
CL-232-PB		1/4-20		3/8	
CLM-222-PB		M5		5/16	
CLM-232-PB		M6		3/8	
CL-424-PB	1	#10-32	1/2	5/16	31/32
CL-432-PB		1/4-20		7/16	
CL-234-PB		1/4-28			
CL-442-PB		5/16-18			
CL-444-PB		5/16-24			
CL-452-PB		3/8-16			
CLM-432-PB		M6			
CLM-442-PB		M8			
CL-532-PB	1-3/16	1/4-20	9/16	1/2	1-1/8
CL-542-PB		5/16-18			
CL-552-PB		3/8-16			
CL-554-PB		3/8-24			
CLM-542-PB		M8			
CLM-552-PB		M10			
CL-632-PB	1-3/8	1/4-20	5/8	7/16	1-19/64
CL-642-PB		5/16-18			
CL-652-PB		3/8-16		1/2	
CL-654-PB		3/8-24			
CL-672-PB		1/2-13		5/8	
CL-674-PB		1/2-20			
CLM-652-PB		M10		1/2	
CLM-672-PB		M12		5/8	
CL-752-PB	1-5/8	3/8-16	11/16	1/2	1-37/64
CL-772-PB		1/2-13		5/8	
CLM-752-PB		M10		1/2	
CLM-772-PB		M12		5/8	
CL-852-PB	1-7/8	3/8-16	3/4	1/2	1-51/64
CL-854-PB		3/8-24			
CL-872-PB		1/2-13		5/8	
CL-882-PB*		5/8-18		7/8	
CLM-852-PB		M10		1/2	
CLM-872-PB		M12		5/8	
CLM-882-PB		M16		3/4	

PHENOLIC — TAPPED RECESSED TOP (INCH)

CL-856-PB	1-7/8	3/8-16	3/4	1/2	1-15/32
CL-858-PB		3/8-24			
CL-876-PB		1/2-13		5/8	

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BALL KNOBS

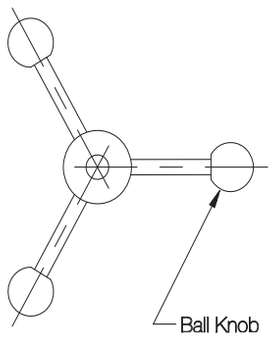
BLACK PHENOLIC, THERMOPLASTIC, OR CUSHION-GRIP PLASTIC WITH BRASS INSERT

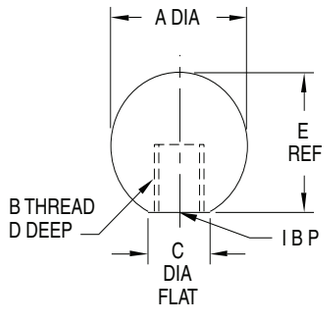
Thermoplastic — Tapped



1/4-20	CL-6320-PB
5/16-18	CL-6420-PB
3/8-16	CL-6520-PB
1/2-13	CL-6720-PB

Ball Knobs are now available in three materials: phenolic plastic (**INFO+**: see page 152), thermoplastic, and cushion-grip plastic.





Cushion Grip — Tapped



1/4-20	CL-6325-PB
5/16-18	CL-6425-PB
3/8-16	CL-6525-PB
1/2-13	CL-6725-PB

THERMOPLASTIC — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D	E
CL-6320-PB	1-1/2	1/4-20	5/8	5/8	1-15/64
CL-6420-PB		5/16-18			
CL-6520-PB		3/8-16			
CL-6720-PB		1/2-13			

CUSHION GRIP — TAPPED (INCH)

CL-6325-PB	1-1/2	1/4-20	5/8	5/8	1-15/64
CL-6425-PB		5/16-18			
CL-6525-PB		3/8-16			
CL-6725-PB		1/2-13			

OVAL BALL KNOBS

BLACK PHENOLIC PLASTIC WITH BRASS INSERT

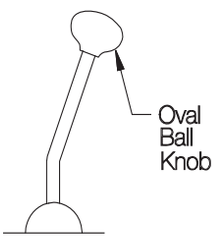
Phenolic — Tapped

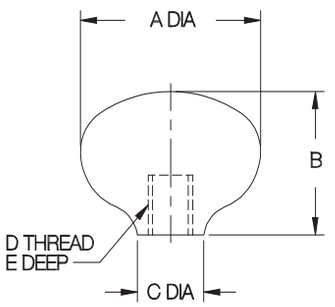


3/8-16	CL-852-OBK
3/8-24	CL-854-OBK
1/2-13	CL-872-OBK



1/4-20	CL-532-OBK
5/16-18	CL-542-OBK
3/8-16	CL-552-OBK





Comfortable-grip ball knobs that are ideal for shift levers, control levers and push/pull rods. Molded-in brass insert provides superior thread strength. Choice of two shapes. Non-standard thread sizes or molded-in studs are available in quantities of 500 and above. Note: Catalog photos are actual size.

PHENOLIC — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D	E
CL-532-OBK	1-1/8	1-7/16	1/2	1/4-20	7/16
CL-542-OBK				5/16-18	
CL-552-OBK				3/8-16	1/2
CL-852-OBK	2-1/32	1-1/2	3/4	3/8-16	1/2
CL-854-OBK				3/8-24	
CL-872-OBK				1/2-13	5/8

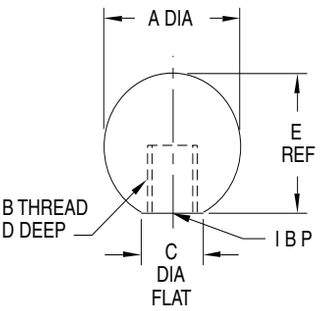
BALL KNOBS

1018 STEEL, BLACK OXIDE FINISH, OR 316 STAINLESS STEEL



1/4-20	CL-632-SBK
5/16-18	CL-642-SBK
3/8-16	CL-652-SBK
1/2-13	CL-672-SBK
M6	CLM-632-SBK
M8	CLM-642-SBK
M10	CLM-652-SBK
M12	CLM-672-SBK

Steel — Tapped



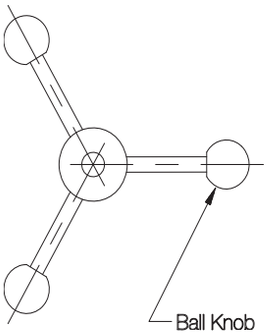
STEEL — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D	E
CL-632-SBK	1-1/2	1/4-20	5/8	9/16	1-7/16
CL-642-SBK		5/16-18		5/8	
CL-652-SBK		3/8-16			
CL-672-SBK		1/2-13			

STEEL — TAPPED (METRIC)

PART NO.	A DIA	B	C DIA	D	E
CLM-632-SBK	1-1/2	M6	5/8	9/16	1-7/16
CLM-642-SBK		M8		5/8	
CLM-652-SBK		M10			
CLM-672-SBK		M12			

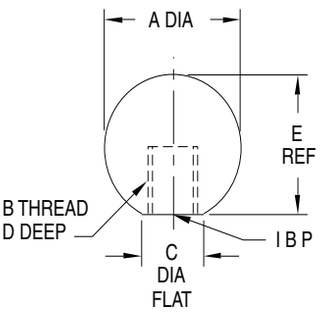
Heavy-duty knob handle made of steel with a black oxide finish. This durable, multi-purpose knob is suitable for many applications. Ideal when added weight is desirable for easier lever actuation. Note: Catalog photo is actual size.





1/4-20	CL-632-SBK-S
5/16-18	CL-642-SBK-S
3/8-16	CL-652-SBK-S
1/2-13	CL-672-SBK-S
M6	CLM-632-SBK-S
M8	CLM-642-SBK-S
M10	CLM-652-SBK-S
M12	CLM-672-SBK-S

Stainless Steel — Tapped



STAINLESS STEEL — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D	E
CL-632-SBK-S	1-1/2	1/4-20	5/8	9/16	1-7/16
CL-642-SBK-S		5/16-18		5/8	
CL-652-SBK-S		3/8-16			
CL-672-SBK-S		1/2-13			

STAINLESS STEEL — TAPPED (METRIC)

PART NO.	A DIA	B	C DIA	D	E
CLM-632-SBK-S	1-1/2	M6	5/8	9/16	1-7/16
CLM-642-SBK-S		M8		5/8	
CLM-652-SBK-S		M10			
CLM-672-SBK-S		M12			

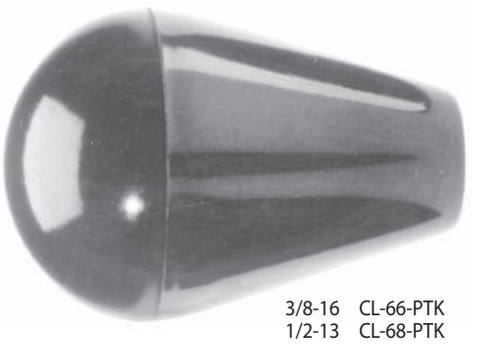
Heavy-duty knob handle made of type 316 stainless steel for excellent corrosion resistance. This durable, multi-purpose knob is suitable for many applications, including marine and chemical environments. Ideal when added weight is desirable for easier lever actuation. Attractive polished finish. Note: Catalog photo is actual size.

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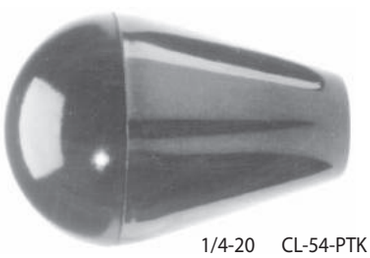
OVAL TAPERED KNOBS

BLACK PHENOLIC OR CUSHION-GRIP PLASTIC WITH BRASS INSERT

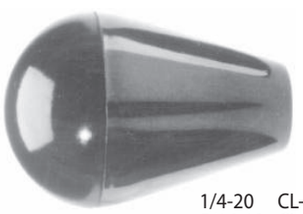
Phenolic — Tapped



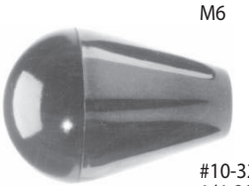
3/8-16 CL-66-PTK
1/2-13 CL-68-PTK
M10 CLM-610-PTK
M12 CLM-612-PTK



1/4-20 CL-54-PTK
5/16-18 CL-55-PTK
M8 CLM-58-PTK

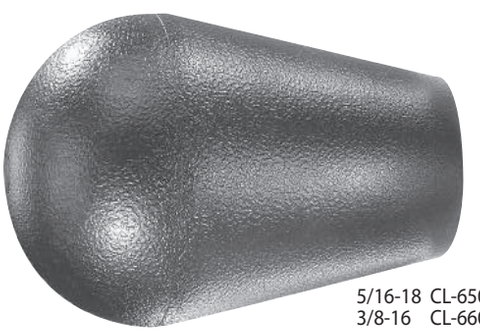


1/4-20 CL-44-PTK
5/16-18 CL-45-PTK
3/8-16 CL-46-PTK
M6 CLM-46-PTK



#10-32 CL-23-PTK
1/4-20 CL-24-PTK
M6 CLM-26-PTK

Cushion Grip — Tapped



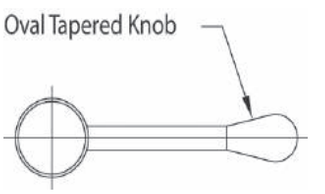
5/16-18 CL-650-PTK
3/8-16 CL-660-PTK

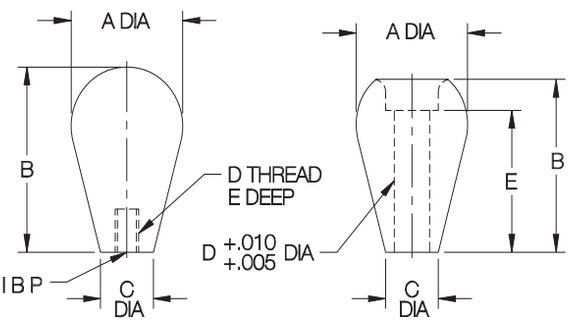
Attractive design suitable for control levers and push/pull rods. Molded-in brass insert provides superior thread strength. The solid-plastic through-hole version can be used with a Shoulder Screw as a revolving crank handle. Choice of four knob sizes. Non-standard thread sizes, molded-in studs, or special colors (cushion grip only) are available in quantities of 500 and above. Note: Catalog photos are actual size.

Phenolic —Through Hole



3/8 Dia CL-560-PTK





PHENOLIC — TAPPED (INCH & METRIC)

PART NO.	A DIA	B	C DIA	D	E
CL-23-PTK	3/4	1-1/4	3/8	#10-32	5/16
CL-24-PTK*				1/4-20	7/16
CLM-26-PTK*				M6	
CL-44-PTK	1	1-5/8	1/2	1/4-20	7/16
CL-45-PTK				5/16-18	
CL-46-PTK				3/8-16	
CLM-46-PTK				M6	
CL-54-PTK	1-3/16	1-7/8	9/16	1/4-20	7/16
CL-55-PTK				5/16-18	
CLM-58-PTK				M8	
CL-66-PTK	1-5/8	2-1/2	7/8	3/8-16	1/2
CL-68-PTK				1/2-13	5/8
CLM-610-PTK				M10	1/2
CLM-612-PTK				M12	5/8

PHENOLIC — THROUGH HOLE

CL-560-PTK*	1-3/16	1-3/4	9/16	.375	1-7/16

CUSHION GRIP — TAPPED (INCH)

CL-650-PTK	1-5/8	2-1/2	7/8	5/16-18	5/8
CL-660-PTK				3/8-16	

* These sizes are solid plastic, without a brass insert.

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TAPERED KNOBS

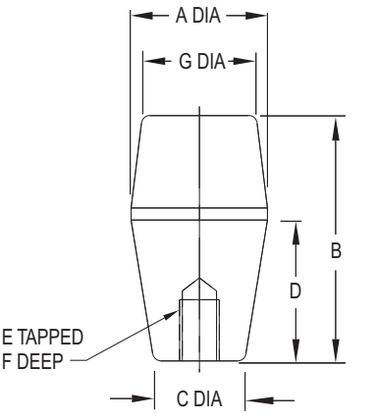
BLACK CUSHION-GRIP PLASTIC WITH BRASS INSERT

Cushion Grip — Tapped



5/16-18 CL-655-TAPK
3/8-16 CL-665-TAPK
1/2-13 CL-685-TAPK

Attractive square design, ideal for lever handles. Made from Cushion Grip plastic, a unique material that feels soft to the touch, comfortable yet rugged. Textured non-slip, non-glare finish. Molded-in brass insert provides superior thread strength. Non-standard thread sizes, molded-in studs, or special colors are available in quantities of 500 and above. Note: Catalog photo is actual size.



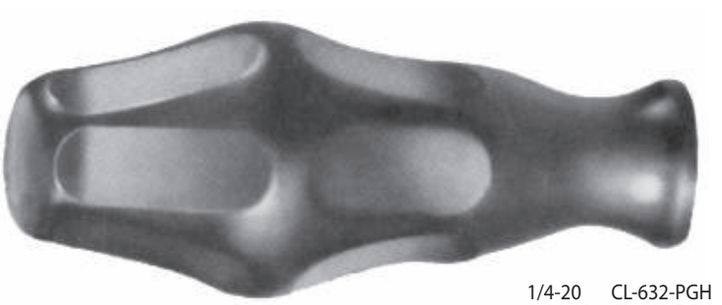
CUSHION GRIP — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D	E	F	G DIA
CL-655-TAPK	1-1/2	2-1/2	15/16	1-1/2	5/16-18	3/4	1-1/8
CL-665-TAPK					3/8-16	5/8	
CL-685-TAPK					1/2-13		

PALM-GRIP HANDLES

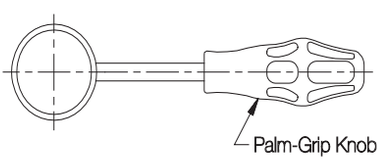
BLACK THERMOPLASTIC WITH BRASS INSERT

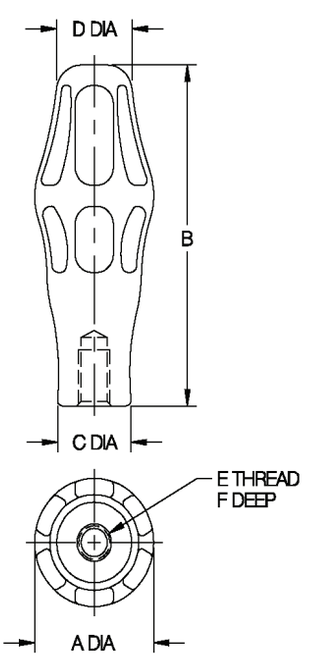
Thermoplastic — Tapped



1/4-20 CL-632-PGH
5/16-18 CL-642-PGH
3/8-16 CL-652-PGH

This unique, ergonomically designed handle provides an extremely comfortable grip. Greatly reduces stress on hands, wrists, and arms to help eliminate the risk of repetitive-motion disorders. Textured non-slip, non-glare finish. Molded-in brass insert provides superior thread strength. Non-standard thread sizes, molded-in studs, or special colors are available in quantities of 500 and above. Note: Catalog photo is actual size.





THERMOPLASTIC — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D DIA	E	F
CL-632-PGH	1-3/8	3-3/4	7/8	7/8	1/4-20	7/8
CL-642-PGH					5/16-18	5/8
CL-652-PGH					3/8-16	

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KNOB HANDLES

BLACK CUSHION-GRIP PLASTIC. TAPPED VERSION WITH BRASS INSERT

Cushion Grip — Tapped or Cored



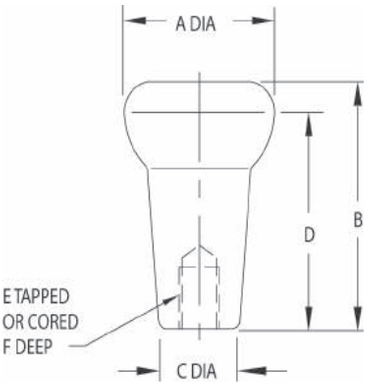
5/16-18 CL-855-KH
3/8-16 CL-865-KH
3/8 DIA CL-866-KH



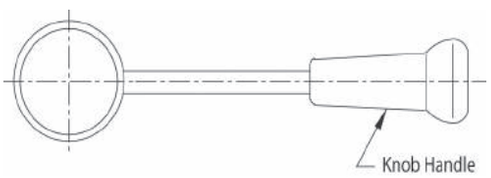
5/16-18 CL-655-KH
3/8-16 CL-665-KH
3/8 DIA CL-666-KH



5/16-18 CL-455-KH
3/8-16 CL-465-KH
3/8 DIA CL-466-KH



Tapered handle with a knob end for secure gripping. Made from Cushion-Grip plastic, a unique material that feels soft to the touch, comfortable yet rugged. Non-slip, non-glare finish. Molded-in brass insert on the tapped version provides superior thread strength. Optionally available with a plain cored hole to press fit on a shaft. The cored hole is somewhat undersize to grip tightly on a nominal-size shaft without requiring pinning. Non-standard thread sizes, molded-in studs, or special colors are available in quantities of 500 and above. Note: Catalog photos are actual size.



Combination knob and tapered handle. The knob end helps prevent operator's hand from sliding off the handle.

CUSHION GRIP — TAPPED (INCH)

PART NO.	A DIA	B	C DIA	D	E	F
CL-455-KH	1-3/8	2-1/8	13/16	11-1/4	5/16-18	5/8
CL-465-KH					3/8-16	
CL-655-KH	1-5/8	2-1/2	7/8	1-1/2	5/16-18	
CL-665-KH					3/8-16	
CL-855-KH	1-1/2	4-3/8		3-1/2	5/16-18	7/16
CL-865-KH					3/8-16	1/2

CUSHION GRIP — CORED

PART NO.	A DIA	B	C DIA	D	E FOR SHAFT DIA	E ACTUAL DIA	F
CL-466-KH	1-3/8	2-1/8	13/16	1-1/4	3/8	.312-.327	1
CL-666-KH	1-5/8	2-1/2	7/8	1-1/2			
CL-866-KH	1-1/2	4-3/8	7/8	3-1/2			

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TAPERED HANDLES

BLACK PHENOLIC PLASTIC WITH BRASS INSERT



1/2-13 CL-3-PH
M10 CLM-10-PH



3/8-16 CL-2-PH
M8 CLM-8-PH



1/4-20 CL-1-PH
5/16-18 CL-15-PH
3/8-16 CL-16-PH
M6 CLM-6-PH
M8 CLM-18-PH



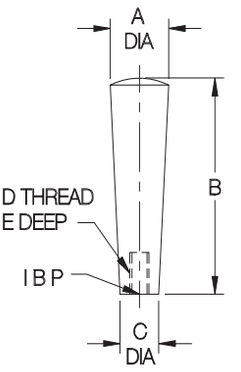
1/4-20 CL-0-PH
5/16-18 CL-05-PH
M6 CLM-06-PH
M8 CLM-08-PH

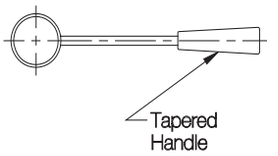


#10-32 CL-00-PH
M5 CLM-005-PH

Phenolic — Tapped

Heavy-duty design that makes an excellent grasp handle or machine shift lever. Molded-in brass insert provides superior thread strength. The solid-plastic through-hole version can be used with a Shoulder Screw as a revolving crank handle. Choice of five handle sizes. Non-standard thread sizes or molded-in studs are available in quantities of 500 and above. Note: Catalog photos are actual size.





PHENOLIC — TAPPED (INCH & METRIC)

PART NO.	A DIA	B	C DIA	D	E
CL-00-PH	3/4	7/8	3/8	#10-32	5/16
CLM-005-PH				M5	
CL-0-PH	1	1-1/4	1/2	1/4-20	7/16
CL-05-PH				5/16-18	
CLM-06-PH				M6	3/8
CLM-08-PH				M8	
CL-1-PH	1	2-5/8	5/8	1/4-20	7/16
CL-15-PH				5/16-18	
CL-16-PH				3/8-16	1/2
CLM-6-PH				M6	7/16
CLM-18-PH				M8	
CL-2-PH	1-1/8	3-7/8	3/4	3/8-16	5/8
CLM-8-PH				M8	7/16
CL-3-PH	1-3/8	4-1/2	1	1/2-13	2
CLM-10-PH				M10	



3/8 Dia CL-30-PH

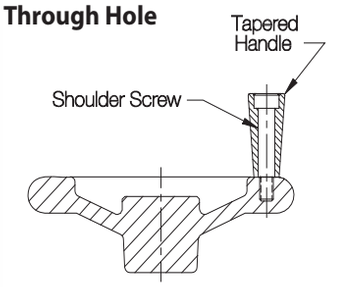


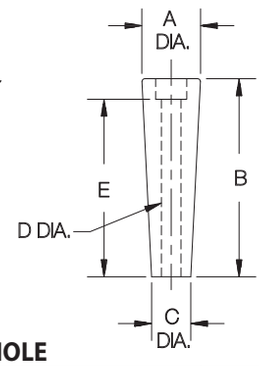
3/8 Dia CL-20-PH



1/4 Dia CL-10-PH

Phenolic — Through Hole





PHENOLIC — THROUGH HOLE

PART NO.	A DIA	B	C DIA	D NOMINAL	D ACTUAL	E
CL-10-PH*	1	2-9/16	5/8	1/4	.251/.256	5/8
CL-20-PH*	1-1/8	3-11/16	3/4	3/8	.380/.385	2-5/8
CL-30-PH*	1-3/8	4-3/32	1	3/8	.380/.390	2-5/8

* This size is solid plastic, without a brass insert.

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PULL KNOBS

BLACK PHENOLIC PLASTIC WITH BRASS INSERT

Versatile knob with an enlarged head for pulling, pushing, or lifting. Molded-in brass insert provides superior thread strength. Choice of three types, in two sizes each. Non-standard thread sizes or molded-in studs are available in quantities of 500 and above. Note: Catalog photos are actual size.

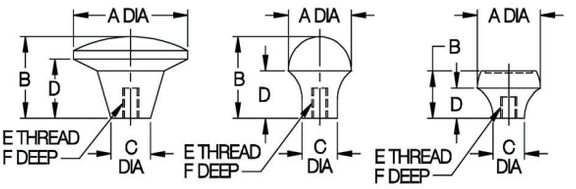


1/4-20 CL-632-PK
5/16-18 CL-642-PK
3/8-16 CL-652-PK
M8 CLM-642-PK



#10-32 CL-424-PK
1/4-20 CL-432-PK
M5 CLM-422-PK
M6 CLM-432-PK

Phenolic—Tapped Flat Top





3/8-24 CL-654-PKO



#10-32 CL-424-PKO
1/4-20 CL-432-PKO
M5 CLM-422-PKO
M6 CLM-432-PKO

Phenolic—Tapped Oval Top

PHENOLIC — TAPPED, FLAT TOP (INCH & METRIC)

PART NO.	A DIA	B	C DIA	D	E	F
CL-424-PK	1-3/8	7/8	5/8	5/8	#10-32	5/16
CL-432-PK					1/4-20	7/16
CLM-422-PK					M5	5/16
CLM-432-PK					M6	7/16
CL-632-PK	1-13/16	1-3/16	5/8	7/8	1/4-20	7/16
CL-642-PK					5/16-18	
CL-652-PK					3/8-16	1/2
CLM-642-PK					M8	

PHENOLIC — TAPPED, OVAL TOP (INCH & METRIC)

CL-424-PKO	1	1-3/16	9/16	11/16	#10-32	5/16
CL-432-PKO					1/4-20	7/16
CLM-422-PKO					M5	5/16
CLM-432-PKO					M6	7/16
CL-654-PKO	1-5/8	1	5/8	3/8	3/8-24	1/2



#10-32 CL-424-PKR
1/4-20 CL-432-PKR



#6-32 CL-202-PKR
#8-32 CL-212-PKR
#10-32 CL-224-PKR
1/4-20 CL-232-PKR

Phenolic—Tapped Recessed Top

PHENOLIC — TAPPED, RECESSED TOP (INCH)

CL-202-PKR	3/4	3/4	1/2	21/32	#6-32	5/16
CL-212-PKR					#8-32	
CL-224-PKR					#10-32	
CL-232-PKR					1/4-20	
CL-424-PKR	1	11/16	1/2	7/16	#10-32	5/16
CL-432-PKR					1/4-20	

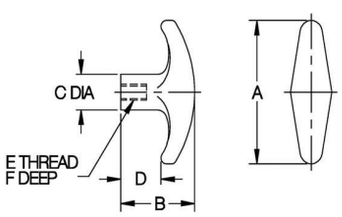
T HANDLES

BLACK PHENOLIC PLASTIC WITH BRASS INSERT

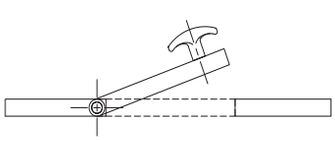


#10-32 CL-424-TH
1/4-20 CL-432-TH
1/4-28 CL-434-TH
5/16-18 CL-442-TH
M5 CLM-422-TH
M6 CLM-432-TH
M8 CLM-442-TH

Easy-gripping handle for push/pull applications, such as release latches and cabinet doors. Molded-in brass insert provides superior thread strength. Non-standard thread sizes or molded-in studs are available in quantities of 500 and above. Note: Catalog photo is actual size.



Phenolic—Tapped

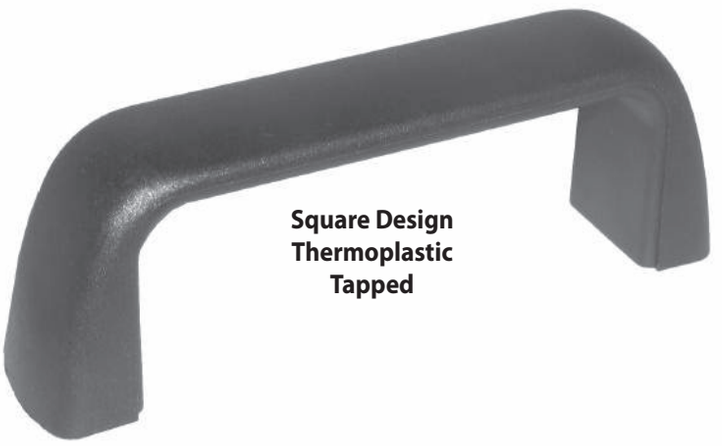


PHENOLIC — TAPPED (INCH & METRIC)

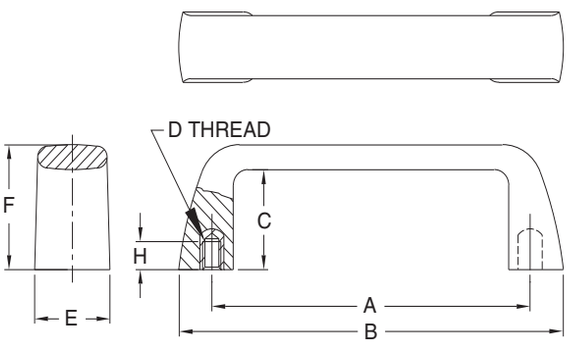
PART NO.	A	B	C DIA	D	E	F
CL-424-TH	2-1/4	1-1/4	9/16	11/16	#10-32	5/16
CL-432-TH					1/4-20	7/16
CL-434-TH					1/4-28	
CL-442-TH					5/16-18	
CLM-422-TH					M5	5/16
CLM-432-TH					M6	7/16
CLM-442-TH					M8	

PULL HANDLES

BLACK THERMOPLASTIC WITH BRASS INSERT



Square Design Thermoplastic Tapped



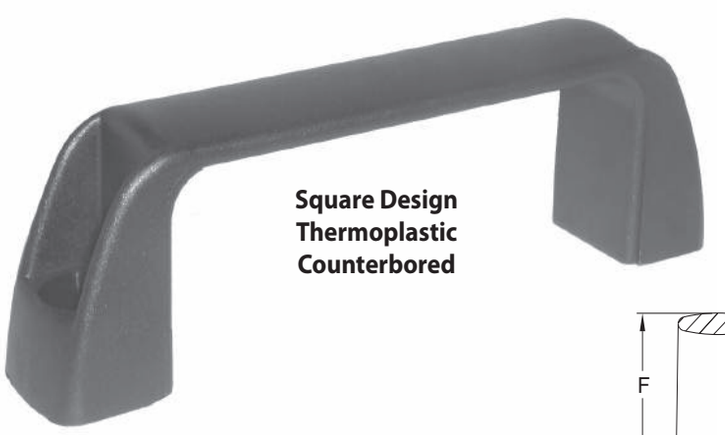
Attractive, modern-design handle that provides a comfortable grip with good ergonomic features. Excellent durability. Textured non-slip, non-glare finish. Molded-in brass insert provides superior thread strength. Black fiber-reinforced nylon thermoplastic (textured surface for secure gripping, excellent impact resistance, operating temperatures to 230°F). Choice of two handle sizes, available with either inch or metric threads.

TAPPED (INCH)

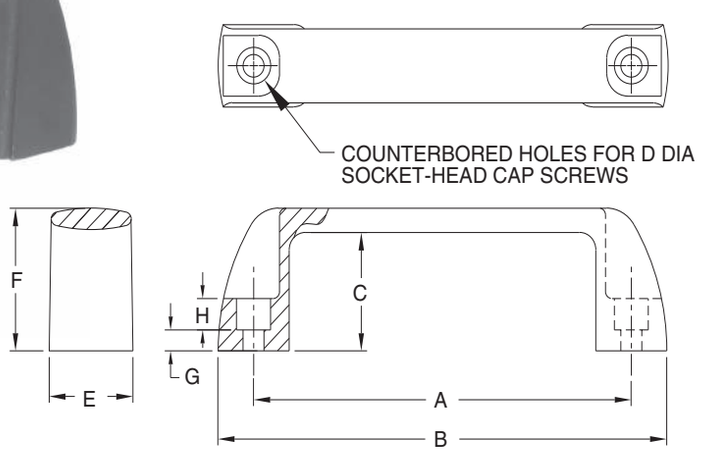
PART NO.	A	B	C	D	E	F	H
CL-105-PHS-4	4.13	4.76	1.14	1/4-20	1.02	1.46	.35
CL-117-PHS-5	4.61	5.24	1.26	5/16-18		1.57	

TAPPED (METRIC)

CLM-105-PHS-6	4.13	4.76	1.14	M6	1.02	1.46	.35
CLM-117-PHS-8	4.61	5.24	1.26	M8		1.57	



Square Design Thermoplastic Counterbored



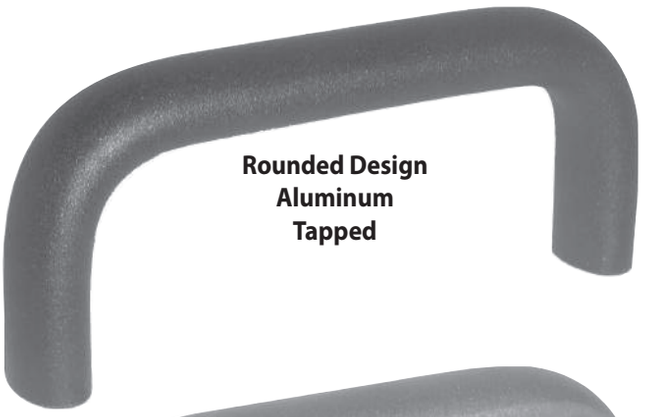
Attractive, modern-design handle that provides a comfortable grip with good ergonomic features. Excellent durability. Textured non-slip, non-glare finish. Counterbored for Socket-Head Cap Screws. Choice of four handle sizes. Black fiber-reinforced nylon thermoplastic (textured surface for secure gripping, excellent impact resistance, operating temperatures to 230°F).

COUNTERBORED

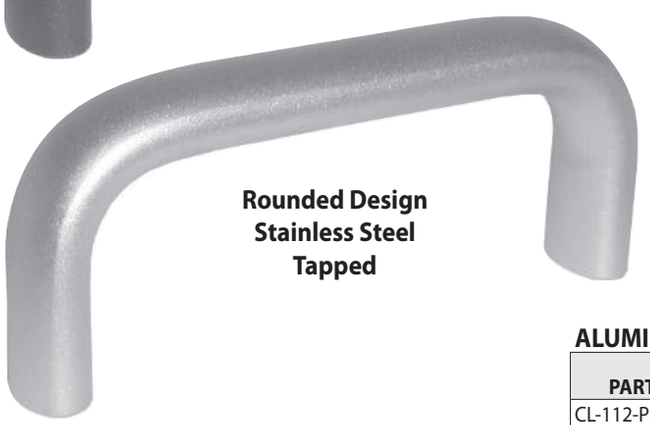
PART NO.	A	B	C	D DIA	E	F	G	H
CL-94-PHSC-4	3.68	4.41	1.18	1/4 or M6	.83	1.42	.24	.28
CL-117-PHSC-5	4.61	5.47	1.34	5/16 or M8	1.02	1.61	.24	.35
CL-132-PHSC-5	5.20	6.14	1.46		1.06	1.77	.28	
CL-179-PHSC-5	7.05	8.03	1.65		1.10	1.97	.31	

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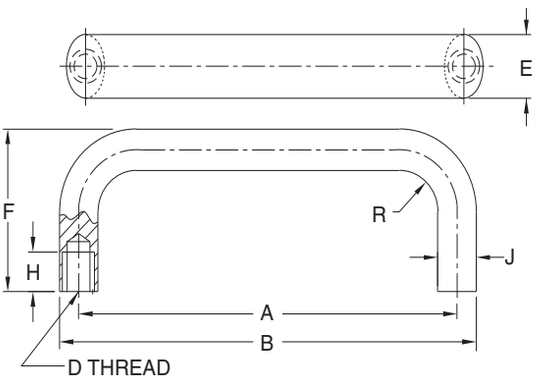
ALUMINUM, BLACK POWDER-COATED FINISH, OR 304 STAINLESS STEEL



Rounded Design Aluminum Tapped



Rounded Design Stainless Steel Tapped



Attractive, modern-design aluminum handle provides a comfortable grip with good ergonomic features. Durable black powder-coated pebble finish. Tapped holes for mounting. Choice of four handle sizes, available with either inch or metric threads. Also available in stainless steel, shot blasted with a satin finish (two sizes).

ALUMINUM — TAPPED (INCH)

PART NO.	A	B	D	E	F	H	J	R
CL-112-PHR-4	4.41	4.92	1/4-20	.79	1.93	.39	.51	.51
CL-128-PHR-4	5.04	5.55			2.01			
CL-160-PHR-5	6.30	6.97	5/16-18	1.02	2.24	.47	.67	.67
CL-192-PHR-5	7.56	8.23						

ALUMINUM — TAPPED (METRIC)

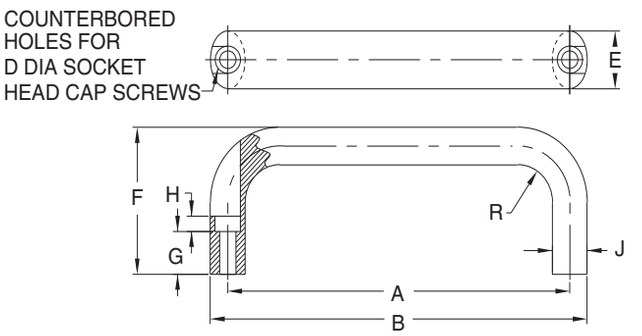
CLM-112-PHR-6	4.41	4.92	M6	.79	1.93	.39	.51	.51
CLM-128-PHR-6	5.04	5.55			2.01			
CLM-160-PHR-8	6.30	6.97	M8	1.02	2.24	.47	.67	.67
CLM-192-PHR-8	7.56	8.23						

STAINLESS STEEL — TAPPED (METRIC)

CLM-112-PHR-6-S	4.41	4.92	M6	.79	1.93	.39	.51	.51
CLM-128-PHR-6-S	5.04	5.55			2.01			



Rounded Design Aluminum Counterbored



Similar to the handles above, except counterbored for Socket-Head Cap Screws. Attractive, modern-design aluminum handle provides a comfortable grip with good ergonomic features. Durable black powder-coated pebble finish. Choice of four handle sizes.

ALUMINUM — COUNTERBORED

PART NO.	A	B	D	E	F	G	H	J	R
CL-116-PHRC-4	4.57	5.08	1/4 or M6	1.02	2.09	.39	.28	.67	.67
CL-132-PHRC-4	5.20	5.71			2.17				
CL-164-PHRC-4	6.46	6.97			2.24				
CL-196-PHRC-4	7.72	8.23							

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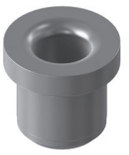
Floating Clamps
Page 305



Captive Locating Screws
and Jig Pins
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Air Rest Buttons
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LIFE-EX® Pins
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Ball Plungers



Hand-Retractable Plungers



Index Plungers



Spring Stop Buttons



Spring Locating Pins

Also see:



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Adjustable-Torque Knobs
p. 125



Torque Screw Jacks
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SPRING PLUNGERS

TYPES



STANDARD
Long bearing length on plunger for smooth operation. Locking element holds the unit securely in place after installation. Install and/or adjust from either end (when using the slot at the plunger end).



SHORT
Compact, short-stroke version of our standard Spring Plungers. Self-contained plunger-and-spring device available in many sizes and forces. Locking element holds the unit securely in place after installation.



SHORT WITH EXTENDED TRAVEL
This self-contained plunger-and-spring device is available in a wide range of sizes. Locking element holds the unit securely in place after installation.



PRESS FIT
Sturdy shoulder provides a fixed seating position and positively resists detent force (installation hole can be counterbored to recess the shoulder).

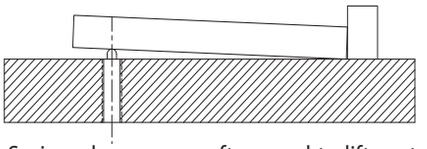
SELECTION CHART

STYLE	OD																
	#6-32	#8-32	#8-36	#10-32	M5	1/4-20	M6	1/4-28	5/16-18	M8	3/8-16	M10	1/2-13	M12	5/8-11	3/4-10	1"-8
Spring Plunger																	
Steel Nose	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
Stainless Steel	X	X		X		X	X	X	X	X	X	X	X				
Delrin® Nose		X		X		X	X		X	X	X	X	X	X	X		
Stainless Steel, Delrin® Nose		X		X		X	X		X	X	X	X	X	X			
Short Spring Plunger																	
Steel Nose		X	X	X	X	X	X		X	X	X	X	X				
Stainless Steel		X	X	X	X	X			X		X		X				
Delrin® Nose		X	X	X	X	X	X		X	X	X	X	X		X		
Stainless Steel, Delrin® Nose		X	X	X	X	X			X		X		X				
Extended Travel, Steel Nose		X	X	X	X	X	X		X	X	X	X	X		X		
Extended Travel, Stainless Steel		X	X	X	X	X			X		X		X				
Extended Travel, Delrin® Nose		X	X	X	X	X	X		X	X	X	X	X		X		
Extended Travel, Stainless Steel, Delrin® Nose		X	X	X	X	X			X		X		X				
Press Fit Spring Plunger																	
Steel Nose		1/8"		3/16"		1/4"			5/16"		3/8"		1/2"				
Stainless Steel		1/8"		3/16"		1/4"			5/16"		3/8"		1/2"				
Delrin® Nose		1/8"		3/16"		1/4"			5/16"		3/8"		1/2"				
Stainless Steel, Delrin® Nose		1/8"		3/16"		1/4"			5/16"		3/8"		1/2"				

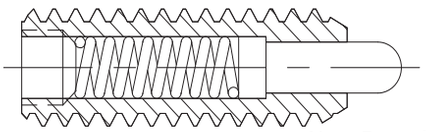
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SPRING PLUNGERS

TECHNICAL INFORMATION



Spring plungers are often used to lift parts after machining to make unloading easier.



Nose Extended

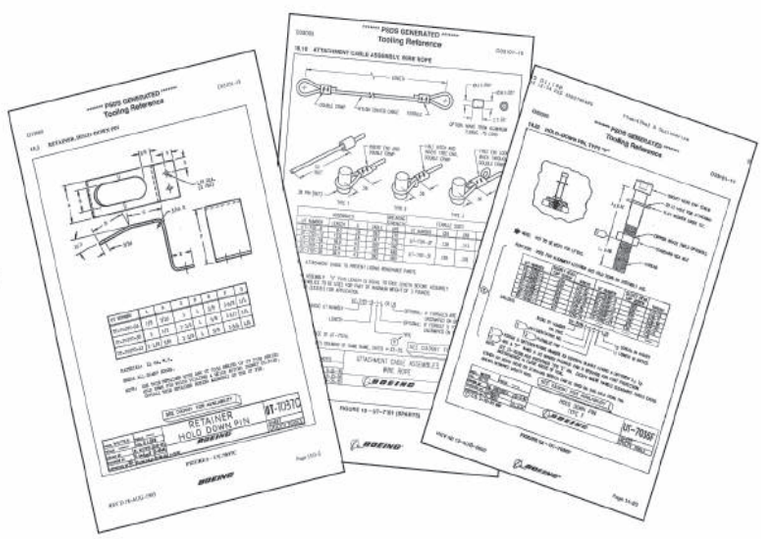
Spring Plungers are self-contained plunger-and-spring devices that apply force over a relatively wide range of travel. The plunger nose has a long bearing length to provide smooth, linear operation. Spring Plungers are available in a wide range of sizes and forces, most in a choice of light or heavy end force. A Spring Plunger's end force is very consistent -- beginning at the stated "initial" value, and increasing linearly (due to spring compression) through the range of travel, until it reaches the stated "final" value at maximum travel.

Most Spring Plungers have a locking element to hold it securely in place after installation. This element is a locking patch on small diameters and a nylon locking pellet on larger sizes. To obtain full holding torque on sizes with a locking pellet, countersink the installation hole to avoid cutting the pellet. Countersink at a 90° angle to a diameter 1/32" larger than the major thread diameter. Then, as you screw the plunger into its hole, the locking pellet will be compressed, no cut. The locking pellet does not apply excessive force, so it also works well in softer metals such as aluminum.

Spring Plungers are recommended only for applying straight-line force, not for sideways breakaway from a detent position. For breakaway applications, the rolling ball and short stroke of a Ball Plunger are crucial features for smooth, repeatable operation.

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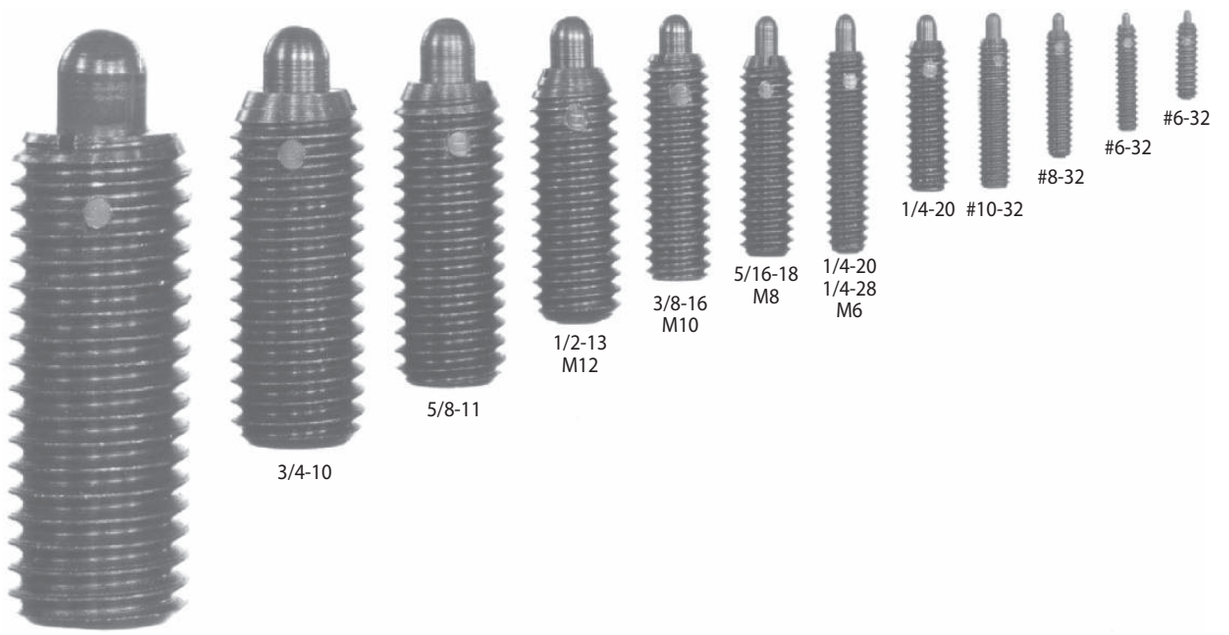
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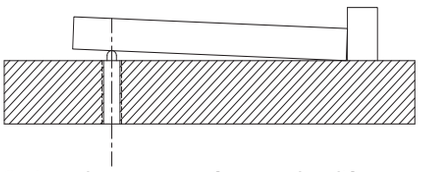
SPRING PLUNGERS

STEEL – BODY: 12L14 STEEL, BLACK OXIDE FINISH (METRIC SIZES ZINC PLATED CLEAR CHROMATE).
PLUNGER NOSE: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH OR
ZINC PLATED CLEAR CHROMATE (OR DELRIN®). SPRING: MUSIC WIRE.
STAINLESS STEEL – BODY: 300-SERIES STAINLESS.
PLUNGER NOSE: 300-SERIES STAINLESS (OR DELRIN®). SPRING: 302 STAINLESS.

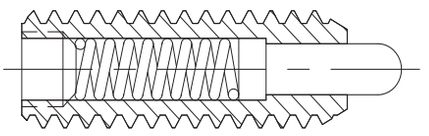


Self-contained plunger-and-spring device available in many sizes and forces. Long bearing length on plunger for smooth operation. Locking element holds the unit securely in place after installation. Install and/or adjust from either end (when using the slot at the plunger end, install with a Plunger Wrench to avoid over-compressing the spring).

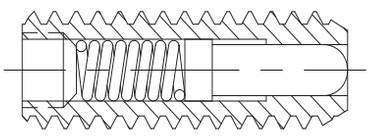
Available in thread sizes from #6-32 to 1″-8 (M6 to M12 in metric). Choice of light or heavy force in each thread size. Available in steel, with hardened plunger nose, or stainless steel. Optionally available with a Delrin® nose to prevent marring. Note: Catalog photos are actual size.



Spring plungers are often used to lift parts after machining to make unloading easier.



Nose Extended

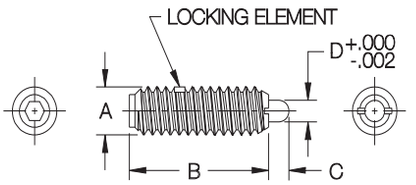


Nose Retracted

PLUNGER NOSE COLOR CODES

BODY	NOSE	FORCE	COLOR CODE
STEEL	STEEL	LIGHT	SILVER
		HEAVY	BLACK
	DELRIN®	LIGHT	WHITE
		HEAVY	BROWN
STAINLESS	STAINLESS	LIGHT	PLAIN
		HEAVY	PLAIN
	DELRIN®	LIGHT	WHITE
		HEAVY	BROWN

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STANDARD PLUNGER NOSE, LIGHT FORCE (INCH)

PART NO.		A	END FORCE (LBS)		B	C	D DIA
STEEL	STAINLESS		INITIAL	FINAL			
CL-10-SPS-2	CL-10-SSPS-2	#6-32	0.5	1.5	17/32	1/16	.046
CL-20-SPS-2	CL-20-SSPS-2	#8-32	0.7	2.3	5/8	3/32	.070
CL-30-SPS-2	CL-30-SSPS-2	#10-32	1.3	2.7	3/4	1/8	.093
CL-40-SPS-2	CL-40-SSPS-2	1/4-20	1	4	1	3/16	.119
CL-41-SPS-2	CL-41-SSPS-2	1/4-28					
CL-50-SPS-2	CL-50-SSPS-2	5/16-18	1.5	4.5	1	3/16	.135
CL-60-SPS-2	CL-60-SSPS-2	3/8-16	2.8	7.2	1-1/8	3/16	.186
CL-70-SPS-2	CL-70-SSPS-2	1/2-13	2.7	9.3	1-1/4	1/4	.248
CL-80-SPS-2	—	5/8-11	3.5	10.5	1-1/2	5/16	.310
CL-90-SPS-2	—	3/4-10	4	16	1-3/4	5/16	.374
CL-95-SPS-2	—	1″-8	4	31	2-13/32	1/2	.499

DELRIN® PLUNGER NOSE, LIGHT FORCE (INCH)

PART NO.		A	END FORCE (LBS)		B	C	D DIA
STEEL	STAINLESS		INITIAL	FINAL			
—	—	#6-32	—	—	—	—	—
CL-20-SPN-2	—	#8-32	0.7	2.3	5/8	3/32	.070
CL-30-SPN-2	—	#10-32	1.3	2.7	3/4	1/8	.093
CL-40-SPN-2	—	1/4-20	1	4	1	3/16	.119
—	—	1/4-28	—	—	—	—	—
CL-50-SPN-2	—	5/16-18	1.5	4.5	1	3/16	.135
CL-60-SPN-2	—	3/8-16	2.8	7.2	1-1/8	3/16	.186
CL-70-SPN-2	—	1/2-13	2.7	9.3	1-1/4	1/4	.248
CL-80-SPN-2	—	5/8-11	3.5	10.5	1-1/2	5/16	.310
—	—	3/4-10	—	—	—	—	—
—	—	1″-8	—	—	—	—	—

STANDARD PLUNGER NOSE, HEAVY FORCE (INCH)

PART NO.		A	END FORCE (LBS)		B	C	D DIA
STEEL	STAINLESS		INITIAL	FINAL			
CL-11-SPS-1	CL-11-SSPS-1	#6-32	1.0	1.6	3/8	1/16	.046
CL-10-SPS-1	CL-10-SSPS-1		1.5	4.5	17/32		
CL-20-SPS-1	CL-20-SSPS-1	#8-32	2.7	7.3	5/8	3/32	.070
CL-30-SPS-1	CL-30-SSPS-1	#10-32	2.9	11.1	3/4	1/8	.093
CL-42-SPS-1	CL-42-SSPS-1	1/4-20	2	9	3/4	1/8	.119
CL-40-SPS-1	CL-40-SSPS-1		3	13	1	3/16	
CL-41-SPS-1	CL-41-SSPS-1	1/4-28					
CL-50-SPS-1	CL-50-SSPS-1	5/16-18	3	15	1	3/16	.135
CL-60-SPS-1	CL-60-SSPS-1	3/8-16	5.5	14.5	1-1/8	3/16	.186
CL-70-SPS-1	CL-70-SSPS-1	1/2-13	6.6	17.4	1-1/4	1/4	.248
CL-80-SPS-1	—	5/8-11	10.5	25.5	1-1/2	5/16	.310
CL-90-SPS-1	—	3/4-10	6.7	37.3	1-3/4	5/16	.374
CL-95-SPS-1	—	1″-8	16	68	2-13/32	1/2	.499

DELRIN® PLUNGER NOSE, HEAVY FORCE (INCH)

PART NO.		A	END FORCE (LBS)		B	C	D DIA
STEEL	STAINLESS		INITIAL	FINAL			
—	—	#6-32	—	—	—	—	—
—	—		—	—	—	—	—
CL-20-SPN-1	—	#8-32	2.7	7.3	5/8	3/32	.070
CL-30-SPN-1	—	#10-32	2.9	11.1	3/4	1/8	.093
—	—	1/4-20	—	—	—	—	—
CL-40-SPN-1	—		3	13	1	3/16	.119
—	—	1/4-28	—	—	—	—	—
CL-50-SPN-1	—	5/16-18	3	15	1	3/16	.135
CL-60-SPN-1	—	3/8-16	5.5	14.5	1-1/8	3/16	.186
CL-70-SPN-1	—	1/2-13	6.6	17.4	1-1/4	1/4	.248
CL-80-SPN-1	—	5/8-11	10.5	25.5	1-1/2	5/16	.310
—	—	3/4-10	—	—	—	—	—
—	—	1″-8	—	—	—	—	—

STANDARD PLUNGER NOSE, LIGHT FORCE (METRIC)

PART NO.		A	END FORCE (LBS)		B	C	D DIA
STEEL	STAINLESS		INITIAL	FINAL			
CLM-6-SPS-1	CLM-6-SSPS-1	M6	1.0	4.0	1	3/16	.119
CLM-8-SPS-1	CLM-8-SSPS-1	M8	1.5	4.5	1	3/16	.135
CLM-10-SPS-1	CLM-10-SSPS-1	M10	2.8	7.2	1-1/8	3/16	.186
CLM-12-SPS-1	CLM-12-SSPS-1	M12	2.7	9.3	1-1/4	1/4	.248

DELRIN® PLUNGER NOSE, LIGHT FORCE (METRIC)

PART NO.		A	END FORCE (LBS)		B	C	D DIA
STEEL	STAINLESS		INITIAL	FINAL			
CLM-6-SPN-1	—	M6	1.0	4.0	1	3/16	.119
CLM-8-SPN-1	—	M8	1.5	4.5	1	3/16	.135
CLM-10-SPN-1	—	M10	2.8	7.2	1-1/8	3/16	.186
CLM-12-SPN-1	—	M12	2.7	9.3	1-1/4	1/4	.248

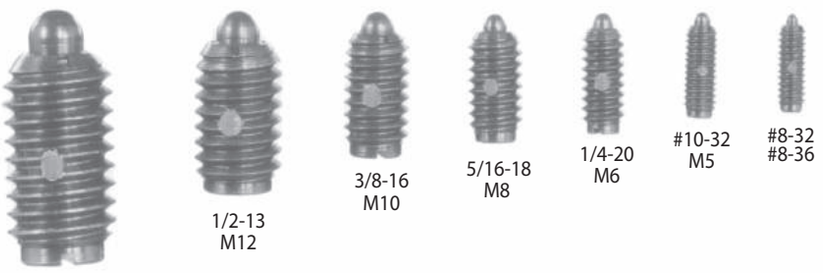
STANDARD PLUNGER NOSE, HEAVY FORCE (METRIC)

PART NO.		A	END FORCE (LBS)		B	C	D DIA
STEEL	STAINLESS		INITIAL	FINAL			
CLM-6-SPS-2	CLM-6-SSPS-2	M6	3.0	13.0	1	3/16	.119
CLM-8-SPS-2	CLM-8-SSPS-2	M8	3.0	15.0	1	3/16	.135
CLM-10-SPS-2	CLM-10-SSPS-2	M10	5.5	14.5	1-1/8	3/16	.186
CLM-12-SPS-2	CLM-12-SSPS-2	M12	6.6	17.4	1-1/4	1/4	.248

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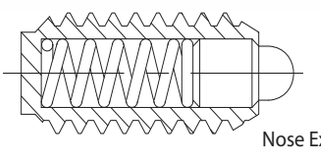
SHORT SPRING PLUNGERS

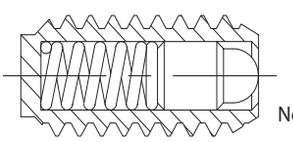
STEEL – BODY: 12L14 STEEL, BLACK OXIDE FINISH. PLUNGER NOSE: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH OR ZINC PLATED CLEAR CHROMATE (OR DELRIN®). SPRING: MUSIC WIRE.
STAINLESS STEEL – BODY: 300-SERIES STAINLESS.
PLUNGER NOSE: 300-SERIES STAINLESS (OR DELRIN®). SPRING: 302 STAINLESS.

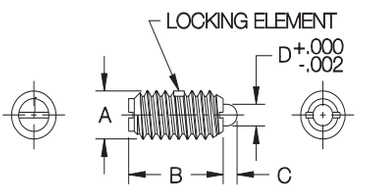


Compact, short-stroke version of our standard Spring Plungers. Self-contained plunger-and-spring device available in many sizes and forces. Locking element holds the unit securely in place after installation. Install and/or adjust from either end (when using the slot at the plunger end, install with a Plunger Wrench to avoid over-compressing the spring).

Available in thread sizes from #8-32 to 5/8-11 (M5 to M12 in metric). Choice of light or heavy force in each thread size. Available in steel, with a hardened plunger nose, or stainless steel. Optionally available with a Delrin® nose to prevent marring. Note: Catalog photos are actual size.


Nose Extended


Nose Retracted



STANDARD PLUNGER NOSE, LIGHT FORCE (INCH)

PART NO.			END FORCE (LBS)				D
STEEL	STAINLESS	A	INITIAL	FINAL	B	C	DIA
CL-21-SPS-2	CL-21-SSPS-2	#8-32	0.5	1.5	7/16	.052	.070
CL-22-SPS-2	CL-22-SSPS-2	#8-36					
CL-31-SPS-2	CL-31-SSPS-2	#10-32	0.75	2.5	15/32	.065	.093
CL-43-SPS-2	CL-43-SSPS-2	1/4-20	1	3.5	17/32	.078	.119
CL-51-SPS-2	CL-51-SSPS-2	5/16-18	1.5	4	9/16	.084	.135
CL-61-SPS-2	CL-61-SSPS-2	3/8-16	1.5	5	5/8	.110	.186
CL-71-SPS-2	CL-71-SSPS-2	1/2-13	1.75	5.5	3/4	.151	.248
CL-81-SPS-2	—	5/8-11	2	8.5	1-1/16	.215	.310

DELRIN® PLUNGER NOSE, LIGHT FORCE (INCH)

PART NO.			END FORCE (LBS)				D
STEEL	STAINLESS	A	INITIAL	FINAL	B	C	DIA
CL-21-SPN-2	—	#8-32	0.5	1.5	7/16	.052	.070
CL-22-SPN-2	—	#8-36					
CL-31-SPN-2	—	#10-32	0.75	2.5	15/32	.065	.093
CL-43-SPN-2	—	1/4-20	1	3.5	17/32	.078	.119
CL-51-SPN-2	—	5/16-18	1.5	4	9/16	.084	.135
CL-61-SPN-2	—	3/8-16	1.5	5	5/8	.110	.186
CL-71-SPN-2	—	1/2-13	1.75	5.5	3/4	.151	.248
CL-81-SPN-2	—	5/8-11	2	8.5	1-1/16	.215	.310

STANDARD PLUNGER NOSE, HEAVY FORCE (INCH)

CL-21-SPS-1	CL-21-SSPS-1	#8-32	1.5	4.75	7/16	.052	.070
CL-22-SPS-1	CL-22-SSPS-1	#8-36					
CL-31-SPS-1	CL-31-SSPS-1	#10-32	1.75	6.25	15/32	.065	.093
CL-43-SPS-1	CL-43-SSPS-1	1/4-20	3	10.5	17/32	.078	.119
CL-51-SPS-1	CL-51-SSPS-1	5/16-18	3.75	15.5	9/16	.084	.135
CL-61-SPS-1	CL-61-SSPS-1	3/8-16	4.5	18.5	5/8	.110	.186
CL-71-SPS-1	CL-71-SSPS-1	1/2-13	5	28	3/4	.151	.248
CL-81-SPS-1	—	5/8-11	7	50	1-1/16	.215	.310

DELRIN® PLUNGER NOSE, HEAVY FORCE (INCH)

CL-21-SPN-1	—	#8-32	1.5	4.75	7/16	.052	.070
CL-22-SPN-1	—	#8-36					
CL-31-SPN-1	—	#10-32	1.75	6.25	15/32	.065	.093
CL-43-SPN-1	—	1/4-20	3	10.5	17/32	.078	.119
CL-51-SPN-1	—	5/16-18	3.75	15.5	9/16	.084	.135
CL-61-SPN-1	—	3/8-16	4.5	18.5	5/8	.110	.186
CL-71-SPN-1	—	1/2-13	5	28	3/4	.151	.248
CL-81-SPN-1	—	5/8-11	7	50	1-1/16	.215	.310

STANDARD PLUNGER NOSE, LIGHT FORCE (METRIC)

CLM-51-SPS-1	—	M5	.7	2.5	.47	.065	.093
CLM-61-SPS-1	—	M6	1	3.5	.53	.078	.119
CLM-81-SPS-1	—	M8	1.5	4	.56	.084	.135
CLM-101-SPS-1	—	M10	1.5	5	.62	.110	.186
CLM-121-SPS-1	—	M12	1.8	5.5	.75	.151	.248

DELRIN® PLUNGER NOSE, LIGHT FORCE (METRIC)

CLM-51-SPN-1	—	M5	.7	2.5	.47	.065	.093
CLM-61-SPN-1	—	M6	1	3.5	.53	.078	.119
CLM-81-SPN-1	—	M8	1.5	4	.56	.084	.135
CLM-101-SPN-1	—	M10	1.5	5	.62	.110	.186
CLM-121-SPN-1	—	M12	1.8	5.5	.75	.151	.248

STANDARD PLUNGER NOSE, HEAVY FORCE (METRIC)

CLM-51-SPS-2	—	M5	1.8	6.3	.47	.065	.093
CLM-61-SPS-2	—	M6	3	10.5	.53	.078	.119
CLM-81-SPS-2	—	M8	3.8	15.5	.56	.084	.135
CLM-101-SPS-2	—	M10	4.5	18.5	.62	.110	.186
CLM-121-SPS-2	—	M12	5	28	.75	.151	.248

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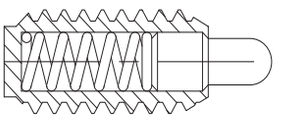
SHORT SPRING PLUNGERS WITH EXTENDED TRAVEL

STEEL – BODY: 12L14 STEEL, BLACK OXIDE FINISH. PLUNGER NOSE: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH OR ZINC PLATED CLEAR CHROMATE (OR DELRIN®). SPRING: MUSIC WIRE
STAINLESS STEEL – BODY: 300-SERIES STAINLESS.
PLUNGER NOSE: 300-SERIES STAINLESS (OR DELRIN®). SPRING: 302 STAINLESS.

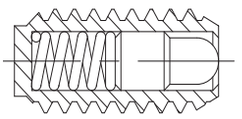


These Spring Plungers have the body length of a Short Spring Plunger while providing the longer stroke of a standard Spring Plunger (spring force is somewhat reduced). This self-contained plunger-and-spring device is available in a wide range of sizes. Locking element holds the unit securely in place after installation. Install and/or adjust from either end (when using the slot at the plunger end, install with a Plunger Wrench to avoid over-compressing the spring).

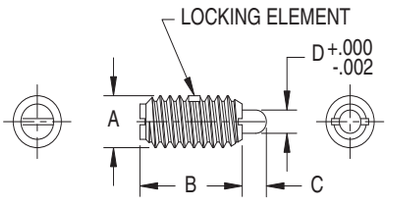
Available in thread sizes from #8-32 to 5/8-11 (M5 to M12 in metric). Available in steel, with a hardened plunger nose, or stainless steel. Optionally available with a Delrin® nose to prevent marring. Note: Catalog photos are actual size.



Nose Extended



Nose Retracted



STANDARD PLUNGER NOSE (INCH)

PART NO.			END FORCE (LBS)				D
STEEL	STAINLESS	A	INITIAL	FINAL	B	C	DIA
CL-25-SPS-1	CL-25-SSPS-1	#8-32	1.0	3.2	7/16	.093	.070
CL-26-SPS-1	CL-26-SSPS-1	#8-36					
CL-35-SPS-1	CL-35-SSPS-1	#10-32	1.2	4.2	15/32	.125	.093
CL-45-SPS-1	CL-45-SSPS-1	1/4-20	2.0	7.0	17/32	.187	.119
CL-55-SPS-1	CL-55-SSPS-1	5/16-18	2.5	10.5	9/16	.187	.135
CL-65-SPS-1	CL-65-SSPS-1	3/8-16	3.0	12.5	5/8	.187	.186
CL-75-SPS-1	CL-75-SSPS-1	1/2-13	3.5	19	3/4	.250	.248
CL-85-SPS-1	—	5/8-11	4.5	34	1-1/16	.312	.310

DELRIN® PLUNGER NOSE (INCH)

PART NO.			END FORCE (LBS)				D
STEEL	STAINLESS	A	INITIAL	FINAL	B	C	DIA
—	—	#8-32	1.0	3.2	7/16	.093	.070
—	—	#8-36					
CL-35-SPN-1	—	#10-32	1.2	4.2	15/32	.125	.093
CL-45-SPN-1	—	1/4-20	2.0	7.0	17/32	.187	.119
—	—	5/16-18	2.5	10.5	9/16	.187	.135
CL-65-SPN-1	—	3/8-16	3.0	12.5	5/8	.187	.186
—	—	1/2-13	3.5	19	3/4	.250	.248
—	—	5/8-11	4.5	34	1-1/16	.312	.310

STANDARD PLUNGER NOSE (METRIC)

PART NO.			END FORCE (LBS)				D
STEEL	STAINLESS	A	INITIAL	FINAL	B	C	DIA
CLM-55-SPS-1	—	M5	1.2	4.2	.47	.125	.093
CLM-65-SPS-1	—	M6	2.0	7.0	.53	.187	.119
CLM-85-SPS-1	—	M8	2.5	10.5	.56	.187	.135
CLM-105-SPS-1	—	M10	3.0	12.5	.62	.187	.186
CLM-125-SPS-1	—	M12	3.5	19	.75	.250	.248

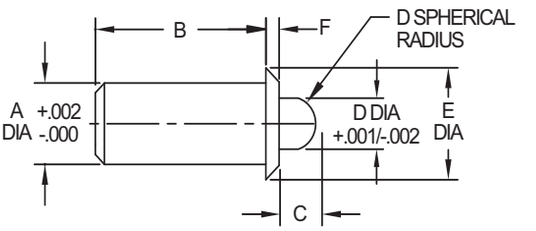
DELRIN® PLUNGER NOSE (METRIC)

PART NO.			END FORCE (LBS)				D
STEEL	STAINLESS	A	INITIAL	FINAL	B	C	DIA
—	—	M5	1.2	4.2	.47	.125	.093
CLM-65-SPN-1	—	M6	2.0	7.0	.53	.187	.119
CLM-85-SPN-1	—	M8	2.5	10.5	.56	.187	.135
—	—	M10	3.0	12.5	.62	.187	.186
—	—	M12	3.5	19	.75	.250	.248

PRESS-FIT SPRING PLUNGERS

STEEL – BODY: 12L14 STEEL, BLACK OXIDE FINISH. PLUNGER NOSE: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH OR ZINC PLATED CLEAR CHROMATE (OR DELRIN®). SPRING: MUSIC WIRE.
STAINLESS STEEL – BODY: 300-SERIES STAINLESS. PLUNGER NOSE: 300-SERIES STAINLESS (OR DELRIN®).
SPRING: 302 STAINLESS





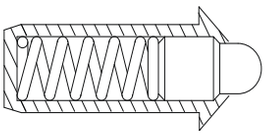
Simple, economical spring-loaded plunger ideal for installation in softer materials, such as aluminum, wood or plastic. Sturdy shoulder provides a fixed seating position and positively resists detent force (installation hole can be counterbored to recess the shoulder). Use when a threaded hole would be impractical and/or adjustment is not required. Choice of six sizes, each in light or heavy force. Available in steel, with a hardened plunger nose, or stainless steel. Optionally available with a Delrin® nose to prevent marring. Note: Catalog photos are actual size.

STANDARD PLUNGER NOSE, LIGHT FORCE

PART NO.		A	END FORCE (LBS)					E	
STEEL	STAINLESS	DIA	INITIAL	FINAL	B	C	D	DIA	F
CL-2-PSP-1	CL-2-PSPS-1	.125	.5	1	.252	.062	.070	.187	.032
CL-3-PSP-1	CL-3-PSPS-1	.188	.8	2.5	.405	.094	.121	.250	.035
CL-4-PSP-1	CL-4-PSPS-1	.250	1.5	3	.481	.125	.168	.312	.044
CL-5-PSP-1	CL-5-PSPS-1	.312	2	5	.643	.151	.186	.375	.045
CL-6-PSP-1	CL-6-PSPS-1	.375	2.5	7	.785	.187	.234	.500	.078
CL-8-PSP-1	CL-8-PSPS-1	.500	4	9	1.130	.250	.332	.688	.088

STANDARD PLUNGER NOSE, HEAVY FORCE

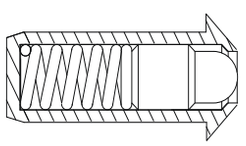
PART NO.		A	END FORCE (LBS)					E	
STEEL	STAINLESS	DIA	INITIAL	FINAL	B	C	D	DIA	F
CL-2-PSP-2	CL-2-PSPS-2	.125	1	2	.252	.062	.070	.187	.032
CL-3-PSP-2	CL-3-PSPS-2	.188	1.5	4.5	.405	.094	.121	.250	.035
CL-4-PSP-2	CL-4-PSPS-2	.250	2.5	6	.481	.125	.168	.312	.044
CL-5-PSP-2	CL-5-PSPS-2	.312	4	10	.643	.151	.186	.375	.045
CL-6-PSP-2	CL-6-PSPS-2	.375	5	14	.785	.187	.234	.500	.078
CL-8-PSP-2	CL-8-PSPS-2	.500	8	18	1.130	.250	.332	.688	.088



Nose Extended

DELRIN® PLUNGER NOSE, LIGHT FORCE

PART NO.		A	END FORCE (LBS)					E	
STEEL	STAINLESS	DIA	INITIAL	FINAL	B	C	D	DIA	F
CL-2-PSPN-1	CL-2-PSPSN-1	.125	.5	1	.252	.062	.070	.187	.032
CL-3-PSPN-1	CL-3-PSPSN-1	.188	.8	2.5	.405	.094	.121	.250	.035
CL-4-PSPN-1	CL-4-PSPSN-1	.250	1.5	3	.481	.125	.168	.312	.044
CL-5-PSPN-1	CL-5-PSPSN-1	.312	2	5	.643	.151	.186	.375	.045
CL-6-PSPN-1	CL-6-PSPSN-1	.375	2.5	7	.785	.187	.234	.500	.078
CL-8-PSPN-1	CL-8-PSPSN-1	.500	4	9	1.130	.250	.332	.688	.088



Nose Retracted

DELRIN® PLUNGER NOSE, HEAVY FORCE

PART NO.		A	END FORCE (LBS)					E	
STEEL	STAINLESS	DIA	INITIAL	FINAL	B	C	D	DIA	F
CL-2-PSPN-2	CL-2-PSPSN-2	.125	1	2	.252	.062	.070	.187	.032
CL-3-PSPN-2	CL-3-PSPSN-2	.188	1.5	4.5	.405	.094	.121	.250	.035
CL-4-PSPN-2	CL-4-PSPSN-2	.250	2.5	6	.481	.125	.168	.312	.044
CL-5-PSPN-2	CL-5-PSPSN-2	.312	4	10	.643	.151	.186	.375	.045
CL-6-PSPN-2	CL-6-PSPSN-2	.375	5	14	.785	.187	.234	.500	.078
CL-8-PSPN-2	CL-8-PSPSN-2	.500	8	18	1.130	.250	.332	.688	.088

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BALL PLUNGERS

TYPES



STANDARD, STEEL BALL
Self-contained ball-and-spring device available in many sizes and forces. Locking element holds the unit securely in place after installation. Install and/or adjust from either end.



STANDARD, DELRIN® BALL
Self-contained ball-and-spring device available in many sizes and forces. Locking element holds the unit securely in place after installation. Install and/or adjust from either end.

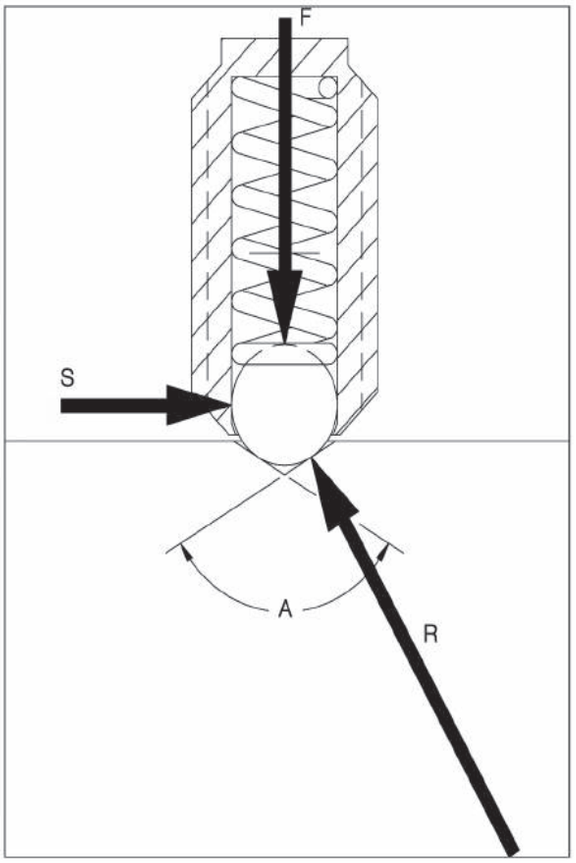


PRESS FIT
Simple, economical spring-loaded plunger ideal for installation in softer materials, such as aluminum, wood, or plastic. Sturdy shoulder provides a fixed seating position.



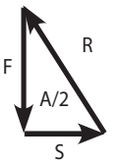
SELF-RETAINING
Due to their self-retaining design, these press-fit ball plungers can be securely installed in an ordinary drilled hole. The slotted end of the thermoplastic body expands to compensate for hole tolerances up to .008" oversize.

TECHNICAL INFORMATION



INSTALLATION:
To obtain full locking torque, countersink the installation hole to avoid cutting the locking element. Countersink at a 90-100° angle to a diameter 1/32" larger than the major thread diameter. Then, as you screw the plunger into its hole, the locking element will be compressed, not cut. **INFO+:** See page 171 for plunger wrenches.

BREAKAWAY FORCE:
To calculate the side force needed to slide a ball plunger out of its detent hole, refer to the free-body force diagram to the left. In the diagram, S= Side force, F= End force (spring force), R= Reaction force, and A= Countersink angle. The reaction force (R) is perpendicular to the contact surface. Solving for side force (S):



$$S = \frac{F}{\tan(A/2)}$$

End force (F) depends on how far the spring will be compressed, which depends on how far away from the sliding surface the ball plunger is installed. Maximum spring compression and end force occur as the ball breaks out of its hole.

BREAKAWAY-FORCE EXAMPLE:
A CL-40-BP-3 ball plunger (1/4-20) exerts an initial force of 4 lbs, a half-way force of 8 lbs, and a final force of 12 lbs. With a 90° countersink angle and half-way compression:

$$S = \frac{8\ lbs}{\tan(90°/2)} = 8\ lbs \qquad S = \frac{8\ lbs}{\tan(120°/2)} = 4.6\ lbs$$

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BALL PLUNGERS

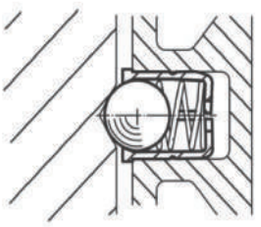
SELECTION CHART:

STYLE	4-48	5-40	M3	6-40	8-32	M4	8-36	10-32	M6	1/4-20	M8	5/16-18	M10	3/8-16	M12	1/2-13	M16	5/8-11
Ball Plunger	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ball Plunger, Stainless Steel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ball Plunger, Delrin® Body										X		X		X				
Ball Plunger, Delrin® Ball	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ball Plunger, Stainless Steel, Delrin® Ball	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ball Plunger, Delrin® Body, Delrin® Ball										X		X		X				
Press Fit Ball Plunger					1/8″			3/16″		1/4″		5/16″		3/8″		1/2″		
Press Fit Ball Plunger, Stainless Steel Ball					1/8″			3/16″		1/4″		5/16″		3/8″		1/2″		
Press Fit Ball Plunger, Delrin® Ball					1/8″			3/16″		1/4″		5/16″		3/8″		1/2″		
Press Fit Ball Plunger, Stainless Steel, Delrin® Ball					1/8″			3/16″		1/4″		5/16″		3/8″		1/2″		
Self-Retaining Stainless Steel Ball								3/16″		1/4″				3/8″		1/2″		

New Self-Retaining Ball Plungers

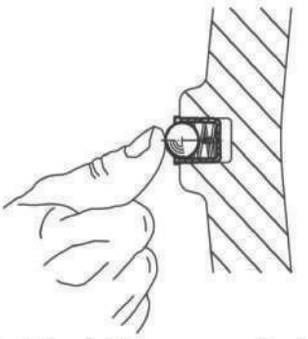
The slotted end of the thermoplastic body expands to compensate for hole tolerances up to .008″.

Due to their self-retaining design, these press-fit ball plungers can be securely installed in an ordinary drilled hole.



These plungers can be installed in a plain hole, with the shoulder exposed, or slightly counterbored for flush installation.





Self-Retaining Ball Plungers can often be installed by hand, due to the body's flexible design.

See Page 177

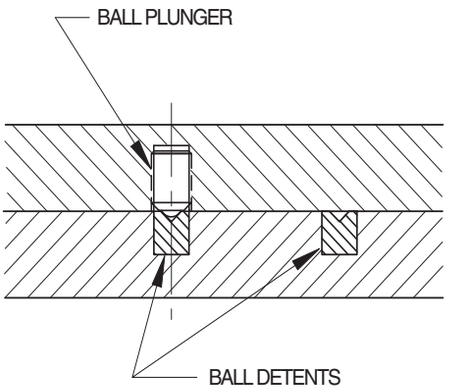
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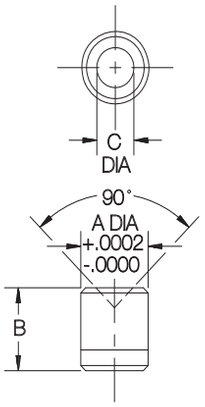
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BALL DETENTS

440C STAINLESS STEEL, HEAT TREATED







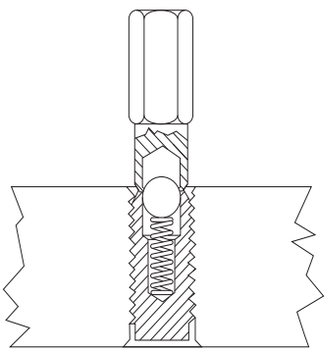
Press-in receptacle that provides a perfect mating hole for a Ball Plunger. Hole has a 90° point for smooth detent action and reliable retention. These hardened Ball Detents resist side loads to prevent wear to the parent material. Available in sizes to fit all Ball Plungers, from #4-48 to 5/8-11 (M4 to M12 in metric).

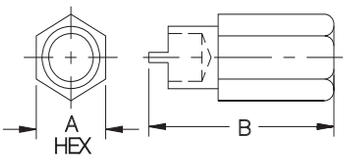
PART NO.	FOR BALL PLUNGER	A DIA	B	C DIA
CL-1-BD	#4-48, #5-40, M3	.1075	1/8	.056
CL-2-BD	#6-40	.1175	1/8	.061
CL-3-BD	#8-32, #8-36, #10-32, M4, M5	.1614	3/16	.082
CL-4-BD	1/4-20, M6	.2034	1/4	.111
CL-5-BD	5/16-18, M8	.2659	5/16	.139
CL-6-BD	3/8-16, M10	.3284	3/8	.164
CL-8-BD	1/2-13, M12	.4378	1/2	.241
CL-10-BD	5/8-11, M16	.5472	5/8	.330

PLUNGER WRENCHES

STEEL





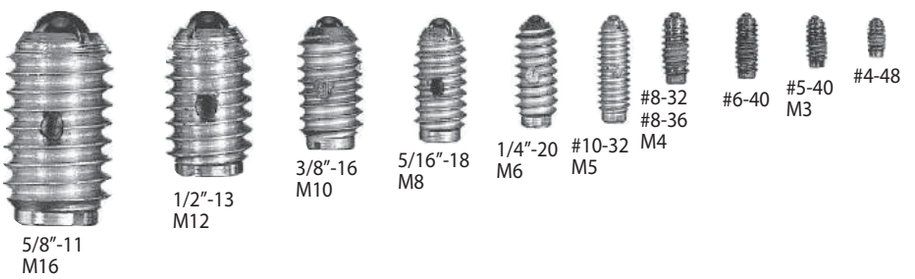


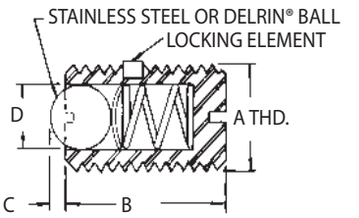
Handy tool to speed up installation of Ball Plungers or Spring Plungers. Much better than using a screwdriver on the ball/nose end, because the clearance hole in the center prevents over-compressing the plunger's internal spring. Available in sizes to fit all Ball Plungers and Spring Plungers, from #4-48 to 1"-8 (M4 to M12 in metric).

PART NO.	FITS THESE PLUNGER SIZES	A	B
CL-2-SPW	#4-48, #5-40, #6-32, #6-40	1/4	7/8
CL-4-SPW	#8-32, #8-36, M4	1/4	7/8
CL-6-SPW	#10-32, M5	1/4	7/8
CL-8-SPW	1/4-20, 1/4-28, M6	1/4	1
CL-10-SPW	5/16-18, M8	3/8	1
CL-12-SPW	3/8-16, M10	3/8	1
CL-14-SPW	1/2-13, M12	1/2	1
CL-16-SPW	5/8-11	5/8	1-1/8
CL-18-SPW	3/4-10	3/4	1-1/8
CL-20-SPW	1"-8	7/8	1-3/8

BALL PLUNGERS

STEEL – BODY: 12L14 STEEL, ZINC PLATED OR BLACK OXIDE FINISH.
BALL: 440C STAINLESS. SPRING: MUSIC WIRE
STAINLESS STEEL – BODY: 300-SERIES STAINLESS. BALL: 440C STAINLESS. SPRING: 302 STAINLESS.
DELRIN® – BODY: DELRIN® 500, WHITE, BLACK, OR YELLOW. BALL: 440C STAINLESS. SPRING: 302 STAINLESS





4

STANDARD BALL (INCH)

PART NO.			A	END FORCE (LBS)		B	C	D DIA	COLOR CODE
STEEL BODY	STAINLESS BODY	DELRIN® BODY		INITIAL	FINAL				
CL-5-BP-1	CL-5-SBP-1	—	#4-48	1/8	1/2	3/16	.020	.062	PLAIN
CL-10-BP-1	CL-10-SBP-1	—	#5-40	1/4	3/4	1/4			
CL-15-BP-1	CL-15-SBP-1	—	#6-40	1/2	1	5/16	.023	.078	
CL-22-BP-1	CL-22-SBP-1	—	#8-32	1/2	1-1/4	11/32	.025	.093	
CL-20-BP-1	CL-20-SBP-1	—	#8-36						
CL-30-BP-1	CL-30-SBP-1	—	#10-32	1/2	1-1/2	33/64	.025	.093	PLAIN
CL-30-BP-2	CL-30-SBP-2	—		1-1/2	3				BLACK
CL-30-BP-3	CL-30-SBP-3	—		2	5				YELLOW
CL-40-BP-1	CL-40-SBP-1	CL-40-DBP-1-LL	1/4-20	2	4	17/32	.035	.125	PLAIN
CL-40-BP-2	CL-40-SBP-2	CL-40-DBP-2-LL		3	7				BLACK
CL-40-BP-3	CL-40-SBP-3	CL-40-DBP-3-LL		4	12				YELLOW
CL-50-BP-1	CL-50-SBP-1	CL-50-DBP-1-LL	5/16-18	2	4-1/2	37/64	.040	.156	PLAIN
CL-50-BP-2	CL-50-SBP-2	CL-50-DBP-2-LL		4	9				BLACK
CL-50-BP-3	CL-50-SBP-3	CL-50-DBP-3-LL		6	17				YELLOW
CL-60-BP-1	CL-60-SBP-1	CL-60-DBP-1-LL	3/8-16	2-1/2	5	5/8	.048	.187	PLAIN
CL-60-BP-2	CL-60-SBP-2	CL-60-DBP-2-LL		5	10				BLACK
CL-60-BP-3	CL-60-SBP-3	CL-60-DBP-3-LL		6	21				YELLOW
CL-70-BP-1	CL-70-SBP-1	—	1/2-13	3	6	3/4	.072	.281	PLAIN
CL-70-BP-2	CL-70-SBP-2	—		6	12				BLACK
CL-70-BP-3	CL-70-SBP-3	—		6	30				YELLOW
CL-80-BP-1	CL-80-SBP-1	—	5/8-11	4-1/2	9	63/64	.096	.375	PLAIN
CL-80-BP-2	CL-80-SBP-2	—		9	18				BLACK
CL-80-BP-3	CL-80-SBP-3	—		7	50				YELLOW

STANDARD BALL (METRIC)

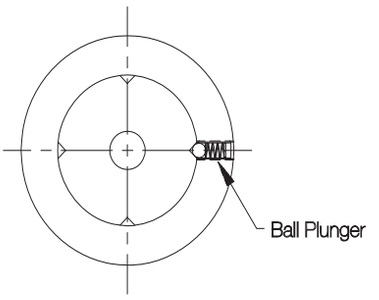
—	CLM-3-SBP-1	—	M3	.12	.5	.19	.020	.062	PLAIN
CLM-4-BP-1	CLM-4-SBP-1	—	M4	0.6	1.1	.34	.024	.094	PLAIN
CLM-5-BP-2	CLM-5-SBP-2	—	M5	.5	1.5	.51	.024	.094	PLAIN
CLM-5-BP-1	CLM-5-SBP-1	—		1.5	2.9				GREEN
CLM-5-BP-3	CLM-5-SBP-3	—		2	4.9				YELLOW
CLM-6-BP-2	CLM-6-SBP-2	—	M6	2	4	.53	.035	.125	PLAIN
CLM-6-BP-1	CLM-6-SBP-1	—		2.9	7				GREEN
CLM-6-BP-3	CLM-6-SBP-3	—		4	12				YELLOW
CLM-8-BP-2	CLM-8-SBP-2	—	M8	2.2	4.4	.58	.039	.156	PLAIN
CLM-8-BP-1	CLM-8-SBP-1	—		3.9	8.8				GREEN
CLM-8-BP-3	CLM-8-SBP-3	—		6.1	17.1				YELLOW
CLM-10-BP-2	CLM-10-SBP-2	—	M10	2.5	5.0	.63	.047	.187	PLAIN
CLM-10-BP-1	CLM-10-SBP-1	—		5.0	9.9				GREEN
CLM-10-BP-3	CLM-10-SBP-3	—		6.1	20.9				YELLOW
CLM-12-BP-2	CLM-12-SBP-2	—	M12	3.0	6.1	.75	.079	.281	PLAIN
CLM-12-BP-1	CLM-12-SBP-1	—		6.1	12.1				GREEN
CLM-12-BP-3	CLM-12-SBP-3	—		6.1	29.7				YELLOW
CLM-16-BP-2	CLM-16-SBP-2	—	M16	4.5	9	.98	.098	.375	PLAIN
CLM-16-BP-1	CLM-16-SBP-1	—		9	18				GREEN
CLM-16-BP-3	CLM-16-SBP-3	—		7	50				YELLOW

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BALL PLUNGERS

STAINLESS STEEL – BODY: 300-SERIES STAINLESS. BALL: WHITE DELRIN® 500. SPRING: 302 STAINLESS.
DELRIN® – BODY: DELRIN® 500, BLACK, OR YELLOW. BALL: WHITE DELRIN® 500. SPRING: 302 STAINLESS.

Self-contained ball-and-spring device available in many sizes and forces. Available in thread sizes from #4-48 to 5/8-11 (M3 to M16 in metric). Choice of light, medium, or heavy force in most thread sizes. Available in steel, stainless steel or Delrin®, all with a 440C stainless steel ball (optionally available with a Delrin® ball). Locking element (steel and stainless only) holds the unit securely in place after installation. Install and/or adjust from either end (when using the slot at the ball end, install with a Plunger Wrench to avoid over-compressing the spring). The three smallest sizes, and all Delrin® sizes, have no slot at the ball end. Note: Catalog photos are actual size.



DELRIN® BALL (INCH)

PART NO.			END FORCE (LBS)				D	
STAINLESS BODY	DELRIN® BODY	A	INITIAL	FINAL	B	C	DIA	COLOR CODE
CL-5-SBPN-1	—	#4-48	1/8	1/2	3/16	.020	.062	PLAIN
CL-10-SBPN-1	—	#5-40	1/4	3/4	1/4			
CL-15-SBPN-1	—	#6-40	1/2	1	5/16	.023	.078	
CL-22-SBPN-1	—	#8-32	1/2	1-1/4	11/32	.025	.093	
CL-20-SBPN-1	—	#8-36						
CL-30-SBPN-1	—	#10-32	1/2	1-1/2	33/64	.025	.093	PLAIN
CL-30-SBPN-2	—		1-1/2	3				BLACK
CL-30-SBPN-3	—		2	5				YELLOW
CL-40-SBPN-1	CL-40-DBPN-1-LL	1/4-20	2	4	17/32	.035	.125	PLAIN
CL-40-SBPN-2	CL-40-DBPN-2-LL		3	7				BLACK
CL-40-SBPN-3	—		4	12				YELLOW
CL-50-SBPN-1	CL-50-DBPN-1-LL	5/16-18	2	4-1/2	37/64	.040	.156	PLAIN
CL-50-SBPN-2	CL-50-DBPN-2-LL		4	9				BLACK
CL-50-SBPN-3	—		6	17				YELLOW
CL-60-SBPN-1	CL-60-DBPN-1-LL	3/8-16	2-1/2	5	5/8	.048	.187	PLAIN
CL-60-SBPN-2	CL-60-DBPN-2-LL		5	10				BLACK
CL-60-SBPN-3	—		6	21				YELLOW
CL-70-SBPN-1	—	1/2-13	3	6	3/4	.072	.281	PLAIN
CL-70-SBPN-2	—		6	12				BLACK
CL-70-SBPN-3	—		6	30				YELLOW
CL-80-SBPN-1	—	5/8-11	4-1/2	9	63/64	.096	.375	PLAIN
CL-80-SBPN-2	—		9	18				BLACK
CL-80-SBPN-3	—		7	50				YELLOW

DELRIN® BALL (METRIC)

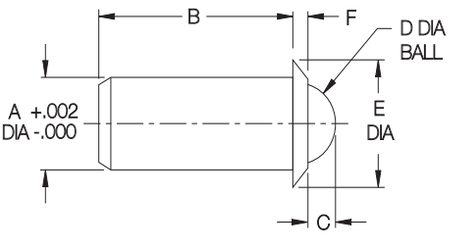
CLM-3-SBPN-1	—	M3	.12	.5	.19	.020	.062	PLAIN
CLM-4-SBPN-1	—	M4	.9	2.2	.34	.024	.094	PLAIN
CLM-5-SBPN-2	—	M5	.5	1.5	.51	.024	.094	PLAIN
CLM-5-SBPN-1	—		1.5	2.9				GREEN
CLM-6-SBPN-2	—	M6	2	4	.53	.035	.125	PLAIN
CLM-6-SBPN-1	—		2.9	7				GREEN
CLM-8-SBPN-2	—	M8	2.2	4.4	.58	.039	.156	PLAIN
CLM-8-SBPN-1	—		3.9	9				GREEN
CLM-10-SBPN-2	—	M10	2.5	5	.63	.047	.187	PLAIN
CLM-10-SBPN-1	—		5	10				GREEN
CLM-12-SBPN-2	—	M12	3	6	.75	.079	.281	PLAIN
CLM-12-SBPN-1	—		6	12				GREEN
CLM-16-SBPN-2	—	M16	4.5	9	.98	.098	.375	PLAIN
CLM-16-SBPN-1	—		9	18				GREEN

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PRESS-FIT BALL PLUNGERS

STEEL – BODY: 12L14 STEEL, BLACK OXIDE FINISH. BALL: 440C STAINLESS (OR DELRIN®). SPRING: MUSIC WIRE
STAINLESS STEEL – BODY: 300-SERIES STAINLESS. BALL: 440C STAINLESS (OR DELRIN®). SPRING: 302 STAINLESS





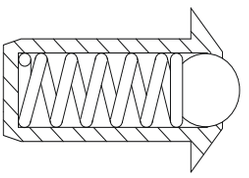
Simple, economical ball plunger ideal for installation in softer materials, such as aluminum, wood or plastic. Sturdy shoulder provides a fixed seating position and positively resists detent force (installation hole can be counterbored to recess the shoulder). Use when a threaded hole would be impractical and/or adjustment is not required. Available in steel or stainless steel. Choice of six sizes, each in light or heavy force, with a stainless steel or Delrin® ball. Note: Catalog photos are actual size.

STANDARD BALL, LIGHT FORCE

PART NO.		A	END FORCE (LBS)		B	C	D	E	F
STEEL	STAINLESS	DIA	INITIAL	FINAL			DIA	DIA	
CL-2-PBP-1	CL-2-PBPS-1	.125	.5	1	.252	.035	.093	.187	.032
CL-3-PBP-1	CL-3-PBPS-1	.188	1	2.5	.405	.058	.156	.250	.035
CL-4-PBP-1	CL-4-PBPS-1	.250	1.5	3.5	.481	.070	.188	.312	.044
CL-5-PBP-1	CL-5-PBPS-1	.312	2	5	.643	.090	.250	.375	.045
CL-6-PBP-1	CL-6-PBPS-1	.375	2.5	7	.785	.110	.312	.500	.078
CL-8-PBP-1	CL-8-PBPS-1	.500	4	9	1.130	.161	.438	.688	.088

STANDARD BALL, HEAVY FORCE

PART NO.		A	END FORCE (LBS)		B	C	D	E	F
STEEL	STAINLESS	DIA	INITIAL	FINAL			DIA	DIA	
CL-2-PBP-2	CL-2-PBPS-2	.125	.75	2.5	.252	.035	.093	.187	.032
CL-3-PBP-2	CL-3-PBPS-2	.188	2	5	.405	.058	.156	.250	.035
CL-4-PBP-2	CL-4-PBPS-2	.250	3	7	.481	.070	.188	.312	.044
CL-5-PBP-2	CL-5-PBPS-2	.312	4	10	.643	.090	.250	.375	.045
CL-6-PBP-2	CL-6-PBPS-2	.375	5	14	.785	.110	.312	.500	.078
CL-8-PBP-2	CL-8-PBPS-2	.500	8	18	1.130	.161	.438	.688	.088

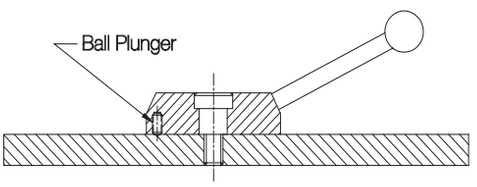


DELRIN® BALL, LIGHT FORCE

PART NO.		A	END FORCE (LBS)		B	C	D	E	F
STEEL	STAINLESS	DIA	INITIAL	FINAL			DIA	DIA	
CL-2-PBPN-1	CL-2-PBPSN-1	.125	.5	1	.252	.035	.093	.187	.032
CL-3-PBPN-1	CL-3-PBPSN-1	.188	1	2.5	.405	.058	.156	.250	.035
CL-4-PBPN-1	CL-4-PBPSN-1	.250	1.5	3.5	.481	.070	.188	.312	.044
CL-5-PBPN-1	CL-5-PBPSN-1	.312	2	5	.643	.090	.250	.375	.045
CL-6-PBPN-1	CL-6-PBPSN-1	.375	2.5	7	.785	.110	.312	.500	.078
CL-8-PBPN-1	CL-8-PBPSN-1	.500	4	9	1.130	.161	.438	.688	.088

DELRIN® BALL, HEAVY FORCE

PART NO.		A	END FORCE (LBS)		B	C	D	E	F
STEEL	STAINLESS	DIA	INITIAL	FINAL			DIA	DIA	
CL-2-PBPN-2	CL-2-PBPSN-2	.125	.75	2.5	.252	.035	.093	.187	.032
CL-3-PBPN-2	CL-3-PBPSN-2	.188	2	5	.405	.058	.156	.250	.035
CL-4-PBPN-2	CL-4-PBPSN-2	.250	3	7	.481	.070	.188	.312	.044
CL-5-PBPN-2	CL-5-PBPSN-2	.312	4	10	.643	.090	.250	.375	.045
CL-6-PBPN-2	CL-6-PBPSN-2	.375	5	14	.785	.110	.312	.500	.078
CL-8-PBPN-2	CL-8-PBPSN-2	.500	8	18	1.130	.161	.438	.688	.088



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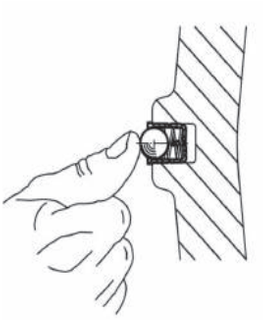
SELF-RETAINING BALL PLUNGERS

BODY: BLACK THERMOPLASTIC (POM)
BALL: STAINLESS STEEL, HARDENED
SPRING: STAINLESS STEEL

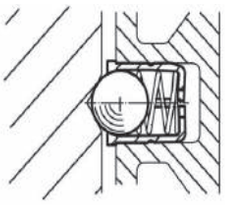


1/2 Dia **3/8 Dia** **1/4 Dia** **3/16 Dia**

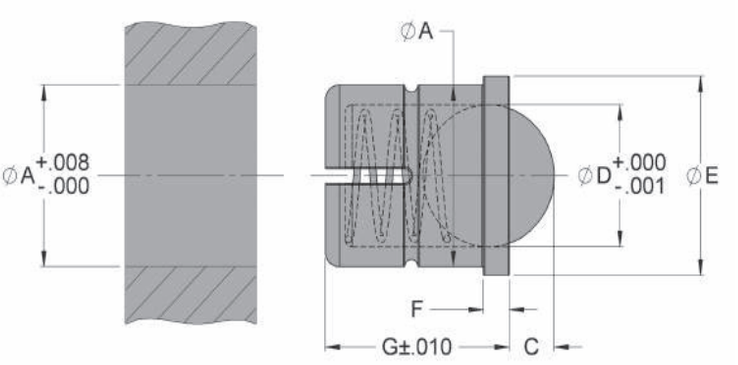
Due to their self-retaining design, these press-fit ball plungers can be securely installed in an ordinary drilled hole. The slotted end of the thermoplastic body expands to compensate for hole tolerances up to .008" oversize. Sturdy shoulder provides a fixed seating position and positively resists detent force. Installation hole can be counterbored to recess the shoulder. Note: catalog photos are actual size.



Self-Retaining Ball Plungers can often be installed by hand, due to the body's flexible design.



These plungers can be installed in a plain hole, with the shoulder exposed, or slightly counterbored for flush installation.



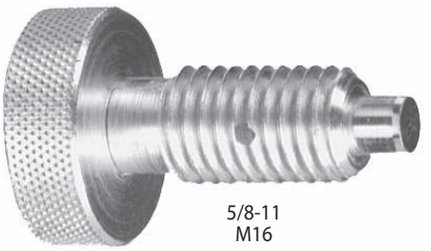
INCH

PART NO.	A DIA	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	C	D DIA	E DIA	F	G
CL-3-SRBP-1	.188	1.3	2.1	.039	.157	.220	.039	.236
CL-4-SRBP-1	.250	1.4	2.8	.059	.197	.276	.039	.276
CL-6-SRBP-1	.375	2.7	5.0	.091	.315	.433	.059	.531
CL-8-SRBP-1	.500	3.1	5.6	.126	.394	.551	.059	.630

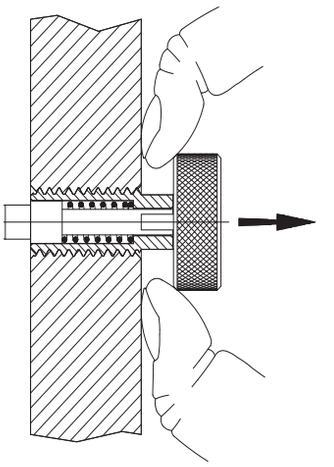
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HAND-RETRACTABLE PLUNGERS

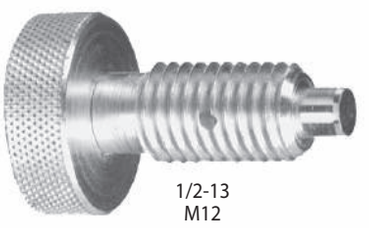
STEEL: 12L14 BODY, 12L14 PLUNGER CARBURIZED-HARDENED (OR DELRIN®, 17-7PH SPRING.
ALL STEEL COMPONENTS ZINC PLATED CLEAR CHROMATE.
STAINLESS STEEL: 300 SERIES



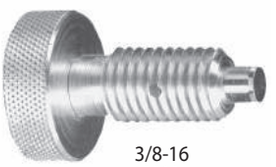
Spring-loaded plunger that locks in retracted position. To lock, pull knurled knob back and turn 90°. Standard plunger has a slight taper on plunger tip for easy alignment. Also available with a radiused Delrin® plunger (slightly larger diameter and lighter spring force). Available in steel or stainless steel. Note: Catalog photos are actual size.

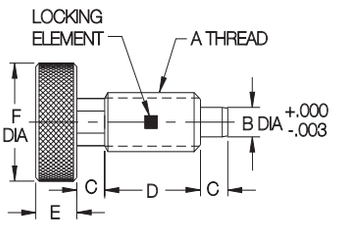


Pull knob to retract...

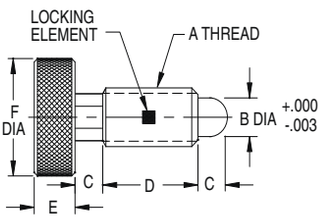


Knurled Head (Locking Type)

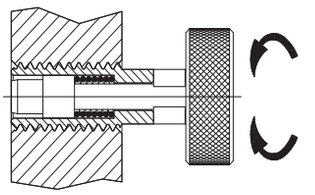




Standard Plunger



Radiused Delrin® Plunger



...then turn 90° in either direction to lock.





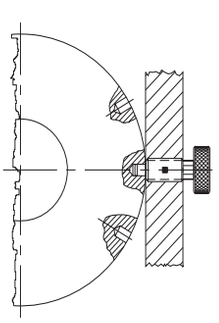


KNURLED HEAD — STEEL (INCH)

PART NO. STANDARD PLUNGER	PART NO. RADIUSED DELRIN PLUNGER	A	STANDARD PLUNGER END FORCE (LBS) INITIAL	STANDARD PLUNGER END FORCE (LBS) FINAL	STANDARD PLUNGER B DIA NOMINAL	STANDARD PLUNGER B DIA ACTUAL	RADIUSED DELRIN® PLUNGER END FORCE (LBS) INITIAL	RADIUSED DELRIN® PLUNGER END FORCE (LBS) FINAL	RADIUSED DELRIN® PLUNGER B DIA NOMINAL	RADIUSED DELRIN® PLUNGER B DIA ACTUAL	C	D	E	F DIA
CL-3-HRP	—	#10-32	1	3.5	7/64	.105	—	—	—	—	3/32	13/32	3/16	3/8
CL-4-HRP	CL-4-HRPN	1/4-20	1	5	1/8	.125	.5	2.5	5/32	.145	1/8	1/2	1/4	1/2
CL-5-HRP	CL-5-HRPN	5/16-18	1.5	6	5/32	.156	.7	3	3/16	.180	3/16	5/8	9/32	5/8
CL-6-HRP	CL-6-HRPN	3/8-16	1.5	8	3/16	.187	.7	4	7/32	.217	7/32	3/4	5/16	3/4
CL-8-HRP	CL-8-HRPN	1/2-13	2.5	10	1/4	.250	1.2	5	5/16	.311	1/4	7/8	3/8	1
CL-10-HRP	CL-10-HRPN	5/8-11	5	10	5/16	.312	3	6	3/8	.374	5/16	1	3/8	1-1/8

KNURLED HEAD — STAINLESS (INCH)

CL-3-HRP-S	—	#10-32	1	3.5	7/64	.105	—	—	—	—	3/32	13/32	3/16	3/8
CL-4-HRP-S	CL-4-HRPN-S	1/4-20	1	5	1/8	.125	.5	2.5	5/32	.145	1/8	1/2	1/4	1/2
CL-5-HRP-S	CL-5-HRPN-S	5/16-18	1.5	6	5/32	.156	.7	3	3/16	.180	3/16	5/8	9/32	5/8
CL-6-HRP-S	CL-6-HRPN-S	3/8-16	1.5	8	3/16	.187	.7	4	7/32	.217	7/32	3/4	5/16	3/4
CL-8-HRP-S	CL-8-HRPN-S	1/2-13	2.5	10	1/4	.250	1.2	5	5/16	.311	1/4	7/8	3/8	1
CL-10-HRP-S	CL-10-HRPN-S	5/8-11	5	10	5/16	.312	3	6	3/8	.374	5/16	1	3/8	1-1/8



KNURLED HEAD — STEEL (METRIC)

CLM-6-HRP	—	M6	1	5	3mm	.118	—	—	—	—	1/8	1/2	1/4	1/2
CLM-8-HRP	—	M8	1.5	6	4mm	.157	—	—	—	—	3/16	5/8	9/32	5/8
CLM-10-HRP	—	M10	1.5	8	5mm	.197	—	—	—	—	7/32	3/4	5/16	3/4
CLM-12-HRP	—	M12	2.5	10	6mm	.236	—	—	—	—	1/4	7/8	3/8	1
CLM-16-HRP	—	M16	5	10	8mm	.315	—	—	—	—	5/16	1	3/8	1-1/8

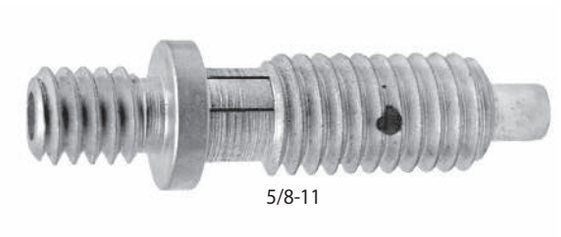
KNURLED HEAD — STAINLESS (METRIC)

CLM-6-HRP-S	—	M6	1	5	3mm	.118	—	—	—	—	1/8	1/2	1/4	
CLM-8-HRP-S	—	M8	1.5	6	4mm	.157	—	—	—	—	3/16	5/8	9/32	
CLM-10-HRP-S	—	M10	1.5	8	5mm	.197	—	—	—	—	7/32	3/4	5/16	
CLM-12-HRP-S	—	M12	2.5	10	6mm	.236	—	—	—	—	1/4	7/8	3/8	
CLM-16-HRP-S	—	M16	5	10	8mm	.315	—	—	—	—	5/16	1	3/8	

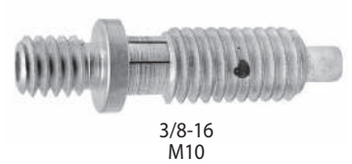
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HAND-RETRACTABLE PLUNGERS

STEEL: 12L14 BODY, 12L14 PLUNGER CARBURIZED-HARDENED, 17-7PH SPRING.
ALL STEEL COMPONENTS ZINC PLATED CLEAR CHROMATE.
STAINLESS STEEL: 300 SERIES


5/8-11

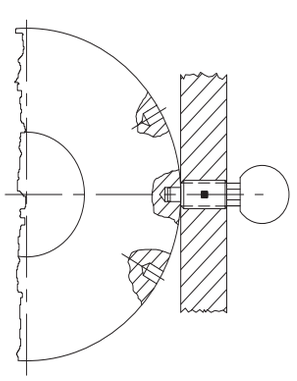

1/2-13
M12


3/8-16
M10


5/16-18
M8

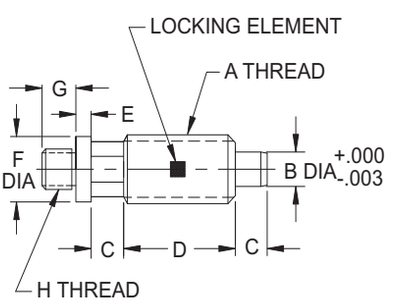

1/4-20
M6

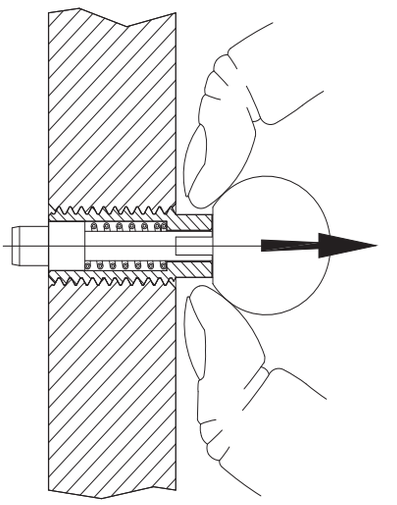

#10-32

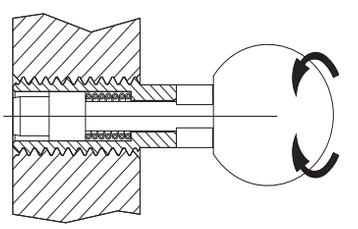


Threaded Stud for Knob Handle (Locking Type)

Spring-loaded plunger that locks in retracted position. To lock, pull knob back and turn 90°. Slight taper on plunger tip for easy alignment. Available in steel or stainless steel. The threaded-stud version shown here accepts virtually any type of knob handle (**INFO+**: order separately — available in steel, stainless steel, and several different plastics, see pages 152-159). Knob handles can be permanently secured with thread-locking adhesive if desired. Note: Catalog photos are actual size.




Pull knob to retract...


... then turn 90° in either direction to lock.

4

THREADED STUD FOR KNOB HANDLE — STEEL (INCH)

PART NO.	A	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	B DIA NOMINAL	B DIA ACTUAL	C	D	E	F DIA	G	H
CL-3-HRPT	#10-32	1	3	—	.105	3/32	13/32	5/64	5/16	15/64	#10-32
CL-4-HRPT	1/4-20	1	5	1/8	.125	1/8	1/2	3/32	5/16	15/64	#10-32
CL-5-HRPT	5/16-18	1.5	6	5/32	.156	3/16	5/8	3/32	5/16	11/32	1/4-20
CL-6-HRPT	3/8-16	1.5	8	3/16	.187	7/32	3/4	1/8	3/8	13/32	5/16-18
CL-8-HRPT	1/2-13	2.5	10	1/4	.250	1/4	7/8	1/8	1/2	7/16	3/8-16
CL-10-HRPT	5/8-11	5	10	5/16	.312	5/16	1	5/32	5/8	1/2	1/2-13

THREADED STUD FOR KNOB HANDLE — STAINLESS STEEL (INCH)

CL-3-HRPT-S	#10-32	1	3.5	7/64	.105	3/32	13/32	5/64	5/16	15/64	#10-32
CL-4-HRPT-S	1/4-20	1	5	1/8	.125	1/8	1/2	3/32	5/16	15/64	#10-32
CL-5-HRPT-S	5/16-18	1.5	6	5/32	.156	3/16	5/8	3/32	5/16	11/32	1/4-20
CL-6-HRPT-S	3/8-16	1.5	8	3/16	.187	7/32	3/4	1/8	3/8	13/32	5/16-18
CL-8-HRPT-S	1/2-13	2.5	10	1/4	.250	1/4	7/8	1/8	1/2	7/16	3/8-16
CL-10-HRPT-S	5/8-11	5	10	5/16	.312	5/16	1	5/32	5/8	1/2	1/2-13

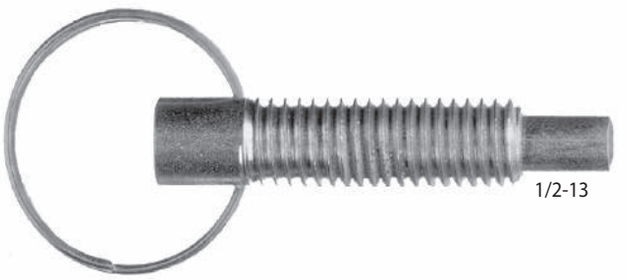
THREADED STUD FOR KNOB HANDLE — STEEL (METRIC)

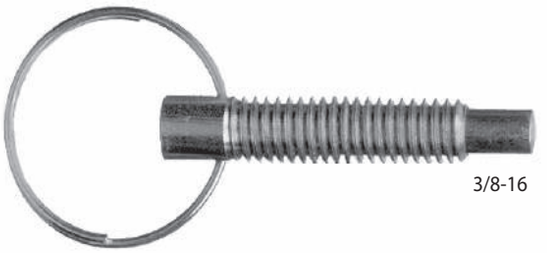
CLM-6-HRPT	M6	1	5	3mm	.1181	1/8	1/2	3/32	5/16	15/64	#10-32
CLM-8-HRPT	M8	1.5	6	4mm	.1575	3/16	5/8	3/32	5/16	11/32	1/4-20
CLM-10-HRPT	M10	1.5	8	5mm	.1969	7/32	3/4	1/8	3/8	13/32	5/16-18
CLM-12-HRPT	M12	2.5	10	6mm	.2362	1/4	7/8	1/8	1/2	7/16	3/8-16

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HAND-RETRACTABLE PLUNGERS

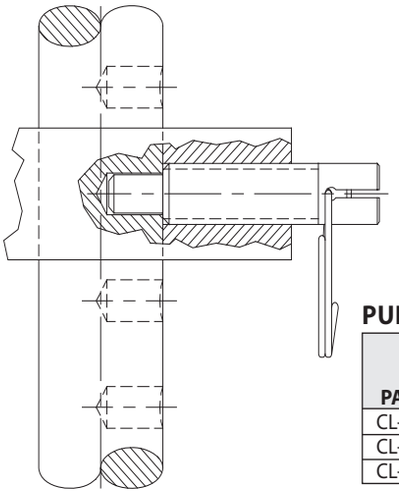
STEEL: 12L14 BODY, 12L14 PLUNGER CARBURIZED-HARDENED, 17-7PH SPRING
ALL STEEL COMPONENTS ZINC PLATED CLEAR CHROMATE
STAINLESS STEEL: 300 SERIES

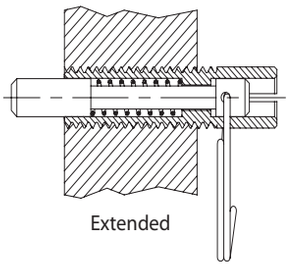


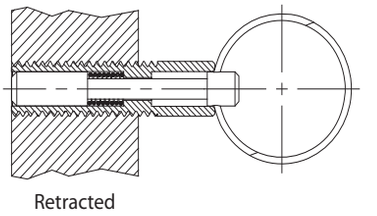




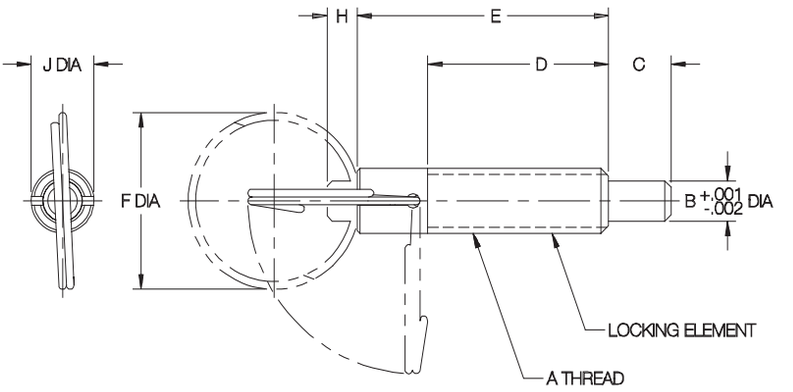
Pull Ring (Locking Type)







Spring-loaded plunger that can be withdrawn completely into the body and locked in retracted position. Comfortable pull ring allows quick actuation, yet stays out of the way when not in use. Note: Catalog photos are actual size.



PULL RING, LOCKING TYPE — STEEL (INCH)

PART NO.	A	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	B DIA	C	D	E	F DIA	H	J DIA
CL-4-PHRP	1/4-20	1	2.5	.156	1/4	13/16	1-1/8	1	7/64	1/4
CL-6-PHRP	3/8-16	2	4	.250	3/8	1-1/4	1-11/16	1-1/4	3/16	3/8
CL-8-PHRP	1/2-13	2.5	5	.312	1/2	1-7/16	2	1-3/8	1/4	1/2

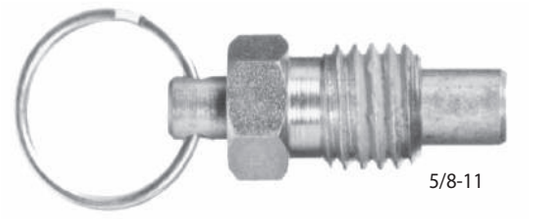
PULL RING, LOCKING TYPE — STAINLESS STEEL (INCH)

PART NO.	A	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	B DIA	C	D	E	F DIA	H	J DIA
CL-4-PHRP-S	1/4-20	1	2.5	.156	1/4	13/16	1-1/8	1	7/64	1/4
CL-6-PHRP-S	3/8-16	2	4	.250	3/8	1-1/4	1-11/16	1-1/4	3/16	3/8
CL-8-PHRP-S	1/2-13	2.5	5	.312	1/2	1-7/16	2	1-3/8	1/4	1/2

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HAND-RETRACTABLE PLUNGERS

STEEL: 12L14 BODY, 12L14 PLUNGER CARBURIZED-HARDENED, 17-7PH SPRING
ALL STEEL COMPONENTS ZINC PLATED CLEAR CHROMATE
STAINLESS STEEL: 300 SERIES



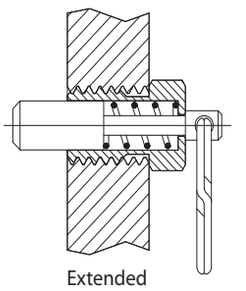


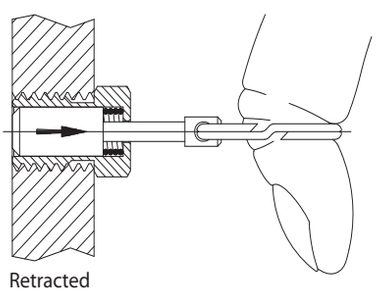


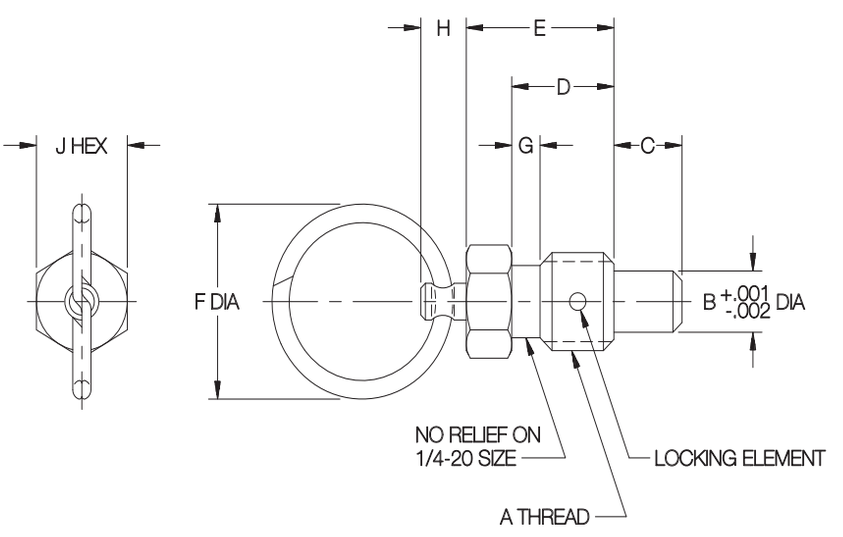


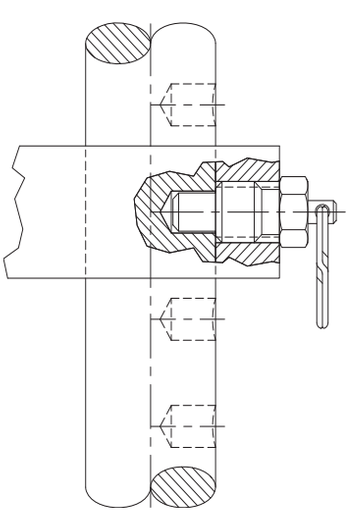
Extremely compact spring-loaded plunger that extends unless manually held in retracted position. Comfortable pull ring allows quick actuation, yet stays out of the way when not in use. Note: Catalog photos are actual size.

Pull Ring
(Non-Locking Type)









PULL RING, NON-LOCKING TYPE — STEEL (INCH)

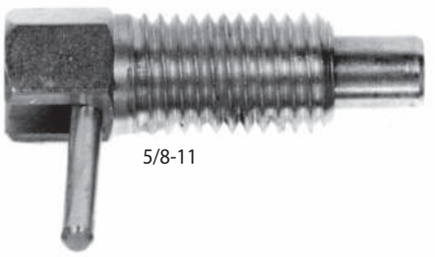
PART NO.	A	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	B DIA	C	D	E	F DIA	G	H	J
CL-4-RHRP	1/4-20	.5	2	.156	3/16	9/32	7/16	3/4	1/32	5/32	1/4
CL-6-RHRP	3/8-16	.75	3	.250	9/32	7/16	5/8		1/8	3/16	3/8
CL-8-RHRP	1/2-13	1	4	.312	3/8	9/16	13/16	1	5/32	1/4	1/2
CL-10-RHRP	5/8-11	1.25	5	.375	7/16	11/16	1			5/16	5/8

PULL RING, NON-LOCKING TYPE — STAINLESS STEEL (INCH)

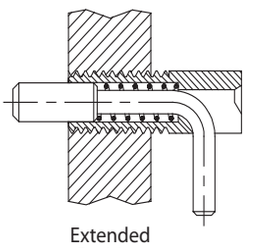
PART NO.	A	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	B DIA	C	D	E	F DIA	G	H	J
CL-4-RHRP-S	1/4-20	.5	2	.156	3/16	9/32	7/16	3/4	1/32	5/32	1/4
CL-6-RHRP-S	3/8-16	.75	3	.250	9/32	7/16	5/8		1/8	3/16	3/8
CL-8-RHRP-S	1/2-13	1	4	.312	3/8	9/16	13/16	1	5/32	1/4	1/2
CL-10-RHRP-S	5/8-11	1.25	5	.375	7/16	11/16	1			5/16	5/8

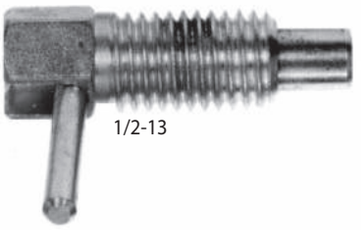
HAND-RETRACTABLE PLUNGERS

STEEL: 12L14 BODY, 12L14 PLUNGER CARBURIZED-HARDENED, 17-7PH SPRING
ALL STEEL COMPONENTS ZINC PLATED CLEAR CHROMATE
STAINLESS STEEL: 300 SERIES

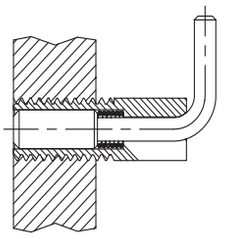

5/8-11

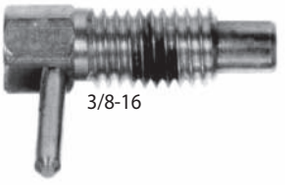
Spring-loaded plunger that locks in retracted position. Convenient L handle for quick retraction and locking. Note: Catalog photos are actual size.

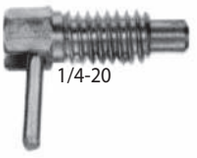

Extended Position

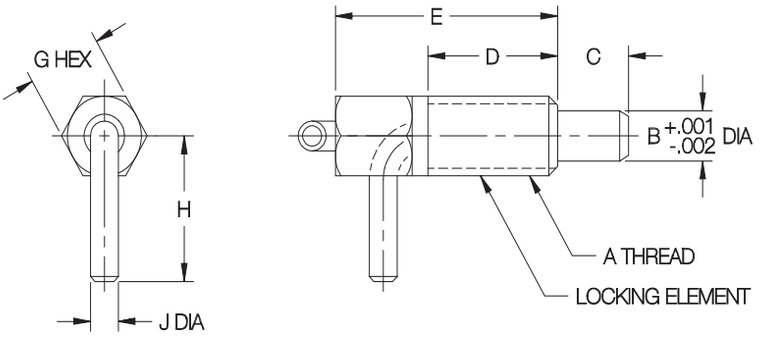

1/2-13

L Handle
Short Stroke
(Locking Type)


Retracted Position


3/8-16


1/4-20



L HANDLE, SHORT STROKE — STEEL (INCH)

PART NO.	A	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	B DIA	C	D	E	G	H	J DIA
CL-40-LHRP	1/4-20	.12	.5	.156	3/16	7/16	3/4	1/4	9/16	3/32
CL-60-LHRP	3/8-16	.25	1.25	.250	5/16	5/8	1-1/8	3/8	3/4	9/64
CL-80-LHRP	1/2-13	.5	2	.312	13/32	7/8	1-1/2	1/2	1	3/16
CL-100-LHRP	5/8-11	.75	2.5	.375	1/2	1-1/8	1-7/8	5/8	1-3/16	

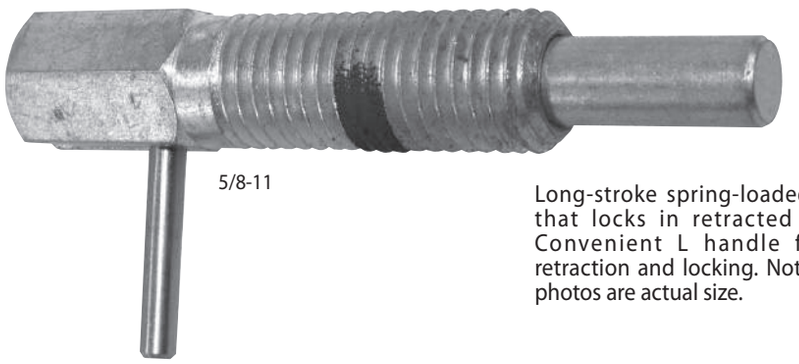
L HANDLE, SHORT STROKE — STAINLESS STEEL (INCH)

PART NO.	A	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	B DIA	C	D	E	G	H	J DIA
CL-40-LHRP-S	1/4-20	.12	.5	.156	3/16	7/16	3/4	1/4	9/16	3/32
CL-60-LHRP-S	3/8-16	.25	1.25	.250	5/16	5/8	1-1/8	3/8	3/4	9/64
CL-80-LHRP-S	1/2-13	.5	2	.312	13/32	7/8	1-1/2	1/2	1	3/16
CL-100-LHRP-S	5/8-11	.75	2.5	.375	1/2	1-1/8	1-7/8	5/8	1-3/16	

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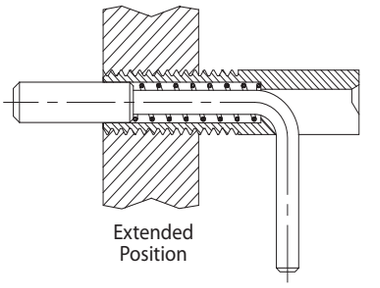
HAND-RETRACTABLE PLUNGERS

STEEL: 12L14 BODY, 12L14 PLUNGER CARBURIZED-HARDENED, 17-7PH SPRING
ALL STEEL COMPONENTS ZINC PLATED CLEAR CHROMATE
STAINLESS STEEL: 300 SERIES

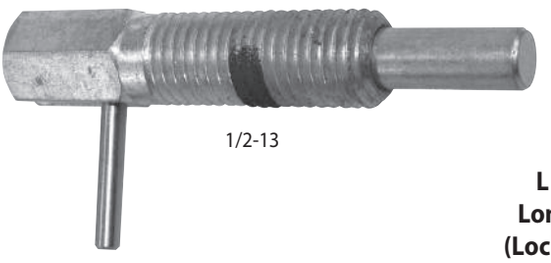


5/8-11

Long-stroke spring-loaded plunger that locks in retracted position. Convenient L handle for quick retraction and locking. Note: Catalog photos are actual size.

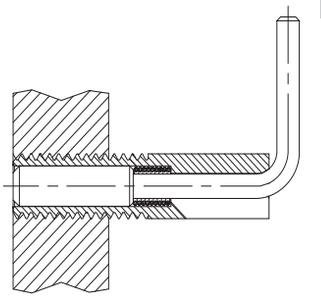


Extended Position

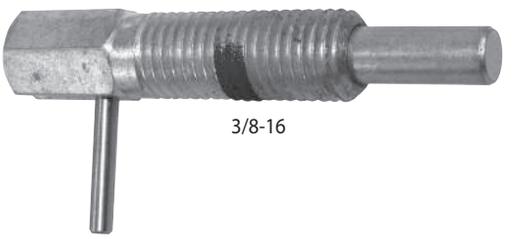


1/2-13

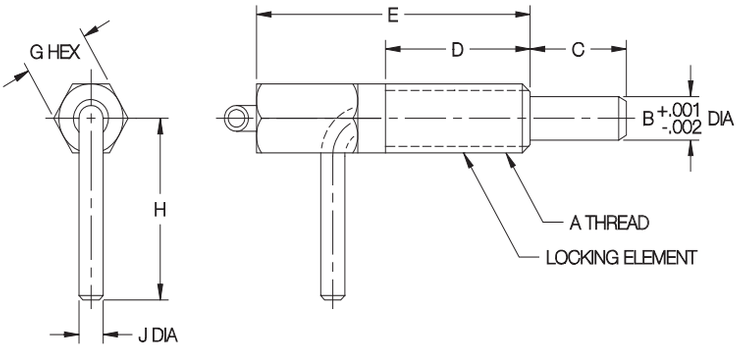
L Handle
Long Stroke
(Locking Type)

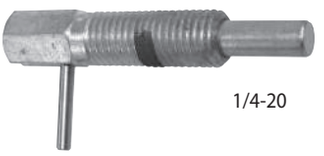


Retracted Position



3/8-16





1/4-20

L HANDLE, LONG STROKE — STEEL (INCH)

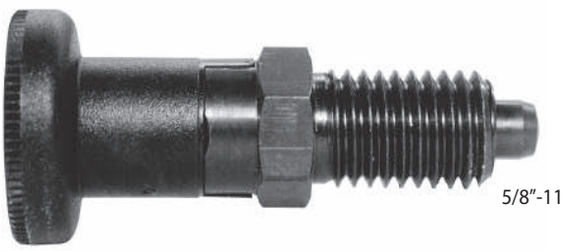
PART NO.	A	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	B DIA	C	D	E	G	H	J DIA
CL-4-LHRP	1/4-20	.5	2.5	.156	3/8	5/8	1-1/4	1/4	5/8	3/32
CL-6-LHRP	3/8-16	.75	3.75	.250	9/16	1-1/16	2	3/8	15/16	9/64
CL-8-LHRP	1/2-13	1	5	.312	3/4	1-1/8	2-1/8	1/2	1-1/4	3/16
CL-10-LHRP	5/8-11			.375	1	1-3/4	3	5/8	1-5/16	

L HANDLE, LONG STROKE — STAINLESS (INCH)

CL-4-LHRP-S	1/4-20	.5	2.5	.156	3/8	5/8	1-1/4	1/4	5/8	3/32
CL-6-LHRP-S	3/8-16	.75	3.75	.250	9/16	1-1/16	2	3/8	15/16	9/64
CL-8-LHRP-S	1/2-13	1	5	.312	3/4	1-1/8	2-1/8	1/2	1-1/4	3/16
CL-10-LHRP-S	5/8-11			.375	1	1-3/4	3	5/8	1-5/16	

HAND-RETRACTABLE PLUNGERS

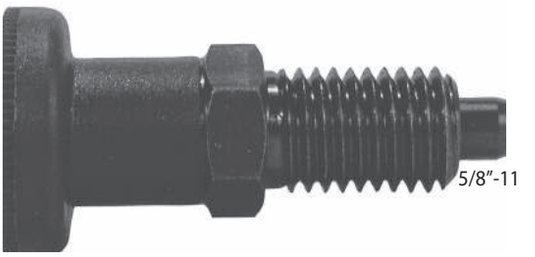
KNOB: MATTE BLACK FIBER-REINFORCED NYLON THERMOPLASTIC
PLUNGER: STEEL, HEAT TREATED.
BODY: STEEL, BLACK OXIDE FINISH

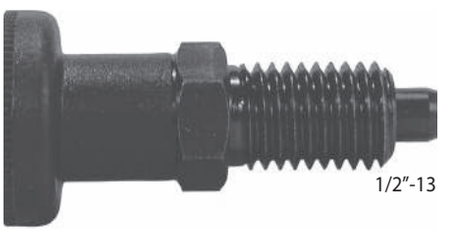






Knob Handle (Locking Type)





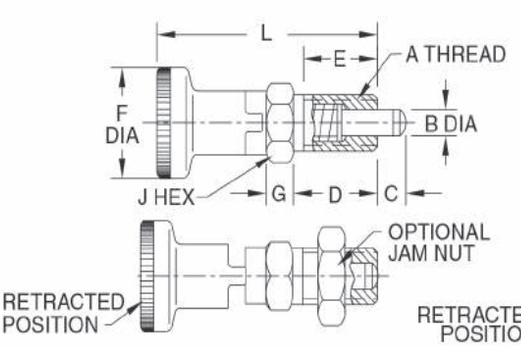


Knob Handle (Non-Locking Type)

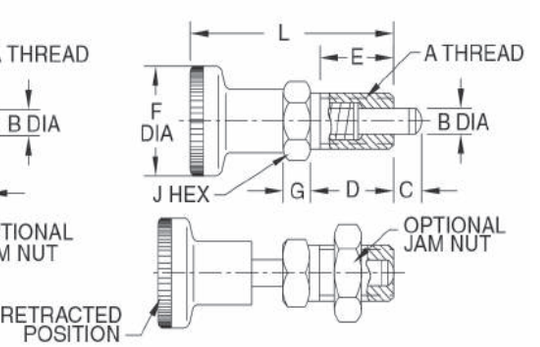
Precision indexing plunger with a attractive knob handle for convenient retraction. Threaded-body version provides adjustment and can be secured with an optional Jam Nut. High strength and durability in an extremely compact assembly (catalog photos are actual size). Hardened and ground plunger tip has a slight taper for easy alignment. Available in two types, locking and non-locking.

Locking type has a spring-loaded plunger that locks in retracted position. To lock, pull knurled knob back and turn 90°. Body is notched at 90° to keep the knob in its retracted position.

Non-locking type has a spring-loaded plunger that stays extended by spring force except when manually held in retracted position.



Locking



Non-locking

LOCKING TYPE (INCH)

PART NO.	A	B DIA NOMINAL	B DIA ACTUAL	C	D	E	F DIA	G	J	L	END FORCE (LBS) INITIAL	END FORCE (LBS) FINAL	JAM NUT (OPTIONAL)
CL-6-HRPK-L	3/8-24	5mm	.1961/.1953	.20	.67	.59	.83	.20	12mm	1.73	1.6	3.6	CL-6-FJN
CL-8-HRPK-L	1/2-13	6mm	.2354/.2346	.24	.79	.67	.98	.24	14mm	2.09	1.5	3.4	CL-8-JN
CL-10-HRPK-L	5/8-11	8mm	.3142/.3134	.28	1.02	.91	1.22	.31	19mm	2.62	2.7	7.0	CL-10-JN

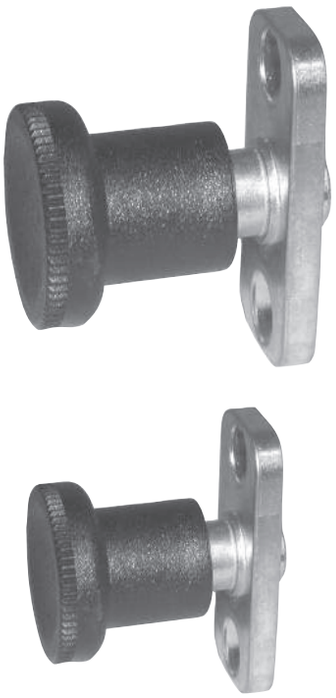
NON-LOCKING TYPE (INCH)

CL-6-HRPK-N	3/8-24	5mm	.1961/.1953	.20	.67	.59	.83	.20	12mm	1.73	1.6	3.6	CL-6-FJN
CL-8-HRPK-N	1/2-13	6mm	.2354/.2346	.24	.79	.67	.98	.24	14mm	2.09	1.5	3.4	CL-8-JN
CL-10-HRPK-N	5/8-11	8mm	.3142/.3134	.28	1.02	.91	1.22	.31	19mm	2.62	2.7	7.0	CL-10-JN

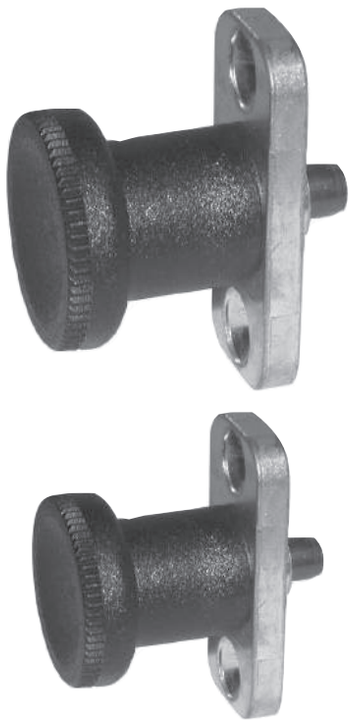
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HAND-RETRACTABLE PLUNGERS

KNOB: MATTE BLACK FIBER-REINFORCED NYLON THERMOPLASTIC
PLUNGER: STEEL, HEAT TREATED
BODY PLATE: STEEL, ZINC PLATED CLEAR CHROMATE



Knob Handle with Mounting Plate (Locking Type)



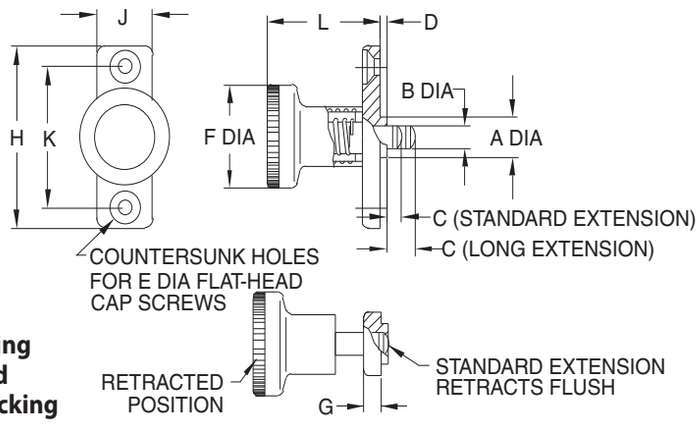
Knob Handle with Mounting Plate (Non-Locking Type)

Precision indexing plunger with an attractive knob handle for convenient retraction. Mounting-plate version installs in a fixed position with two flat-head screws, and is available with either a short or long plunger extension. High strength and durability in an extremely compact assembly (catalog photos are actual size). Hardened and ground plunger tip has a slight taper for easy alignment. Available in two types, locking and non-locking, each with a choice of short or long plunger extension.

Locking type has a spring-loaded plunger that locks in retracted position. To lock, pull knurled knob back and turn 90°. The body is notched at 90° to keep the knob in its retracted position.

Non-locking type has a spring-loaded plunger that stays extended by spring force except when manually held in retracted position.

Locking and Non-Locking



LOCKING TYPE

PART NO. STANDARD EXTENSION	PART NO. LONG EXTENSION	A DIA		B DIA		C		D	E DIA	F DIA	G	H	J	K	L	END FORCE (LBS)	
		NOMINAL	ACTUAL	NOMINAL	ACTUAL	STANDARD EXTENSION	LONG EXTENSION									INITIAL	FINAL
CL-8-HRPM-L	CL-8-HRPM-LE	10mm	.393/.390	6mm	.2354/.2346	.24	.55 (.24 stroke)	.10	#8 or M4	.98	.18	1.57	.71	1.181	1.12	1.9	4.9
CL-10-HRPM-L	CL-10-HRPM-LE	12mm	.472/.468	8mm	.3142/.3134	.31	.71 (.31 stroke)		#10 or M5	1.22	.22	1.81	.79	1.339	1.32	3.5	6.3

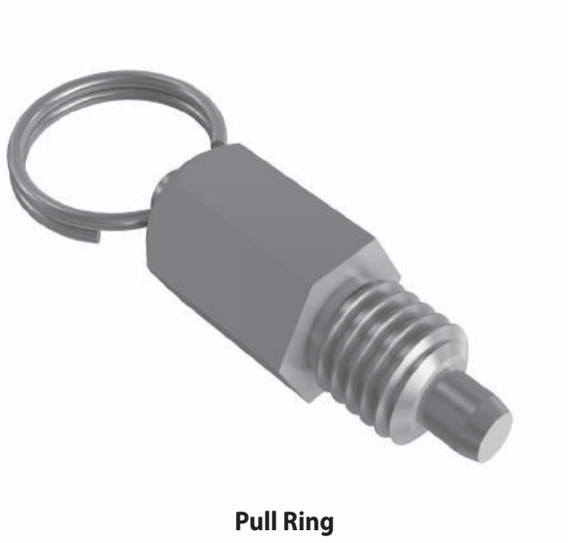
NON-LOCKING TYPE

CL-8-HRPM-N	CL-8-HRPM-NE	10mm	.393/.390	6mm	.2354/.2346	.24	.55 (.24 stroke)	.10	#8 or M4	.98	.18	1.57	.71	1.181	1.12	1.9	4.9
CL-10-HRPM-N	CL-10-HRPM-NE	12mm	.472/.468	8mm	.3142/.3134	.31	.71 (.31 stroke)		#10 or M5	1.22	.22	1.81	.79	1.339	1.32	3.5	6.3

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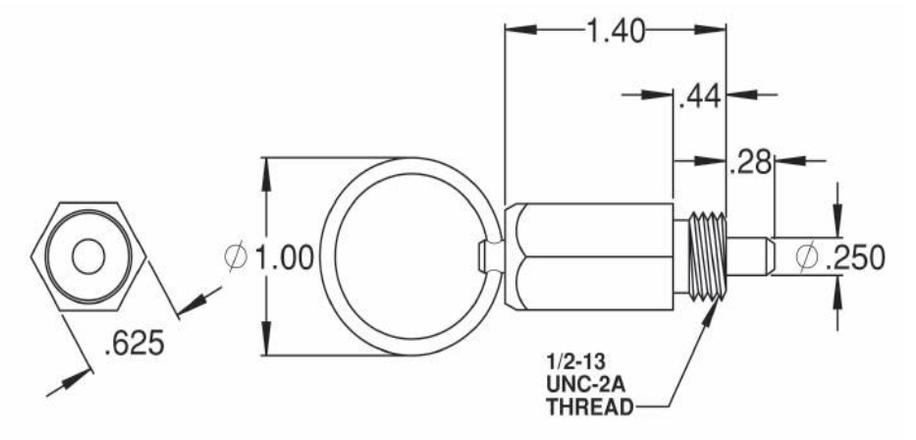
HAND-RETRACTABLE PLUNGERS

PLUNGER: MILD STEEL, CARBURIZED HARDENED, ZINC PLATED CLEAR CHROMATE
BODY: MILD STEEL, ZINC PLATED CLEAR CHROMATE
SPRING: SPRING STEEL



Pull Ring
(Extended-Locking Type)

This unique, quick-release pull pin positively locks in extended position. The hand-retractable plunger tip automatically locks in the forward position unless manually disengaged by pulling the ring, rather than being held forward by spring force. Slight taper on plunger tip for easy alignment. **Patent no. 8,821,061.** Made in USA.



INCH

PART NO.	BODY THREAD	END FORCE	PLUNGER DIA	PLUNGER LENGTH	BODY LENGTH	RING DIA	BODY HEX
CL-8-EHRP	1/2-13	Locked	.250	.28	1.40	1.00	5/8

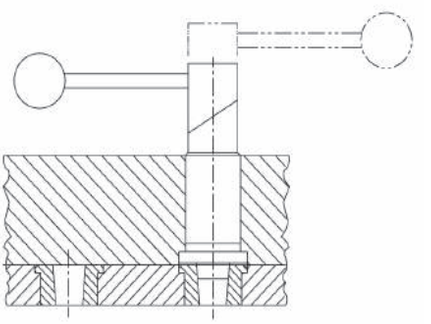
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TAPERED INDEX PLUNGERS

PLUNGER, BODY, CAM, AND BUSHING: 1144 STEEL, HEAT TREATED. CENTER SHAFT: 11L44 STEEL. SPRING: MUSIC WIRE.
BALL KNOB: BLACK PHENOLIC PLASTIC WITH MOLDED-IN BRASS INSERT

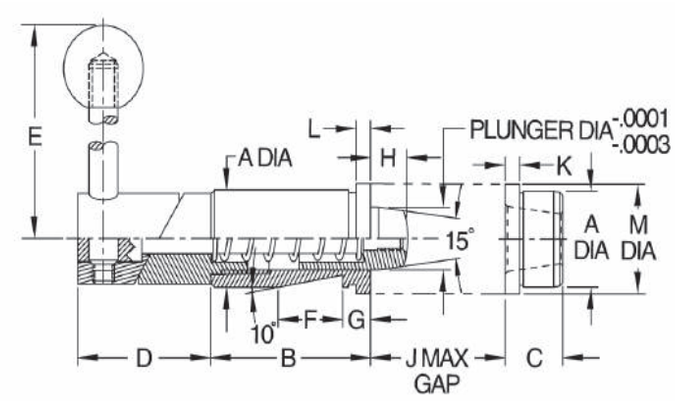


Tapered Index Plungers
Rotary Cam
Standard Mount



Index Plungers are precision, heavy-duty assemblies with a retractable spring-loaded plunger and a matching locating bushing. Tapered Index Plungers feature a 15° taper on the plunger tip with a mating taper on the bushing. The taper makes alignment easier and also eliminates any binding during retraction. Straight Index Plungers have an entirely cylindrical plunger with a slight radius at the tip, used together with a straight bushing. A straight plunger provides slightly greater positional accuracy. Order plunger and bushing separately.

The rotary-cam version completely retracts when the handle is rotated 180°. Cam surfaces are hardened steel. The standard-mount configuration has a precision ground body with a whistle notch for orientation with a setscrew (also available with a slightly oversize unground body to allow custom grinding to size). Index Plungers are manufactured with precision working tolerances and are designed for very light interference-fit installations to avoid binding of the mechanism. Set screws with nylon tip inserts are recommended. Set screws should firmly contact the whistle notch, but not exert significant force.



TAPERED INDEX PLUNGERS — ROTARY CAM, STANDARD MOUNT (INCH)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	E	F	G	H	J	K	N DIA	N DIA
			NOMINAL	GROUND	UNGROUND											
CL-22018-TIP	CL-22032-TIPB	1/2	3/4	.7518/.7515	—	1-3/8	1/2	1-1/8	3	7/16	5/16	5/16	3/32	1/8	1/8	7/8
CL-22016-TIP	CL-22030-TIPB			—	.766/.765											
CL-22118-TIP	CL-22132-TIPB	3/4	1-1/8	1.1268/1.1265	—	2	5/8	1-5/8	3-1/2	9/16	3/8	13/32	1/8	1/8	1/8	1-1/4
CL-22116-TIP	CL-22130-TIPB			—	1.141/1.140											
CL-22218-TIP	CL-22232-TIPB	1	1-1/2	1.5021/1.5018	—	2-1/4	3/4	2-1/8	4-1/2	11/16	7/16	7/16	1/8	1/8	1/8	1-5/8
CL-22216-TIP	CL-22230-TIPB			—	1.516/1.515											

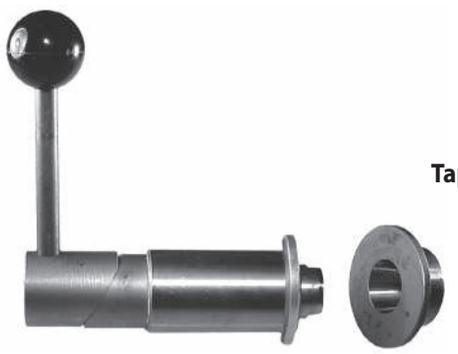
TAPERED INDEX PLUNGERS — ROTARY CAM, STANDARD MOUNT (METRIC)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	E	F	G	H	J	K	N DIA	N DIA
			NOMINAL	GROUND	UNGROUND											
CLM-22018-TIP	CLM-22032-TIPB	12mm	20mm	.7892/.7889	—	35mm	12mm	1-1/8	3	7/16	5/16	5/16	3/32	3mm	3mm	22mm
CLM-22118-TIP	CLM-22132-TIPB	20mm	30mm	1.1829/1.1826	—	51mm	16mm	1-5/8	3-1/2	9/16	3/8	13/32	1/8	3mm	3mm	32mm

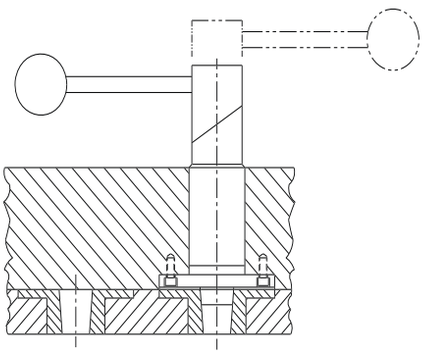
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TAPERED INDEX PLUNGERS

PLUNGER, BODY, RETAINER, AND CAM: 1144 STEEL, HEAT TREATED. CENTER SHAFT: 11L44 STEEL.SPRING: MUSIC WIRE.
BALL KNOB: BLACK PHENOLIC PLASTIC WITH MOLDED-IN BRASS INSERT

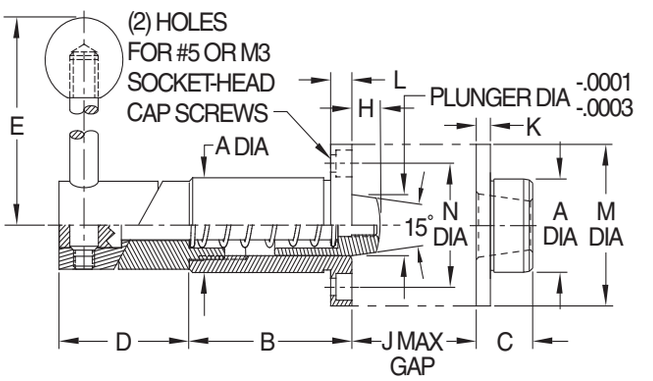


Tapered Index Plungers
Rotary Cam
Flange Mount



Index Plungers are precision, heavy-duty assemblies with a retractable spring-loaded plunger and a matching locating bushing. Tapered Index Plungers feature a 15° taper on the plunger tip with a mating taper on the bushing. The taper makes alignment easier and also eliminates any binding during retraction. Straight Index Plungers have an entirely cylindrical plunger with a slight radius at the tip, used together with a straight bushing. A straight plunger provides slightly greater positional accuracy. Order plunger and bushing separately.

The rotary-cam version completely retracts when the handle is rotated 180°. Cam surfaces are hardened steel. The flange-mount configuration shown here has a precision ground body with a flange used for orientation by fastening with two Socket-Head Cap Screws (also available with a slightly oversize unground body to allow custom grinding to size). Flange mounting is designed for installations where a cross hole for a set screw is not practical. Index plungers are manufactured with precision working tolerances and are designed for a very light interference-fit installations to avoid binding of the mechanism.



TAPERED INDEX PLUNGERS — ROTARY CAM, FLANGE MOUNT (INCH)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	E	H	J	K	L	M DIA	N DIA
			NOMINAL	GROUND	UNGROUND										
CL-22019-TIP	CL-22033-TIPB	1/2	3/4	.7518/.7515	—	1-3/8	1/2	1-1/8	3	5/16	3/32	1/8	3/16	1-5/16	1
CL-22017-TIP	CL-22031-TIPB			—	.766/.765										
CL-22119-TIP	CL-22133-TIPB	3/4	1-1/8	1.1268/1.1265	—	2	5/8	1-1/2	3-1/2	13/32	1/8	1/8	3/16	1-11/16	1-3/8
CL-22117-TIP	CL-22131-TIPB			—	1.141/1.140										

TAPERED INDEX PLUNGERS — ROTARY CAM, FLANGE MOUNT (METRIC)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	E	H	J	K	L	M DIA	N DIA
			NOMINAL	GROUND	UNGROUND										
CLM-22019-TIP	CLM-22033-TIPB	12mm	20mm	.7892/.7889	-----	35mm	12mm	1-1/8	3	5/16	3/32	3mm	5mm	34mm	25mm
CLM-22119-TIP	CLM-22133-TIPB	20mm	30mm	1.1829/1.1826	-----	51mm	16mm	1-5/8	3-1/2	13/32	1/8	3mm	5mm	42mm	35mm

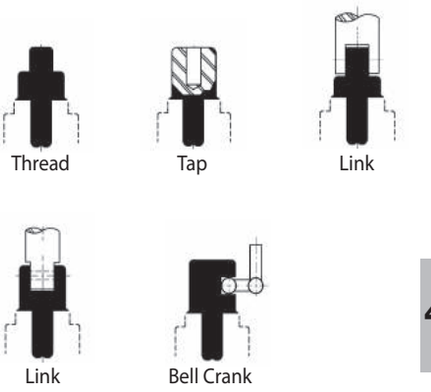
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TAPERED INDEX PLUNGERS

PLUNGER, BODY, CAM, AND BUSHING: 1144 STEEL, HEAT TREATED. CENTER SHAFT: 11L44 STEEL. SPRING: MUSIC WIRE.

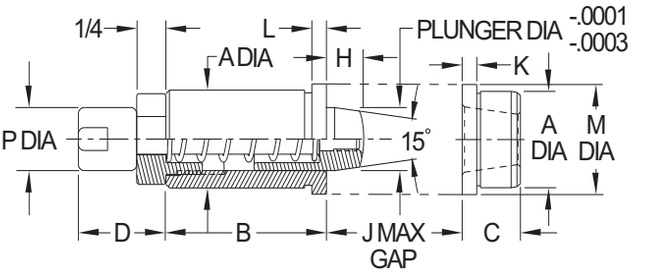


Tapered Index Plunger
Blank Machinable End



Index Plungers are precision, heavy-duty assemblies with a retractable spring-loaded plunger and a matching locating bushing. Tapered Index Plungers feature a 15° taper on the plunger tip with a mating taper in the bushing. The taper makes alignment easier and also eliminates any binding during retraction. Straight Index Plungers have an entirely cylindrical plunger with a slight radius at the tip, used together with a straight bushing. A straight plunger provides slightly greater positional accuracy. Order plunger and bushing separately.

The version shown on this page has a blank machinable end for easy adaptation to various actuating devices, including automated setups. Precision ground body (also available with a slightly oversize unground body to allow custom grinding to size). Index Plungers are manufactured with precision working tolerances and are designed for a very light interference-fit installations to avoid binding of the mechanism.



TAPERED INDEX PLUNGERS — BLANK MACHINABLE END (INCH)

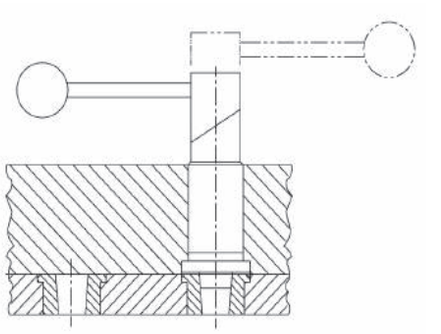
PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	H	J	K	L	M DIA	P DIA
			NOMINAL	GROUND	UNGROUND									
CL-22014-TIP	CL-22032-TIPB	1/2	3/4	.7518/.7515	—	1-3/8	1/2	3/4	5/16	3/32	1/8	1/8	7/8	1/2
CL-22012-TIP	CL-22030-TIPB			—	.766/.765									
CL-22114-TIP	CL-22132-TIPB	3/4	1-1/8	1.1268/1.1265	—	2	5/8	1	3/8	1/8	1/8	1/8	1-1/4	3/4
CL-22112-TIP	CL-22130-TIPB			—	1.141/1.140									
CL-22214-TIP	CL-22232-TIPB	1	1-1/2	1.5021/1.5018	—	2-1/4	3/4	1-1/4	3/8	1/8	1/8	1/8	1-5/8	15/16
CL-22212-TIP	CL-22230-TIPB			—	1.5021/1.5018									

STRAIGHT INDEX PLUNGERS

PLUNGER, BODY, CAM, AND BUSHING: 1144 STEEL, HEAT TREATED. CENTER SHAFT: 11L44 STEEL. SPRING: MUSIC WIRE.
BALL KNOB: BLACK PHENOLIC PLASTIC WITH MOLDED-IN BRASS INSERT

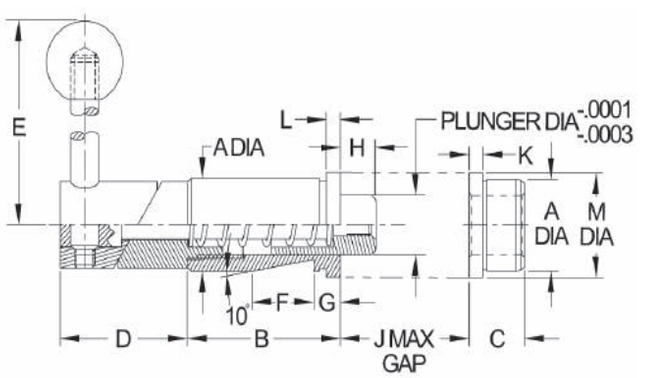


Straight Index Plungers
Rotary Cam
Standard Mount



Index Plungers are precision, heavy-duty assemblies with a retractable spring-loaded plunger and a matching locating bushing. Tapered Index Plungers feature a 15° taper on the plunger tip with a mating taper on the bushing. The taper makes alignment easier and also eliminates any binding during retraction. Straight Index Plungers have an entirely cylindrical plunger with a slight radius at the tip, used together with a straight bushing. A straight plunger provides slightly greater positional accuracy. Order plunger and bushing separately.

The rotary-cam version completely retracts when the handle is rotated 180°. Cam surfaces are hardened steel. The standard-mount configuration has a precision ground body with a whistle notch for orientation with a setscrew (also available with a slightly oversize unground body to allow custom grinding to size). Index Plungers are manufactured with precision working tolerances and are designed for very light interference-fit installations to avoid binding of the mechanism. Set screws with nylon tip inserts are recommended. Set screws should firmly contact the whistle notch, but not exert significant force.



STRAIGHT INDEX PLUNGERS — ROTARY CAM, STANDARD MOUNT (INCH)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	E	F	G	H	J	K	N DIA	N DIA
			NOMINAL	GROUND	UNGROUND											
CL-22006-SIP	CL-22028-SIPB	1/2	3/4	.7518/.7515	—	1-3/8	1/2	1-1/8	3	7/16	5/16	5/16	3/32	1/8	1/8	7/8
CL-22004-SIP	CL-22026-SIPB				.766/.765											
CL-22106-SIP	CL-22128-SIPB	3/4	1-1/8	1.1268/1.1265	—	2	5/8	1-1/2	3-1/2	9/16	3/8	13/32	1/8	1/8	1/8	1-1/4
CL-22104-SIP	CL-22126-SIPB				1.141/1.140											
CL-22206-SIP	CL-22228-SIPB	1	1-1/2	1.5021/1.5018	—	2-1/4	3/4	1-7/8	4-1/2	11/16	7/16	7/16	1/8	1/8	1/8	1-5/8
CL-22204-SIP	CL-22226-SIPB				1.516/1.515											

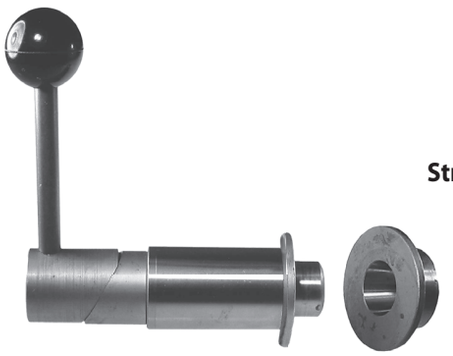
STRAIGHT INDEX PLUNGERS — ROTARY CAM, STANDARD MOUNT (METRIC)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	E	F	G	H	J	K	N DIA	N DIA
			NOMINAL	GROUND	UNGROUND											
CLM-22006-SIP	CLM-22028-SIPB	12mm	20mm	.7892/.7889	—	35mm	12mm	1-1/8	3	7/16	5/16	5/16	3/32	3mm	3mm	22mm
CLM-22106-SIP	CLM-22128-SIPB	20mm	30mm	1.1829/1.1826	—	51mm	16mm	1-5/8	3-1/2	9/16	3/8	13/32	1/8	3mm	3mm	32mm

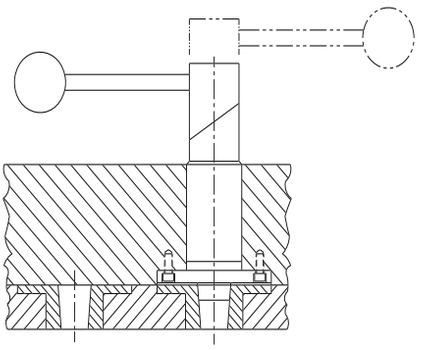
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STRAIGHT INDEX PLUNGERS

PLUNGER, BODY, RETAINER, AND CAM: 1144 STEEL, HEAT TREATED. CENTER SHAFT: 11L44 STEEL.SPRING: MUSIC WIRE.
BALL KNOB: BLACK PHENOLIC PLASTIC WITH MOLDED-IN BRASS INSERT

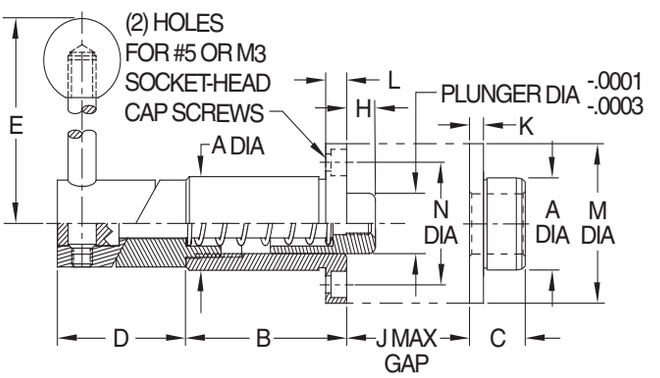


Straight Index Plungers
Rotary Cam
Flange Mount



Index Plungers are precision, heavy-duty assemblies with a retractable spring-loaded plunger and a matching locating bushing. Tapered Index Plungers feature a 15° taper on the plunger tip with a mating taper on the bushing. The taper makes alignment easier and also eliminates any binding during retraction. Straight Index Plungers have an entirely cylindrical plunger with a slight radius at the tip, used together with a straight bushing. A straight plunger provides slightly greater positional accuracy. Order plunger and bushing separately.

The rotary-cam version completely retracts when the handle is rotated 180°. Cam surfaces are hardened steel. The flange-mount configuration shown here has a precision ground body with a flange used for orientation by fastening with two Socket-Head Cap Screws (also available with a slightly oversize unground body to allow custom grinding to size). Flange mounting is designed for installations where a cross hole for a set screw is not practical. Index plungers are manufactured with precision working tolerances and are designed for a very light interference-fit installations to avoid binding of the mechanism.



STRAIGHT INDEX PLUNGERS — ROTARY CAM, FLANGE MOUNT (INCH)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	E	H	J	K	L	M DIA	N DIA
			NOMINAL	GROUND	UNGROUND										
CL-22007-SIP	CL-22029-SIPB	1/2	3/4	.7518/.7515	—	1-3/8	1/2	1-1/8	3	5/16	3/32	1/8	3/16	1-5/16	1
CL-22005-SIP	CL-22027-SIPB			—	.766/.765										
CL-22107-SIP	CL-22129-SIPB	3/4	1-1/8	1.1268/1.1265	—	2	5/8	1-1/2	3-1/2	13/32	1/8	1/8	3/16	1-11/16	1-3/8
CL-22105-SIP	CL-22127-SIPB			—	1.141/1.140										

STRAIGHT INDEX PLUNGERS — ROTARY CAM, FLANGE MOUNT (METRIC)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	E	F	G	H	J	K	N DIA
			NOMINAL	GROUND	UNGROUND										
CLM-22007-SIP	CLM-22029-SIPB	12mm	20mm	.7892/.7889	—	35mm	12mm	1-1/8	3	5/16	3/32	3mm	5mm	34mm	25mm
CLM-22107-SIP	CLM-22129-SIPB	20mm	30mm	1.1829/1.1826	—	51mm	16mm	1-5/8	3-1/2	13/32	1/8	3mm	5mm	42mm	35mm

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STRAIGHT INDEX PLUNGERS

PLUNGER, BODY, CAM, AND BUSHING: 1144 STEEL, HEAT TREATED. CENTER SHAFT: 11L44 STEEL. SPRING: MUSIC WIRE.

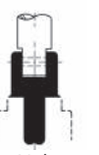


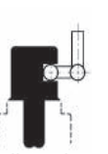
Straight Index Plunger
Blank Machinable End


Thread


Tap


Link

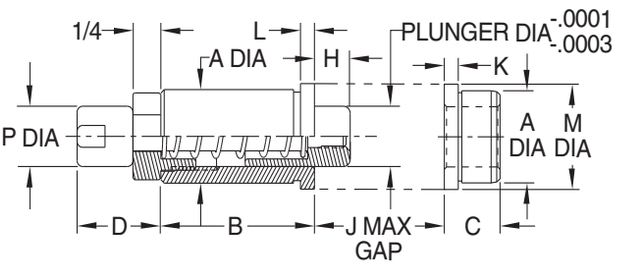

Link


Bell Crank

4

Index Plungers are precision, heavy-duty assemblies with a retractable spring-loaded plunger and a matching locating bushing. Tapered Index Plungers feature a 15° taper on the plunger tip with a mating taper in the bushing. The taper makes alignment easier and also eliminates any binding during retraction. Straight Index Plungers have an entirely cylindrical plunger with a slight radius at the tip, used together with a straight bushing. A straight plunger provides slightly greater positional accuracy. Order plunger and bushing separately.

The version shown on this page has a blank machinable end for easy adaptation to various actuating devices, including automated setups. Precision ground body (also available with a slightly oversize unground body to allow custom grinding to size). Index Plungers are manufactured with precision working tolerances and are designed for a very light interference-fit installations to avoid binding of the mechanism.



STRAIGHT INDEX PLUNGERS — BLANK MACHINABLE END (INCH)

PART NO. INDEX PLUNGER	PART NO. BUSHING	PLUNGER DIA	A DIA			B	C	D	H	J	K	L	M DIA	P DIA
			NOMINAL	GROUND	UNGROUND									
CL-22002-SIP	CL-22028-SIPB	1/2	3/4	.7518/.7515	—	1-3/8	1/2	3/4	5/16	3/32	1/8	1/8	7/8	1/2
CL-22102-SIP	CL-22128-SIPB	3/4	1-1/8	1.1268/1.1265	—	2	5/8	1	1/2	1/8	1/8	1/8	1-1/4	3/4
CL-22202-SIP	CL-22228-SIPB	1	1-1/2	1.5021/1.5018	—	2-1/4	3/4	1-1/4	5/8	1/8	1/8	1/8	1-5/8	15/16

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SPRING STOP BUTTONS

BODY: ALUMINUM ALLOY; SPRING: SPRING STEEL (OR STAINLESS STEEL)
PLUNGER: MILD STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH (OR STAINLESS STEEL, OR DELRIN®)



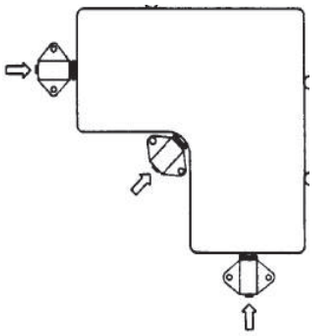
Large
CL-30A-SSB



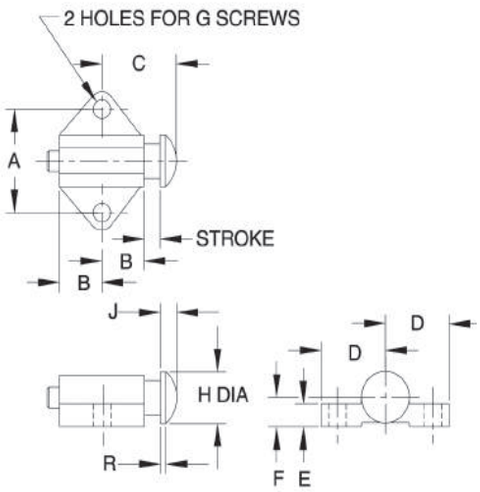
Medium
CL-20A-SSB



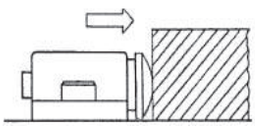
Small
CL-10A-SSB



Spring Stop Buttons are ideal for holding a workpiece against its locators until clamps are in place, and for other light clamping jobs. Choice of three sizes in each type. The smallest of the three sizes is optionally available with light spring force. Note: Catalog photos are actual size.



Type A
Spherical Radius



Spring-loaded plunger has a spherical radius to exert contact force at a single point. Choice of steel, stainless steel, or Delrin® plunger.

TYPE A – SPHERICAL RADIUS (STEEL)

PART NO. STANDARD FORCE	PART NO. LIGHT FORCE	STROKE	STANDARD CONTACT FORCE (LBS)			LIGHT CONTACT FORCE (LBS)			A	B	C	D	E	F	G DIA	H DIA	J	R
			INITIAL	HALFWAY	FINAL	INITIAL	HALFWAY	FINAL										
CL-10A-SSB	CL-10A-SSB-2	1/8	5	10	15	1.5	2	2.5	.656	11/32	19/32	7/16	3/16	7/32	#6-32 or M3.5	3/8	1/8	1/16
CL-20A-SSB	—	3/16	2	14	26	—	—	—	1.125	1/2	7/8	3/4	1/4	5/16	#10-32 or M5	9/16	3/16	1/16
CL-30A-SSB	—	1/4	16	32	48	—	—	—	1.500	11/16	1-7/32	1	1/4	7/16	1/4-20 or M6	13/16	9/32	9/64

TYPE A – SPHERICAL RADIUS (STAINLESS STEEL)

CL-10A-SSB-S	CL-10A-SSB-2-S	1/8	5	10	15	1.5	2	2.5	.656	11/32	19/32	7/16	3/16	7/32	#6-32 or M3.5	3/8	1/8	1/16
CL-20A-SSB-S	—	3/16	2	14	26	—	—	—	1.125	1/2	7/8	3/4	1/4	5/16	#10-32 or M5	9/16	3/16	1/16
CL-30A-SSB-S	—	1/4	16	32	48	—	—	—	1.500	11/16	1-7/32	1	1/4	7/16	1/4-20 or M6	13/16	9/32	9/64

TYPE A – SPHERICAL RADIUS (DELRIN®)

CL-10A-SSBN	CL-10A-SSBN-2	1/8	5	10	15	1.5	2	2.5	.656	11/32	19/32	7/16	3/16	7/32	#6-32 or M3.5	3/8	1/8	1/16
CL-20A-SSBN	—	3/16	2	14	26	—	—	—	1.125	1/2	7/8	3/4	1/4	5/16	#10-32 or M5	9/16	3/16	1/16
CL-30A-SSBN	—	1/4	16	32	48	—	—	—	1.500	11/16	1-7/32	1	1/4	7/16	1/4-20 or M6	13/16	9/32	9/64

SPRING STOP BUTTONS

BODY: ALUMINUM ALLOY; SPRING: SPRING STEEL
PLUNGER: MILD STEEL, CARBURIZED-HARDENED, ZINC PLATED CLEAR CHROMATE



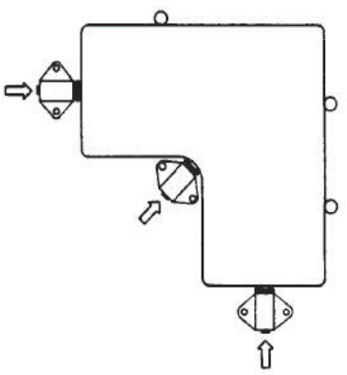
Large
CL-30B-SSB



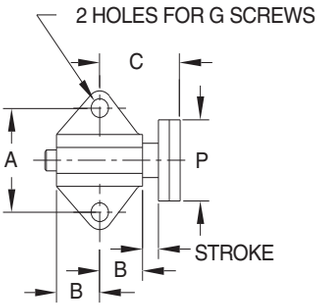
Medium
CL-20B-SSB



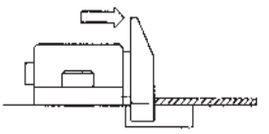
Small
CL-10B-SSB

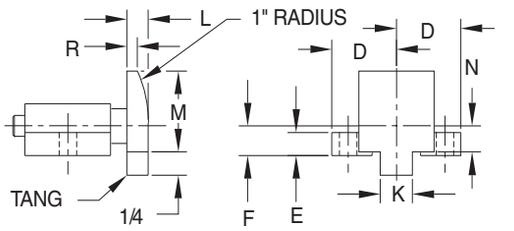


Spring Stop Buttons are ideal for holding a workpiece against its locators until clamps are in place, and for other light clamping jobs. Choice of three sizes in each type. The smallest of the three sizes is optionally available with light spring force. Note: Catalog photos are actual size.



Type B
Flat Face with Tang





Designed for thin workpieces and sheets. Tang prevents sheet from sliding under plunger. Requires machining a slot in the fixture base for the tang. Large bevel on plunger makes loading easier.

TYPE B – FLAT FACE WITH TANG (STEEL)

PART NO. STANDARD FORCE	PART NO. LIGHT FORCE	STROKE	STANDARD CONTACT FORCE (LBS)			LIGHT CONTACT FORCE (LBS)			A	B	C	D	E	F	G DIA	K	L	M	N	P	R
			INITIAL	HALFWAY	FINAL	INITIAL	HALFWAY	FINAL													
CL-10B-SSB	CL-10B-SSB-2	1/8	5	10	15	1.5	2	2.5	.656	11/32	21/32	7/16	3/16	7/32	#6-32 or M3.5	1/4	3/16	5/8	3/16	5/8	1/16
CL-20B-SSB	—	3/16	2	14	26	—	—	—	1.125	1/2	15/16	3/4	1/4	5/16	#10-32 or M5	3/8	1/4	7/8	9/32	7/8	3/32
CL-30B-SSB	—	1/4	16	32	48	—	—	—	1.500	11/16	1-5/16	1	1/4	7/16	1/4-20 or M6	1/2	3/8	1-1/4	13/32	1-1/4	3/32

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SPRING STOP BUTTONS

BODY: ALUMINUM ALLOY; SPRING: SPRING STEEL
PLUNGER: MILD STEEL, CARBURIZED-HARDENED, ZINC PLATED CLEAR CHROMATE



Large
CL-30C-SSB

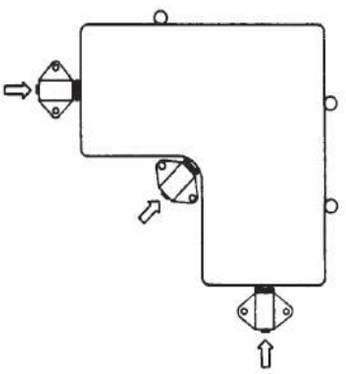


Medium
CL-20C-SSB

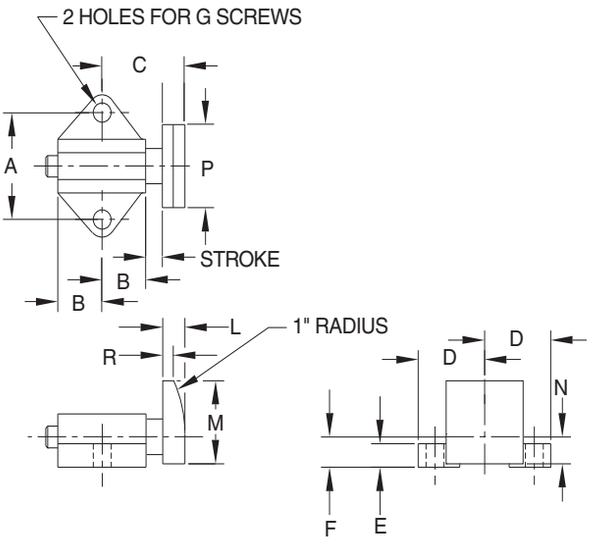


Small
CL-10C-SSB

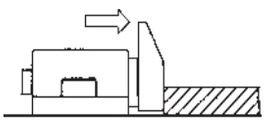
4



Spring Stop Buttons are ideal for holding a workpiece against its locators until clamps are in place, and for other light clamping jobs. Choice of three sizes in each type. The smallest of the three sizes is optionally available with light spring force. Note: Catalog photos are actual size.



Type C
Flat Face



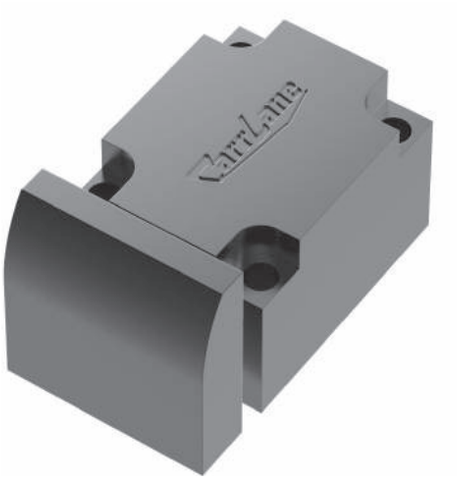
Flat contact surface is ideal for short workpieces.
Large bevel on plunger makes loading easier.

TYPE C – FLAT FACE (STEEL)

PART NO. STANDARD FORCE	PART NO. LIGHT FORCE	STROKE	STANDARD CONTACT FORCE (LBS)			LIGHT CONTACT FORCE (LBS)			A	B	C	D	E	F	G DIA	K	L	M	N	P	R
			INITIAL	HALFWAY	FINAL	INITIAL	HALFWAY	FINAL													
CL-10C-SSB	CL-10C-SSB-2	1/8	5	10	15	1.5	2	2.5	.656	11/32	21/32	7/16	3/16	7/32	#6-32 or M3.5	—	3/16	5/8	3/16	5/8	1/16
CL-20C-SSB	—	3/16	2	14	26	—	—	—	1.125	1/2	15/16	3/4	1/4	5/16	#10-32 or M5	—	1/4	7/8	9/32	7/8	3/32
CL-30C-SSB	—	1/4	16	32	48	—	—	—	1.500	11/16	1-5/16	1	1/4	7/16	1/4-20 or M6	—	3/8	1-1/4	13/32	1-1/4	3/32

HEAVY-DUTY SPRING STOPS

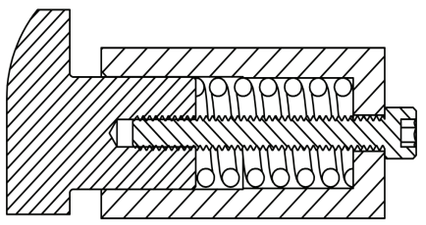
BODY: 1018 STEEL, BLACK OXIDE FINISH
PLUNGER: 1018 STEEL, BLACK OXIDE FINISH
SPRING: MUSIC WIRE



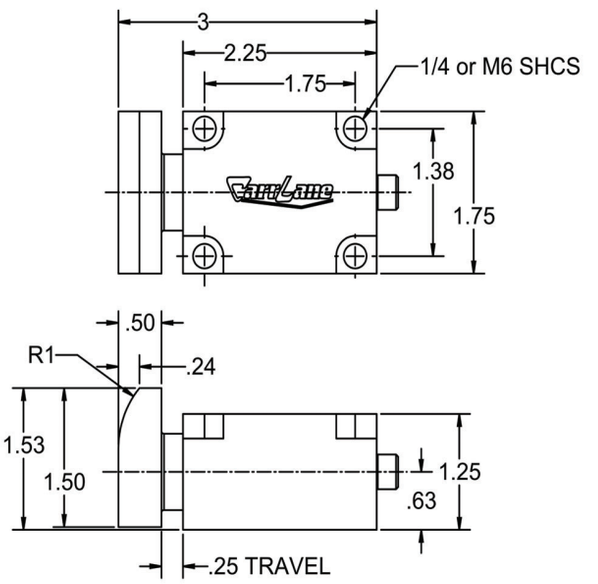
New item!

These massive spring-loaded stops are the largest and strongest of all the Spring Stop Buttons that we manufacture. Heavy-Duty Spring Stops have a large contact face and are useful for applying side force to hold a workpiece against its locators until clamps are in place, For some workholding applications, including many welding fixtures, a spring stop this strong can often be used without additional clamps. Mid-stroke spring force is approximately 100 lbs.

The large flat contact face is ideal for pushing flat-sided workpieces, with a radiused top edge to make loading easier. Heavy-Duty Spring Stops have a large-diameter plunger with a long bearing length to effectively resist loads applied to the top of the contact face. The plunger and body are both made of steel for maximum strength.



Heavy-Duty Spring Stops have a large-diameter plunger with a long bearing length to effectively resist loads applied to the top of the contact face.



PART NO.	STROKE	CONTACT FORCE (LBS)		
		INITIAL	HALFWAY	FINAL
CL-100-HDSS	1/4	50	105	160

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SPRING LOCATING PINS

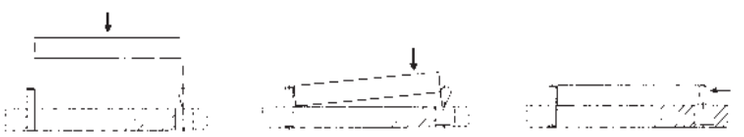
PIN: MILD STEEL, CARBURIZED-HARDENED, ZINC PLATED CLEAR CHROMATE
SPRING: MUSIC WIRE. HOUSING: ALUMINUM

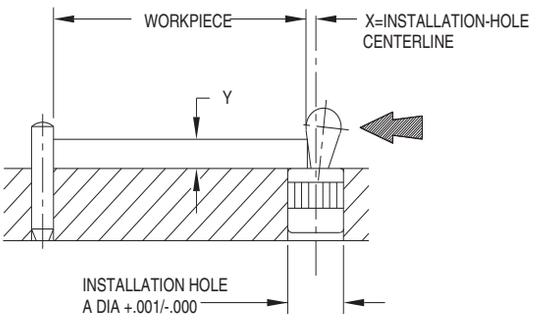


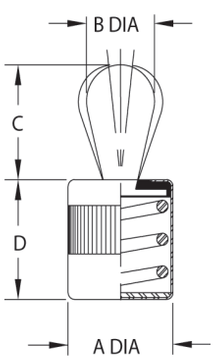
5/8 Dia | 1/2 Dia | 7/16 Dia | 7/16 Dia | 1/4 Dia

Hardened Steel Pin Coil Spring

Our patented Spring Locating Pins are an extremely compact way to apply side force to a workpiece. The tapered contact pin is securely anchored in a spring base. Unit installs easily in a drilled hole. Available in five sizes, each in light, medium, or heavy force. Choice of steel, stainless steel, or Delrin® contact pin. **INFO+**: Also available with a tapped receptacle (p. 200) for custom contact pins. Note: Catalog photos are actual size. Our most popular version is shown on this page, with a durable case-hardened steel contact pin and aluminum body containing a coil spring. Protective rubber seal around contact pin keeps out chips and coolant. This type has the most travel, so it allows the most part-size variation.







HARDENED STEEL PIN, COIL SPRING

PART NO.	A DIA	APPROX SIDE FORCE (LBS)	ALLOWABLE WORKPIECE TOLERANCE	B DIA	C	D	X DIMENSION WHEN Y EQUALS 1/16	1/8	3/16	1/4	5/16	3/8	7/16 OR MORE
CL-4-SLP-1	1/4	2.2	.020	.118	.158	.268	.022	.024	.024	.024	.024	.024	.024
CL-4-SLP-2		4.5											
CL-4-SLP-3		9											
CL-7-SLP-1	7/16	4.5	.031	.197	.236	.434	—	.055	.055	.055	.055	.055	.055
CL-7-SLP-2		11											
CL-7-SLP-3		22											
CL-7A-SLP-1	7/16	9	.039	.236	.394	.434	—	—	.049	.059	.059	.059	.059
CL-7A-SLP-2		17											
CL-7A-SLP-3		34											
CL-8-SLP-1	1/2	11	.051	.315	.530	.520	—	—	—	.077	.087	.087	.087
CL-8-SLP-2		22											
CL-8-SLP-3		45											
CL-10-SLP-1	5/8	22	.063	.394	.640	.705	—	—	—	—	.098	.107	.110
CL-10-SLP-2		45											
CL-10-SLP-3		67											

SPRING LOCATING PINS

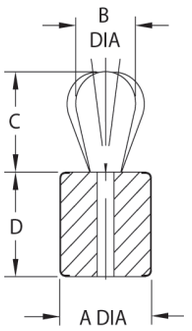
PIN: 300-SERIES STAINLESS STEEL
SPRING: SOLID POLYURETHANE. HOUSING: ALUMINUM



5/8 Dia | 1/2 Dia | 7/16 Dia | 7/16 Dia | 1/4 Dia

Stainless Steel Pin
Solid Polyurethane Spring

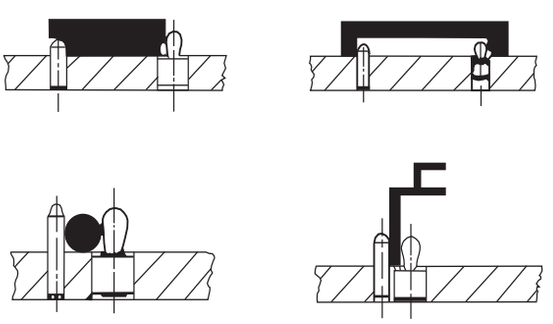
Stainless steel contact pin is ideal for corrosive environments and hygienic applications. Solid polyurethane body is covered by an aluminum shell.

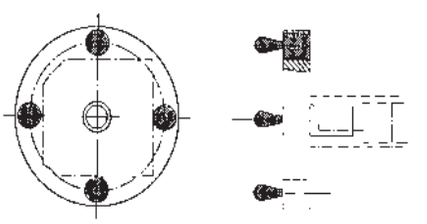


STAINLESS STEEL PIN, SOLID POLYURETHANE SPRING

PART NO.	A DIA	APPROX SIDE FORCE (LBS)	ALLOWABLE WORKPIECE TOLERANCE	B DIA	C	D	X DIMENSION WHEN 7 EQUALS						
							1/16	1/8	3/16	1/4	5/16	3/8	7/16 OR MORE
CL-4-SLPS-1	1/4	2.2	.008	.118	.158	.008	.022	.024	.024	.024	.024	.024	.024
CL-4-SLPS-2		4.5											
CL-7-SLPS-1	7/16	6.7	.016	.197	.292	.016	—	.055	.055	.055	.055	.055	.055
CL-7-SLPS-2		13											
CL-7-SLPS-3		20											
CL-7A-SLPS-1	7/16	6.7	.016	.236	.473	.016	—	—	.049	.059	.059	.059	.059
CL-7A-SLPS-2		13											
CL-7A-SLPS-3		20											
CL-8-SLPS-1	1/2	11	.024	.315	.512	.024	—	—	—	.077	.087	.087	.087
CL-8-SLPS-2		22											
CL-8-SLPS-3		33											
CL-10-SLPS-1	5/8	22	.031	.394	.640	.658	—	—	—	—	.098	.107	.110
CL-10-SLPS-2		45											
CL-10-SLPS-3		67											

APPLICATION EXAMPLES





Can also be used as a gripper for light clamping.

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SPRING LOCATING PINS

PIN: DELRIN®
SPRING: SOLID POLYURETHANE. HOUSING: ALUMINIUM



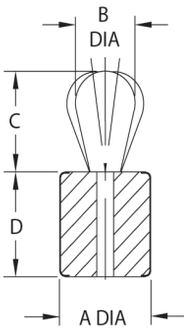
5/8 Dia | 1/2 Dia | 7/16 Dia | 7/16 Dia | 1/4 Dia

Delrin® Pin
Solid Polyurethane Spring

Delrin® contact pin avoids marring soft or finished surfaces. Solid polyurethane body is covered by an aluminium shell.

4

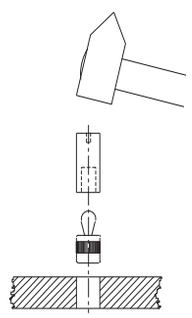
DELRIN® PIN, SOLID POLYURETHANE SPRING



PART NO.	A DIA	APPROX SIDE FORCE (LBS)	ALLOWABLE WORKPIECE TOLERANCE	B DIA	C	D	X DIMENSION WHEN 7 EQUALS						
							1/16	1/8	3/16	1/4	5/16	3/8	7/16 OR MORE
CL-4-SLPP-1	1/4	2.2	.008	.118	.158	.291	.022	.024	.024	.024	.024	.024	.024
CL-4-SLPP-2		4.5											
CL-7-SLPP-1	7/16	6.7	.016	.197	.292	.371	—	.055	.055	.055	.055	.055	.055
CL-7-SLPP-2		13											
CL-7A-SLPP-1	7/16	6.7	.016	.236	.473	.371	—	—	.049	.059	.059	.059	.059
CL-7A-SLPP-2		13											
CL-8-SLPP-1	1/2	11	.024	.315	.512	.551	—	—	—	.077	.087	.087	.087
CL-8-SLPP-2		22											
CL-10-SLPP-1	5/8	22	.031	.394	.640	.658	—	—	—	—	.098	.107	.110
CL-10-SLPP-2		45											



Installation Tools



Handy tool to speed up installation of Spring Locating Pins. Use with any of the three types.

INSTALLATION TOOLS

PART NO.	USE TO INSTALL		
CL-4-SLPT	CL-4-SLP-x	CL-4-SLPS-x	CL-4-SLPP-x
CL-7-SLPT	CL-7-SLP-x	CL-7-SLPS-x	CL-7-SLPP-x
CL-7A-SLPT	CL-7A-SLP-x	CL-7A-SLPS-x	CL-7A-SLPP-x
CL-8-SLPT	CL-8-SLP-x	CL-8-SLPS-x	CL-8-SLPP-x
CL-10-SLPT	CL-10-SLP-x	CL-10-SLPS-x	CL-10-SLPP-x

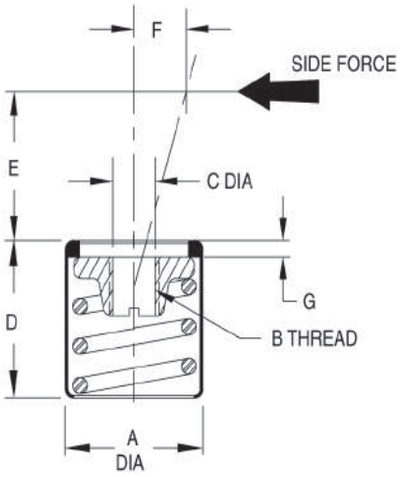
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SPRING LOCATING PINS

RECEPTACLE: MILD STEEL, BLACK OXIDE FINISH
SPRING: MUSIC WIRE. HOUSING: ALUMINUM

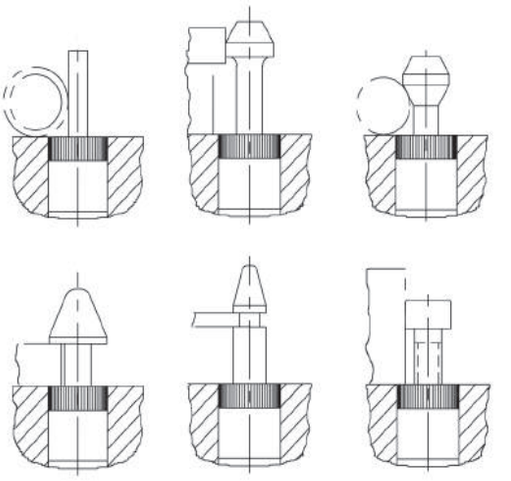


5/8 Dia 7/16 Dia



Tapped Receptacle for Custom Pin Coil Spring

This version has a tapped receptacle for installing custom contact pins. Available in two sizes, each in light, medium, or heavy force. Dimension E is a theoretical contact height which allows F maximum travel and provides the side force listed in the table. Taller pins will have more travel and less force, while shorter pins will have less travel and more force. To achieve maximum travel, the bottom diameter of the custom pin should be approximately equal to the C dimension.



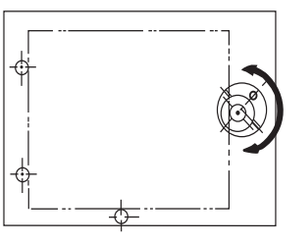
TAPPED RECEPTACLE FOR CUSTOM PIN, COIL SPRING

PART NO.	A DIA	B	APPROX SIDE FORCE (LBS)	C	D	E	F	G
CL-7-SLPR-1	7/16	#8-32	4.5	.164	.434	.16	.063	.04
CL-7-SLPR-2			11					
CL-7-SLPR-3			22					
CL-10-SLPR-1	5/8	1/4-20	22	.250	.705	.45	.126	.06
CL-10-SLPR-2			45					
CL-10-SLPR-3			67					



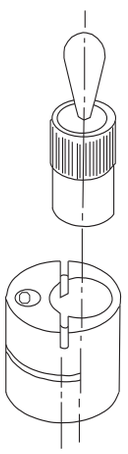
Eccentric Liners

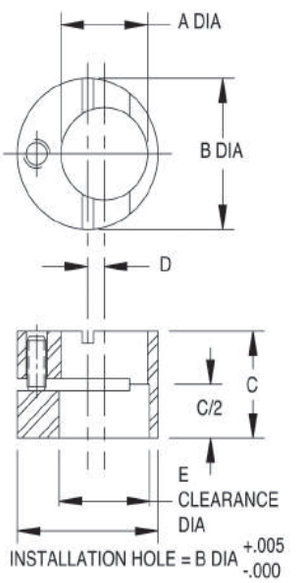
Eccentric Liners provide additional adjustment for workpieces with looser tolerances. Steel.



ECCENTRIC LINERS

PART NO.	FITS THESE PINS	A DIA NOMINAL	A DIA ACTUAL	B DIA NOMINAL	B DIA ACTUAL	C	D
CL-4-SLPE	CL-4-SLP-x CL-4-SLPS-x CL-4-SLPP-x	1/4	.2500 .2507	1/2	.5000 .4983	.390	.079
CL-7-SLPE	CL-7-SLP-x CL-7-SLPS-x CL-7-SLPP-x CL-7A-SLP-x CL-7A-SLPS-x CL-7A-SLPP-x	7/16	.4375 .4386	11/16	.6875 .6858	.469	.079
CL-8-SLPE	CL-8-SLP-x CL-8-SLPS-x CL-8-SLPP-x	1/2	.5000 .5011	3/4	.7500 .7480	.547	.079
CL-10-SLPE	CL-10-SLP-x CL-10-SLPS-x CL-10-SLPP-x	5/8	.6250 .6261	1	1.000 .9980	.705	.118





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SUPPORTS, RESTS & FEET



Leveling Feet



Swivel Pads



Grippers



Rest Buttons & Pads



Manual Work Supports



Screw Jacks



Eccentric Leveling Lugs

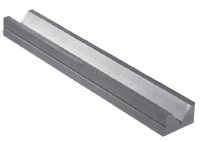


V Blocks

Also see:



Modular Supports & Locators p. 419



V Cast Sections p. 405



Adjustable Locking Hubs pp. 410-414



Hydraulic Work Supports p. 651

LEVELING FEET

TYPES



LEVELING FEET
High-quality, heavy-duty leveling foot with large-diameter pad. Large ball provides high load capacity with a 20° total swivel angle.



STUD LEVELING FEET
High-quality, heavy-duty leveling foot with large-diameter pad and integral stud. Stud and ball are one solid piece. Large ball provides high load capacity with a 20° total swivel angle.



JIG FEET LEVELING
Medium-duty leveing foot with removable pad. Lefthand thread in pad prevents backout while pad rotates and pivots freely.



JIG FEET LEVELING ASSEMBLIES
Complete leveling assembly includes radius-head screw, plate, and hex nut.

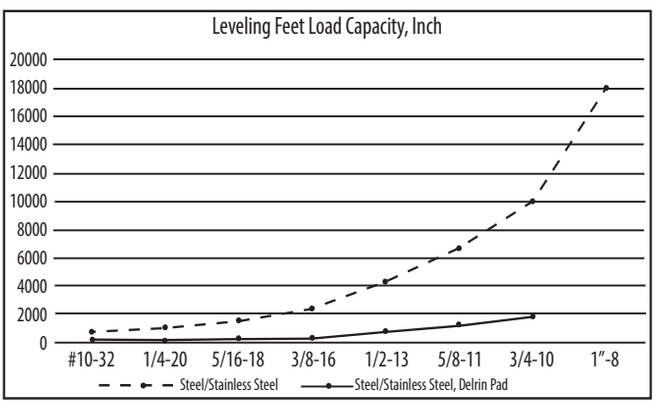
MATERIALS

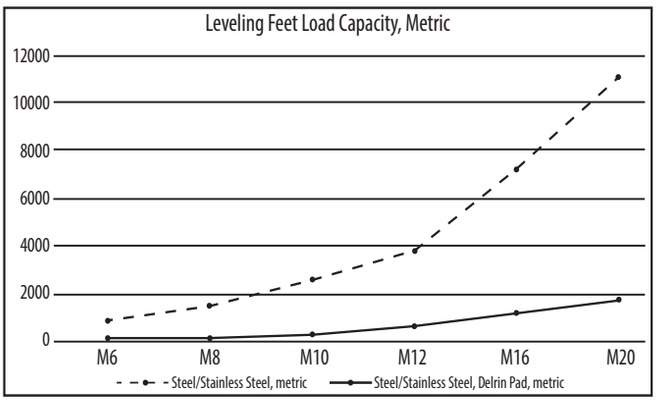
STEEL
12L14 steel, carburized-hardened, zinc plated yellow chromate. This material is the most economical and wear resistant choice for maximum load capacities.

STAINLESS STEEL
300-series stainless steel provides excellent resistance to rust, can be sanitized, and works well in corrosive environments. DFARS and RoHS compliant.

DELRIN®
White Delrin® 500 is non-marking, will not rust and can be sanitized. Has the lowest load capacity of these materials.

LOAD RATINGS





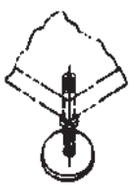
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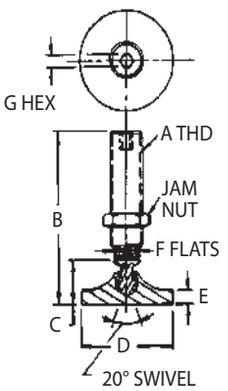
JIG FEET LEVELING

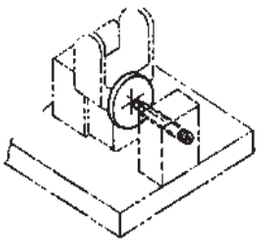
SCREW: 12L14 STEEL, CARBURIZED-HARDENED, ZINC PLATED YELLOW CHROMATE
FOOT: 12L14 STEEL, ZINC PLATED YELLOW CHROMATE



Medium-duty leveling foot with removable pad. Lefthand thread in pad prevents backout while pad rotates and pivots freely.
Patent no. 2,531,892.







INCH

PART NO.	A	B	C	D DIA	E	F	G	*LOAD RATING (LBS)
CL-1-JFL	1/2-13	2-7/32	7/8	1-1/2	1/4	3/8	1/4	1,400
CL-2-JFL		4-7/32						430
CL-3-JFL	5/8-11	3-1/4	29/32	2	5/16	1/2	5/16	2,900
CL-4-JFL		5-1/4						1,200
CL-5A-JFL	3/4-10	3-1/2	1-1/6	2-1/2	3/8	9/16	3/8	3,700
CL-6-JFL		5-17/32						1,800
CL-7A-JFL	1-8	3-1/2	1-19/32	3-1/2	1/2	3/4	1/2	6,700
CL-8-JFL		5-19/32						6,400

METRIC

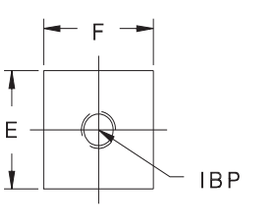
CLM-1-JFL	M12	2.17	.87	1-1/2	1/4	10mm	6mm	1,400
CLM-2-JFL		4.33						430
CLM-3-JFL	M16	3.35	.91	2	5/16	13mm	8mm	2,900
CLM-4-JFL		5.31						1,200
CLM-5A-JFL	M20	3.54	1.06	2-1/2	3/8	17mm	10mm	3,700
CLM-6-JFL		5.51						1,800
CLM-7A-JFL	M24	3.54	1.61	3-1/2	1/2	19mm	12mm	6,700
CLM-8-JFL		5.71						6,400

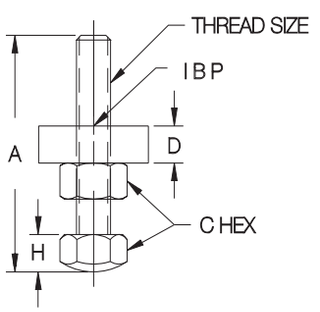
5

JIG FEET LEVELING ASSEMBLIES

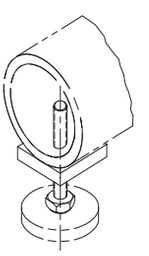
MILD STEEL, BLACK OXIDE FINISH







Complete leveling assembly includes radius-head screw, plate, and hex nut.



INCH

PART NO.	THREAD SIZE	A	C	D	E	F	H	*LOAD RATING (LBS)
CL-1-JF	3/8-16	3	11/16	1/2	1-1/2	1-3/4	.42	2,300
CL-2-JF	1/2-13	4	7/8	1/2	1-3/4	2	.53	4,200
CL-3-JF	5/8-11	4	1-1/16	5/8	2	2	.63	6,600
CL-4-JF	3/4-10	4	1-1/4	5/8	2	2	.75	10,000
CL-5-JF	1"-8	5	1-5/8	3/4	2	2	1.06	18,000

METRIC

CLM-10-JF	M10	2.95	17mm	1/2	1-1/2	1-3/4	.43	2,600
CLM-12-JF	M12	3.94	19mm	1/2	1-3/4	2	.55	3,800
CLM-16-JF	M16	3.94	24mm	5/8	2	2	.63	7,200
CLM-20-JF	M20	3.94	30mm	5/8	2	2	.75	11,000
CLM-24-JF	M24	5.12	36mm	3/4	2	2	1.06	16,000

* Safe static load with stud securely mounted in a plate at least one-stud-diameter thick, at maximum stud extension (2:1 safety factor). Jig Feet Leveling Assemblies are rated with the standard plate provided.

LEVELING FEET

STEEL: 12L14, CARBURIZED-HARDENED (BODY ONLY), ZINC PLATED YELLOW CHROMATE OR BLACK OXIDE FINISH
STAINLESS STEEL: 300 SERIES. DELRIN® PAD: WHITE DELRIN® 500.



Steel Zinc Plated



Steel Zinc Plated with Delrin® Pad



Steel Black Oxide Finish

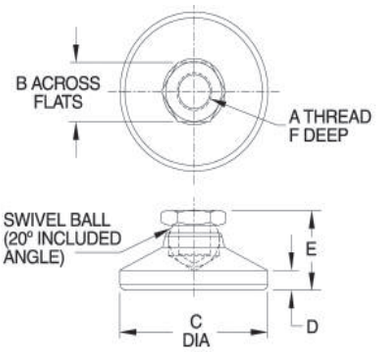


Stainless Steel



Stainless Steel with Delrin® Pad

High-quality, heavy-duty leveling foot with large-diameter pad. Large ball provides high load capacity with a 20° total swivel angle.



INCH

PART NO. STEEL ZINC PLATED	PART NO. STEEL ZINC PLATED DELRIN® PAD	PART NO. STEEL BLACK OXIDE	PART NO. STAINLESS	PART NO. STAINLESS DELRIN® PAD	A	B	C DIA	D	E	F	LOAD RATING (LBS)* STEEL & STAINLESS	LOAD RATING (LBS)* DELRIN®
CL-3-LF	CL-3-LFN	CL-3-LF-BO	CL-3-LF-S	CL-3-LFN-S	#10-32	3/8	3/4	7/64	17/32	1/4	700	150
CL-4-LF	CL-4-LFN	CL-4-LF-BO	CL-4-LF-S	CL-4-LFN-S	1/4-20	1/2	1	5/32	45/64	5/16	1,000	200
CL-5-LF	CL-5-LFN	CL-5-LF-BO	CL-5-LF-S	CL-5-LFN-S	5/16-18	9/16	1-1/8	3/16	3/16	3/8	1,500	250
CL-6-LF	CL-6-LFN	CL-6-LF-BO	CL-6-LF-S	CL-6-LFN-S	3/8-16	5/8	1-1/4	3/16	7/8	13/32	2,300	300
CL-8-LF	CL-8-LFN	CL-8-LF-BO	CL-8-LF-S	CL-8-LFN-S	1/2-13	3/4	1-7/8	1/4	1-1/8	1/2	4,200	700
CL-10-LF	CL-10-LFN	CL-10-LF-BO	CL-10-LF-S	CL-10-LFN-S	5/8-11	15/16	2-1/2	5/16	1-1/4	1/2	6,600	1,200
CL-12-LF	CL-12-LFN	CL-12-LF-BO	CL-12-LF-S	CL-12-LFN-S	3/4-10	1-1/8	3	1/2	1-1/2	5/8	10,000	1,800
CL-16-LF	—	CL-16-LF-BO	CL-16-LF-S	—	1"-8	1-1/2	4	13/32	1-7/8	15/16	18,000	

METRIC

CLM-6-LF	CLM-6-LFN	CLM-6-LF-BO	CLM-6-LF-S	CLM-6-LFN-S	M6	10mm	1	5/32	45/64	5/16	900	180
CLM-8-LF	CLM-8-LFN	CLM-8-LF-BO	CLM-8-LF-S	CLM-8-LFN-S	M8	13mm	1-1/8	3/16	13/16	3/8	1,500	250
CLM-10-LF	CLM-10-LFN	CLM-10-LF-BO	CLM-10-LF-S	CLM-10-LFN-S	M10	17mm	1-1/4	3/16	7/8	13/32	2,600	300
CLM-12-LF	CLM-12-LFN	CLM-12-LF-BO	CLM-12-LF-S	CLM-12-LFN-S	M12	19mm	1-7/8	1/4	1-1/8	1/2	3,800	700
CLM-16-LF	CLM-16-LFN	CLM-16-LF-BO	CLM-16-LF-S	CLM-16-LFN-S	M16	24mm	2-1/2	5/16	1-1/4	1/2	7,200	1,200
CLM-20-LF	CLM-20-LFN	CLM-20-LF-BO	CLM-20-LF-S	CLM-20-LFN-S	M20	30mm	3	1/2	1-1/2	5/8	11,000	1,800

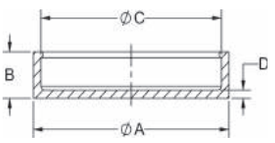
*Safe static load with stud securely mounted in a plate at least one-stud-diameter thick, at maximum stud extension (2:1 safety factor). Leveling Feet are rated with the same-length stud as on Stud Leveling Feet. Load capacity will drop significantly with longer studs.



Rubber Pad Covers for Leveling Feet



Rubber Pad Covers fit over the bottom of Leveling Feet. These pad covers provide increased gripping to prevent sliding on sloped or uneven surfaces. They reduce walking and transmitted machine vibrations. Durable PVC material. Note: load capacity will be reduced with Rubber Pad Covers. See table below.



RUBBER PAD COVERS

PART NO.	FITS LEVELING FEET	A DIA	B	C DIA	D	LOAD RATING LBS)
CL-6-RPC	3/8-16 and M10	1-1/2	.40	1.22	1/8	300
CL-8-RPC	1/2-13 and M12	2-1/8	.46	1.85		700
CL-10-RPC	5/8-11 and M16	2-3/4	.52	2.47		1,200
CL-12-RPC	3/4-10 and M20	3-1/4	.72	3.00		1,800

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STUD LEVELING FEET

STEEL: 12L14, CARBURIZED-HARDENED (BODY ONLY), ZINC PLATED YELLOW CHROMATE OR BLACK OXIDE FINISH
STAINLESS STEEL: 300 SERIES. DELRIN® PAD: WHITE DELRIN® 500.



Steel Zinc Plated



Steel Zinc Plated with Delrin® Pad



Steel Black Oxide Finish



Stainless Steel

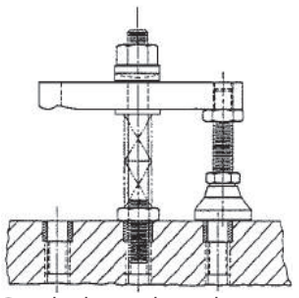


Stainless Steel with Delrin® Pad

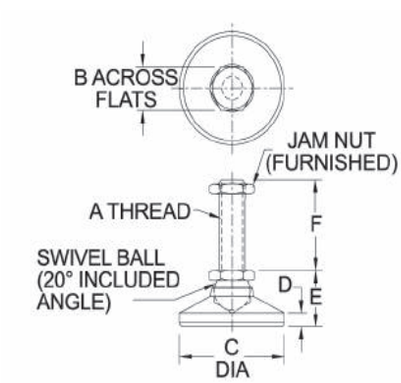
5

High-quality, heavy-duty leveling foot with large-diameter pad and integral stud. Stud and ball are one solid piece. Large ball provides high load capacity with a 20° total swivel angle.

* Safe static load with stud securely mounted in a plate at least one-stud-diameter thick, at maximum stud extension (2:1 safety factor). Load capacity will drop significantly with longer studs.



Can also be used as a clamp rest for Tapped-Heel Clamp Straps.



INCH

PART NO. STEEL ZINC PLATED	PART NO. STEEL ZINC PLATED DELRIN® PAD	PART NO. STEEL BLACK OXIDE	PART NO. STAINLESS	PART NO. STAINLESS DELRIN® PAD	A	B	C DIA	D	E	F	LOAD RATING (LBS)* STEEL & STAINLESS	LOAD RATING (LBS)* DELRIN®
CL-3-SLF	CL-3-SLFN	CL-3-SLF-BO	CL-3-SLF-S	CL-3-SLFN-S	#10-32	3/8	3/4	7/64	17/32	1	700	150
CL-3-SLF-2	CL-3-SLFN-2	CL-3-SLF-2-BO	CL-3-SLF-2-S	CL-3-SLFN-2-S						2	200	
CL-4-SLF	CL-4-SLFN	CL-4-SLF-BO	CL-4-SLF-S	CL-4-SLFN-S	1/4-20	1/2	1	5/32	45/64	1-1/4	1,000	200
CL-4-SLF-2.5	CL-4-SLFN-2.5	CL-4-SLF-2.5-BO	CL-4-SLF-2.5-S	CL-4-SLFN-2.5-S						2-1/2	250	
CL-5-SLF	CL-5-SLFN	CL-5-SLF-BO	CL-5-SLF-S	CL-5-SLFN-S	5/16-18	9/16	1-1/8	3/16	13/16	2	1,500	250
CL-5-SLF-4	CL-5-SLFN-4	CL-5-SLF-4-BO	CL-5-SLF-4-S	CL-5-SLFN-4-S						4	400	
CL-6-SLF	CL-6-SLFN	CL-6-SLF-BO	CL-6-SLF-S	CL-6-SLFN-S	3/8-16	5/8	1-1/4	3/16	7/8	2	2,300	300
CL-6-SLF-4	CL-6-SLFN-4	CL-6-SLF-4-BO	CL-6-SLF-4-S	CL-6-SLFN-4-S						4	600	
CL-8-SLF	CL-8-SLFN	CL-8-SLF-BO	CL-8-SLF-S	CL-8-SLFN-S	1/2-13	3/4	1-7/8	1/4	1-1/8	2	4,200	700
CL-8-SLF-4	CL-8-SLFN-4	CL-8-SLF-4-BO	CL-8-SLF-4-S	CL-8-SLFN-4-S						4	1100	
CL-10-SLF	CL-10-SLFN	CL-10-SLF-BO	CL-10-SLF-S	CL-10-SLFN-S	5/8-11	15/16	2-1/2	5/16	1-1/4	2	6,600	1,200
CL-10-SLF-4	CL-10-SLFN-4	CL-10-SLF-4-BO	CL-10-SLF-4-S	CL-10-SLFN-4-S						4	1700	
CL-12-SLF	CL-12-SLFN	CL-12-SLF-BO	CL-12-SLF-S	CL-12-SLFN-S	3/4-10	1-1/8	3	1/2	1-1/2	2	10,000	1,800
CL-12-SLF-4	CL-12-SLFN-4	CL-12-SLF-4-BO	CL-12-SLF-4-S	CL-12-SLFN-4-S						4	2500	
CL-16-SLF	—	CL-16-SLF-BO	CL-16-SLF-S	—	1"-8	1-1/2	4	13/32	1-7/8	4-1/4	18,000	—
CL-16-SLF-8	—	CL-16-SLF-8-BO	CL-16-SLF-8-S	—						8	4500	

METRIC

CLM-6-SLF	CLM-6-SLFN	CLM-6-SLF-BO	CLM-6-SLF-S	CLM-6-SLFN-S	M6	10mm	1	5/32	45/64	1.57	900	180
CLM-8-SLF	CLM-8-SLFN	CLM-8-SLF-BO	CLM-8-SLF-S	CLM-8-SLFN-S	M8	13mm	1-1/8	3/16	13/16	1.97	1,500	250
CLM-10-SLF	CLM-10-SLFN	CLM-10-SLF-BO	CLM-10-SLF-S	CLM-10-SLFN-S	M10	17mm	1-1/4	3/16	7/8	2	2,600	300
CLM-12-SLF	CLM-12-SLFN	CLM-12-SLF-BO	CLM-12-SLF-S	CLM-12-SLFN-S	M12	19mm	1-7/8	1/4	1-1/8		3,800	700
CLM-16-SLF	CLM-16-SLFN	CLM-16-SLF-BO	CLM-16-SLF-S	CLM-16-SLFN-S	M16	24mm	2-1/2	5/16	1-1/4		7,200	1,200
CLM-20-SLF	CLM-20-SLFN	CLM-20-SLF-BO	CLM-20-SLF-S	CLM-20-SLFN-S	M20	30mm	3	1/2	1-1/2		11,000	1,800

SWIVEL PAD FEET

STEEL PAD: 12L14 STEEL, ZINC PLATED YELLOW CHROMATE OR BLACK OXIDE FINISH
DELRIN® PAD: WHITE DELRIN 500. STAINLESS PAD: 300-SERIES STAINLESS STEEL
STEEL NUT: 12L14 STEEL, CARBURIZED-HARDENED ZINC PLATED YELLOW CHROMATE OR BLACK OXIDE FINISH
STAINLESS NUT: 300-SERIES STAINLESS STEEL



Steel
Zinc Plated



Steel
Zinc Plated
with Delrin® Pad

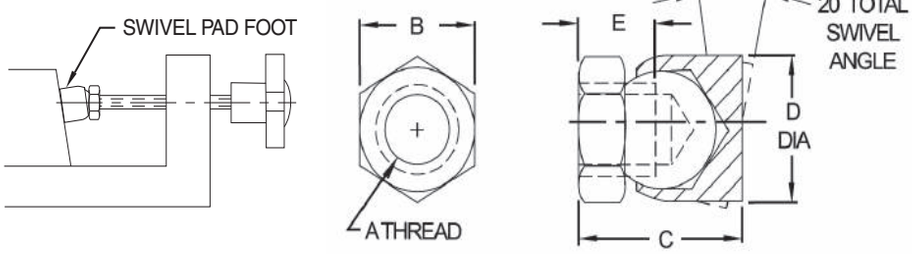


Steel
Black Oxide Finish



Stainless
Steel

Heavy-duty swivel foot pivots to contact sloped surfaces evenly. Large ball provides high load capacity with a 20° total swivel angle. Available in steel (zinc plated or black oxide finish), steel with a Delrin® pad, and stainless steel.



STEEL — ZINC PLATED (INCH)

PART NO.	A	B	C	D DIA	E
CL-4-SPF	1/4-20	1/2	5/8	5/8	5/16
CL-5-SPF	5/16-18	9/16	3/4	11/16	3/8
CL-6-SPF	3/8-16	5/8	13/16	3/4	
CL-8-SPF	1/2-13	3/4	15/16	7/8	7/16
CL-10-SPF	5/8-11	7/8	1	1	
CL-12-SPF	3/4-10	1-1/16	1-11/32	1-1/4	5/8

STEEL — ZINC PLATED (METRIC)

PART NO.	A	B	C	D DIA	E
CLM-6-SPF	M6	10mm	5/8	5/8	5/16
CLM-8-SPF	M8	13mm	3/4	11/16	3/8
CLM-10-SPF	M10	17mm	13/16	3/4	
CLM-12-SPF	M12	19mm	15/16	7/8	7/16
CLM-16-SPF	M16	24mm	1	1	
CLM-20-SPF	M20	30mm	1-11/32	1-1/4	5/8

STEEL — ZINC PLATED WITH DELRIN® PAD (INCH)

CL-4-SPFN	1/4-20	1/2	5/8	5/8	5/16
CL-5-SPFN	5/16-18	9/16	3/4	11/16	3/8
CL-6-SPFN	3/8-16	5/8	13/16	3/4	
CL-8-SPFN	1/2-13	3/4	15/16	7/8	7/16
CL-10-SPFN	5/8-11	7/8	1	1	
CL-12-SPFN	3/4-10	1-1/16	1-11/32	1-1/4	5/8

STEEL — ZINC PLATED WITH DELRIN® PAD (METRIC)

CLM-6-SPFN	M6	10mm	5/8	5/8	5/16
CLM-8-SPFN	M8	13mm	3/4	11/16	3/8
CLM-10-SPFN	M10	17mm	13/16	3/4	
CLM-12-SPFN	M12	19mm	15/16	7/8	7/16
CLM-16-SPFN	M16	24mm	1	1	
CLM-20-SPFN	M20	30mm	1-11/32	1-1/4	5/8

STEEL — BLACK OXIDE FINISH (INCH)

CL-4-SPF-BO	1/4-20	1/2	5/8	5/8	5/16
CL-5-SPF-BO	5/16-18	9/16	3/4	11/16	3/8
CL-6-SPF-BO	3/8-16	5/8	13/16	3/4	
CL-8-SPF-BO	1/2-13	3/4	15/16	7/8	7/16
CL-10-SPF-BO	5/8-11	7/8	1	1	
CL-12-SPF-BO	3/4-10	1-1/16	1-11/32	1-1/4	5/8

STEEL — BLACK OXIDE FINISH (METRIC)

CLM-6-SPF-BO	M6	10mm	5/8	5/8	5/16
CLM-8-SPF-BO	M8	13mm	3/4	11/16	3/8
CLM-10-SPF-BO	M10	17mm	13/16	3/4	
CLM-12-SPF-BO	M12	19mm	15/16	7/8	7/16
CLM-16-SPF-BO	M16	24mm	1	1	
CLM-20-SPF-BO	M20	30mm	1-11/32	1-1/4	5/8

STAINLESS STEEL (INCH)

CL-4-SPF-S	1/4-20	1/2	5/8	5/8	5/16
CL-5-SPF-S	5/16-18	9/16	3/4	11/16	3/8
CL-6-SPF-S	3/8-16	5/8	13/16	3/4	
CL-8-SPF-S	1/2-13	3/4	15/16	7/8	7/16
CL-10-SPF-S	5/8-11	7/8	1	1	
CL-12-SPF-S	3/4-10	1-1/16	1-11/32	1-1/4	5/8

STAINLESS STEEL (METRIC)

CLM-6-SPF-S	M6	10mm	5/8	5/8	5/16
CLM-8-SPF-S	M8	13mm	3/4	11/16	3/8
CLM-10-SPF-S	M10	17mm	13/16	3/4	
CLM-12-SPF-S	M12	19mm	15/16	7/8	7/16
CLM-16-SPF-S	M16	24mm	1	1	
CLM-20-SPF-S	M20	30mm	1-11/32	1-1/4	5/8

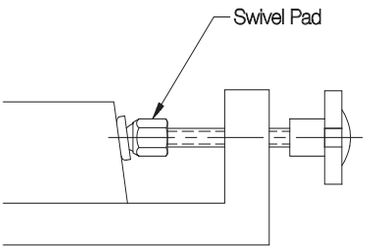
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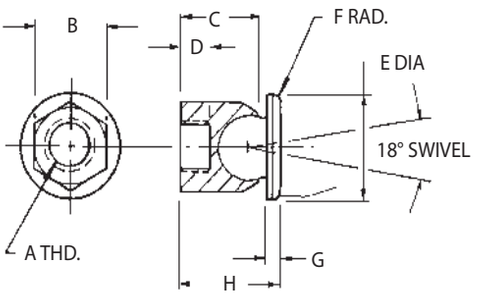
SWIVEL PADS

PAD: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH OR DELRIN®
NUT: 12L14 STEEL, BLACK OXIDE FINISH



Heavy-duty swivel foot pivots to contact sloped surfaces evenly. Large ball provides high load capacity with a 18° total swivel angle. Choice of steel or Delrin® pad.





INCH

PART NO. STEEL PAD	PART NO. DELRIN® PAD	A	B	C	D	E DIA	F	G	H
CL-1-SPA	CL-1-SPAN	1/4-20	1/2	.50	.23	5/8	.06	.10	.67
CL-2-SPA	CL-2-SPAN	5/16-18	9/16	.58	.27	3/4			.75
CL-3-SPA	CL-3-SPAN	3/8-16	5/8	.71	.29	7/8		.12	.91
CL-4-SPA	CL-4-SPAN	1/2-13	3/4	.81	.31	1	.09	.15	1.05
CL-5-SPA	CL-5-SPAN	5/8-11	7/8	1.00	.35	1-1/8			1.25
CL-6-SPA	—	3/4-10	1-1/16	1.12		1-1/4			1.38
CL-7-SPA	—	1-8	1-3/8	1.50		1-5/8		.20	1.82

METRIC

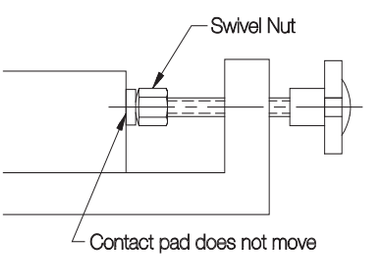
CLM-6-SPA	—	M6	10mm	.56	.23	1/2	.04	.08	.67
CLM-8-SPA	—	M8	13mm	.58	.22	3/4	.06	.10	.75
CLM-10-SPA	—	M10	17mm	.71	.29	7/8		.12	.91
CLM-12-SPA	—	M12	19mm	.81	.31	1	.09	.15	1.05
CLM-16-SPA	—	M16	24mm	1.00	.35	1-1/8			1.25
CLM-20-SPA	—	M20	30mm	1.12		1-1/4			1.38

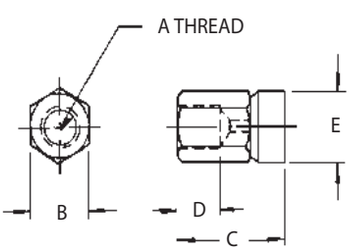
SWIVEL NUTS

NUT: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
PAD: 12L14 STEEL, BLACK OXIDE FINISH



Nut turns freely without pivoting while pad remains stationary, to avoid moving or marring the workpiece.





INCH

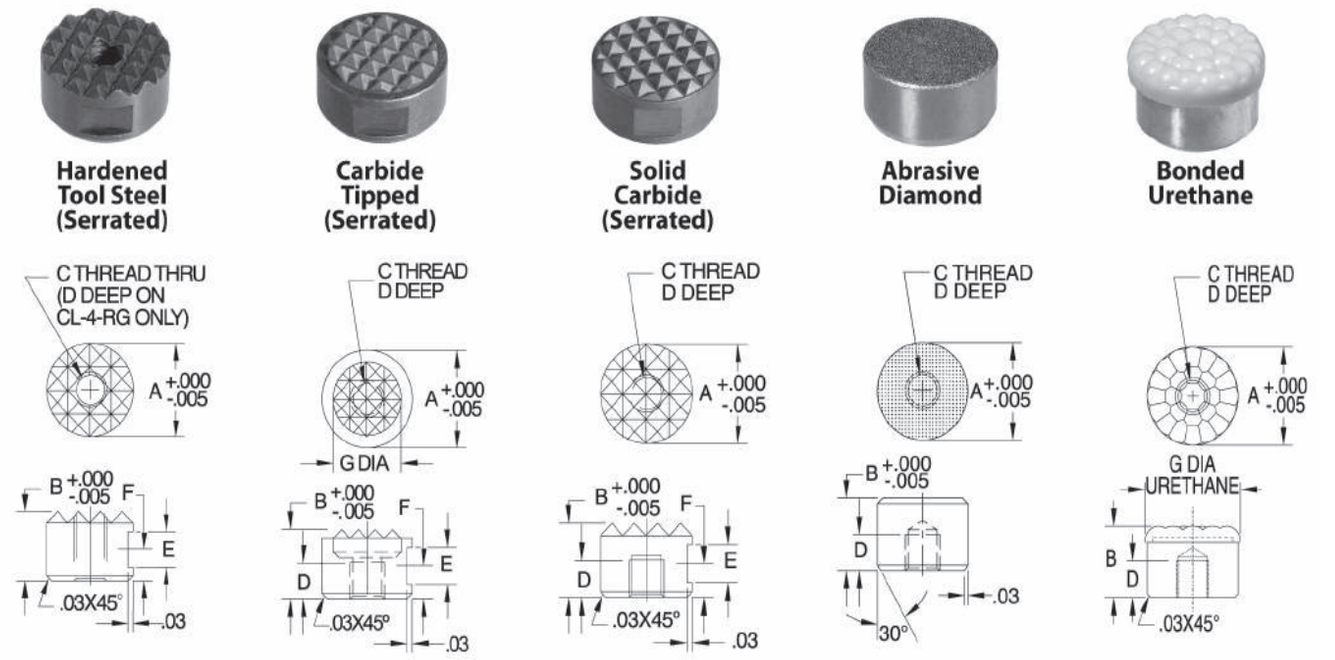
PART NO.	A	B	C	D	E DIA
CL-4-SN	1/4-20	5/16	7/16	3/16	3/8
CL-5-SN	5/16-18	3/8	15/32	1/4	7/16
CL-6-SN	3/8-16	7/16	17/32	17/64	1/2
CL-8-SN	1/2-13	5/8	21/32	3/8	11/16
CL-10-SN	5/8-11	3/4	27/32	7/16	7/8
CL-12-SN	3/4-10	7/8	1	1/2	1

METRIC

CLM-6-SN	M6	8mm	.43	3/16	.39
CLM-10-SN	M10	13mm	.55	17/64	.51
CLM-12-SN	M12	17mm	.67	3/8	.71

ROUND GRIPPERS

HARDENED TOOL STEEL: M-2 TOOL STEEL, HEAT TREATED RC 60-62, BLACK OXIDE FINISH
CARBIDE TIPPED: ALLOY STEEL, HEAT TREATED, WITH BRAZED CARBIDE INSERT, BLACK OXIDE FINISH
SOLID CARBIDE: CARBIDE WITH STEEL THREAD INSERT
ABRASIVE DIAMOND: 17-4PH STAINLESS STEEL, HEAT TREATED RC 43-46, WITH FUSED ABRASIVE DIAMOND SURFACE
BONDED URETHANE: 300-SERIES STAINLESS STEEL WITH BONDED URETHANE SURFACE



Round Grippers are replaceable inserts that provide additional holding force and/or wear resistance when installed in a fixture. Fasten from behind with a socket-head cap screw, or clamp with a setscrew on the O.D. locking flat (where provided). Grippers can be recess-mounted in a flat-bottom hole, or surface mounted to use as a rest pad. Round Grippers can also be installed in Gripper Swivel Pads and Gripper Swivel Contact Bolts.

Serrated grippers are designed to slightly penetrate the workpiece to significantly increase gripping force, rather than relying on static friction alone. The hardened-tool-steel version is the most economical and impact resistant. The carbide-tipped version is still economical and impact resistant while providing extra durability. The solid-carbide version is the most durable.

Abrasive-diamond grippers have an abrasive-diamond surface permanently fused to a hardened stainless steel pad. This abrasive surface, comparable to a 100-grit abrasive, provides significant holding force with relatively low clamping pressure and minimal surface marring. This diamond-particle surface also offers excellent wear resistance.

Bonded-urethane grippers have a urethane surface permanently bonded to a stainless steel pad. This non-marking, non-staining urethane provides excellent protection against damage to finished workpieces. The bubbled texture of the urethane surface offers firm gripping, yet allows air to escape so that no suction is created under load. Urethane also provides excellent wear resistance, and is available in three firmnesses to suit a wide variety of applications.

INCH

PART NO. HARDENED TOOL STEEL (SERRATED)	PART NO. CARBIDE TIPPED (SERRATED)	PART NO. SOLID CARBIDE (SERRATED)	PART NO. ABRASIVE DIAMOND	A DIA	B	C	D	E	F	G DIA	SERRATIONS		PART NO. BONDED URETHANE	URETHANE B	URETHANE D	URETHANE G DIA
CL-4-RG	—	—	—	1/4	3/8	#8-32	3/16	—	—	—	Extra Fine	.094x90°	—	—	—	—
CL-6-RG	CL-6-RGT	—	CL-6-RGD	3/8		#10-32		3/16	11/64	5/16			CL-6-RGU-1*	1/2	1/4	.39
CL-8-RG	CL-8-RGT	CL-8-RGC	CL-8-RGD	1/2						3/8	Fine	.125x90°	CL-8-RGU-1*			.51
CL-10-RG	CL-10-RGT	CL-10-RGC	CL-10-RGD	5/8		1/4-28				1/2			CL-10-RGU-1*		3/8	.63
CL-12-RG	CL-12-RGT	CL-12-RGC	CL-12-RGD	3/4						5/8			CL-12-RGU-1*			.83
CL-16-RG	CL-16-RGT	—	CL-16-RGD	1						3/4			CL-16-RGU-1*			1.06

METRIC

CLM-10-RG	CLM-10-RGT	—	CLM-10-RGD	.394 (10mm)	.3937 (10mm)	M5	.18	.185	.177	—	Extra Fine		CLM-10-RGU-1*	.472 (12mm)	.24	.39
CLM-12-RG	CLM-12-RGT	—	CLM-12-RGD	.472 (12mm)							Fine	.094x90°	CLM-12-RGU-1*			.51
CLM-16-RG	CLM-16-RGT	—	CLM-16-RGD	.630 (16mm)		M6						.125x90°	CLM-16-RGU-1*		.37	.63
CLM-20-RG	CLM-20-RGT	—	CLM-20-RGD	.787 (20mm)									CLM-20-RGU-1*			.83
CLM-25-RG	CLM-25-RGT	—	CLM-25-RGD	.984 (25mm)									CLM-25-RGU-1*			1.06

* -1=35 Durometer, -2=60 Durometer, -3=80 Durometer

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ROUND GRIPPERS

CARBIDE TIPPED: ALLOY STEEL, HEAT TREATED, WITH BRAZED CARBIDE INSERT, BLACK OXIDE FINISH
HARDENED STEEL: 8620 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
HARDENED STAINLESS STEEL: 17-4 STAINLESS STEEL, HEAT TREATED RC 43-46
DELRIN®: WHITE DELRIN® 500



Carbide Tipped (Flat)



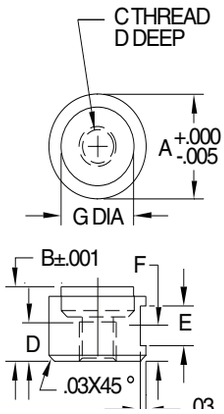
Hardened Steel (Flat)

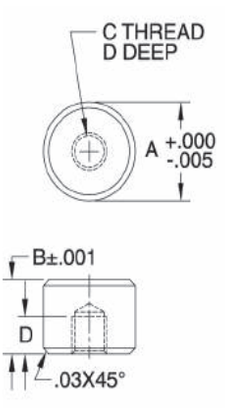


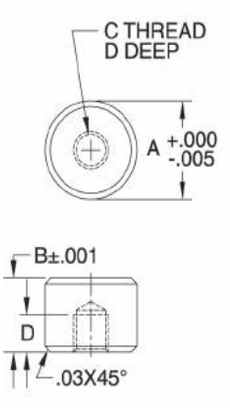
Hardened Stainless Steel (Flat)

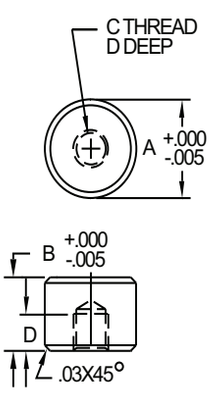


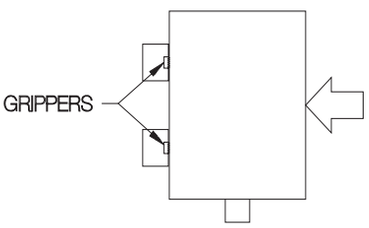
Delrin® (Flat)





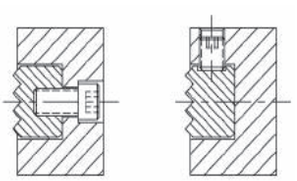






Serrated grippers recessed into a fixture's locating surfaces dramatically increase resistance to movement by embedding themselves in the workpiece.

Flat grippers can be used to provide additional wear resistance, or as precision rest pads. The carbide-tipped version is the most durable. The hardened-steel version is the most economical and impact resistant. The hardened-stainless-steel version provides high strength and excellent corrosion resistance. The Delrin® version helps avoid marring finished workpieces.



Round Grippers can be fastened from behind with a Socket-Head Cap Screw. Some gripper types also have an O.D. locking flat for fastening with a set screw.

INCH

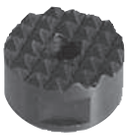
PART NO. CARBIDE TIPPED (FLAT)	PART NO. HARDENED STEEL (FLAT)	PART NO. HARDENED STAINLESS (FLAT)	PART NO. DELRIN® (FLAT)	A DIA	B	C	D	E	F	G DIA
CL-6-RGFT	CL-6-RGF	CL-6-RGF-S	CL-6-RGFN	3/8	3/8	#10-32	3/8	3/16	11/64	5/16
CL-8-RGFT	CL-8-RGF	CL-8-RGF-S	CL-8-RGFN	1/2						3/8
CL-10-RGFT	CL-10-RGF	CL-10-RGF-S	CL-10-RGFN	5/8		1/4-28				1/2
CL-12-RGFT	CL-12-RGF	CL-12-RGF-S	CL-12-RGFN	3/4						5/8
CL-16-RGFT	CL-16-RGF	CL-16-RGF-S	CL-16-RGFN	1						3/4

METRIC

—	CLM-10-RGF	CLM-10-RGF-S	CLM-10-RGFN	.394 (10mm)	.3937 (10mm)	M5	.18	.185	.177	—
—	CLM-12-RGF	CLM-12-RGF-S	CLM-12-RGFN	.472 (12mm)						
—	CLM-16-RGF	CLM-16-RGF-S	CLM-16-RGFN	.630 (16mm)		M6				
—	CLM-20-RGF	CLM-20-RGF-S	CLM-20-RGFN	.787 (20mm)						
—	CLM-25-RGF	CLM-25-RGF-S	CLM-25-RGFN	.984 (25mm)						

ROUND GRIPPERS (COUNTERBORED)

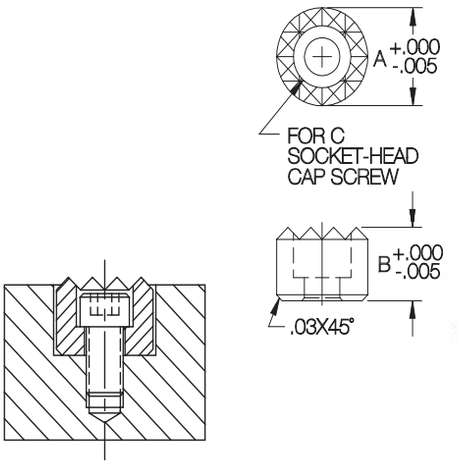
HARDENED TOOL STEEL: M-2 TOOL STEEL, HEAT TREATED RC 60-62, BLACK OXIDE FINISH
ABRASIVE DIAMOND: 17-4 STAINLESS STEEL, HEAT TREATED RC 43-46, WITH ABRASIVE DIAMOND SURFACE



Hardened Tool Steel (Serrated)



Abrasive Diamond



Counterbored Round Grippers are ideal for blind-hole installation and surface mounting. Fasten with a standard socket-head cap screw. The serrated version, made of hardened tool steel, is designed to slightly penetrate the workpiece to significantly increase gripping force. The abrasive-diamond version has an abrasive-diamond surface permanently fused to a hardened stainless steel pad. This abrasive surface, comparable to a 100-grit abrasive, provides significant holding force with relatively low clamping pressure and minimal surface marring. This diamond-particle surface also offers excellent wear resistance.

INCH

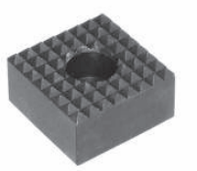
PART NO. HARDENED TOOL STEEL (SERRATED)	PART NO. DIAMOND ABRASIVE	A DIA	B	C	SERRATIONS (HARDENED TOOL STEEL VERSION)	
CL-8-RGB	CL-8-RGBD	1/2	3/8	#8	Fine	.125x90°
CL-10-RGB	CL-10-RGBD	5/8				
CL-12-RGB	CL-12-RGBD	3/4	1/2	#10		
CL-16-RGB	CL-16-RGBD	1		1/4		

METRIC

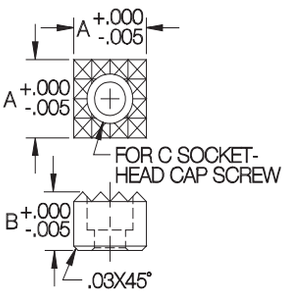
CLM-12-RGB	CLM-12-RGBD	.472 (12mm)	.394 (10mm)	M4	Fine	.125x90°
CLM-16-RGB	CLM-16-RGBD	.630 (16mm)				
CLM-20-RGB	CLM-20-RGBD	.787 (20mm)	.472 (12mm)	M5		
CLM-25-RGB	CLM-25-RGBD	.984 (25mm)		M6		

SQUARE GRIPPERS (COUNTERBORED)

M-2 TOOL STEEL, HEAT TREATED RC 60-62, BLACK OXIDE FINISH



Hardened Tool Steel (Serrated)



Counterbored Round Grippers are ideal for blind-hole installation and surface mounting. Fasten with a standard socket-head cap screw.

COUNTERBORED (INCH)

PART NO. HARDENED TOOL STEEL (SERRATED)	A	B	C	SERRATIONS	
CL-8-SGB	1/2	1/2	#10	Fine	.125x90°
CL-12-SGB	3/4		1/4		
CL-16-SGB	1				

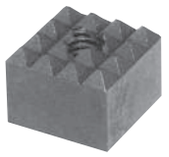
COUNTERBORED (METRIC)

CLM-12-SGB	.472 (12mm)	.472 (12mm)	M4	Fine	.125x90°
CLM-20-SGB	.787 (20mm)		M5		
CLM-25-SGB	.984 (25mm)		M6		

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SQUARE GRIPPERS

HARDENED TOOL STEEL: M-2 TOOL STEEL, HEAT TREATED RC 60-62, BLACK OXIDE FINISH
CARBIDE TIPPED: ALLOY STEEL, HEAT TREATED, WITH BRAZED CARBIDE INSERT, BLACK OXIDE FINISH
SOLID CARBIDE: CARBIDE WITH STEEL THREAD INSERT



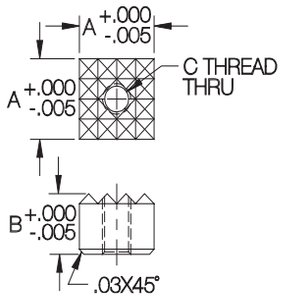
Hardened Tool Steel (Serrated)

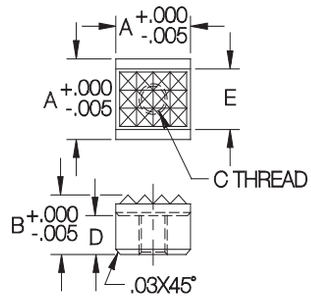


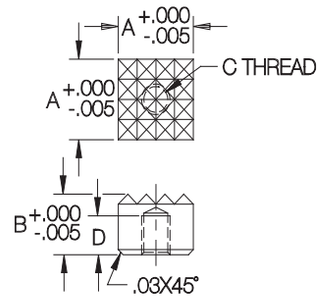
Carbide Tipped (Serrated)



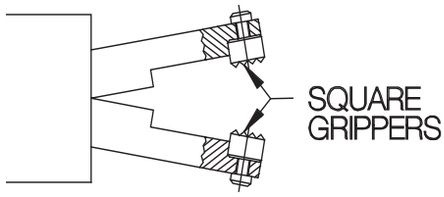
Solid Carbide (Serrated)







Square Grippers are similar to Round Grippers, but their shape is useful when positive resistance to rotation is required (they can be mounted against a step to prevent rotation). These serrated grippers are hard, replaceable inserts that provide additional holding force and/or wear resistance when installed in a fixture. They are designed to slightly penetrate the workpiece to significantly increase gripping force, rather than relying on static friction alone. The hardened-tool-steel version is the most economical and impact resistant. The carbide-tipped version is still economical and impact resistant while providing extra durability. The solid-carbide version is the most durable.



Square Grippers can be mounted against a step for positive resistance to rotation.

INCH

PART NO. HARDENED TOOL STEEL (SERRATED)	PART NO. CARBIDE TIPPED (SERRATED)	PART NO. SOLID CARBIDE (SERRATED)	A	B	C	D	E	SERRATIONS	
CL-6-SG	—	—	3/8	3/8	#10-32	—	—	XFine	.094x90°
CL-8-SG	CL-8-SGT	CL-8-SGC	1/2			3/16	13/32	Fine	.125x90°
CL-12-SG	—	—	3/4			—	—		
CL-16-SG	—	—	1		1/4-28	—	—		

INCH

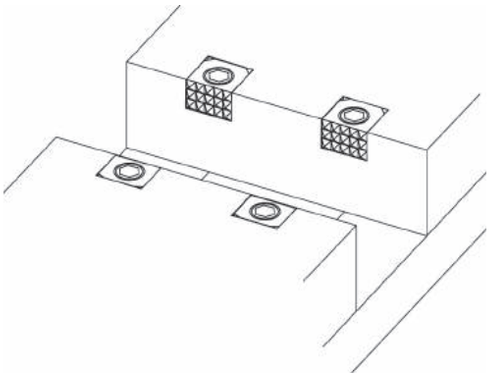
CLM-10-SG	—	—	.394(10mm)	.394 (10mm)	M5	—	—	XFine	.094x90°
CLM-12-SG	CLM-12-SGT	—	.472(12mm)			3/16	13/32	Fine	.125x90°
CLM-20-SG	—	—	.787(20mm)			—	—		
CLM-25-SG	—	—	.984(25mm)		M6	—	—		

EDGE GRIPPERS

M-2 TOOL STEEL, HEAT TREATED RC 60-62, BLACK OXIDE FINISH



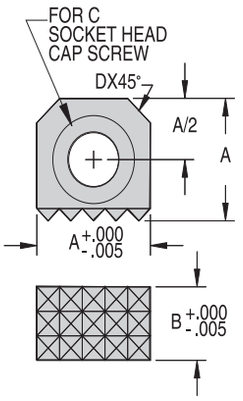
Serrated Hardened Tool Steel



Edge Grippers are ideal for mounting at the top edge of a clamping face such as a vise jaw.

Edge Grippers are helpful for applications where traditional face-mounted grippers are difficult to install. They have a useful flat profile because the mounting screw is parallel to the serrated face. These serrated grippers are hard, replaceable inserts used to provide additional holding force and/or wear resistance when installed in a fixture. They are designed to slightly penetrate the workpiece to significantly increase gripping force, rather than relying on static friction alone. Edge Grippers should be mounted in a flat-bottom recess that provides support behind the gripper. Fasten with a standard socket-head cap screw (on the largest three sizes, a low-head cap screw is required). The serrated face should project 50 to 100% of serration height for maximum effectiveness (serration height is .062" on grippers with fine serrations, .047" on grippers with extra-fine serrations, and .031" on grippers with super-fine serrations).

5



INCH

PART NO.	A	B	SERRATIONS		C	COUNTERBORE DEPTH	D
CL-6-EG-4	3/8	1/4	Extra Fine	.094x90°	#6	.146	1/16
CL-6-EG-4-SF			Super Fine	.062x90°			
CL-6-EG-6		3/8	Extra Fine	.094x90°			
CL-6-EG-6-SF			Super Fine	.062x90°			
CL-8-EG-4	1/2	1/4	Fine	.125x90°	#8	.170	3/32
CL-8-EG-4-EF			Extra Fine	.094x90°			
CL-8-EG-6		3/8	Fine	.125x90°		.175	
CL-8-EG-6-EF			Extra Fine	.094x90°			
CL-8-EG-8		1/2	Fine	.125x90°			
CL-8-EG-8-EF			Extra Fine	.094x90°			
CL-10-EG-4	5/8	1/4	Fine	.125x90°	1/4 LHCS	.130	1/8
CL-10-EG-4-EF			Extra Fine	.094x90°			
CL-10-EG-6		3/8	Fine	.125x90°			
CL-10-EG-6-EF			Extra Fine	.094x90°			
CL-10-EG-8		1/2	Fine	.125x90°			
CL-10-EG-8-EF			Extra Fine	.094x90°			
CL-12-EG-4	3/4	1/4	Fine	.125x90°	5/16 LHCS	.161	1/8
CL-12-EG-4-EF			Extra Fine	.094x90°			
CL-12-EG-6		3/8	Fine	.125x90°			
CL-12-EG-6-EF			Extra Fine	.094x90°			
CL-12-EG-8		1/2	Fine	.125x90°			
CL-12-EG-8-EF			Extra Fine	.094x90°			
CL-16-EG-6	1	3/8	Fine	.125x90°	3/8 LHCS	.194	1/8
CL-16-EG-6-EF			Extra Fine	.094x90°			
CL-16-EG-8		1/2	Fine	.125x90°			
CL-16-EG-8-EF			Extra Fine	.094x90°			

METRIC

CLM-10-EG-6	.394(10mm)	.236(6mm)	Extra Fine	.094x90°	M3 or #6	.148	.06
CLM-10-EG-10		.394(10mm)					
CLM-12-EG-6	.472(12mm)	.236(6mm)	Fine	.125x90°	M4 or #8	.160	.09
CLM-12-EG-10		.394(10mm)					
CLM-12-EG-12		.472(12mm)					
CLM-16-EG-6	.630(16mm)	.236(6mm)	Fine	.125x90°	M6 or 1/4 LHCS	.165	.13
CLM-16-EG-10		.394(10mm)					
CLM-16-EG-12		.472(12mm)					
CLM-20-EG-6	.787(20mm)	.236(6mm)	Fine	.125x90°	M8 or 5/16 LHCS	.200	.13
CLM-20-EG-10		.394(10mm)					
CLM-20-EG-12		.472(12mm)					
CLM-25-EG-10	.984(25mm)	.394(10mm)	Fine	.125x90°	M10 or 3/8 LHCS	.260	.13
CLM-25-EG-12		.472(12mm)					

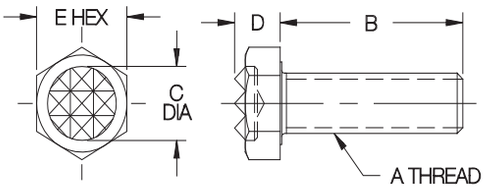
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GRIPPER CONTACT BOLTS

STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH, WITH BRAZED CARBIDE GRIPPER

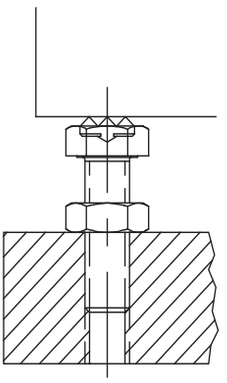


Carbide Tipped (Serrated)



5

Fully threaded contact bolt with a carbide-tipped gripper head. Can be used as an adjustable support, or as a contact bolt in a clamp. Available in thread sizes from 1/4-20 to 5/8-11 (M6 to M16 in metric) each in a choice of lengths.



INCH

PART NO.	A	B	C DIA	D	E	SERRATIONS	
CL-405-GCB	1/4-20	1/2	5/16	13/64	7/16	Extra Fine	.094x90°
CL-410-GCB		1					
CL-505-GCB	5/16-18	1/2	3/8	1/4	1/2	Fine	.125x90°
CL-510-GCB		1					
CL-515-GCB		1-1/2					
CL-605-GCB	3/8-16	1/2	1/2	9/32	9/16		
CL-610-GCB		1					
CL-615-GCB		1-1/2					
CL-810-GCB	1/2-13	1	5/8	23/64	3/4		
CL-815-GCB		1-1/2					
CL-1010-GCB	5/8-11	1	3/4	7/16	15/16		
CL-1020-GCB		2					

METRIC

CLM-612-GCB	M6	.47	5/16	.20	10mm	Extra Fine	.094x90°
CLM-625-GCB		.98					
CLM-812-GCB	M8	.47	3/8	.25	13mm	Fine	.125x90°
CLM-825-GCB		.98					
CLM-835-GCB		1.38					
CLM-1012-GCB	M10	.47	1/2	.30	17mm		
CLM-1025-GCB		.98					
CLM-1040-GCB		1.57					
CLM-1225-GCB	M12	.98	5/8	.34	19mm		
CLM-1240-GCB		1.57					
CLM-1635-GCB	M16	1.38	3/4	.43	24mm		
CLM-1650-GCB		1.97					

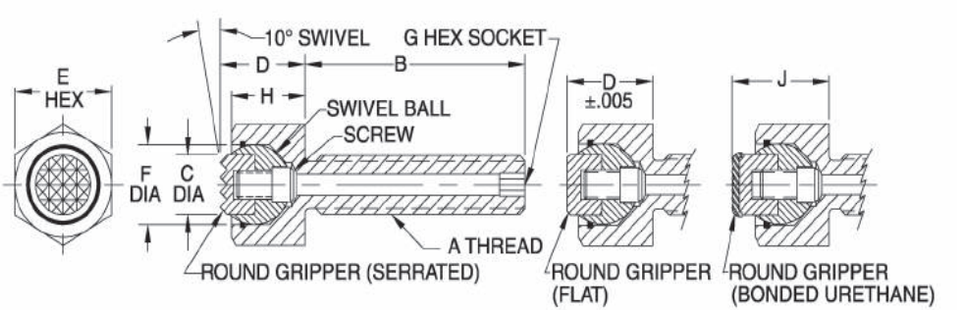
GRIPPER SWIVEL CONTACT BOLTS

BODY AND GRIPPER SCREW: STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
SWIVEL BALL: 440C STAINLESS STEEL, HEAT TREATED. O-RING: RUBBER
INFO+: SEE PAGES 172-173 FOR ROUND GRIPPER MATERIAL SPECIFICATIONS



Hardened Tool Steel (Serrated) | **Carbide Tipped (Serrated)** | **Solid Carbide (Serrated)** | **Abrasive Diamond** | **Bonded Urethane** | **Carbide Tipped (Flat)** | **Hardened Steel or Stainless, or Delrin® (Flat)**

Threaded contact bolt with a built-in swivel ball to hold a Round Gripper. This swivel ball, held by a retaining ring, is removable to allow installing any of the eleven different gripper types (order gripper separately). A fastening screw is furnished with the contact bolt. This screw serves as a positive stop to prevent the ball from swiveling too far. Can be used as a contact bolt, or as a support. Available in thread sizes from 3/8-16 to 1"-8 (M10 to M24 in metric), most in a choice of several lengths.



BODY AND GRIPPER — ORDER SEPARATELY (INCH)

PART NO. BODY WITHOUT GRIPPER	PART NO. — ROUND GRIPPER							A	B	C DIA	D	E	F DIA	G	H	J	SERRATIONS	
	HARDENED TOOL STEEL (SERRATED)	CARBIDE TIPPED (SERRATED)	SOLID CARBIDE (SERRATED)	ABRASIVE DIAMOND	BONDED URETHANE	CARBIDE TIPPED (FLAT)	STEEL, SS, OR DELRIN® (FLAT)											
CL-605-GSB	CL-6-RG	CL-6-RGT	—	CL-6-RGD	CL-6-RGU-1	CL-6-RGFT	CL-6-RGF	3/8-16	1/2	3/8	5/8	5/8	1/2	1/8	1/2	3/4	Extra Fine	.094x90°
CL-610-GSB					CL-6-RGU-2		CL-6-RGF-S		1									
CL-615-GSB					CL-6-RGU-3		CL-6-RGFN		1-1/2									
CL-810-GSB	CL-8-RG	CL-8-RGT	CL-8-RGC	CL-8-RGD	CL-8-RGU-1	CL-8-RGFT	CL-8-RGF	1/2-13	1	1/2	3/4	13/16	5/8	3/16	5/8	7/8	Fine	.125x90°
CL-815-GSB					CL-8-RGU-2		CL-8-RGF-S		1-1/2									
					CL-8-RGU-3		CL-8-RGFN											
CL-1010-GSB	CL-10-RG	CL-10-RGT	CL-10-RGC	CL-10-RGD	CL-10-RGU-1	CL-10-RGFT	CL-10-RGF	5/8-11	1	5/8	13/16	15/16	3/4	1/4	11/16	15/16		
CL-1020-GSB					CL-10-RGU-2		CL-10-RGF-S		2									
					CL-10-RGU-3		CL-10-RGFN											
CL-1210-GSB	CL-12-RG	CL-12-RGT	CL-12-RGC	CL-12-RGD	CL-12-RGU-1	CL-12-RGFT	CL-12-RGF	3/4-10	1	3/4	7/8	1-1/8	7/8	5/16	3/4	1		
CL-1225-GSB					CL-12-RGU-2		CL-12-RGF-S		2-1/2									
					CL-12-RGU-3		CL-12-RGFN											
CL-1620-GSB	CL-16-RG	CL-16-RGT	—	CL-16-RGD	CL-16-RGU-1	CL-16-RGFT	CL-16-RGF	1"-8	2	1	1-1/8	1-1/2	1-1/8	3/8	1	1-1/4		
					CL-16-RGU-2		CL-16-RGF-S											
					CL-16-RGU-3		CL-16-RGFN											

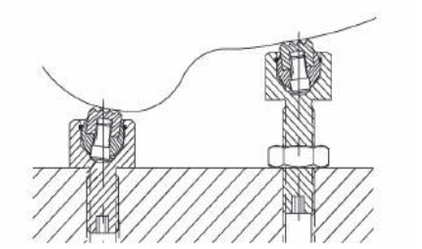
BODY AND GRIPPER — ORDER SEPARATELY (METRIC)

CLM-1015-GSB	CLM-10-RG	CLM-10-RGT	—	CLM-10-RGD	CLM-10-RGU-1	—	CLM-10-RGF	M10	.59	.394	.669	17mm	.51	3mm	.51	.75	Extra Fine	.094x90°
CLM-1030-GSB					CLM-10-RGU-2		CLM-10-RGF-S		1.18									
					CLM-10-RGU-3		CLM-10-RGFN											
CLM-1220-GSB	CLM-12-RG	CLM-12-RGT	—	CLM-12-RGD	CLM-12-RGU-1	—	CLM-12-RGF	M12	.79	.472	.748	19mm	.59	5mm	.59	.83	Fine	.125x90°
CLM-1240-GSB					CLM-12-RGU-2		CLM-12-RGF-S		1.57									
					CLM-12-RGU-3		CLM-12-RGFN											
CLM-1625-GSB	CLM-16-RG	CLM-16-RGT	—	CLM-16-RGD	CLM-16-RGU-1	—	CLM-16-RGF	M16	.98	.630	.906	24mm	.79	6mm	.75	.98		
CLM-1650-GSB					CLM-16-RGU-2		CLM-16-RGF-S		1.97									
					CLM-16-RGU-3		CLM-16-RGFN											
CLM-2030-GSB	CLM-20-RG	CLM-20-RGT	—	CLM-20-RGD	CLM-20-RGU-1	—	CLM-20-RGF	M20	1.18	.787	.945	30mm	.91	8mm	.79	1.02		
CLM-2060-GSB					CLM-20-RGU-2		CLM-20-RGF-S		2.36									
					CLM-20-RGU-3		CLM-20-RGFN											
CLM-2440-GSB	CLM-25-RG	CLM-25-RGT	—	CLM-25-RGD	CLM-25-RGU-1	—	CLM-25-RGF	M24	1.57	.984	1.181	36mm	1.10	10mm	1.02	1.26		
					CLM-25-RGU-2		CLM-25-RGF-S											
					CLM-25-RGU-3		CLM-25-RGFN											

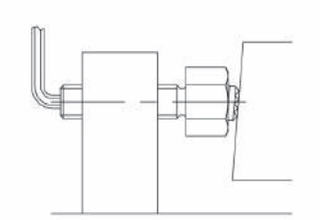
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GRIPPER SWIVEL CONTACT BOLTS

BODY: STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
O-RING: RUBBER
SERRATED SWIVEL BALL: HIGH-SPEED TOOL STEEL, BLACK OXIDE FINISH
FLAT SWIVEL BALL: STEEL, HARDENED, BLACK OXIDE FINISH
FLAT DELRIN® SWIVEL BALL: WHITE DELRI® 500



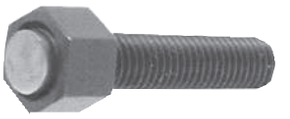
Gripper Swivel Contact Bolts are ideal as either fixed or adjustable supports under workpieces with curved or sloped surfaces.



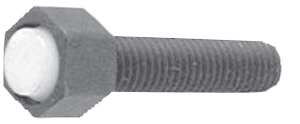
Gripper Swivel Contact Bolts can also be used as screw clamps by turning them with a hex wrench (large sizes only).



Hardened Tool Steel (Serrated)



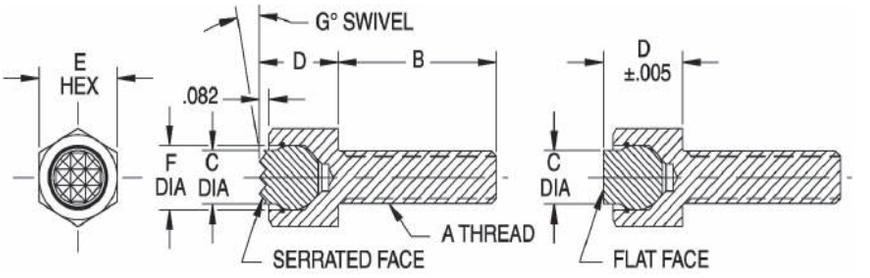
Hardened Steel (Flat)



Delrin® (Flat)

Mini Sizes

Mini threaded contact bolt with a built-in swivel ball held by a retaining ring. Choose from the three gripper types shown, serrated or flat. The gripper face is machined directly on the swivel ball. A positive stop prevents the ball from swiveling too far. Can be used as a contact bolt, or as a support. Available in thread sizes from #10-32 to 5/16-18 (M6 to M8 in metric), most in a choice of several lengths.



MINI — COMPLETE ASSEMBLY (INCH)

PART NO. — COMPLETE			A	B	C DIA	D	E	F DIA	G	SERRATIONS	
HARDENED TOOL STEEL (SERRATED)	HARDENED STEEL (FLAT)	DELRIN® (FLAT)									
CL-305-GSB	CL-305-GBF	CL-305-GBFN	#10-32	1/2	5/32	5/16	3/8	3/16	14°	Super Fine	.062x90°
CL-405-GSB	CL-405-GBF	CL-405-GBFN	1/4-20	1/2	1/4	3/8	7/16	7/32			
CL-410-GSB	CL-410-GBF	CL-410-GBFN		1							
CL-415-GSB	CL-415-GBF	CL-415-GBFN		1-1/2							
CL-505-GSB	CL-505-GBF	CL-505-GBFN	5/16-18	1/2	5/16	7/16	1/2	3/8		Extra Fine	.094x90°
CL-510-GSB	CL-510-GBF	CL-510-GBFN		1							
CL-515-GSB	CL-515-GBF	CL-515-GBFN		1-1/2							

MINI — COMPLETE ASSEMBLY (METRIC)

CLM-612-GSB	CLM-612-GBF	CLM-612-GBFN	M6	.47	.24	.374	10mm	.28	14°	Super Fine	.062x90°
CLM-625-GSB	CLM-625-GBF	CLM-625-GBFN		.98							
CLM-640-GSB	CLM-640-GBF	CLM-640-GBFN		1.57							
CLM-812-GSB	CLM-812-GBF	CLM-812-GBFN	M8	.47	.33	.512	13mm	.39	12°	Extra Fine	.094x90°
CLM-825-GSB	CLM-825-GBF	CLM-825-GBFN		.98							
CLM-840-GSB	CLM-840-GBF	CLM-840-GBFN		1.57							

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GRIPPER SWIVEL PADS

BODY AND GRIPPER SCREW: STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH. O-RING: RUBBER
SWIVEL BALL ON STANDARD SIZES: 440C STAINLESS STEEL, HEAT TREATED
INFO+: SEE PAGES 204-205 FOR ROUND GRIPPER MATERIAL SPECIFICATIONS



Hardened Tool Steel (Serrated)



Carbide Tipped (Serrated)



Solid Carbide (Serrated)



Abrasive Diamond



Bonded Urethane



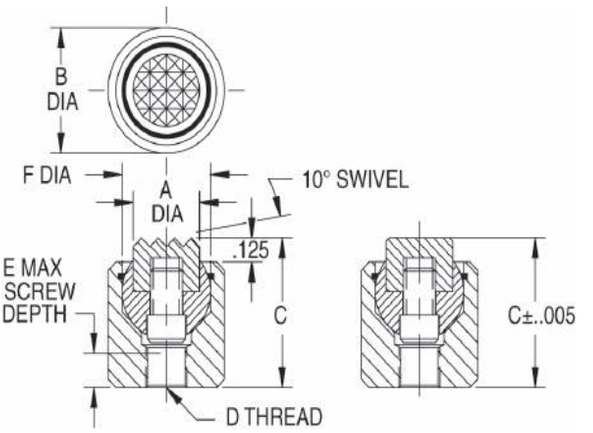
Carbide Tipped (Flat)



Hardened Steel or Stainless, or Delrin® (Flat)

5

Rest pad with a built-in swivel ball held by a retaining ring. A positive stop prevents the ball from swiveling too far. The swivel ball is removable to allow installing any of 11 different Round-Gripper types (order separately). Simply insert a hex wrench or rod to push the ball out from behind. Gripper Swivel Pads are available in a wide range of sizes. They can be surface-mounted or installed in a counterbored hole.



BODY AND GRIPPER — ORDER SEPARATELY (INCH)

PART NO. BODY WITHOUT GRIPPER	PART NO. — ROUND GRIPPER							A DIA	B DIA	C	D	E	F DIA	H	J	SERRATIONS	
	HARDENED TOOL STEEL (SERRATED)	CARBIDE TIPPED (SERRATED)	SOLID CARBIDE (SERRATED)	ABRASIVE DIAMOND	BONDED URETHANE	CARBIDE TIPPED (FLAT)	STEEL, SS, OR DELRIN® (FLAT)										
CL-6-GSP	CL-6-RG	CL-6-RGT	—	CL-6-RGD	CL-6-RGU-1 CL-6-RGU-2 CL-6-RGU-3	CL-6-RGFT	CL-6-RGF CL-6-RGF-S CL-6-RGFN	3/8	5/8	7/8	1/4-28	.24	1/2	3/4	1	XFine	.094x90°
CL-8-GSP	CL-8-RG	CL-8-RGT	CL-8-RGC	CL-8-RGD	CL-8-RGU-1 CL-8-RGU-2 CL-8-RGU-3	CL-8-RGFT	CL-8-RGF CL-8-RGF-S CL-8-RGFN	1/2	13/16	1	5/16-24	.35	5/8	7/8	1-1/8	Fine	.125x90°
CL-10-GSP	CL-10-RG	CL-10-RGT	CL-10-RGC	CL-10-RGD	CL-10-RGU-1 CL-10-RGU-2 CL-10-RGU-3	CL-10-RGFT	CL-10-RGF CL-10-RGF-S CL-10-RGFN	5/8	15/16	1	3/8-24	.28	3/4	7/8	1-1/8		
CL-12-GSP	CL-12-RG	CL-12-RGT	CL-12-RGC	CL-12-RGD	CL-12-RGU-1 CL-12-RGU-2 CL-12-RGU-3	CL-12-RGFT	CL-12-RGF CL-12-RGF-S CL-12-RGFN	3/4	1-1/8	1-1/16	1/2-20	.25	7/8	15/16	1-3/16		
CL-16-GSP	CL-16-RG	CL-16-RGT	—	CL-16-RGD	CL-16-RGU-1 CL-16-RGU-2 CL-16-RGU-3	CL-16-RGFT	CL-16-RGF CL-16-RGF-S CL-16-RGFN	1	1-1/2	1-3/8		.44	1-1/8	1-1/4	1-1/2		

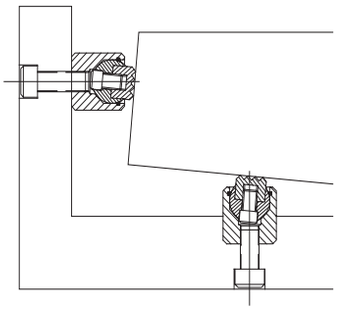
BODY AND GRIPPER — ORDER SEPARATELY (METRIC)

CLM-10-GSP	CLM-10-RG	CLM-10-RGT	—	CLM-10-RGD	CLM-10-RGU-1 CLM-10-RGU-2 CLM-10-RGU-3	—	CLM-10-RGF CLM-10-RGF-S CLM-10-RGFN	10mm	.67	.866	M6	.29	.512	.71	.95	XFine	.094x90°
CLM-12-GSP	CLM-12-RG	CLM-12-RGT	—	CLM-12-RGD	CLM-12-RGU-1 CLM-12-RGU-2 CLM-12-RGU-3	—	CLM-12-RGF CLM-12-RGF-S CLM-12-RGFN	12mm	.75	.945	M8	.33	.591	.79	1.02	Fine	.125x90°
CLM-16-GSP	CLM-16-RG	CLM-16-RGT	—	CLM-16-RGD	CLM-16-RGU-1 CLM-16-RGU-2 CLM-16-RGU-3	—	CLM-16-RGF CLM-16-RGF-S CLM-16-RGFN	16mm	.94	1.102	M10	.35	.787	.95	1.18		
CLM-20-GSP	CLM-20-RG	CLM-20-RGT	—	CLM-20-RGD	CLM-20-RGU-1 CLM-20-RGU-2 CLM-20-RGU-3	—	CLM-20-RGF CLM-20-RGF-S CLM-20-RGFN	20mm	1.18	1.181	M12	.33	.906	1.02	1.26		
CLM-25-GSP	CLM-25-RG	CLM-25-RGT	—	CLM-25-RGD	CLM-25-RGU-1 CLM-25-RGU-2 CLM-25-RGU-3	—	CLM-25-RGF CLM-25-RGF-S CLM-25-RGFN	25mm	1.42	1.417	M12	.47	1.102	1.26	1.50		

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GRIPPER SWIVEL PADS

BODY: STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
O-RING: RUBBER
SERRATED SWIVEL BALL: HIGH-SPEED TOOL STEEL, BLACK OXIDE FINISH
FLAT SWIVEL BALL: STEEL, HARDENED, BLACK OXIDE FINISH
FLAT DELRIN® SWIVEL BALL: WHITE DELRIN® 500



Gripper Swivel Pads can be surface mounted or installed in a counterbored hole.



Hardened Tool Steel (Serrated)



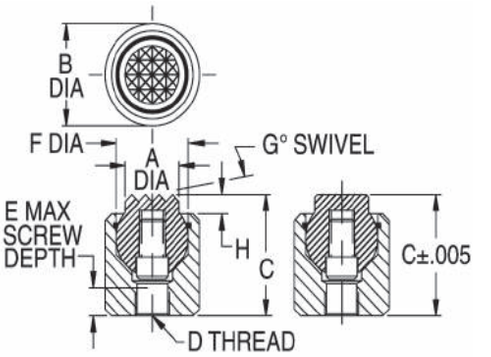
Hardened Steel (Flat)



Delrin® (Flat)

Mini sizes

Mini-size rest pad with a built-in swivel ball held by a retaining ring. Choose from the three gripper types shown, serrated or flat. The gripper face is machined directly on the swivel ball. A positive stop prevents the ball from swiveling too far. Gripper Swivel Pads can be surface mounted or installed in a counterbored hole. Available in the following body diameters from 3/8 to 5/8" (10 to 17mm in metric).



MINI — COMPLETE ASSEMBLY (INCH)

PART NO. — COMPLETE			A DIA	B DIA	C	D	E	F BALL DIA	G	H	SERRATIONS	
HARDENED TOOL STEEL (SERRATED)	HARDENED STEEL (FLAT)	DELRIN® (FLAT)										
CL-3-GSPS	CL-3-GSPF	CL-3-GSPN	5/32	3/8	3/8	#4-40	1/4	3/16	14°	.062	Super Fine	.062x90°
CL-4-GSPS	CL-4-GSPF	CL-4-GSPN	1/4	7/16	7/16	#8-32	5/32	9/32	14°	.062		
CL-5-GSPS	CL-5-GSPF	CL-5-GSPN	5/16	1/2	9/16	#10-32	5/32	3/8	14°	.062	Extra Fine	.094x90°
CL-6-GSPS	CL-6-GSPF	CL-6-GSPN	3/8	5/8	15/16	1/4-28	1/4	1/2	17°	.125		

MINI — COMPLETE ASSEMBLY (METRIC)

CLM-6-GSPS	CLM-6-GSPF	CLM-6-GSPN	.24	.39	.472	M4	.14	.276	14°	.059	SFine	.062x90°
CLM-8-GSPS	CLM-8-GSPF	CLM-8-GSPN	.33	.51	.630	M5	.25	.394	12°	.059	Extra Fine	.094x90°
CLM-10-GSPS	CLM-10-GSPF	CLM-10-GSPN	.39	.67	.768	M6	.27	.512	21°	.059		

GRIPPER SWIVEL SCREWS

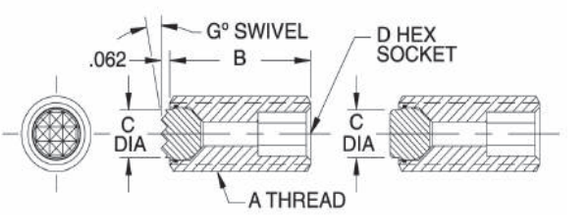
BODY: STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
SWIVEL BALL: HIGH-SPEED TOOL STEEL



Hardened Tool Steel (Serrated)



Hardened Tool Steel (Flat)

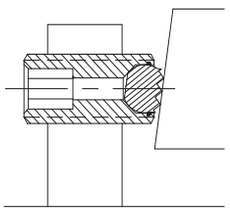


5

Screw clamp with a hardened tool steel swivel ball, either serrated or flat. A positive stop prevents the ball from swiveling too far. Serrated grippers are designed to slightly penetrate the workpiece to significantly increase gripping force, rather than relying on static friction alone. Available in thread sizes from 3/8-16 to 5/8-11 (M10 to M16 in metric) each in a choice of several lengths.

COMPLETE ASSEMBLY (INCH)

PART NO. — COMPLETE		A	B	C DIA	D	G	SERRATIONS	
HARDENED TOOL STEEL (SERRATED)	HARDENED TOOL STEEL (FLAT)							
CL-605-GSS	CL-605-GSF	3/8-16	1/2	5/32	3/16	14°	Super Fine	.062x90°
CL-610-GSS	CL-610-GSF		1					
CL-620-GSS	CL-620-GSF		2					
CL-810-GSS	CL-810-GSF	1/2-13	1	1/4	1/4			
CL-820-GSS	CL-820-GSF		2					
CL-830-GSS	CL-830-GSF		3					
CL-1010-GSS	CL-1010-GSF	5/8-11	1	5/16	5/16		Extra Fine	.094x90°
CL-1020-GSS	CL-1020-GSF		2					
CL-1030-GSS	CL-1030-GSF		3					



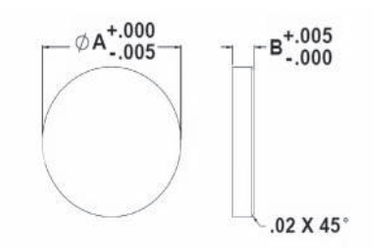
COMPLETE ASSEMBLY (METRIC)

PART NO. — COMPLETE		A	B	C DIA	D	G	SERRATIONS	
HARDENED TOOL STEEL (SERRATED)	HARDENED TOOL STEEL (FLAT)							
CLM-1025-GSS	CLM-1025-GSF	M10	.98	.16	5mm	15°	Super Fine	.062x90°
CLM-1050-GSS	CLM-1050-GSF		1.97					
CLM-1225-GSS	CLM-1225-GSF	M12	.98	.24	6mm	14°		
CLM-1250-GSS	CLM-1250-GSF		1.97					
CLM-1625-GSS	CLM-1625-GSF	M16	.98	.33	8mm	12°	Extra Fine	.094x90°
CLM-1650-GSS	CLM-1650-GSF		1.97					

ROUND CARBIDE PADS

SOLID CARBIDE





These handy round pads are made from solid carbide for high wear resistance. Pads can be brazed or bonded to install. The bottom is slightly chamfered for clearance in a mounting bracket. Available in diameters from 1/4 to 1". Made in USA.

PART NO.	A	B
CL-4-RCP	1/4	1/8
CL-5-RCP	5/16	1/8
CL-6-RCP	3/8	1/8
CL-8-RCP	1/2	1/8
CL-10-RCP	5/8	1/8
CL-12-RCP	3/4	1/8
CL-16-RCP	1	5/32

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REST BUTTONS

TYPES



REST BUTTONS
Precision height locator with a close-tolerance shank for installation in a reamed hole. Rest Buttons are extremely useful as supports, side locator pads, and jig feet. Available in steel, stainless steel, or steel with a carbide pad.



CARBIDE-TIPPED REST BUTTONS
Precision height locator similar to the rest buttons above, but with a carbide tip for extra wear resistance.



AIR REST BUTTONS
Air Rest Buttons are used to incorporate pneumatic position control to detect proper workpiece loading in a machining fixture. These modular units consist of a threaded body installed in the fixture, which holds a precision floating plunger.



SPHERICAL RADIUS LOCATOR BUTTONS
Precision height locator with a spherical-radius head to minimize workpiece contact area. Close-tolerance shank allows press-fit installation in a reamed hole.



JIG REST BUTTONS
Precision height locator with a counterbored hole for mounting with a Socket-Head Cap Screw (not furnished). Jig Rest Buttons are extremely useful as supports, side locator pads, and jig feet.



SCREW REST PADS
Precision height locator with a threaded shank for installation in a tapped hole. Cone shape provides a small contact area in combination with a large stable base. Screw Rest Pads are extremely useful as supports, side locator pads, and jig feet.



SCREW REST BUTTONS
Threaded rest button with a hex head machined .005 to .010″ over nominal height for finish grinding after installation.



SWIVEL CONTACT BOLTS
Swivel contact bolts are precision swivel balls that can be used either as a contact bolt or a rest pad. Ideal for evenly distributing clamping pressure on sloped surfaces.



DRILL JIG FEET
Precision jig foot available in four heights. Dowel in place to prevent rotation.



DOUBLE-END JIG FEET
Tapped jig foot commonly used in pairs with a stud.



JIG LEG PLATES
Precision ground pad with a large contact area. Can be used either as a jig foot, or as a rest pad for heavy workpieces. Choice of three sizes.



HEAVY-DUTY REST PADS
Large, precision rest pad for heavy-duty applications, These hardened pads have a large, durable contact surface to support heavy workpieces, or to serve as wear plates. Choice of four sizes.

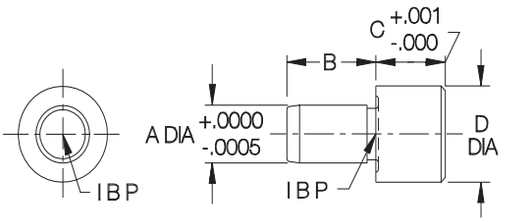


HEIGHT SHIMS
Precision shims that allow raising a height locator by a small, exact amount. Ideal when supporting at different levels underneath a workpiece.

REST BUTTONS

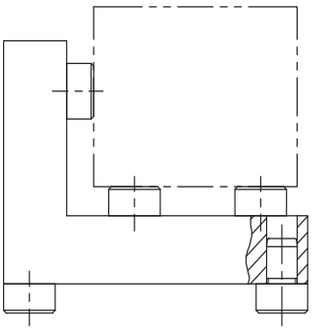
STEEL: 1144, HEAT TREATED RC 40-45 BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES





5

Precision height locator with a close-tolerance shank for installation in a reamed hole. Rest Buttons are extremely useful as supports, side locator pads, and jig feet. Available in steel, stainless steel, or steel with a carbide pad on opposite page.



STEEL (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C NOMINAL	C ACTUAL	D DIA
CL-12-RB	3/16	.1885	3/8	1/4	.2500	3/8
CL-13-RB				3/8	.3750	
CL-14-RB				1/2	.5000	
CL-2-RB	1/4	.2510	1/2	1/4	.2500	1/2
CL-3-RB				3/8	.3750	
CL-1-RB				1/2	.5000	
CL-5-RB	3/8	.3760	5/8	1/4	.2500	5/8
CL-6-RB				3/8	.3750	
CL-4-RB				1/2	.5000	
CL-7-RB				5/8	.6250	
CL-8-RB				3/4	.7500	
CL-15-RB	1/2	.5010	5/8	3/8	.3750	7/8
CL-9-RB				1/2	.5000	
CL-16-RB				5/8	.6250	
CL-17-RB	5/8	.6260	3/4	3/8	.3750	1
CL-10-RB				1/2	.5000	
CL-18-RB				3/4	.7500	
CL-19-RB	3/4	.7515	7/8	1/2	.5000	1-1/4
CL-11-RB				5/8	.6250	

STAINLESS STEEL (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C NOMINAL	C ACTUAL	D DIA
CL-26432	3/16	.1885	1/4	1/4	.2500	3/8
CL-26433				3/8	.3750	
CL-26434				1/2	.5000	
CL-26542	1/4	.2510	5/16	1/4	.2500	1/2
CL-26646	5/16	.3135	5/16	3/4	.7500	1/2



For additional metric Rest Buttons, see
Round Locating Pads
DIN 6321
(**Info+:** Page 244)

STEEL (METRIC)

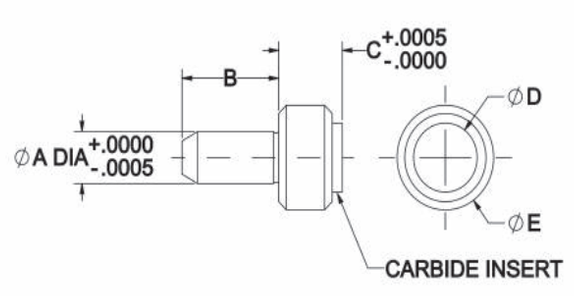
PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C NOMINAL	C ACTUAL	D DIA
CLM-605-RB	6mm	.2372	.31	5mm	.1969	.39
CLM-610-RB				10mm	.3937	
CLM-805-RB	8mm	.3160	.39	5mm	.1969	.63
CLM-810-RB				10mm	.3937	
CLM-815-RB				15mm	.5906	
CLM-820-RB				20mm	.7874	
CLM-1010-RB	10mm	.3947	.47	10mm	.3937	.79
CLM-1015-RB				15mm	.5906	
CLM-1020-RB				20mm	.7874	

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CARBIDE-TIPPED REST BUTTONS

BODY: 1144 STEEL, HEAT TREATED RC 40-45, BLACK OXIDE FINISH
PAD: CARBIDE





Carbide-Tipped Rest Buttons are available in many of the same diameters and heights as our standard Rest Buttons on the opposite page, so they can be used as direct replacements where additional wear resistance is desired. These rest buttons feature a thick embedded carbide pad, finish machined to a precision height. Like a standard Rest Button, these locators have a close-tolerance shank for installation in a reamed hole.

STEEL (INCH)

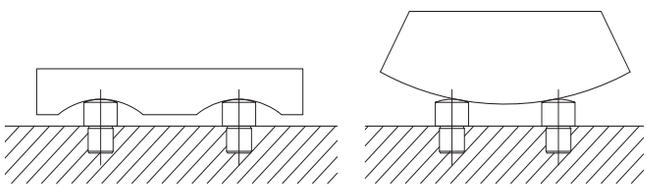
PART NO.	A DIA NOMINAL	A DIA ACTUAL	B	C NOMINAL	C ACTUAL	D DIA	E DIA
CL-12-CTRB	3/16	.1885	3/8	1/4	.2500	1/4	3/8
CL-14-CTRB				1/2	.5000		
CL-3-CTRB	1/4	.2510	1/2	3/8	.3750	3/8	1/2
CL-5-CTRB	3/8	.3760	5/8	1/4	.2500	1/2	5/8
CL-6-CTRB				3/8	.3750		
CL-7-CTRB				5/8	.6250		
CL-15-CTRB	1/2	.5010	5/8	3/8	.3750	3/4	7/8
CL-9-CTRB				1/2	.5000		
CL-19-CTRB	3/4	.7515	7/8	1/2	.5000	1	1-1/4

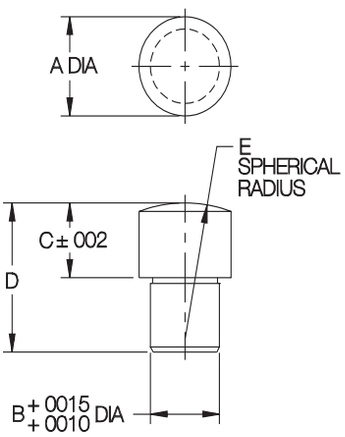
5

SPHERICAL RADIUS LOCATOR BUTTONS

1144 STEEL, HEAT TREATED RC 40-45, BLACK OXIDE FINISH







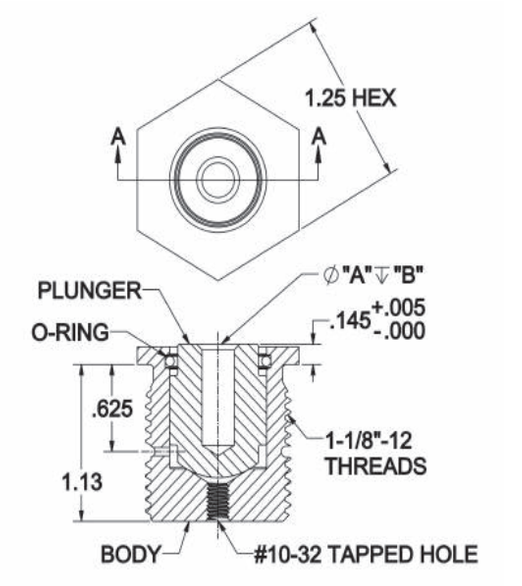
Precision height locator with a spherical-radius head to minimize workpiece contact area. Close-tolerance shank allows press-fit installation in a reamed hole. Spherical-Radius Locator Buttons are extremely useful as supports, side locator pads, and jig feet.

PART NO.	B DIA	A DIA	C	D	E
CL-1-SLB	3/16	5/16	.1250	3/8	1/2
CL-2-SLB	1/4	3/8	.1875	1/2	5/8
CL-3-SLB	3/8	1/2	.1875	9/16	3/4
CL-4-SLB			.2500	5/8	
CL-5-SLB			.3750	3/4	
CL-6-SLB			.5000	7/8	

AIR REST BUTTONS

PLUNGER & BODY: 1144 STEEL, HEAT TREATED RC 40-45, BLACK OXIDE FINISH





5

Air Rest Buttons allow using pneumatic position control to detect proper workpiece loading in a machining fixture. These modular units consist of a threaded body installed in a fixture, which holds a precision floating plunger. This plunger has a reamed hole, available in a choice of three diameters, that accepts any height of our standard press-fit-type Rest Buttons.

Proper placement of a workpiece on the Air Rest Button assembly causes the plunger to fully retract into the body. This seals off air flow, which increases the overall pressure of the system (30 psi maximum air pressure). This pressure value can be read using an analog or digital pressure sensor which can then be tied into a PLC or control system. **Patent pending.**

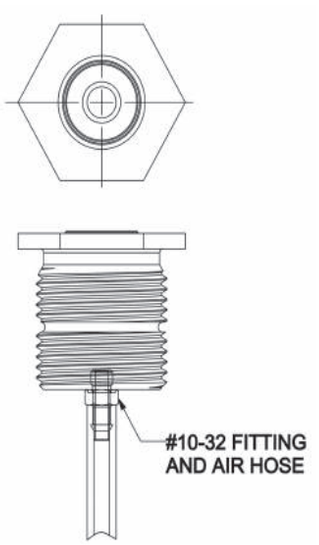
After installation, the retracted plunger's top surface will be .145" above the fixture surface before a Rest Button is installed (the body's top flange is .125" thick, and the plunger protrudes .020" above the flange). If desired to achieve ultimate precision, the top surfaces of all Rest Buttons can be reground after installation of all Rest Button assemblies.

When using pneumatic position control, please consider that keeping the support surfaces reasonably clean is always important. Operations that produce fine chips or grit, such as when machining cast iron, should be avoided. The use of flood coolant, or aggressive coolant, should also be avoided.

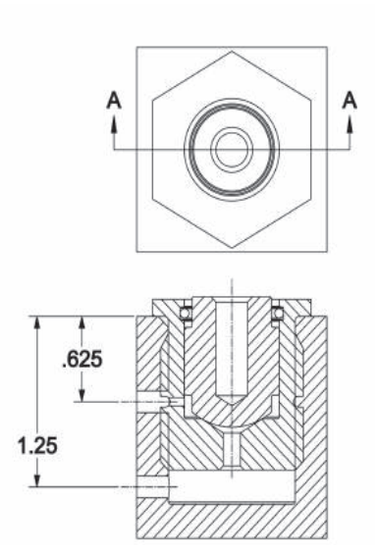
For more information and videos, see our online catalog at carrlane.com.

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B DIA	MAXIMUM AIR PRESSURE (psi)
CL-213-ARB	3/16	.1870/.1875	11/16	30
CL-214-ARB	1/4	.2495/.2500		
CL-216-ARB	3/8	.3745/.3750		





Air connection with external fitting



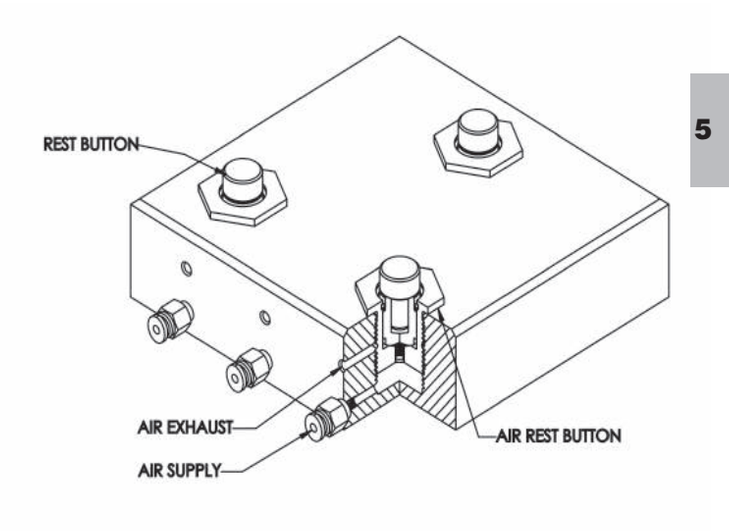
Air connection with drilled manifold passage

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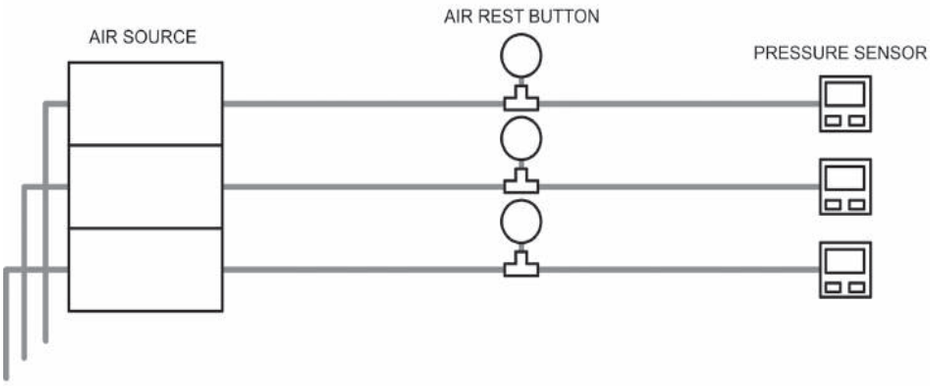


This example uses three Air Rest Buttons to provide full 3-point support under a workpiece.

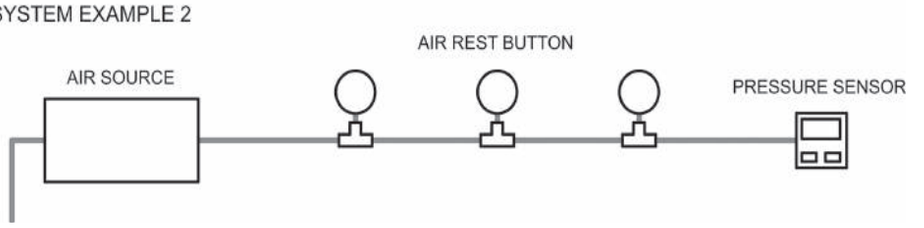
For more information and videos, see our online catalog at carrlane.com.



SYSTEM EXAMPLE 1



SYSTEM EXAMPLE 2

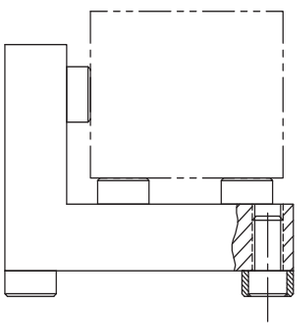


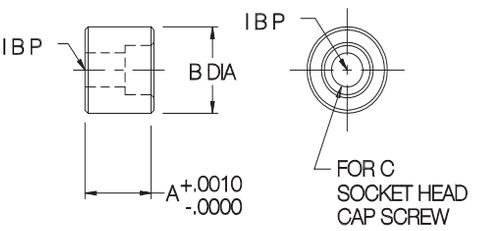
JIG REST BUTTONS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Precision height locator with a counterbored hole for mounting with a Socket-Head Cap Screw (not furnished). Jig Rest Buttons are extremely useful as supports, side locator pads, and jig feet.





INCH

PART NO.	B DIA	A NOMINAL	A ACTUAL	C
CL-24-JRB	1/2	1/8	.1250	#8 Flat Head*
CL-00-JRB		3/8	.3750	#10
CL-0-JRB		1/2	.5000	
CL-12-JRB	5/8	1/4	.2500	#10 Flat Head*
CL-13-JRB		3/8	.3750	1/4
CL-1-JRB		1/2	.5000	
CL-14-JRB		5/8	.6250	
CL-2-JRB		3/4	.7500	
CL-16-JRB		1	1.0000	
CL-17-JRB	7/8	3/8	.3750	1/4
CL-18-JRB		1/2	.5000	5/16
CL-3-JRB		5/8	.6250	
CL-19-JRB		3/4	.7500	
CL-20-JRB		1	1.0000	
CL-25-JRB	1-1/4	1/2	.5000	3/8
CL-21-JRB		3/4	.7500	
CL-6-JRB		1	1.0000	
CL-7-JRB		1-1/2	1.5000	
CL-8-JRB		2	2.0000	

* Countersunk for flat-head screw these sizes only.

METRIC

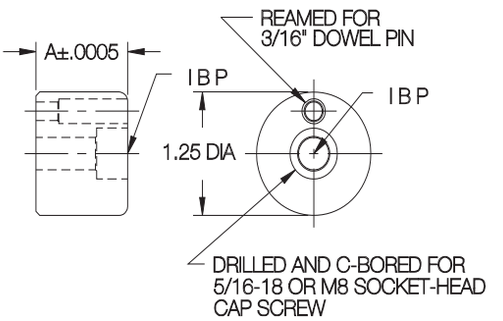
PART NO.	B DIA	A NOMINAL	A ACTUAL	C
CLM-1-JRB	.63	10mm	.3937	M5
CLM-2A-JRB		15mm	.5906	
CLM-4-JRB	.79	10mm	.3937	M6
CLM-6A-JRB		15mm	.5906	
CLM-7A-JRB		20mm	.7874	
CLM-8-JRB		25mm	.9843	
CLM-11A-JRB	.98	15mm	.5906	M8
CLM-12A-JRB		20mm	.7874	
CLM-13-JRB		25mm	.9843	
CLM-14A-JRB	1.26	20mm	.7874	M10
CLM-15-JRB		25mm	.9843	
CLM-16A-JRB		30mm	1.1811	
CLM-17A-JRB		50mm	1.9685	

DRILL JIG FEET

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Precision jig foot available in four heights. Dowel in place to prevent rotation.



INCH

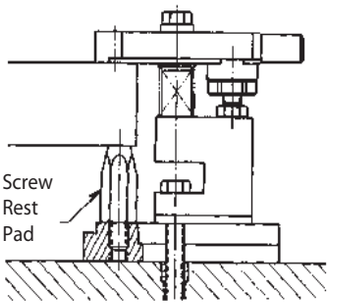
PART NO.	A
CL-1-DJF	.5000
CL-2-DJF	1.0000
CL-3-DJF	2.0000
CL-4-DJF	3.0000

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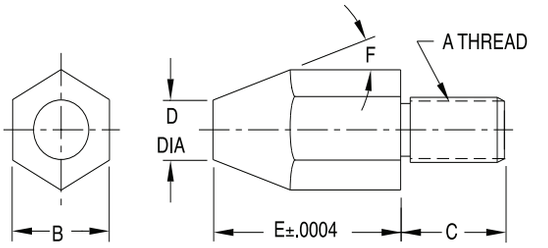
SCREW REST PADS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH





Precision height locator with a threaded shank for installation in a tapped hole. Cone shape provides a small contact area in combination with a large stable base. Screw Rest Pads are extremely useful as supports, side locator pads, and jig feet.



INCH

PART NO.	A	B	C	D DIA	E	F
CL-MF25-4801	5/16-18	3/4	5/8	5/16	.2500	75°
CL-MF25-4802					.3750	60°
CL-MF25-4803					.5000	35°
CL-MF25-4804					.7500	25°
CL-MF25-4805					1.0000	20°
CL-MF25-4806					1.2500	15°
CL-MF25-4807					1.5000	
CL-MF40-4801	1/2-13	7/8	15/16	1/2	.2500	75°
CL-MF40-4802					.3750	60°
CL-MF40-4803					.5000	35°
CL-MF40-4804					.7500	25°
CL-MF40-4805					1.0000	20°
CL-MF40-4806					1.2500	15°
CL-MF40-4807					1.5000	
CL-MF40-4808					2.0000	
CL-MF50-4801	5/8-11	1	1-1/4	5/8	.2500	75°
CL-MF50-4802					.3750	60°
CL-MF50-4803					.5000	35°
CL-MF50-4804					.7500	25°
CL-MF50-4805					1.0000	20°
CL-MF50-4806					1.2500	15°
CL-MF50-4807					1.5000	
CL-MF50-4808					2.0000	

METRIC

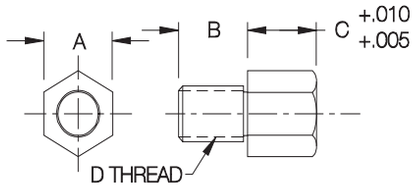
PART NO.	A	B	C	D DIA	E	F
CL-MF08-4801	M8	17mm	.63	.31	.1969 (5mm)	75°
CL-MF08-4802					.3937 (10mm)	60°
CL-MF08-4803					.5906 (15mm)	35°
CL-MF08-4804					.7874 (20mm)	25°
CL-MF08-4805					.9843 (25mm)	20°
CL-MF08-4806					1.1811 (30mm)	15°
CL-MF08-4808					1.5748 (40mm)	
CL-MF12-4801	M12	19mm	.94	.47	.1969 (5mm)	75°
CL-MF12-4802					.3937 (10mm)	60°
CL-MF12-4803					.5906 (15mm)	35°
CL-MF12-4804					.7874 (20mm)	25°
CL-MF12-4805					.9843 (25mm)	20°
CL-MF12-4806					1.1811 (30mm)	15°
CL-MF12-4808					1.5748 (40mm)	
CL-MF12-4810					1.9685 (50mm)	
CL-MF16-4802	M16	24mm	1.26	.63	.3937 (10mm)	60°
CL-MF16-4803					.5906 (15mm)	35°
CL-MF16-4804					.7874 (20mm)	25°
CL-MF16-4805					.9843 (25mm)	20°
CL-MF16-4806					1.1811 (30mm)	15°
CL-MF16-4808					1.5748 (40mm)	
CL-MF16-4810					1.9685 (50mm)	

SCREW REST BUTTONS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Threaded rest button with a hex head machined .005 to .010" over nominal height for finish grinding after installation.



INCH

PART NO.	A	B	C NOMINAL	C ACTUAL	D
CL-1-SRB	3/8	3/8	1/4	.2500	1/4-20
CL-2-SRB			3/8	.3750	
CL-3-SRB			1/2	.5000	
CL-4-SRB			3/4	.7500	
CL-5-SRB			1	1.0000	
CL-6-SRB	1/2	1/2	1/4	.2500	3/8-16
CL-7-SRB			3/8	.3750	
CL-8-SRB			1/2	.5000	
CL-9-SRB			3/4	.7500	
CL-10-SRB			1	1.0000	
CL-11-SRB	5/8	5/8	1/4	.2500	1/2-13
CL-12-SRB			3/8	.3750	
CL-13-SRB			1/2	.5000	
CL-14-SRB			5/8	.6250	
CL-15-SRB			3/4	.7500	
CL-16-SRB			1	1.0000	

METRIC

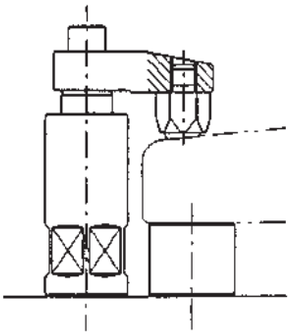
PART NO.	A	B	C NOMINAL	C ACTUAL	D
CLM-605-SRB	10mm	.39	5mm	.1969	M6
CLM-610-SRB			10mm	.3937	
CLM-615-SRB			15mm	.5906	
CLM-620-SRB			20mm	.7874	
CLM-625-SRB			25mm	.9843	
CLM-1005-SRB	13mm	.51	5mm	.1969	M10
CLM-1010-SRB			10mm	.3937	
CLM-1015-SRB			15mm	.5906	
CLM-1020-SRB			20mm	.7874	
CLM-1025-SRB			25mm	.9843	
CLM-1205-SRB	17mm	.63	5mm	.1969	M12
CLM-1210-SRB			10mm	.3937	
CLM-1215-SRB			15mm	.5906	
CLM-1220-SRB			20mm	.7874	
CLM-1225-SRB			25mm	.9843	

SWIVEL CONTACT BOLTS

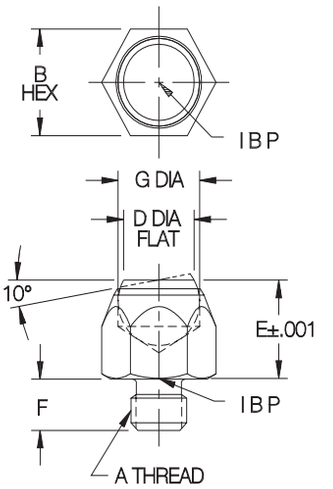
BALL: CHROME STEEL, HEAT TREATED RC 60-67
BODY: 1144 STEEL, HEAT TREATED RC 35-40, BLACK OXIDE FINISH

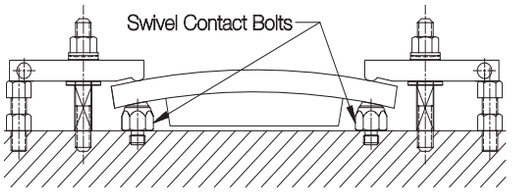


Precision swivel ball that can be used as either a contact bolt or rest pad.



Swivel Contact Bolts are ideal for evenly distributing clamping pressure on sloped surfaces.





Swivel Contact Bolts are precision ground for accurate height location, even on sloped surfaces. **INFO+**: See Riser Blocks (page 432), Extension Supports (page 433), and Height Shims (page 228).

INCH

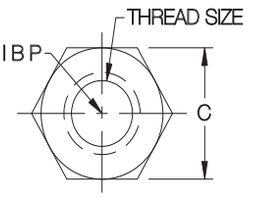
PART NO.	A	B	D DIA	E NOMINAL	E ACTUAL	F	G
CL-MF25-2502	5/16-18	9/16	13/32	1/2	.5000	.32	15/32
CL-MF30-2503	3/8-16	13/16	19/32	13/16	.8125	.47	23/32
CL-MF40-2501	1/2-13	7/8	5/8	13/16	.8125	.41	23/32
CL-MF50-2501	5/8-11	1-1/16	13/16	1	1.0000	.61	29/32

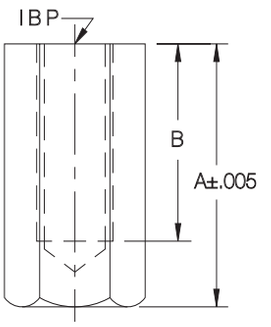
DOUBLE-END JIG FEET

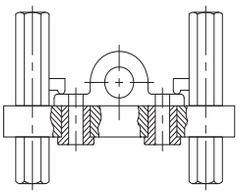
12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Tapped jig foot commonly used in pairs with a stud.







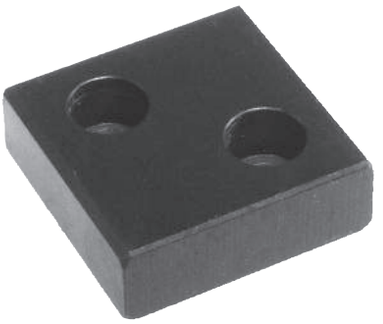
INCH

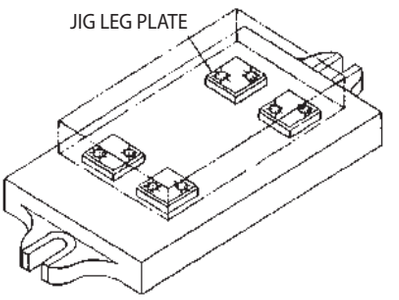
PART NO.	THREAD SIZE	A	B	C
CL-1-DEJF	5/8-11	1.000	5/8	1
CL-3-DEJF		1.500	1	
CL-5-DEJF		2.000	1-1/2	
CL-7-DEJF		3.000		
CL-9-DEJF		4.000		
CL-10-DEJF		6.000		
CL-11-DEJF		8.000		

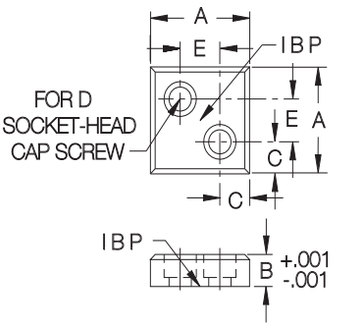
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JIG LEG PLATES

1020 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH







Precision ground pad with a large contact area. Can be used either as a jig foot, or as a rest pad for heavy workpieces. Choice of three sizes.

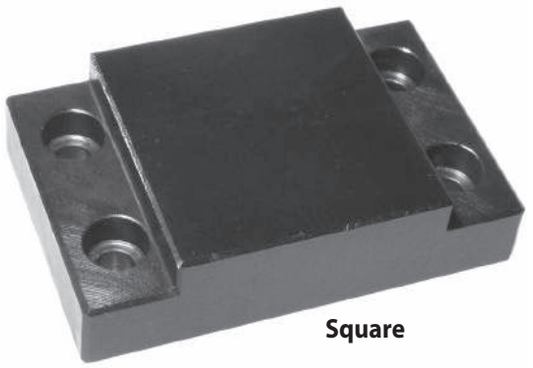
INCH

PART NO.	A	B	C	D	E
CL-1-JLP	1	.3125	5/16	#10-32 OR M5	3/8
CL-2-JLP	1-1/4	.3750	3/8	1/4-20 OR M6	1/2
CL-3-JLP	1-1/2	.4375	7/16		5/8

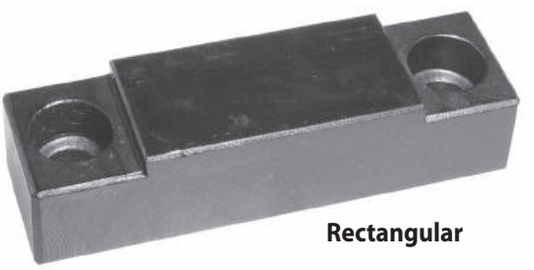
5

HEAVY-DUTY REST PADS

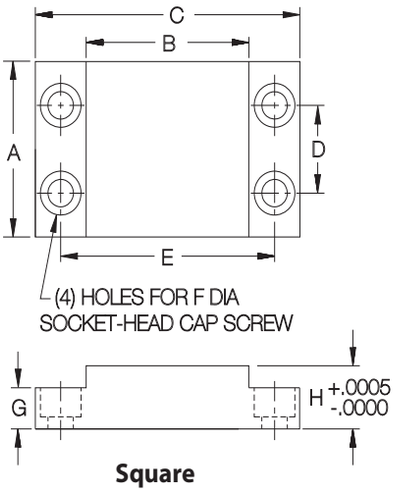
1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



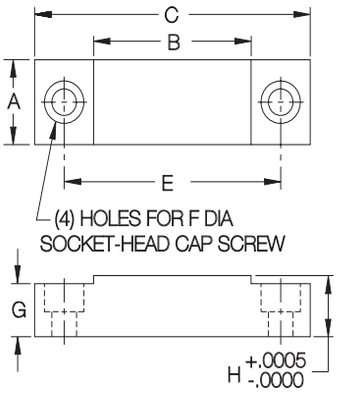
Square



Rectangular



Square



Rectangular

Large, precision rest pad for heavy-duty applications. These hardened pads have a large, durable contact surface to support heavy workpieces, or to serve as wear plates. Choice of four sizes.

SQUARE (INCH)

PART NO.	A	B	C	D	E	F	G	H
CL-1-HDRP	2	2	3-1/4	1	2-1/2	1/4-20 OR M6	1/2	.7500

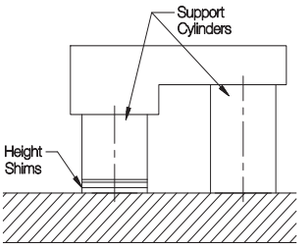
RECTANGULAR (INCH)

CL-2-HDRP	1	2	3-1/2	—	2-3/4	5/16-18 OR M8	5/8	.7500
CL-3-HDRP		3	4-1/2		3-3/4			
CL-4-HDRP		4	5-1/2		4-3/4			

HEIGHT SHIMS

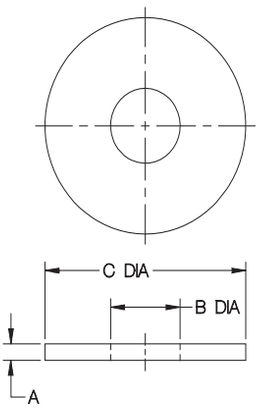
1010 STEEL





Precision shims that allow raising a height locator by a small, exact amount. Ideal when supporting at different levels underneath a workpiece, as in the example shown using Support Cylinders. Thickness tolerance is ±.0003 on .125 size, ± 10% on smaller sizes.

PART NO.	A	B DIA	C DIA
CL-MF25-7005	.005	9/16	15/16
CL-MF25-7010	.010		
CL-MF25-7020	.020		
CL-MF25-7125	1.25		
CL-MF40-7005	.005	9/16	1-5/8
CL-MF40-7010	.010		
CL-MF40-7020	.020		
CL-MF40-7125	1.25		
CL-MF50-7005	.005	11/16	1-7/8
CL-MF50-7010	.010		
CL-MF50-7020	.020		
CL-MF50-7125	1.25		



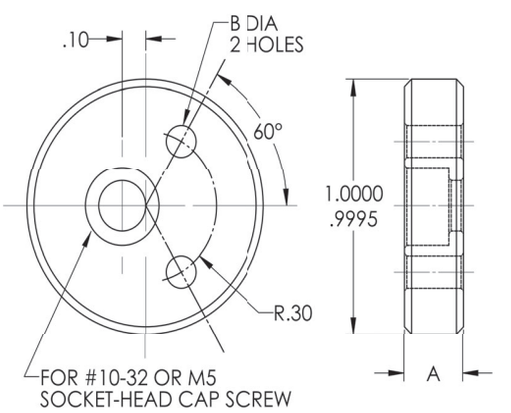
ECCENTRIC LEVELING LUGS

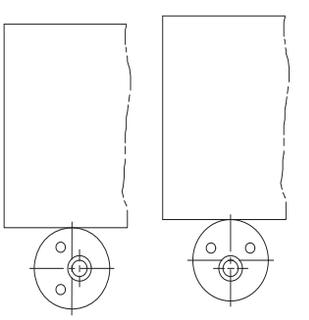
5

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Precision side locator that can be doweled in place after adjustment. Use for vertical leveling or horizontal locating. Available hardened, or soft to allow drilling and reaming after installation.





HARDENED

PART NO.	A	B DIA
CL-3-ELL	1/4	1/8 REAMED
CL-4-ELL	3/8	

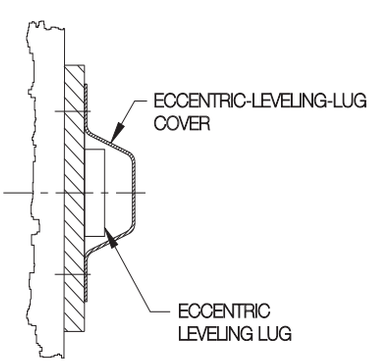
SOFT

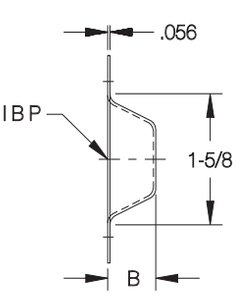
CL-1-ELL	1/4	#31
CL-2-ELL	3/8	

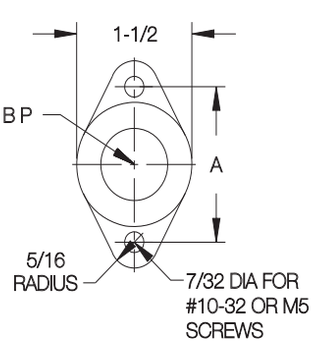
ECCENTRIC-LEVELING-LUG COVERS

MILD STEEL, BLACK OXIDE FINISH









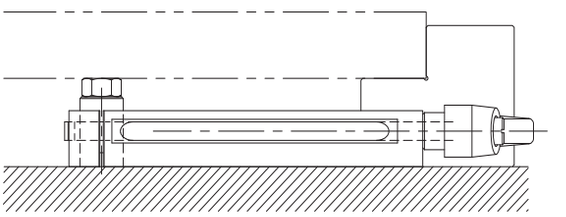
Sturdy cover that protects an Eccentric Leveling Lug from damage or misadjustment after setting.

PART NO.	A	B
CL-1-COVER	1-7/8	5/8

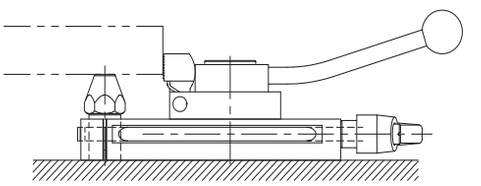
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BODY & PLUNGER: CARBON STEEL, CASE HARDENED, BLACK OXIDE FINISH
HANDLE: ZINC DIE CASTING, ENAMEL PAINT





Low profile allows reaching far underneath low workpieces.



Mounting slot allows stacking other components, such as this Cam Edge Clamp, on top of the support.

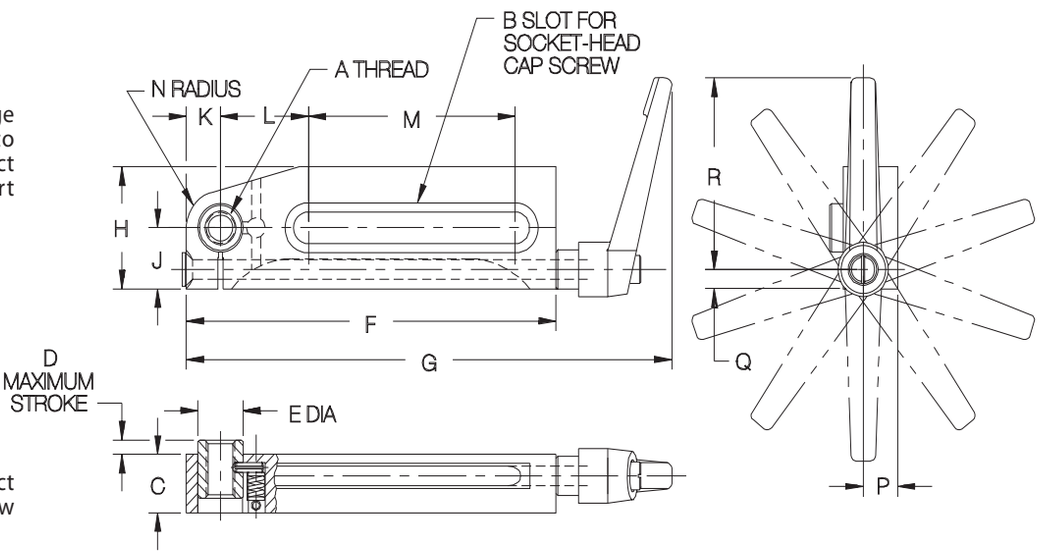
Spring-extended work support with an extremely low profile. Ideal for supporting in hard-to-reach places, because the handle can be positioned for convenient access. Turning the handle counterclockwise unlocks the plunger, allowing the plunger to float. Turning the handle clockwise locks the plunger. If desired, the plunger can be locked in retracted position before loading, for easier loading of light parts. The zinc die-cast Adjustable Handle can be reset to any angle for best leverage.



Screw Rest Pads (**INFO+** page 225), available from 1/4" to 2" tall, are ideal fixed contact bolts to use in the support plunger.



INFO+: For adjustable contact screws, see Knurled Screw Jacks (page 230).



INCH

PART NO.	A	B	C	D	E DIA	F	G	H	J	K	L	M	N	P	Q	R	LOAD CAPACITY (LBS)
CL-MF25-5701	5/16-18	5/16-18 or M8	.708	.118	.591	3-3/8	5-1/16	1-3/16	25/32	13/32	1-1/16	1-13/32	13/32	.433	9/32	2-9/16	110
CL-MF40-5701	1/2-13	1/2-13 or M12	.945	.236	.787	6-1/2	8-9/16	2	1	19/32	1-17/32	3-9/16	19/32	.551	5/16	3-1/8	550
CL-MF50-5702	5/8-11	5/8-11 or M16	1.339	.433	1.102	7-1/2	10-7/16	2-3/8	1-7/16	13/16	1-3/4	4-1/16	13/16	.846	1/2	4-5/16	1100

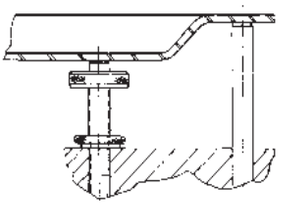
METRIC

CL-MF08-5701	M8	5/16-18 or M8	.708	.118	.591	3-3/8	5-1/16	1-3/16	25/32	13/32	1-1/16	1-13/32	13/32	.433	9/32	2-9/16	110
CL-MF12-5701	M12	1/2-13 or M12	.945	.236	.787	6-1/2	8-9/16	2	1	19/32	1-17/32	3-9/16	19/32	.551	5/16	3-1/8	550
CL-MF16-5702	M16	5/8-11 or M16	1.339	.433	1.102	7-1/2	10-7/16	2-3/8	1-7/16	13/16	1-3/4	4-1/16	13/16	.846	1/2	4-5/16	1100

KNURLED SCREW JACKS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH

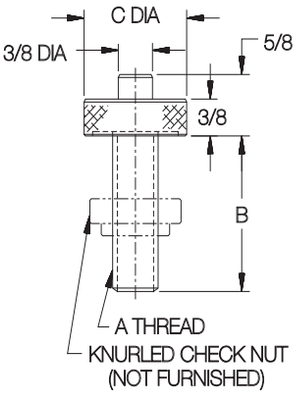




Knurled head allows quick, easy, finger adjustment. **INFO+**: Order Knurled Check Nut separately (page 311).

INCH

PART NO.	A	B	C DIA	KNURLED CHECK NUT (NOT FURNISHED)
CL-0-KSJ	5/16-18	1-5/8	7/8	CL-51618-TSJN
CL-1-KSJ	3/8-16	1-1/4	1-1/8	CL-3816-TSJN
CL-2-KSJ		1-5/8		
CL-3-KSJ		2		
CL-4-KSJ	1/2-13	1-1/4	1-1/8	CL-1213-TSJN
CL-5-KSJ		1-5/8		
CL-6-KSJ		2		
CL-7-KSJ		2-1/2		
CL-8-KSJ	5/8-11	1-5/8	1-3/8	CL-5811-TSJN
CL-9-KSJ		2		
CL-10-KSJ		2-1/2		

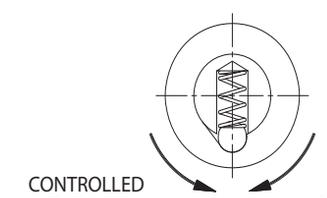


TORQUE SCREW JACKS

12L14 STEEL, BLACK OXIDE FINISH

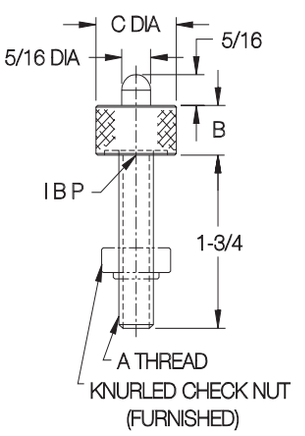


When indicated end force is reached, the knurled head disengages, eliminating the possibility of exerting excessive pressure on thinwall pieces. Furnished with Knurled Check Nut (**INFO+**: see page 311 for dimensions).



INCH

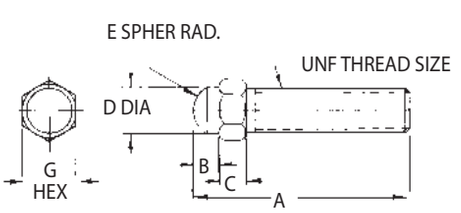
PART NO.	A	END FORCE (LBS)	B	C DIA	KNURLED CHECK NUT (FURNISHED)
CL-4-TSJ	1/4-20	12-14	7/16	7/8	CL-1420-TSJN
CL-4A-TSJ	5/16-18	14-16			CL-51618-TSJN
CL-5-TSJ	3/8-16	16-18			CL-3816-TSJN
CL-6-TSJ	1/2-13	18-20	1/2	1-1/8	CL-1213-TSJN
CL-8-TSJ	5/8-11	20-22			CL-5811-TSJN



ADJUSTABLE LOCATING BUTTONS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH





A support screw with fine threads for precise adjustment. (Metric threads and CL-LB-2A are coarse).

INCH

PART NO.	THREAD SIZE	A	B	C	D DIA	E	G
CL-LB-1	#10-32	1	1/8	1/8	3/16	1/8	1/4
CL-LB-2	1/4-28	1-1/2	3/16	3/16	1/4	3/16	3/8
CL-LB-2A	1/4-20						
CL-LB-7	5/16-24	1-3/4	1/4	1/4	5/16	3/16	7/16
CL-LB-3	3/8-24	2			3/8	1/4	1/2
CL-LB-4	1/2-20	2-1/2	5/16	5/16	1/2	5/16	5/8
CL-LB-5	5/8-18	3	3/8	3/8	5/8	3/8	3/4
CL-LB-6	3/4-16	3-1/2	7/16	7/16	3/4	7/16	7/8

METRIC

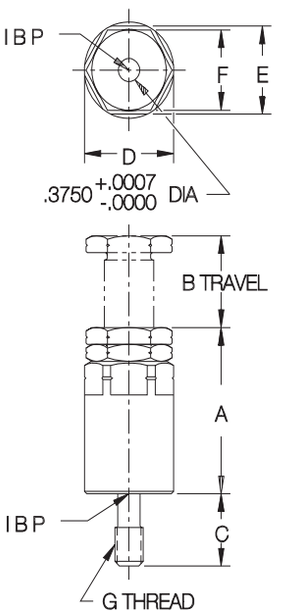
CLM-5-LB	M5	.98	.12	.12	.20	.20	8mm
CLM-6-LB	M6	1.57	.20	.20	.24	.20	10mm
CLM-8-LB	M8	1.77	.24	.24	.31	.20	13mm
CLM-10-LB	M10	1.97			.39	.24	17mm
CLM-12-LB	M12	2.56	.31	.31	.47	.31	19mm
CLM-16-LB	M16	2.95	.39	.39	.63	.39	24mm

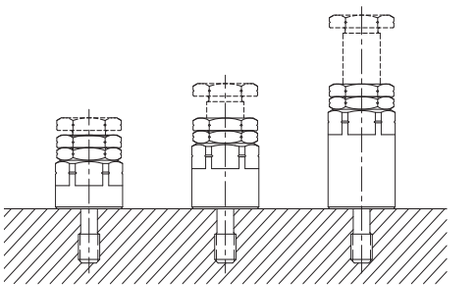
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HEAVY-DUTY SCREW JACKS

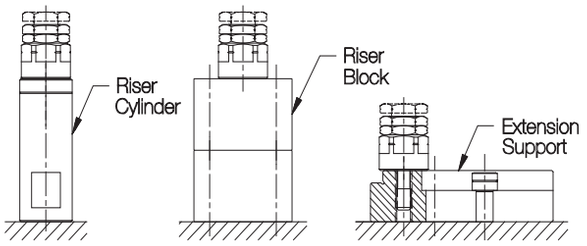
JACK SCREW: 4135 STEEL, HEAT TREATED, BLACK OXIDE FINISH
TIP: 1144 OR 1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH
BODY: 1045 STEEL, BLACK OXIDE FINISH







Heavy-duty adjustable support that accepts any of the three tips shown below. Choice of three heights in each size cover the full range of height possibilities.



INFO+: For additional height and/or mounting flexibility, use Riser Cylinders (page 300), Support Riser Blocks (page 432), or Extension Supports (page 433).

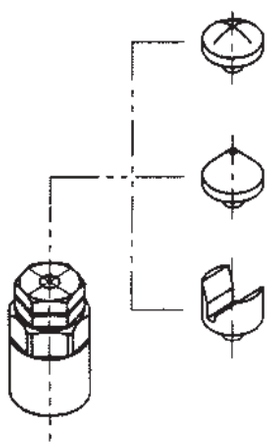
5

SCREW JACKS (INCH)

PART NO.	MOUNTING SCREW SIZE	A	B	C	D DIA	E	F	G
CL-MF40-3401	1/2-13	1-5/8	3/8	1-1/4	1-9/16	1-7/16	1-5/16	1/2-13
CL-MF40-3402		2	3/4					
CL-MF40-3403		2-3/4	1-1/2					
CL-MF50-3401	5/8-11	1-5/8	3/8	1-3/8	1-9/16	1-7/16	1-5/16	5/8-11
CL-MF50-3402		2	3/4					
CL-MF50-3403		2-3/4	1-1/2					

SCREW JACKS (METRIC)

CL-MF12-3401	M12	1-5/8	3/8	1-1/4	1-9/16	1-7/16	1-5/16	M12
CL-MF12-3402		2	3/4					
CL-MF12-3403		2-3/4	1-1/2					
CL-MF16-3401	M16	1-5/8	3/8	1-3/8	1-9/16	1-7/16	1-5/16	M16
CL-MF16-3402		2	3/4					
CL-MF16-3403		2-3/4	1-1/2					





INFO+:
Also see pages 652-655 for Roemheld hydraulically operated work supports.



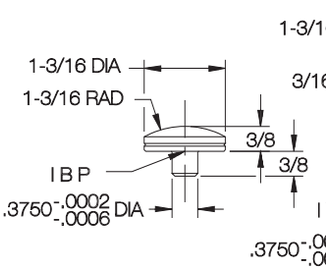
Radius Tip

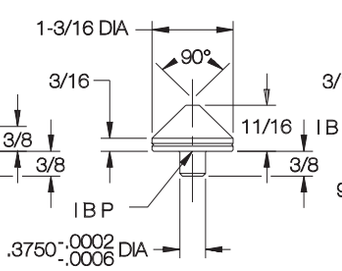


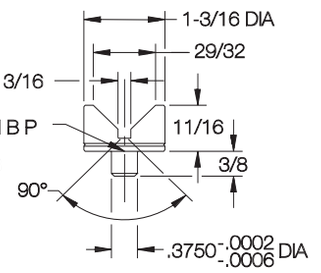
Conical Tip



V-Shaped Tip







SCREW-JACK TIPS

PART NO.	TYPE	FITS SCREW JACKS
CL-MF10-3501	RADIUS	ALL SIZES
CL-MF10-3502	CONICAL	
CL-MF10-3503	V-SHAPED	

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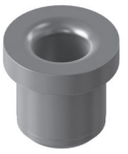
Floating Clamps
Page 305



Captive Locating Screws
and Jig Pins
Pages 34, 37-40



Air Rest Buttons
Page 222-223



ON-SIZE® Bushings
Page 249

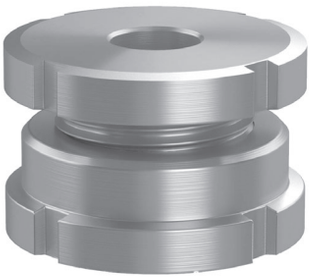


LIFE-EX® Pins
Page 238-239

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THROUGH-HOLE LEVELING JACKS

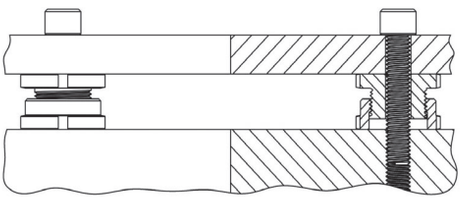
4140 ALLOY STEEL, ZINC PLATED BLUE PASSIVATED



Short Version



Tall Version

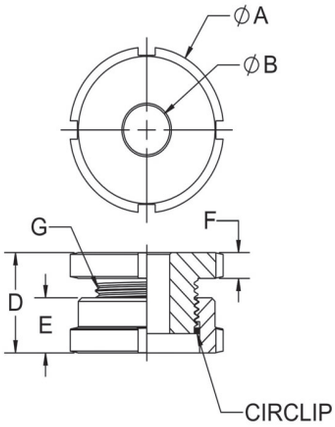


Clamping is achieved by tightening a bolt inserted through the workpiece and through the inside diameter of the leveling jack, after the desired level is set.

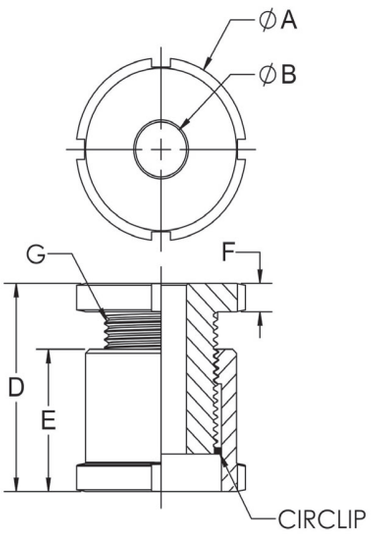
New item!

Through-Hole Leveling Jacks are designed for precise leveling at a desired clamping point. Clamping is achieved by tightening a bolt inserted through the workpiece and through the inside diameter of the leveling jack, after the desired level is set. The static load due to tightening the mounting bolt also securely locks the jack's rotation. These leveling jacks consist of a threaded upper sleeve and a tapped lower sleeve, with a fine thread that allows precise setting. An anti-rotation disk serves as a positive limiter for maximum height. A spanner wrench can be used for additional leverage.

The short version features an extremely low profile, higher load capacity, and a smaller height-adjustment range. The tall version provides a much greater adjustment range, while requiring additional support height and providing somewhat less load capacity. Both versions are available for 3/8", 1/2", and 5/8" bolt sizes (10, 12, and 16mm in metric).



Short Version



Tall Version

SHORT VERSION

PART NO.	FOR BOLT SIZE	HEIGHT ADJUSTMENT RANGE	A DIA	B DIA	D MIN	D MAX	E	F	G THREAD	MAXIMUM STATIC LOAD AFTER STANDARD BOLT PRELOAD (lbs)
CL-310-TLJS	3/8" or M10	.20	1.26	.43	.71	.91	.47	.24	M20x1	8500
CL-412-TLJS	1/2" or M12	.27	1.77	.53	.87	1.14	.59	.28	M30x1.5	18000
CL-516-TLJS	5/8" or M16	.35	2.28	.69	1.10	1.45	.75	.35	M40x1.5	30000

TALL VERSION

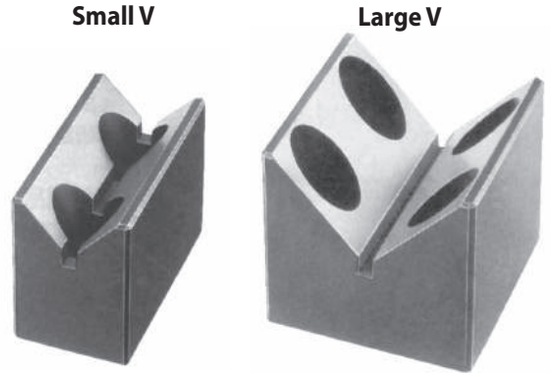
CL-310-TLJT	3/8" or M10	.79	1.26	.43	1.38	2.17	.47	.24	M20x1	5200
CL-412-TLJT	1/2" or M12	.98	1.77	.53	1.65	2.63	.59	.28	M30x1.5	12000
CL-516-TLJT	5/8" or M16	1.26	2.28	.69	2.13	3.39	.75	.35	M40x1.5	20000

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HORIZONTAL V BLOCKS

1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH

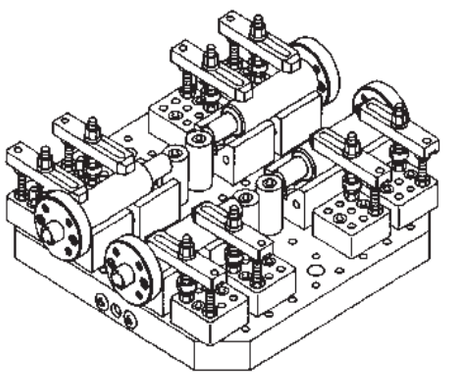
Small V **Large V**



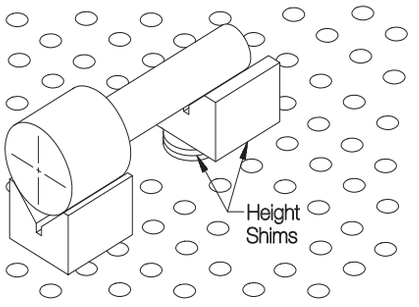
Mini (2 Holes)
Standard (2 Holes)

Mini (4 Holes)
Standard (2 Holes)
Heavy (2 Holes)

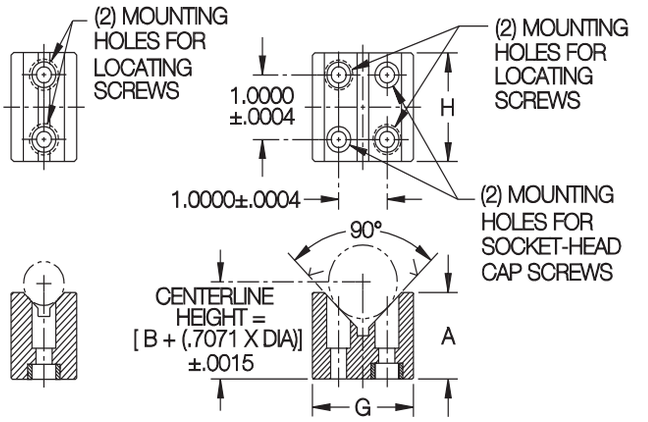
Extremely versatile locator for cylindrical workpieces. Locating surface is precision ground and accurately qualified with respect to the mounting holes. Two tapped holes in the side (standard and heavy sizes only) can be used to mount end stops or clamps. Available in two types: one for small diameters, and one for larger diameters. **INFO+:** Also see page 436 for Vertical V Blocks.



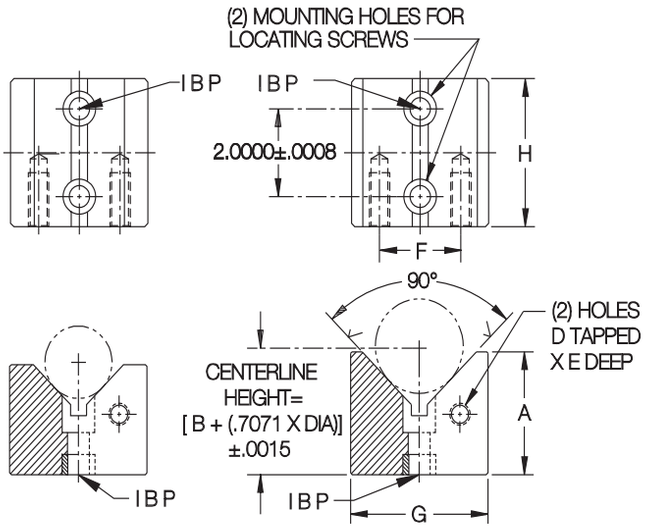
In the above example, Support Cylinders are used as end stops for shafts located in Horizontal V Blocks.



To locate a workpiece from two different diameters simultaneously, use Height Shims (**INFO+** page 228) to raise one V block to the proper level.



Mini—Small V **Mini—Large V**



Standard—Small V **Standard—Large V**
Heavy—Large V

SMALL V

SIZE	PART NO.	WORKPIECE DIAMETER RANGE	A	B	D	E	F	G	H	LOCATING SCREWS (2 REQD)	SOCKET-HEAD CAP SCREWS (0 OR 2 REQD)
MINI	CL-MF25-6001	3/8 to 1	1-1/4	.8750	—	—	—	1	1-3/4	CL-MF25-4300 + CL-5/16-18x1.38-SHCS	—
STANDARD	CL-MF40-6001	9/16 to 3-1/8	2-1/2	1.3951	1/2-13	1-1/8	2	3-3/8	3-3/8	CL-MF40-4302	—

LARGE V

MINI	CL-MF25-6002	9/16 to 2	1-1/2	.7500	—	—	—	1-3/4	1-3/4	CL-MF25-4300 + CL-5/16-18x1.38-SHCS	CL-5/16-18x1.38-SHCS
STANDARD	CL-MF40-6002	9/16 to 4	3	1.5858	1/2-13	1-1/8	2	3-3/8	3-3/8	CL-MF40-4302	—
HEAVY	CL-MF50-6002	9/16 to 4	3	1.5858	5/8-11	1-3/8	2	3-3/8	3-3/8	CL-MF50-4302	—

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LOCATORS



Locating Pins



Construction Balls



Fixture Keys

Also see:



Center Locating Keys for Rotary Tables p. 394



Fixture Locating Pins p. 429



Internal Clamps pp. 308-309



Carr Lock® System pp. 358-372



CL5® Quick-Change 5-Axis Workholding pp. 373-394



Rest Buttons & Pads pp. 219-227

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Nice shell.





Round & Diamond Locating Pins Now Available With LIFE-EX® Coating

Made from a proprietary PVD coating,
LIFE-EX® Locating Pins are very hard, abrasion resistant, and slippery.

The result is a component that has a longer lifecycle for high-production applications.

LIFE-EX® coating from Carr Lane Manufacturing extends the lifecycle of your locating pins, allowing them to remain in production longer with less need for replacement than standard uncoated items.

LIFE-EX® Locating Pins from Carr Lane will have you saying,
"That's one shell of a coating!"

See Page 238-239

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LOCATING PINS

TYPES



ROUND & DIAMOND PINS
Precision locating pins with a chamfered tip for easy part loading, and a shoulde to resist downward forces. Round Pins and Diamond Pins are frequently used together to locate from two holes in a workpiece, or align two pieces of a fixture, without binding.



ROUND & DIAMOND LOCATING PINS
Functionally similar to Round and Diamond Pins, except with a wider selection of head diameters (including any custom diameter from .1150" to 1.0400") and a large shoulder to resist downward forces. Frequently used together to locate from two holes in a workpiece without binding.



FLOATING LOCATING PINS
These locating pins slide in a slotted bushing to provide precise location in one axis while allowing considerable float in the perpendicular axis. Functionally similar rto Diamond Pins, except that they allow greater variation in hole spacing.



BULLET-NOSE DOWELS
Precision locating pin often used with a mating bushing to align two pieces of a fixture.



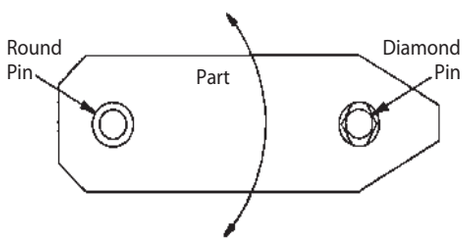
BULLET-NOSE PINS
Bullet-nose round pins and diamond pins are often used together, each with a mating bushing, to align two pieces of a fixture. The pin's shank diameter and the bushing's OD are the same size, to allow boring the installation hole in both fixture pieces at the same time, for greater accuracy.

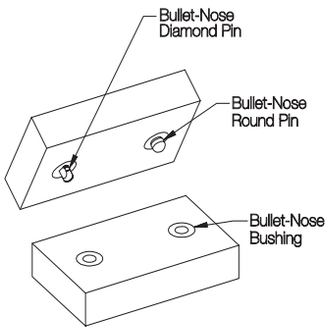


CONE-LOCATOR PINS
Medium-accuracy tapered locating pin used with a mating tapered bushing. Can be used for quick assembly of two fixture pieces.

TECHNICAL INFORMATION

Round Pins and Diamond Pins are frequently used together. Diamond Pins are relieved to locate only radially around the Round Pin, avoiding redundant location. This prevents binding while loading and unloading the part, yet still maintains high accuracy. The Round Pin serves as the primary, 2-axis locator, while the Diamond Pin is the secondary, 1-axis locator.



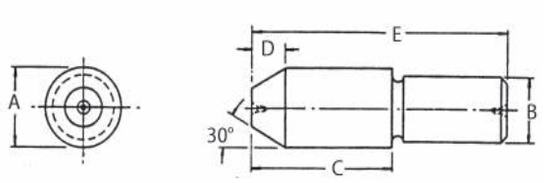


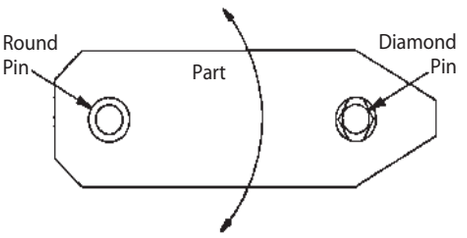
ROUND & DIAMOND PINS

1144 STEEL, HEAT TREATED RC 50-55 BLACK OXIDE FINISH



Round Pin **Diamond Pin**





These precision locating pins have a chamfered tip for easy part loading, and a shoulder to resist downward forces – important advantages over standard dowel pins. One Round Pin and one Diamond Pin are often used together to locate from two machined holes in a workpiece, or to align two pieces of a fixture, without binding. Diamond Pins are relieved, to locate in only 1 axis. Round Pins are also extremely useful as side locators. Head and shank diameters are concentric to within .0005" TIR. Available with head diameters from 1/4 to 1" (6 to 20mm in metric).

ROUND PINS (INCH)

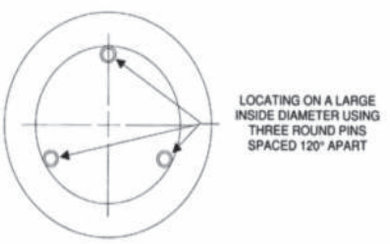
PART NO.	A HEAD DIA NOMINAL	A HEAD DIA ACTUAL	B SHANK DIA NOMINAL	B SHANK DIA ACTUAL	C	D	E
CL-1-RP	1/4	.2495/.2492	3/16	.1878/.1876	11/32	3/32	3/4
CL-2-RP	5/16	.3120/.3117	1/4	.2503/.2501	13/32		7/8
CL-3-RP	3/8	.3745/.3742	5/16	.3128/.3126	1/2	1/8	1
CL-4-RP	7/16	.4370/.4367	3/8	.3753/.3751	19/32	5/32	1-1/4
CL-5-RP	1/2	.4995/.4992	7/16	.4378/.4376	21/32		1-3/8
CL-6-RP	9/16	.5620/.5617	1/2	.5003/.5001	3/4	3/16	1-1/2
CL-7-RP	5/8	.6240/.6237	9/16	.5628/.5626	27/32	7/32	1-3/4
CL-8-RP	11/16	.6865/.6862	5/8	.6253/.6251	29/32		2
CL-9-RP	3/4	.7490/.7487	11/16	.6885/.6880	1	1/4	2-1/8
CL-10-RP	13/16	.8115/.8112	3/4	.7510/.7505	1-3/32	9/32	2-1/4
CL-11-RP	7/8	.8740/.8737	13/16	.8135/.8130	1-5/32		2-1/2
CL-12-RP	15/16	.9365/.9362	7/8	.8760/.8755	1-1/4	5/16	2-3/4
CL-13-RP	1	.9985/.9980	15/16	.9385/.9380	1-5/16		2-7/8

ROUND PINS (METRIC)

CLM-60-RP	6mm	.2357/.2354	5mm	.1972/.1970	11/32	3/32	3/4
CLM-80-RP	8mm	.3145/.3142	6mm	.2365/.2363	13/32		7/8
CLM-100-RP	10mm	.3932/.3929	8mm	.3153/.3151	1/2	1/8	1
CLM-120-RP	12mm	.4719/.4716	10mm	.3940/.3938	21/32	5/32	1-3/8
CLM-140-RP	14mm	.5507/.5504	12mm	.4727/.4725	3/4	3/16	1-1/2
CLM-160-RP	16mm	.6289/.6286	14mm	.5515/.5513	27/32	7/32	1-3/4
CLM-180-RP	18mm	.7077/.7074	16mm	.6302/.6300	29/32		2
CLM-200-RP	20mm	.7864/.7861	18mm	.7097/.7092	1-3/32	9/32	2-1/4

Also available with LIFE-EX® coating!

Many sizes of Round & Diamond Pins are available with our proprietary LIFE-EX® coating. This PVD coating is very hard, abrasion resistant, and slippery, resulting in a component that has a longer lifecycle for high-production applications. This extended lifecycle allows these items to remain in production longer with less need for replacement than standard uncoated items.



A series of locating pins can be used to locate a large diameter, instead of making a custom locating plug. In this example, three Round Pins are positioned 120° apart around the internal diameter of a large bored hole.

LIFE-EX® ROUND PINS (INCH)

PART NO.	A HEAD DIA NOMINAL	A HEAD DIA ACTUAL	B SHANK DIA NOMINAL	B SHANK DIA ACTUAL	C	D	E
CL-2-RP-LX	5/16	.3120/.3117	1/4	.2503/.2501	13/32	3/32	7/8
CL-3-RP-LX	3/8	.3745/.3742	5/16	.3128/.3126	1/2	1/8	1
CL-5-RP-LX	1/2	.4995/.4992	7/16	.4378/.4376	21/32	5/32	1-3/8

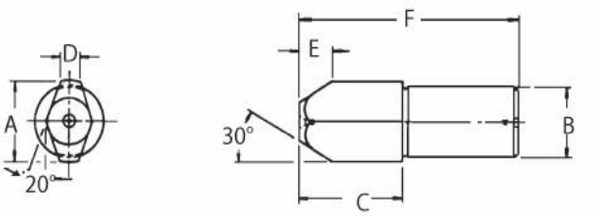
LIFE-EX® ROUND PINS (METRIC)

CLM-80-RP-LX	8mm	.3145/.3142	6mm	.2365/.2363	13/32	3/32	7/8
CLM-100-RP-LX	10mm	.3932/.3929	8mm	.3153/.3151	1/2	1/8	1
CLM-120-RP-LX	12mm	.4719/.4716	10mm	.3940/.3938	21/32	5/32	1-3/8

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ROUND & DIAMOND PINS

1144 STEEL, HEAT TREATED RC 50-55 BLACK OXIDE FINISH



DIAMOND PINS (INCH)

PART NO.			A HEAD DIA				B SHANK DIA		C	D	E	F
X (Tight)	Y (Medium)	Z (Loose)	NOMINAL	X	Y	Z	NOMINAL	ACTUAL				
CL-1-DPX	CL-1-DPY	CL-1-DPZ	1/4	.2493/.2490	.2485/.2482	.2470/.2467	3/16	.1878/.1876	11/32	.062	3/32	3/4
CL-2-DPX	CL-2-DPY	CL-2-DPZ	5/16	.3118/.3115	.3110/.3107	.3095/.3092	1/4	.2503/.2501	13/32	.078		7/8
CL-3-DPX	CL-3-DPY	CL-3-DPZ	3/8	.3743/.3740	.3735/.3732	.3720/.3717	5/16	.3128/.3126	1/2	.093	1/8	1
CL-4-DPX	CL-4-DPY	CL-4-DPZ	7/16	.4368/.4365	.4360/.4357	.4345/.4342	3/8	.3753/.3751	19/32	.109	5/32	1-1/4
CL-5-DPX	CL-5-DPY	CL-5-DPZ	1/2	.4993/.4990	.4985/.4982	.4970/.4967	7/16	.4378/.4376	21/32	.125		1-3/8
CL-6-DPX	CL-6-DPY	CL-6-DPZ	9/16	.5615/.5610	.5595/.5590	.5575/.5570	1/2	.5003/.5001	3/4	.140	3/16	1-1/2
CL-7-DPX	CL-7-DPY	CL-7-DPZ	5/8	.6240/.6235	.6220/.6215	.6200/.6195	9/16	.5628/.5626	27/32	.156	7/32	1-3/4
CL-8-DPX	CL-8-DPY	CL-8-DPZ	11/16	.6865/.6860	.6845/.6840	.6825/.6820	5/8	.6253/.6251	29/32	.172		2
CL-9-DPX	CL-9-DPY	CL-9-DPZ	3/4	.7490/.7485	.7470/.7465	.7450/.7445	11/16	.6885/.6880	1	.187	1/4	2-1/8
CL-11-DPX	CL-11-DPY	CL-11-DPZ	7/8	.8740/.8735	.8720/.8715	.8700/.8695	13/16	.8135/.8130	1-5/32	.219	9/32	2-1/2
CL-13-DPX	CL-13-DPY	CL-13-DPZ	1	.9980/.9972	.9960/.9952	.9920/.9912	15/16	.9385/.9380	1-5/16	.250	5/16	2-7/8

DIAMOND PINS (METRIC)

CLM-60-DPX	CLM-60-DPY	CLM-60-DPZ	6mm	.2357/.2354	.2347/.2344	.2332/.2329	5mm	.1972/.1970	11/32	.062	3/32	3/4
CLM-80-DPX	CLM-80-DPY	CLM-80-DPZ	8mm	.3145/.3142	.3135/.3132	.3120/.3117	6mm	.2365/.2363	13/32	.078		7/8
CLM-100-DPX	CLM-100-DPY	CLM-100-DPZ	10mm	.3932/.3929	.3922/.3919	.3907/.3904	8mm	.3153/.3151	1/2	.093	1/8	1
CLM-120-DPX	CLM-120-DPY	CLM-120-DPZ	12mm	.4719/.4716	.4709/.4706	.4694/.4691	10mm	.3940/.3938	21/32	.125	5/32	1-3/8
CLM-140-DPX	CLM-140-DPY	CLM-140-DPZ	14mm	.5507/.5504	.5482/.5477	.5462/.5457	12mm	.4727/.4725	3/4	.140	3/16	1-1/2
CLM-160-DPX	CLM-160-DPY	CLM-160-DPZ	16mm	.6289/.6286	.6269/.6264	.6249/.6244	14mm	.5515/.5513	27/32	.156	7/32	1-3/4
CLM-180-DPX	CLM-180-DPY	CLM-180-DPZ	18mm	.7077/.7074	.7057/.7052	.7037/.7032	16mm	.6302/.6300	29/32	.172		2
CLM-200-DPX	CLM-200-DPY	CLM-200-DPZ	20mm	.7864/.7861	.7844/.7839	.7824/.7819	18mm	.7097/.7092	1-3/32	.203	9/32	2-1/4

Also available with LIFE-EX® coating!

Many sizes of Round & Diamond Pins are available with our proprietary LIFE-EX® coating. This PVD coating is very hard, abrasion resistant, and slippery, resulting in a component that has a longer lifecycle for high-production applications. This extended lifecycle allows these items to remain in production longer with less need for replacement than standard uncoated items.

LIFE-EX® DIAMOND PINS (INCH)

PART NO.			A HEAD DIA				B SHANK DIA		C	D	E	F
X (Tight)	Y (Medium)	Z (Loose)	NOMINAL	X	Y	Z	NOMINAL	ACTUAL				
CL-2-DPX-LX	—	—	5/16	.3118/.3115	.3110/.3107	.3095/.3092	1/4	.2503/.2501	13/32	.078	3/32	7/8
CL-3-DPX-LX	—	—	3/8	.3743/.3740	.3735/.3732	.3720/.3717	5/16	.3128/.3126	1/2	.093	1/8	1
CL-5-DPX-LX	—	—	1/2	.4993/.4990	.4985/.4982	.4970/.4967	7/16	.4378/.4376	21/32	.125	5/32	1-3/8

LIFE-EX® DIAMOND PINS (METRIC)

CLM-60-DPX-LX	—	—	6mm	.2357/.2354	.2347/.2344	.2332/.2329	5mm	.1972/.1970	11/32	.062	3/32	3/4
CLM-80-DPX-LX	—	—	8mm	.3145/.3142	.3135/.3132	.3120/.3117	6mm	.2365/.2363	13/32	.078		7/8
CLM-100-DPX-LX	—	—	10mm	.3932/.3929	.3922/.3919	.3907/.3904	8mm	.3153/.3151	1/2	.093	1/8	1

ROUND & DIAMOND LOCATING PINS

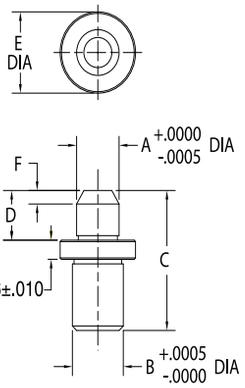
1144 STEEL, HEAT TREATED RC 50-55, BLACK OXIDE FINISH

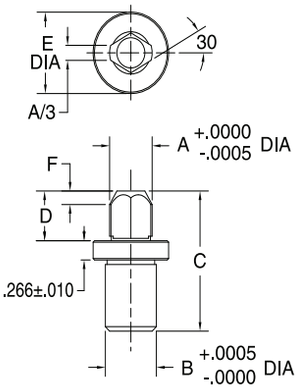


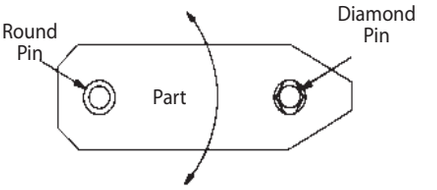
Press-Fit Type Round Pin



Press-Fit Type Diamond Pin

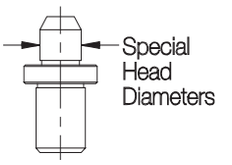






These precision locating pins are especially useful for workpiece location because of the wide selection of head diameters available to fit machined holes in the part. In addition to standard diameters, these pins are also quickly made to order in any special head diameter from .1150" to 1.0400" in .0001" increments. One Round Locating Pin and one Diamond Locating Pin is relieved to locate in only 1 axis. The type shown here, with a press-fit shank, is designed for permanent installation.

Round & Diamond Locating Pins are available in four standard shank diameters, each with a range of standard head diameters in 1/32" increments (2mm increments in metric), each available in either standard or undersize fit. Head and shank diameters are concentric to within .0005"TIR. Made in USA.



Special head diameters (A dimensions) are readily available in any of the four standard shank diameters:

5 = 5/16" shank (.1150-.3180 head dia)
8 = 1/2" shank (.2780-.5040 head dia)
12 = 3/4" shank (.4640-.7540 head dia)
16 = 1" shank (.7140-1.0040 head dia)

Example: For a press-fit round pin with a 1/2-inch shank and A=.4000 inches, order CL-8-RPT-.4000.

PRESS-FIT TYPE (INCH)

ROUND PIN PART NO.	DIAMOND PIN PART NO.	B SHANK DIA	A HEAD DIA		C	D	E DIA	F	G
			NOMINAL	ACTUAL					
CL-123-RPT	CL-123-DPT	5/16	1/8	.1235	1-3/16	7/16	5/8	3/32	33/64
CL-124-RPT	CL-124-DPT			.1245					
CL-154-RPT	CL-154-DPT		5/32	.1548					
CL-155-RPT	CL-155-DPT			.1558					
CL-186-RPT	CL-186-DPT		3/16	.1860					
CL-187-RPT	CL-187-DPT			.1870					
CL-217-RPT	CL-217-DPT		7/32	.2173					
CL-218-RPT	CL-218-DPT			.2183					
CL-248-RPT	CL-248-DPT		1/4	.2485					
CL-249-RPT	CL-249-DPT			.2495					
CL-279-RPT	CL-279-DPT		9/32	.2798					
CL-280-RPT	CL-280-DPT			.2808					
CL-311-RPT	CL-311-DPT		5/16	.3110					
CL-312-RPT	CL-312-DPT			.3120					
CL-310-RPT	CL-310-DPT	1/2	5/16	.3105	1-1/2	1/2	7/8	1/8	41/64
CL-3115-RPT	CL-3115-DPT			.3115					
CL-341-RPT	CL-341-DPT		11/32	.3418					
CL-342-RPT	CL-342-DPT			.3428					
CL-373-RPT	CL-373-DPT		3/8	.3730					
CL-374-RPT	CL-374-DPT			.3740					
CL-404-RPT	CL-404-DPT		13./32	.4043					
CL-405-RPT	CL-405-DPT			.4053					
CL-435-RPT	CL-435-DPT		7/16	.4355					
CL-436-RPT	CL-436-DPT			.4365					
CL-466-RPT	CL-466-DPT		15/32	.4668					
CL-467-RPT	CL-467-DPT			.4678					
CL-498-RPT	CL-498-DPT		1/2	.4980					
CL-499-RPT	CL-499-DPT			.4990					

CONTINUED ON NEXT PAGE

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ROUND & DIAMOND LOCATING PINS

ROUND PIN PART NO.	DIAMOND PIN PART NO.	B SHANK DIA	A HEAD DIA		C	D	E DIA	F	G
			NOMINAL	ACTUAL					
CONTINUED FROM PREVIOUS PAGE									
CL-4980-RPT	CL-4980-DPT	3/4	1/2	.4980	1-15/16	11/16	1-1/8	3/16	49/64
CL-4990-RPT	CL-4990-DPT			.4990					
CL-529-RPT	CL-529-DPT		17/32	.5293					
CL-530-RPT	CL-530-DPT			.5303					
CL-560-RPT	CL-560-DPT		9/16	.5605					
CL-561-RPT	CL-561-DPT			.5615					
CL-591-RPT	CL-591-DPT		19/32	.5918					
CL-592-RPT	CL-592-DPT			.5928					
CL-623-RPT	CL-623-DPT		5/8	.6230					
CL-624-RPT	CL-624-DPT			.6240					
CL-654-RPT	CL-654-DPT		21/32	.6543					
CL-655-RPT	CL-655-DPT			.6553					
CL-685-RPT	CL-685-DPT		11/16	.6855					
CL-686-RPT	CL-686-DPT			.6865					
CL-716-RPT	CL-716-DPT		23/32	.7168					
CL-717-RPT	CL-717-DPT			.7178					
CL-748-RPT	CL-748-DPT		3/4	.7480					
CL-749-RPT	CL-749-DPT			.7490					
CL-7480-RPT	CL-7480-DPT	1	3/4	.7480	2-5/8	1	1-1/2	9/32	61/64
CL-7490-RPT	CL-7490-DPT			.7490					
CL-779-RPT	CL-779-DPT		25/32	.7793					
CL-780-RPT	CL-780-DPT			.7803					
CL-810-RPT	CL-810-DPT		13/16	.8105					
CL-811-RPT	CL-811-DPT			.8115					
CL-841-RPT	CL-841-DPT		27/32	.8418					
CL-842-RPT	CL-842-DPT			.8428					
CL-873-RPT	CL-873-DPT		7/8	.8730					
CL-874-RPT	CL-874-DPT			.8740					
CL-904-RPT	CL-904-DPT		29/32	.9043					
CL-905-RPT	CL-905-DPT			.9053					
CL-935-RPT	CL-935-DPT		15/16	.9355					
CL-936-RPT	CL-936-DPT			.9365					
CL-966-RPT	CL-966-DPT		31/32	.9668					
CL-967-RPT	CL-967-DPT			.9678					
CL-998-RPT	CL-998-DPT		1	.9980					
CL-999-RPT	CL-999-DPT			.9990					

PRESS-FIT TYPE (METRIC)

ROUND PIN PART NO.	DIAMOND PIN PART NO.	B SHANK DIA	A HEAD DIA		C	D	E DIA	F	G
			NOMINAL	ACTUAL					
CL-5-RPT-.2347	CL-5-DPT-.2347	5/16	6mm	.2347	1-3/16	7/16	5/8	3/32	33/64
CL-5-RPT-.2357	CL-5-DPT-.2357			.2357					
CL-8-RPT-.3130	CL-8-DPT-.3130	1/2	8mm	.3130	1-1/2	1/2	7/8	11/82	41/64
CL-8-RPT-.3140	CL-8-DPT-.3140			.3140					
CL-8-RPT-.3917	CL-8-DPT-.3917		10mm	.3917					
CL-8-RPT-.3927	CL-8-DPT-.3927			.3927					
CL-8-RPT-.4704	CL-8-DPT-.4704		12mm	.4704					
CL-8-RPT-.4714	CL-8-DPT-.4714			.4714					
CL-12-RPT-.5492	CL-12-DPT-.5492	3/4	14mm	.5492	1-15/16	11/16	1-1/8	3/16	49/64
CL-12-RPT-.5502	CL-12-DPT-.5502			.5502					
CL-12-RPT-.6279	CL-12-DPT-.6279		16mm	.6279					
CL-12-RPT-.6289	CL-12-DPT-.6289			.6289					
CL-12-RPT-.7067	CL-12-DPT-.7067		18mm	.7067					
CL-12-RPT-.7077	CL-12-DPT-.7077			.7077					
CL-16-RPT-.7854	CL-16-DPT-.7854	1	20mm	.7854	2-5/8	1	1-1/2	9/32	61/64
CL-16-RPT-.7864	CL-16-DPT-.7864			.7864					

ROUND & DIAMOND LOCATING PINS

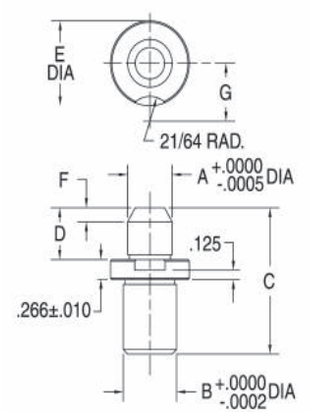
1144 STEEL, HEAT TREATED RC 50-55, BLACK OXIDE FINISH

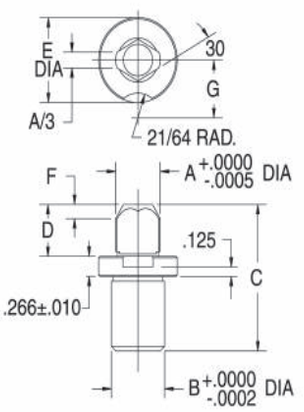


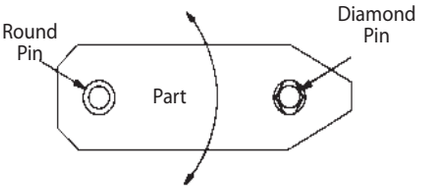
Lockscrew-Type Round Pin



Lockscrew-Type Diamond Pin

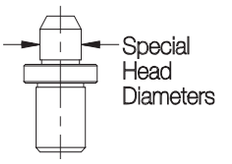






These precision locating pins are especially useful for workpiece location because of the wide selection of head diameters available to fit machined holes in the part. In addition to standard diameters, these pins are also quickly made to order in any special head diameter from .1150" to 1.0400" in .0001" increments. One Round Locating Pin and one Diamond Locating Pin is relieved to locate in only 1 axis. The type shown here, with a slip-fit shank and lockscrew slot, is designed for renewable installation.

Round & Diamond Locating Pins are available in four standard shank diameters, each with a range of standard head diameters in 1/32" increments (2mm increments in metric), each available in either standard or undersize fit. Head and shank diameters are concentric to within .0005" TIR. Made in USA.



Special head diameters (A dimensions) are readily available in any of the four standard shank diameters:

5 = 5/16" shank (.1150-.3180 head dia)
8 = 1/2" shank (.2780-.5040 head dia)
12 = 3/4" shank (.4640-.7540 head dia)
16 = 1" shank (.7140-1.0040 head dia)

Example: For a press-fit round pin with a 1/2-inch shank and A=.4000 inches, order CL-8-RLT-.4000.

LOCKSCREW TYPE (INCH)

ROUND PIN PART NO.	DIAMOND PIN PART NO.	B SHANK DIA	A HEAD DIA NOMINAL	A HEAD DIA ACTUAL	C	D	E DIA	F	G	LINER PART NO.	HEAD LINER PART NO.	LOCK-SCREW PART NO.
CL-123-RLT	CL-123-DLT	5/16	1/8	.1235	1-3/16	7/16	5/8	3/32	33/64	L-32-8	HL-32-8	LS-1
CL-124-RLT	CL-124-DLT			.1245								
CL-154-RLT	CL-154-DLT		5/32	.1548								
CL-155-RLT	CL-155-DLT			.1558								
CL-186-RLT	CL-186-DLT		3/16	.1860								
CL-187-RLT	CL-187-DLT			.1870								
CL-217-RLT	CL-217-DLT		7/32	.2173								
CL-218-RLT	CL-218-DLT			.2183								
CL-248-RLT	CL-248-DLT		1/4	.2485								
CL-249-RLT	CL-249-DLT			.2495								
CL-279-RLT	CL-279-DLT		9/32	.2798								
CL-280-RLT	CL-280-DLT			.2808								
CL-311-RLT	CL-311-DLT		5/16	.3110								
CL-312-RLT	CL-312-DLT			.3120								
CL-310-RLT	CL-310-DLT	1/2	5/16	.3105	1-1/2	1/2	7/8	1/8	41/64	L-48-12	HL-48-12	LS-1
CL-3115-RLT	CL-3115-DLT			.3115								
CL-341-RLT	CL-341-DLT		11/32	.3418								
CL-342-RLT	CL-342-DLT			.3428								
CL-373-RLT	CL-373-DLT		3/8	.3730								
CL-374-RLT	CL-374-DLT			.3740								
CL-404-RLT	CL-404-DLT		13./32	.4043								
CL-405-RLT	CL-405-DLT			.4053								
CL-435-RLT	CL-435-DLT		7/16	.4355								
CL-436-RLT	CL-436-DLT			.4365								
CL-466-RLT	CL-466-DLT		15/32	.4668								
CL-467-RLT	CL-467-DLT			.4678								
CL-498-RLT	CL-498-DLT		1/2	.4980								
CL-499-RLT	CL-499-DLT			.4990								

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ROUND & DIAMOND LOCATING PINS

ROUND PIN PART NO.	DIAMOND PIN PART NO.	B SHANK DIA	A HEAD DIA		C	D	E DIA	F	G	LINER PART NO.	HEAD LINER PART NO.	LOCK-SCREW PART NO.
			NOMINAL	ACTUAL								
CONTINUED FROM PREVIOUS PAGE												
CL-4980-RLT	CL-4980-DLT	3/4	1/2	.4980	1-15/16	11/16	1-1/8	3/16	49/64	L-64-16	HL-64-16	LS-1
CL-4990-RLT	CL-4990-DLT			.4990								
CL-529-RLT	CL-529-DLT		17/32	.5293								
CL-530-RLT	CL-530-DLT			.5303								
CL-560-RLT	CL-560-DLT		9/16	.5605								
CL-561-RLT	CL-561-DLT			.5615								
CL-591-RLT	CL-591-DLT		19/32	.5918								
CL-592-RLT	CL-592-DLT			.5928								
CL-623-RLT	CL-623-DLT		5/8	.6230								
CL-624-RLT	CL-624-DLT			.6240								
CL-654-RLT	CL-654-DLT		21/32	.6543								
CL-655-RLT	CL-655-DLT			.6553								
CL-685-RLT	CL-685-DLT		11/16	.6855								
CL-686-RLT	CL-686-DLT			.6865								
CL-716-RLT	CL-716-DLT		23/32	.7168								
CL-717-RLT	CL-717-DLT			.7178								
CL-748-RLT	CL-748-DLT		3/4	.7480								
CL-749-RLT	CL-749-DLT			.7490								
CL-7480-RLT	CL-7480-DLT	1	3/4	.7480	2-5/8	1	1-1/2	9/32	61/64	L-88-22	HL-88-22	LS-1
CL-7490-RLT	CL-7490-DLT			.7490								
CL-779-RLT	CL-779-DLT		25/32	.7793								
CL-780-RLT	CL-780-DLT			.7803								
CL-810-RLT	CL-810-DLT		13/16	.8105								
CL-811-RLT	CL-811-DLT			.8115								
CL-841-RLT	CL-841-DLT		27/32	.8418								
CL-842-RLT	CL-842-DLT			.8428								
CL-873-RLT	CL-873-DLT		7/8	.8730								
CL-874-RLT	CL-874-DLT			.8740								
CL-904-RLT	CL-904-DLT		29/32	.9043								
CL-905-RLT	CL-905-DLT			.9053								
CL-935-RLT	CL-935-DLT		15/16	.9355								
CL-936-RLT	CL-936-DLT			.9365								
CL-966-RLT	CL-966-DLT		31/32	.9668								
CL-967-RLT	CL-967-DLT			.9678								
CL-998-RLT	CL-998-DLT		1	.9980								
CL-999-RLT	CL-999-DLT			.9990								

6

LOCKSCREW TYPE (METRIC)

ROUND PIN PART NO.	DIAMOND PIN PART NO.	B SHANK DIA	A HEAD DIA		C	D	E DIA	F	G	LINER PART NO.	HEAD LINER PART NO.	LOCK-SCREW PART NO.
			NOMINAL	ACTUAL								
CL-5-RLT-.2347	CL-5-DLT-.2347	5/16	6mm	.2347	1-3/16	7/16	5/8	3/32	33/64	L-32-8	HL-32-8	LS-1
CL-5-RLT-.2357	CL-5-DLT-.2357			.2357								
CL-8-RLT-.3130	CL-8-DLT-.3130	1/2	8mm	.3130	1-1/2	1/2	7/8	11/82	41/64	L-48-12	HL-48-12	
CL-8-RLT-.3140	CL-8-DLT-.3140			.3140								
CL-8-RLT-.3917	CL-8-DLT-.3917		10mm	.3917								
CL-8-RLT-.3927	CL-8-DLT-.3927			.3927								
CL-8-RLT-.4704	CL-8-DLT-.4704		12mm	.4704								
CL-8-RLT-.4714	CL-8-DLT-.4714			.4714								
CL-12-RLT-.5492	CL-12-DLT-.5492	3/4	14mm	.5492	1-15/16	11/16	1-1/8	3/16	49/64	L-64-164	HL-64-164	
CL-12-RLT-.5502	CL-12-DLT-.5502			.5502								
CL-12-RLT-.6279	CL-12-DLT-.6279		16mm	.6279								
CL-12-RLT-.6289	CL-12-DLT-.6289			.6289								
CL-12-RLT-.7067	CL-12-DLT-.7067		18mm	.7067								
CL-12-RLT-.7077	CL-12-DLT-.7077			.7077								
CL-16-RLT-.7854	CL-16-DLT-.7854	1	20mm	.7854	2-5/8	1	1-1/2	9/32	61/64	L-88-22	HL-88-22	
CL-16-RLT-.7864	CL-16-DLT-.7864			.7864								

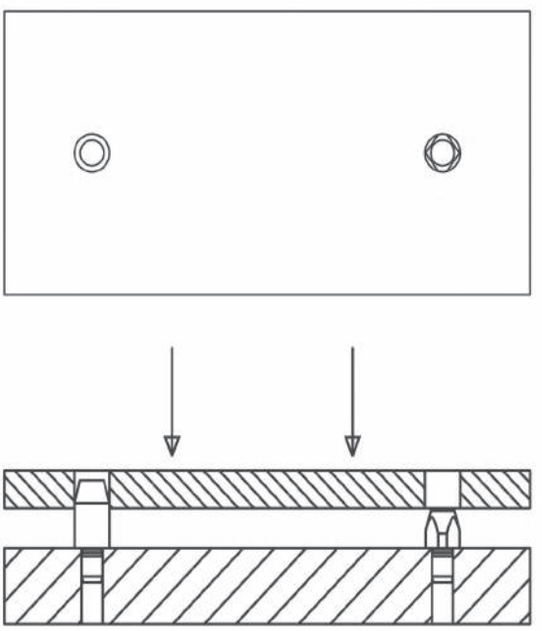
Order liner bushing and lockscrews separately. See table above for proper sizes. (See drill-bushing catalog section for additional dimensions).





ROUND & DIAMOND LOCATING PINS DIN 6321

A2 TOOL STEEL, HEAT TREATED, BLACK OXIDE FINISH

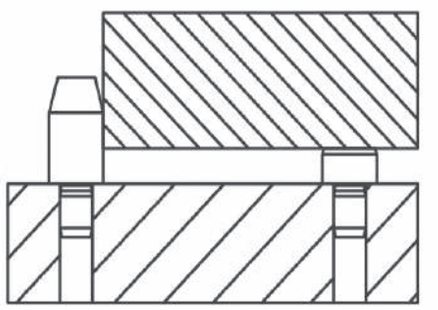


In this application, a Round Locating Pin (Type B, tall version) is used together with a Diamond Locating Pin (Type C, short version) to locate from two holes in a workpiece. Using a taller round pin allows smoother loading because that pin's hole can be fully engaged first, making it easier to engage the second hole.

New item!

DIN 6321 is a system of locating pins designed for hole location, side location, and supporting. These locating pins are available in three distinct types:

- Type A Round Locating Pads are dual-purpose precision locators, with a ground top surface for use as a rest pad, and a ground head diameter for use as a locating pin.
- Type B Round Locating Pins have a ground head diameter for use as a hole locator or for side location
- Type C Diamond Locating Pins also have a ground head diameter for use as a hole locator, but are relieved to locate in only 1 axis

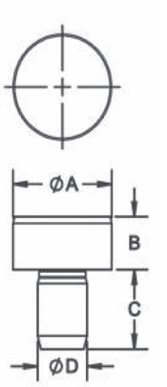


In this application, a Round Locating Pin (Type B) is used as a side locator, together with a Round Locating Pad (Type A) used as a rest pad.



Round Locating Pads
DIN 6321
Type A

Round Locating Pads per DIN 6321 Type A are dual-purpose precision locators, with a ground top surface for use as a rest pad, and a ground head diameter for use as a locating pin. These pads are especially useful as locating pins for side location of thin workpieces. Available with head diameters from 6 to 25mm.



ROUND LOCATING PADS, TYPE A (METRIC)

PART NO.	A DIA (mm) g6	B (mm) h9	C (mm)	D (mm) n6
CL-6321-6-5-A	6	5	6	4
CL-6321-10-6-A	10	6	9	6
CL-6321-16-8-A	16	8	12	8
CL-6321-25-10-A	25	10	18	12

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ROUND & DIAMOND LOCATING PINS DIN 6321

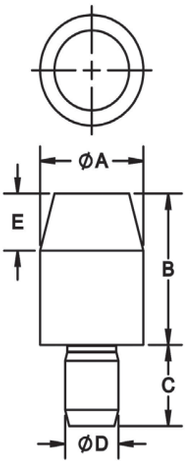
A2 TOOL STEEL, HEAT TREATED, BLACK OXIDE FINISH

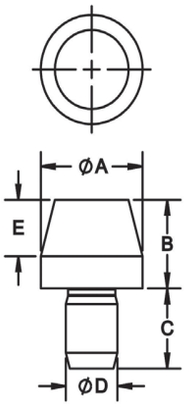




Round Locating Pins
DIN 6321
Type B
(Tall and Short)

Round Locating Pins per DIN 6321 Type B have a ground head diameter for use as a hole locator or for side location. One Round Locating Pin and one Diamond Locating Pin are often used together to locate from two machined holes in a workpiece, or to align two pieces of a fixture, without binding. Round Locating Pins are also extremely useful as side locators. Head and shank diameters are concentric to within .0005"TIR. Available with head diameters from 6 to 25mm, each in a tall and a short version.





ROUND LOCATING PINS, TYPE B (METRIC)

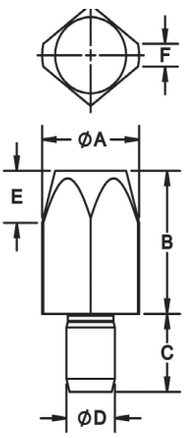
PART NO.	A DIA (mm) g6	VERSION	B (mm)	C (mm)	D DIA (mm) n6	E (mm)
CL-6321-6-7-B	6	Short	7	6	4	4
CL-6321-6-12-B		Tall	12			
CL-6321-8-10-B	8	Short	10	9	6	6
CL-6321-8-16-B		Tall	16			
CL-6321-10-10-B	10	Short	10	9	6	6
CL-6321-10-18-B		Tall	18			
CL-6321-12-10-B	12	Short	10	9	6	6
CL-6321-12-18-B		Tall	18			
CL-6321-16-13-B	16	Short	13	12	8	8
CL-6321-16-22-B		Tall	22			
CL-6321-20-15-B	20	Short	15	18	12	9
CL-6321-20-25-B		Tall	25			
CL-6321-25-15-B	25	Short	15	18	12	9
CL-6321-25-25-B		Tall	25			

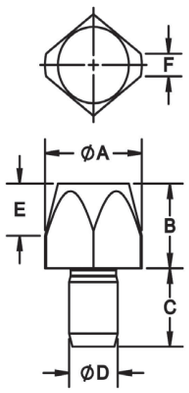




Diamond Locating Pins
DIN 6321
Type C
(Tall and Short)

Diamond Locating Pins per DIN 6321 Type C also have a ground head diameter for use as a hole locator, but are relieved to locate in only 1 axis. One Round Locating Pin and one Diamond Locating Pin are often used together to locate from two machined holes in a workpiece, or to align two pieces of a fixture, without binding. Head and shank diameters are concentric to within .0005"TIR. Available with head diameters from 6 to 25mm, each in a tall and a short version.





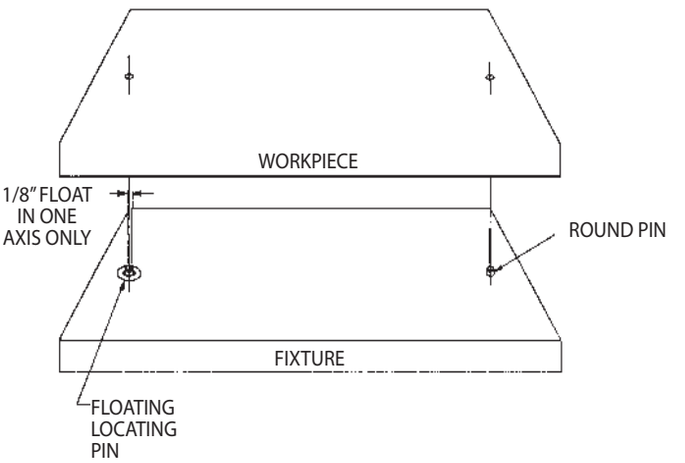
DIAMOND LOCATING PINS, TYPE C (METRIC)

PART NO.	A DIA (mm) g6	VERSION	B (mm)	C (mm)	D DIA (mm) n6	E (mm)	F (mm)
CL-6321-6-7-C	6	Short	7	6	4	4	1
CL-6321-6-12-C		Tall	12				
CL-6321-8-10-C	8	Short	10	9	6	6	1.6
CL-6321-8-16-C		Tall	16				
CL-6321-10-10-C	10	Short	10	9	6	6	2.5
CL-6321-10-18-C		Tall	18				
CL-6321-12-10-C	12	Short	10	9	6	6	2.5
CL-6321-12-18-C		Tall	18				
CL-6321-16-13-C	16	Short	13	12	8	8	3.5
CL-6321-16-22-C		Tall	22				
CL-6321-20-15-C	20	Short	15	18	12	9	5
CL-6321-20-25-C		Tall	25				
CL-6321-25-15-C	25	Short	15	18	12	9	5
CL-6321-25-25-C		Tall	25				

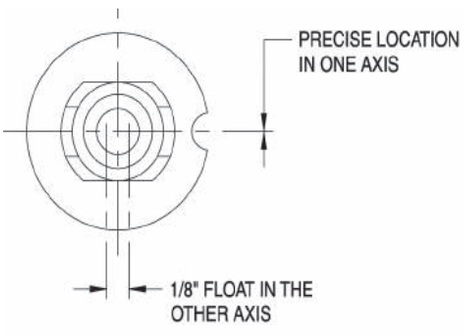
FLOATING LOCATING PINS

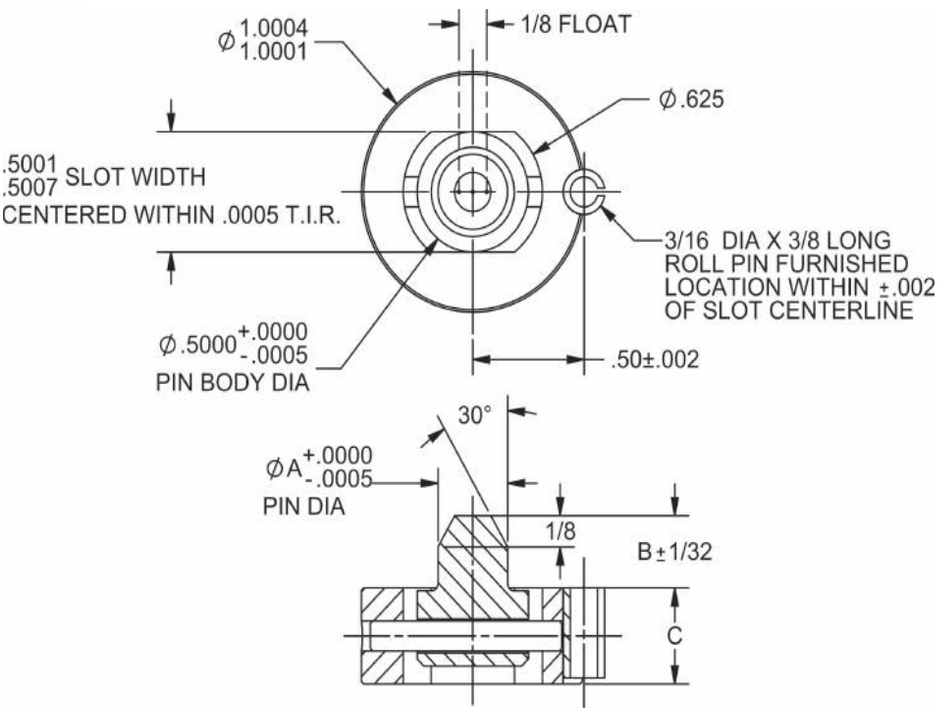
BODY: TOOL STEEL, HEAT TREATED, BLACK OXIDE FINISH
PIN: 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH





Provides precise location in one axis while allowing considerable float in the perpendicular axis. Use in conjunction with a Round Pin when loose workpiece-hole tolerances require more float than a Diamond Pin would allow. Special pin diameters (A dimensions) are available. Please contact factory.
Patent no. 3,381,554.





INCH

PART NO.	A DIA	B	C
CL-4-FLP	.2500	.300	.400
CL-5-FLP	.3125	.300	.400
CL-6-FLP	.3750	.300	.400
CL-8-FLP	.5000	.300	.400
CL-10-FLP	.6250	.310	.400

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BULLET-NOSE PINS

1144 STEEL, HEAT TREATED RC 50-62, BLACK OXIDE FINISH



Bullet-Nose Round Pin



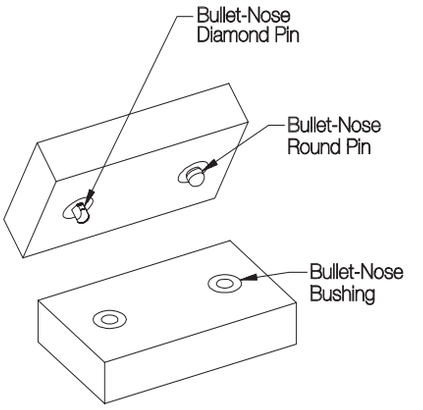
Bushing

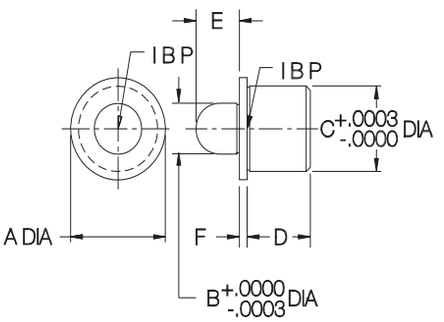


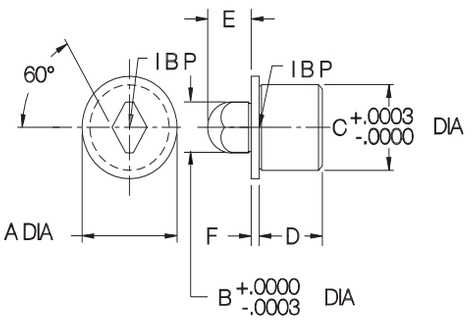
Bullet-Nose Diamond Pin

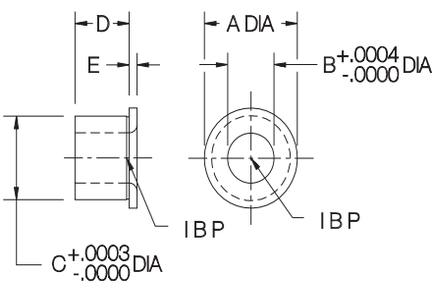
Bullet-Nose Round Pins and Diamond Pins are often used together (with matching bushings) to align two pieces of a fixture. The Diamond Pin is relieved, to locate only radially around the round pin, avoiding redundant location. This prevents binding, yet still maintains high accuracy.

The pin's shank diameter and the bushing's OD are the same size to allow boring the installation hole in both fixture pieces at the same time, for greater accuracy. The pin's head and shank diameters are concentric to within .0005 TIR. The bushing's ID and OD are concentric to within .0003 TIR.









ROUND PINS (INCH)

PART NO.	A DIA	B HEAD DIA NOMINAL	B HEAD DIA ACTUAL	C SHANK DIA NOMINAL	C SHANK DIA ACTUAL	D	E	F
CL-8-BND	9/16	1/4	.2499	13/32	.4075	3/8	7/32	1/16
CL-9-BND	5/8	5/16	.3124	1/2	.5014		9/32	
CL-10-BND	3/4	3/8	.3748	5/8	.6265	1/2	11/32	
CL-11-BND	7/8	1/2	.4998	3/4	.7515		13/32	
CL-12-BND	1-1/8	3/4	.7498	1	1.0015	3/4	9/16	1/8
CL-13-BND	1-1/2	1	.9998	1-3/8	1.3768		3/4	

ROUND PINS (METRIC)

CLM-6-BRP	.512	6mm	.2361	10mm	.3950	.35	.24	.079
CLM-8-BRP	.591	8mm	.3149	12mm	.4738		.28	
CLM-10-BRP	.709	10mm	.3935	15mm	.5921	.43	.35	
CLM-12-BRP	.866	12mm	.4722	18mm	.7102		.39	

DIAMOND PINS (INCH)

CL-8-BDP	9/16	1/4	.2499	13/32	.4075	3/8	7/32	1/16
CL-9-BDP	5/8	5/16	.3124	1/2	.5014		9/32	
CL-10-BDP	3/4	3/8	.3748	5/8	.6265	1/2	11/32	
CL-11-BDP	7/8	1/2	.4998	3/4	.7515		13/32	
CL-12-BDP	1-1/8	3/4	.7498	1	1.0015	3/4	9/16	1/8
CL-13-BDP	1-1/2	1	.9998	1-3/8	1.3768		3/4	

DIAMOND PINS (METRIC)

CLM-6-BDP	.512	6mm	.2361	10mm	.3950	.35	.24	.079
CLM-8-BDP	.591	8mm	.3149	12mm	.4738		.28	
CLM-10-BDP	.709	10mm	.3935	15mm	.5921	.43	.35	
CLM-12-BDP	.866	12mm	.4722	18mm	.7102		.39	

BUSHINGS (INCH)

PART NO.	A DIA	B DIA NOMINAL	B DIA ACTUAL	C DIA NOMINAL	C DIA ACTUAL	D	E
CLB-8000	9/16	1/4	.2501	13/32	.4075	7/16	1/16
CLB-9000	5/8	5/16	.3126	1/2	.5014		
CLB-10000	3/4	3/8	.3751	5/8	.6265		
CLB-11000	7/8	1/2	.5001	3/4	.7515	1/2	
CLB-12000	1-1/8	3/4	.7502	1	1.0015		1/8
CLB-13000	1-1/2	1	1.0002	1-3/8	1.3768	11/16	

BUSHINGS (METRIC)

CLM-6-B	.512	6mm	.2363	10mm	.3950	.31	.079
CLM-8-B	.591	8mm	.3151	12mm	.4738		
CLM-10-B	.709	10mm	.3938	15mm	.5921	.39	
CLM-12-B	.866	12mm	.4725	18mm	.7102		

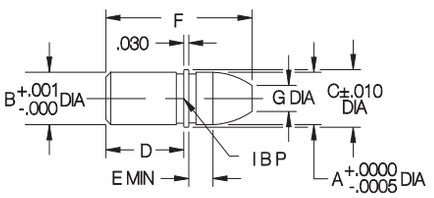
BULLET-NOSE DOWELS

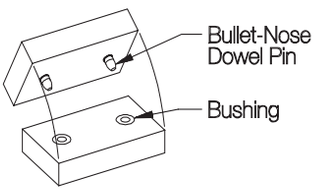
1144 STEEL, HEAT TREATED RC 50-62, BLACK OXIDE FINISH

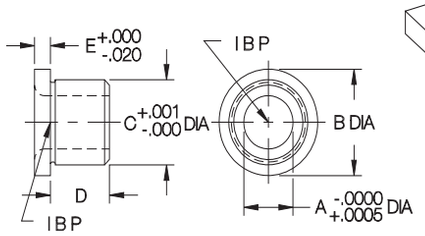


Dowel Pin Bushing

Precision locating pin often used with a matching bushing to align two pieces of a fixture. The pin's head and shank diameters are concentric to within .0005 TIR. The bushing's ID and OD are concentric to within .0003 TIR.







DOWEL PINS (INCH)

PART NO.	A HEAD DIA NOMINAL	A HEAD DIA ACTUAL	B SHANK DIA NOMINAL	B SHANK DIA ACTUAL	C DIA	D	E	F	G DIA
CL-1-BND	1/4	.2499	1/4	.2510	.280	1/2	.12	.90	1/8
CL-2-BND	5/16	.3124	5/16	.3135	.344		.15	.94	5/32
CL-3-BND	3/8	.3749	3/8	.3760	.407		.18	1.03	3/16
CL-4-BND	1/2	.4999	1/2	.5010	.532		.18	1.09	1/4

DOWEL PINS (METRIC)

CLM-60-BND	6mm	.2361	6mm	.2372	.276	.47	.12	.86	.12
CLM-80-BND	8mm	.3149	8mm	.3160	.354		.15	.91	.16
CLM-100-BND	10mm	.3936	10mm	.3947	.433		.19	.98	.20
CLM-120-BND	12mm	.4723	12mm	.4734	.512		.19	1.06	.24

BUSHINGS (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B DIA	C DIA NOMINAL	C DIA ACTUAL	D	E
CLB-1000	1/4	.2501	.625	1/2	.5002	3/8	.100
CLB-2000	5/16	.3126					
CLB-3000	3/8	.3751	.750	5/8	.6253	1/2	
CLB-4000	1/2	.5001	.875	3/4	.7504	5/8	

BUSHINGS (METRIC)

CLM-60-B	6mm	.2363	.512	10mm	.3939	.276	.118
CLM-80-B	8mm	.3151	.591	12mm	.4726		
CLM-100-B	10mm	.3938	.709	15mm	.5909	.354	
CLM-120-B	12mm	.4725	.866	18mm	.7091	.472	.157

CONE LOCATOR PINS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Pin Bushing

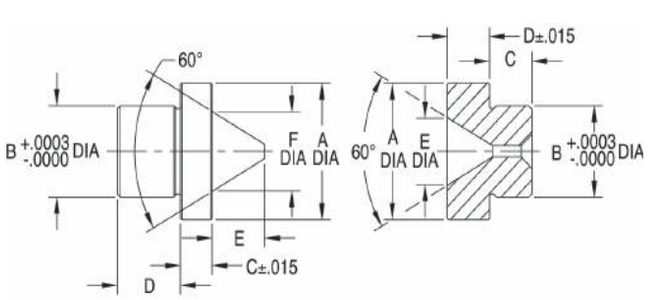
Medium-accuracy tapered locating pin used with the mating bushing. These pins can be used for quick assembly of two fixture pieces, because they compensate for considerable misalignment. The pin's shank diameter and the bushing's OD are exactly the same size, to allow boring the installation hole in both fixture pieces at the same time for greater accuracy.

PIN (INCH)

PART NO.	A DIA	B DIA NOMINAL	B DIA ACTUAL	C	D	E	F DIA
CL-5-CLP	3/4	1/2	.5014	3/16	3/8	5/16	.438
CL-7-CLP	1	3/4	.7515	3/16	9/16	1/2	.676

PIN (METRIC)

CLM-5-CLP	3/4	12mm	.4738	3/16	3/8	5/16	.438
CLM-7-CLP	1	20mm	.7889	3/16	9/16	1/2	.676



BUSHING (INCH)

PART NO.	A DIA	B DIA NOMINAL	B DIA ACTUAL	C	D	E	GAP BETWEEN PIN & BUSHING HEAD WHEN ASSEMBLED
CL-5-CLB	3/4	1/2	.5014	1/4	1/4	.370	.050-.068
CL-7-CLB	1	3/4	.7515	3/8	3/8	.616	.043-.061

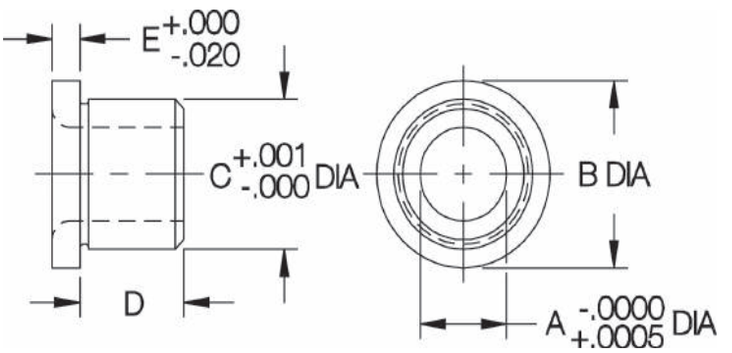
BUSHING (METRIC)

CLM-5-CLB	3/4	12mm	.4738	1/4	1/4	.370	.050-.068
CLM-7-CLB	1	20mm	.7889	3/8	3/8	.616	.043-.061

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ON-SIZE® Bushings for Bullet-Nose Dowels (Head Type)



ON-SIZE® Bushings are made from Invar 36, a 36% nickel-iron alloy that has an extremely low coefficient of thermal expansion. Invar material is particularly useful in applications where minimum thermal expansion and high dimensional stability is required. Useful in high temperature applications up to 750°F (400°C), these products will maintain their size and accuracy even under heat-cool multiple cycles.

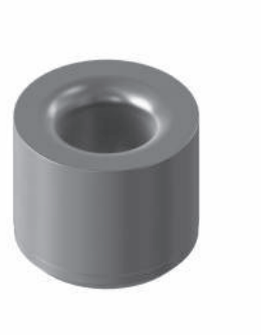
The precision bushings shown here are used with Bullet-Nose Dowels to align two pieces of a fixture. The bushing's ID and OD are concentric to within .0003" TIR. Available for pin diameters 1/4, 5/16, 3/8, and 1/2" (6, 8, 10, and 12mm in metric).

HEAD TYPE (INCH)

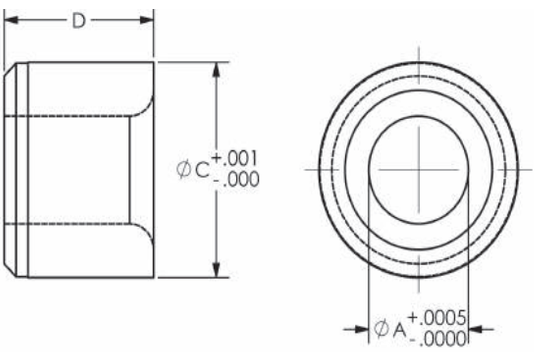
PART NO.	A DIA NOMINAL	A DIA ACTUAL	B DIA	C DIA NOMINAL	C DIA ACTUAL	D	E
CL-1000-BNV	1/4	.2501	.625	1/2	.5002	3/8	.100
CL-2000-BNV	5/16	.3126	.625	1/2	.5002	3/8	.100
CL-3000-BNV	3/8	.3751	.750	5/8	.6253	1/2	.100
CL-4000-BNV	1/2	.5001	.875	3/4	.7504	5/8	.100

HEAD TYPE (METRIC)

CLM-60-BNV	6mm	.2363	.512	10mm	.3939	.276	.118
CLM-80-BNV	8mm	.3151	.591	12mm	.4726	.276	.118
CLM-100-BNV	10mm	.3938	.709	15mm	.5909	.354	.118
CLM-120-BNV	12mm	.4725	.866	18mm	.7091	.472	.157



ON-SIZE® Bushings for Bullet-Nose Dowels (Headless Type)



HEADLESS TYPE (INCH)

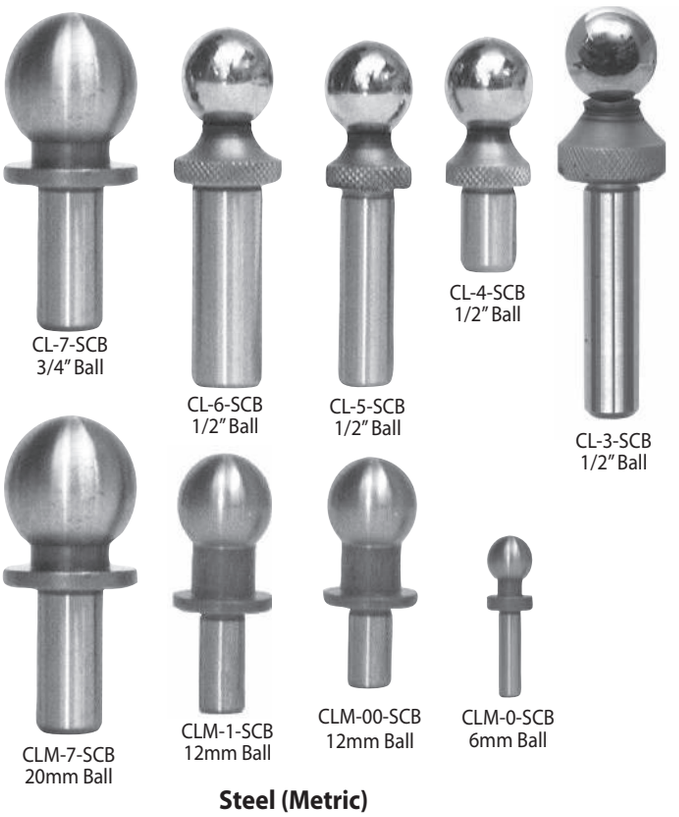
PART NO.	A DIA NOMINAL	A DIA ACTUAL	C DIA NOMINAL	C DIA ACTUAL	D
CL-1000-BPNV	1/4	.2501	1/2	.5002	3/8
CL-2000-BPNV	5/16	.3126	1/2	.5002	3/8
CL-3000-BPNV	3/8	.3751	5/8	.6253	1/2
CL-4000-BPNV	1/2	.5001	3/4	.7504	5/8

HEADLESS TYPE (METRIC)

CLM-60-BPNV	6mm	.2363	10mm	.3939	.276
CLM-80-BPNV	8mm	.3151	12mm	.4726	.276
CLM-100-BPNV	10mm	.3938	15mm	.5909	.354
CLM-120-BPNV	12mm	.4725	18mm	.7091	.472

CONSTRUCTION BALLS (SHOULDER TYPE)

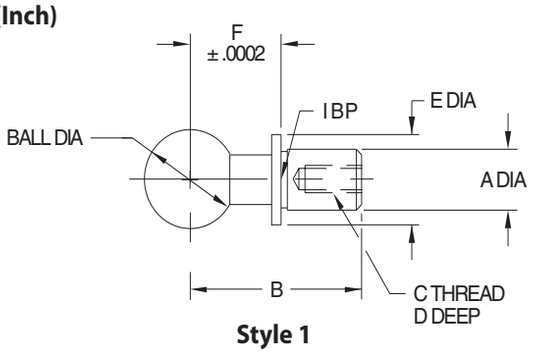
STEEL: 1144 STEEL, HEAT TREATED RC 54-56



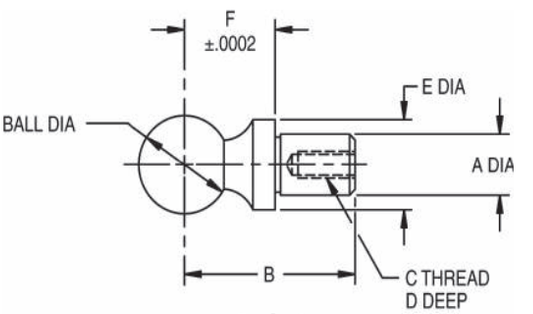
Steel (Metric)



Steel (Inch)



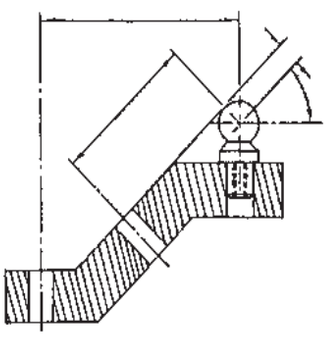
Style 1



Style 2

New 20mm ball diameter!

Precision tooling ball used as a reference point for critical inspection, layout, and machining operations. Shoulder type has a precision height-reference shoulder to locate the ball in three dimensions. Concentricity between ball and shank is .0002" TIR. Available with ball diameters from 1/4 to 3/4" (6 to 20mm in metric), in various shank diameters and lengths. Note: Catalog photos are actual size.



Shoulder-Type Construction Balls provide a reference point in three dimensions.

STEEL (INCH)

PART NO.	BALL DIA NOMINAL	BALL DIA ACTUAL	A DIA NOMINAL	A DIA ACTUAL	B	C	D	E DIA	F	STYLE
CL-0-SCB	1/4	.2502/.2498	1/8	.1250/.1246	.56	—	—	.25	.2000	1
CL-00-SCB	3/8	.3752/.3748	3/16	.1875/.1871	.75	—	—	.37	.3000	
CL-1-SCB	1/2	.5000/.4997	1/4	.2500/.2497	.63	#6-32	1/4	.46	.3125	2
CL-10-SCB		.5002/.4998		.2500/.2496	.94	—	—		.4000	1
CL-2-SCB		.5000/.4997		.2500/.2497	.94	#6-32	5/16		.5000	2
CL-3-SCB					1.50	—	—			
CL-4-SCB			5/16	.3125/.3122	.94	#6-32	5/16			
CL-5-SCB					1.50	—	—			
CL-6-SCB			3/8	.3750/.3747	1.50	—	—	.56	.5000	
CL-7-SCB	3/4	.7502/.7498	3/8	.3750/.3746	1.25	—	—	.75	.5000	1

STEEL (METRIC)

PART NO.	BALL DIA NOMINAL	BALL DIA ACTUAL	A DIA NOMINAL	A DIA ACTUAL	B	C	D	E DIA	F	STYLE
CLM-0-SCB	6mm	.2364/.2360	3mm	.1181/.1177	.47	—	—	.24	.2362 (6mm)	1
CLM-00-SCB	12mm	.4726/.4722	6mm	.2362/.2358	.87	—	—	.47	.4724 (12mm)	
CLM-1-SCB					.98	M3.5	.24			
CLM-7-SCB	20mm	.7876/.7872	10mm	.3937/.3983	1.50	M6	.38	.79	.7874 (20mm)	

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CONSTRUCTION BALLS (SHOULDER TYPE)

STAINLESS STEEL: 440C STAINLESS STEEL, HEAT TREATED RC 57-59



CL-2-SCB
1/2" Ball



CL-1-SCB
1/2" Ball



CL-0-SCB
1/4" Ball

Stainless Steel (Inch)

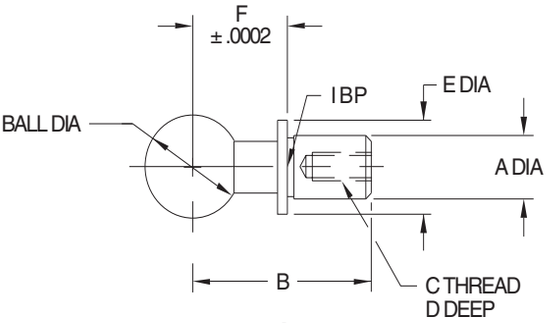


CLM-1-SCB
12mm Ball

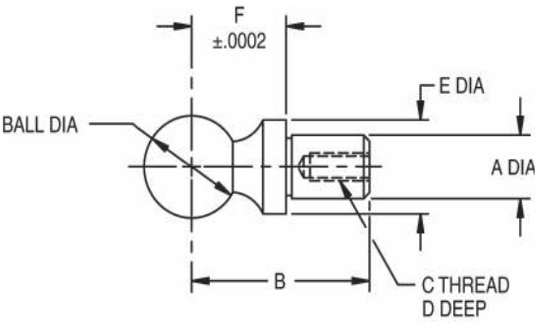


CLM-00-SCB
12mm Ball

Stainless Steel (Metric)



Style 1



Style 2

Also available in stainless steel!

Precision tooling ball used as a reference point for critical inspection, layout, and machining operations. Shoulder type has a precision height-reference shoulder to locate the ball in three dimensions. Concentricity between ball and shank is .0002" TIR. Stainless steel version is available with ball diameters from 1/4 to 1/2" (12mm in metric). Note: Catalog photos are actual size.

6

STAINLESS STEEL (INCH)

PART NO.	BALL DIA NOMINAL	BALL DIA ACTUAL	A DIA NOMINAL	A DIA ACTUAL	B	C	D	E DIA	F	STYLE
CL-0-SCB-S	1/4	.2502/.2498	1/8	.1250/.1246	.56	—	—	.25	.2000	1
CL-1-SCB-S	1/2	.5000/.4997	1/4	.2500/.2497	.63	#6-32	1/4	.46	.3125	2
CL-2-SCB-S		.5000/.4997			.94	#6-32	5/16		.5000	2

STAINLESS STEEL (METRIC)

PART NO.	BALL DIA NOMINAL	BALL DIA ACTUAL	A DIA NOMINAL	A DIA ACTUAL	B	C	D	E DIA	F	STYLE
CLM-00-SCB-S	12mm	.4726/.4722	6mm	.2362/.2358	.87	—	—	.47	.4724 (12mm)	1
CLM-1-SCB-S					.98	M3.5	.24			

CONSTRUCTION BALLS (ADJUSTABLE TYPE)

1144 STEEL, HEAT TREATED RC 54-56



CL-5-CB
1/2" Ball



CL-3-CB
1/2" Ball



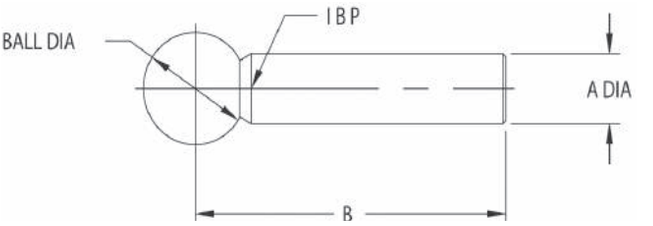
CL-1-CB
1/2" Ball



CL-00-CB
3/8" Ball



CL-0-CB
1/4" Ball



6

Precision tooling ball used as a reference point for critical inspection, layout, and machining operations. Adjustable type has no shoulder, so it can be set at any desired height then locked with a set screw. Concentricity between ball and shank is .0002" TIR. Available with ball diameters from 1/4 to 1/2", in various shank diameters and lengths. Note: Catalog photos are actual size.

STEEL (INCH)

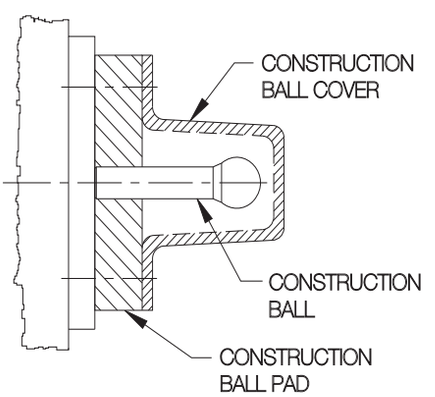
PART NO.	BALL DIA		A DIA		B
	NOMINAL	ACTUAL	NOMINAL	ACTUAL	
CL-0-CB	1/4	.2502/.2498	1/8	.1250/.1246	.56
CL-00-CB	3/8	.3752/.3748	3/16	.1875/.1871	
CL-1-CB	1/2	.5000/.4997	1/4	.2500/.2497	1.50
CL-3-CB			5/16	.3125/.3122	
CL-5-CB			3/8	.3750/.3747	

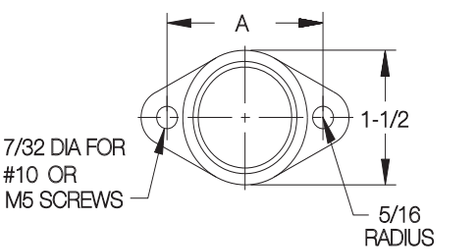
CONSTRUCTION-BALL COVERS

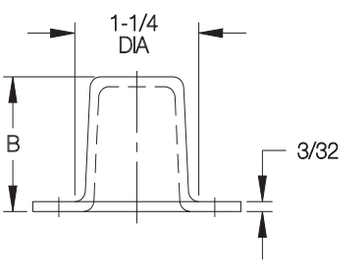
ZINC DIE CASTING



Sturdy cover that protects a Construction Ball from damage after installation.







PART NO.	A	B
CL-2-COVER	1-7/8	1-1/2

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CONSTRUCTION-BALL PADS

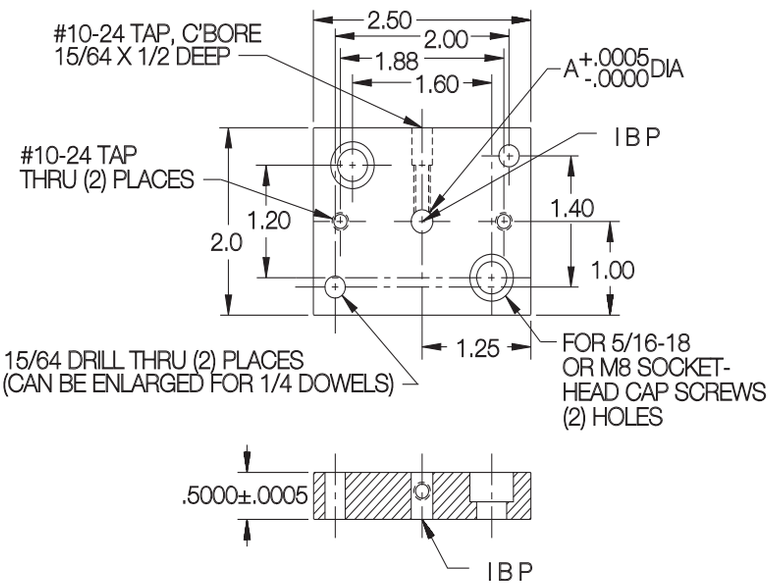
RECTANGULAR (STEEL): 1018 STEEL, BLACK OXIDE FINISH. RECTANGULAR (STAINLESS STEEL): 17-4PH STAINLESS STEEL PASSIVATED.

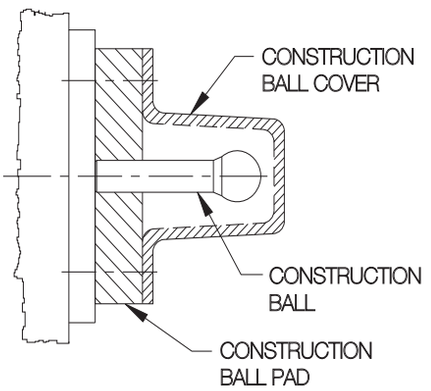


Rectangular

Now also available in stainless steel!

Rectangular Construction-Ball Pads should be fastened with two socket-head cap screws, then can be doweled in place to maintain accurate location. The Construction Ball can be secured by installing a #10-24 set screw (not furnished) in the crosshole.





RECTANGULAR – STEEL (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL
CL-1-CBP	1/4	.2500
CL-2-CBP	5/16	.3125
CL-3-CBP	3/8	.3750

RECTANGULAR – STAINLESS STEEL (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL
CL-1-CBP-S	1/4	.2500
CL-2-CBP-S	5/16	.3125
CL-3-CBP-S	3/8	.3750

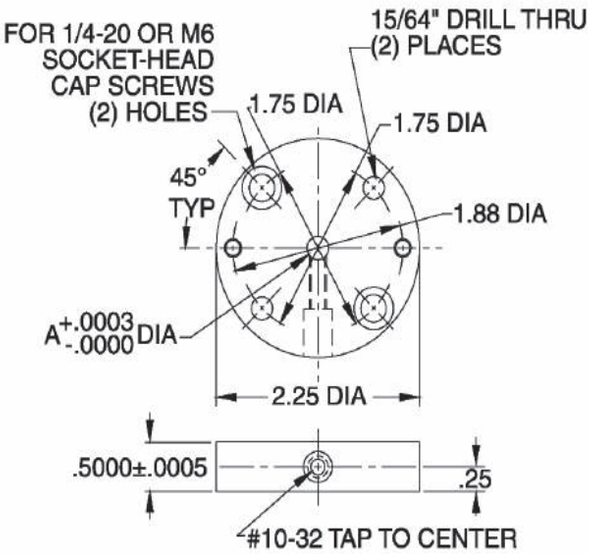
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CONSTRUCTION-BALL PADS

ROUND (STEEL): 1144 STEEL, BLACK OXIDE FINISH. ROUND (STAINLESS STEEL): 17-4PH STAINLESS STEEL, PASSIVATED.
SHANK TYPE: 8620 STEEL. CARBURIZED-HARDENED, BLACK OXIDE FINISH



Round



Now also available in stainless steel!

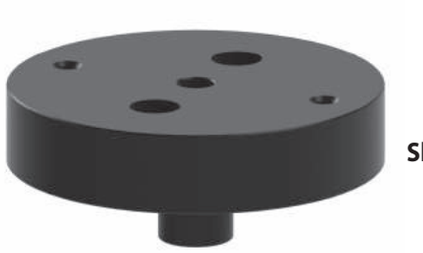
Round Construction-Ball Pads should be fastened with two socket-head cap screws, then can be doweled in place to maintain accurate location. The Construction Ball can be secured by installing a #10-32 set screw (not furnished) in the crosshole.

ROUND – STEEL (INCH)

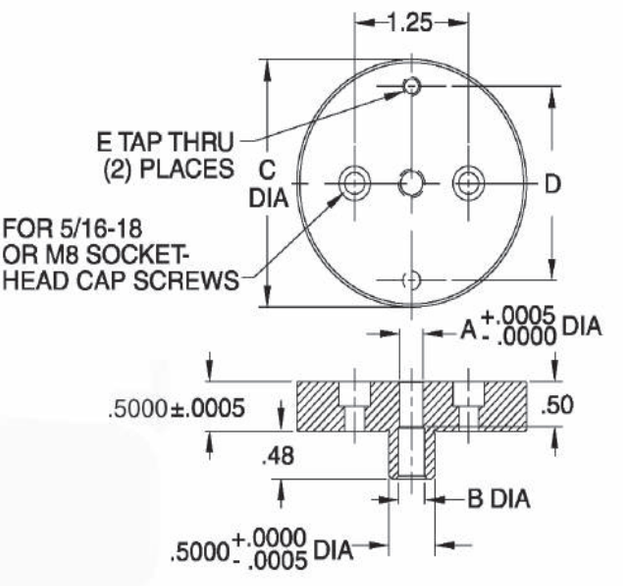
PART NO.	A DIA NOMINAL	A DIA ACTUAL
CL-1-CBPR	1/4	.2500

ROUND – STAINLESS STEEL (INCH)

CL-1-CBPR-S	1/4	.2500



Shank Type



Shank-type Construction-Ball Pads should be installed in a reamed hole for accurate location, then fastened with two socket-head cap screws.

SHANK TYPE – STEEL (INCH)

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B DIA	C DIA	D	E
CL-1-CBPK	1/4	.2500	.257	2.50	1.88	#10-24

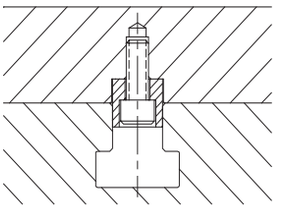
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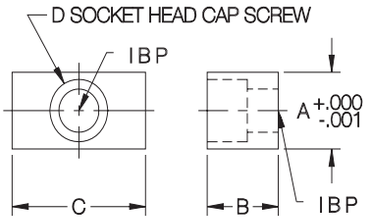
FIXTURE KEYS

1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Standard key for fixtures slotted to mount on one specific machine table. Depth of slot in fixture should be 1/2 of B dimension.





INCH

PART NO.	TABLE SLOT SIZE	A	B	C	D
CL-1-FK	1/2	.5000	1/2	3/4	1/4-20
CL-3-FK	5/8	.6250		3/4	5/16-18
CL-4-FK	11/16	.6875		1	
CL-5-FK	3/4	.7500		1-1/4	
CL-6-FK	13/16	.8125			

METRIC

CLM-12-FK	12mm	.4724	.315	.787	M5
CLM-14-FK	14mm	.5512	.394	.866	M6
CLM-16-FK	16mm	.6299			
CLM-18-FK	18mm	.7087			
CLM-20-FK	20mm	.7874			

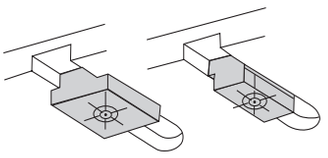
6

STEP FIXTURE KEYS

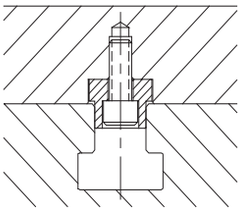
MILD STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH

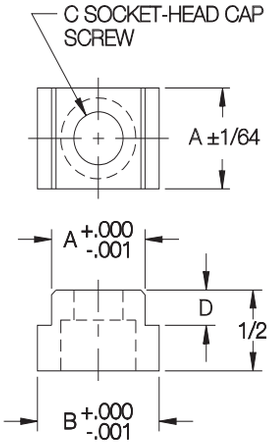


Adapts a key-slotted fixture or vise to machine tables with a different slot size. Available for inch or metric slots. Top and bottom of key are centered within .0005 of each other.



Step Fixture Keys are available for machine-table slots either larger or smaller than a given fixture slot. (Viewed from underside of fixture.)





INCH FIXTURE SLOTS

PART NO.	FIXTURE SLOT SIZE	A	TABLE SLOT SIZE	B	C SOCKET-HEAD CAP SCREW (ORDER SEPARATELY)	D
CL-10-SFK-18	5/8	.6250	18mm	.7087	CL-5/16-18X.75-SHCS	7/32
CL-11-SFK-625	11/16	.6875	5/8	.6250	CL-5/16-18X.75-SHCS	9/32
CL-11-SFK-16			16mm	.6299		9/32
CL-11-SFK-18			18mm	.7087		7/32
CL-11-SFK-20			20mm	.7874		
CL-12-SFK-625	3/4	.7500	5/8	.6250	CL-5/16-18X.75-SHCS	9/32
CL-12-SFK-18			18mm	.7087		9/32
CL-13-SFK-18	13/16	.8125	18mm	.7087	CL-5/16-18X.75-SHCS	9/32

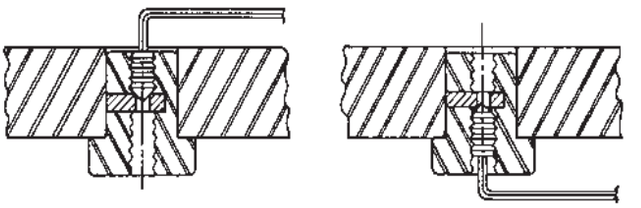
METRIC FIXTURE SLOTS

PART NO.	FIXTURE SLOT SIZE	A	TABLE SLOT SIZE	B	C SOCKET-HEAD CAP SCREW (ORDER SEPARATELY)	D
CL-20-SFK-18	20mm	.7874	18mm	.7087	CLM-6X15-SHCS	9/32

SURE-LOCK™ FIXTURE KEYS

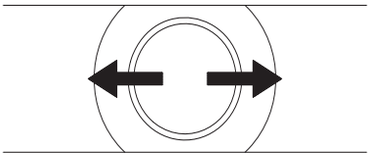
12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH





Lock in place from above or below using a hex wrench.

Perfect fixture key for most applications. Keys are interchangeable because they all fit in a 5/8 reamed hole. Allows mounting any fixture on any machine simply by switching keys. Eliminates the need to slot fixtures. Concentricity .0005 TIR or better. Available for inch or metric machine-table slots.



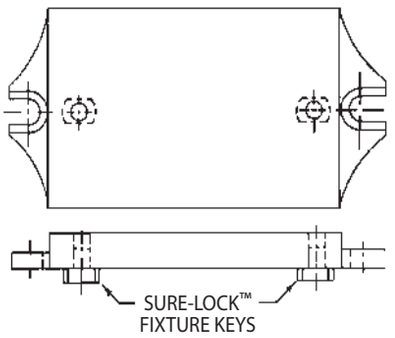
Patented locking action aligns fixture key perfectly with slot axis.

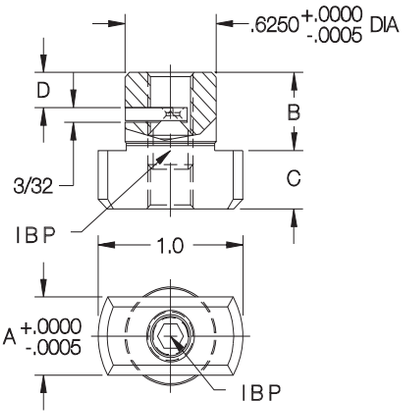
INCH

PART NO.	TABLE SLOT SIZE	A	B	C	D
CL-375-SLFK	3/8	.3750	1/2	3/8	.23
CL-437-SLFK	7/16	.4375			
CL-500-SLFK	1/2	.5000			
CL-5000-SLFK			3/4	7/16	.41
CL-562-SLFK	9/16	.5625	1/2	3/8	.23
CL-5625-SLFK			3/4	7/16	.41
CL-625-SLFK	5/8	.6250	1/2	3/8	.23
CL-6250-SLFK			3/4	7/16	.41
CL-687-SLFK	11/16	.6875	1/2	3/8	.23
CL-6875-SLFK			3/4	7/16	.41
CL-7500-SLFK	3/4	.7500			
CL-8125-SLFK	13/16	.8125			

METRIC

PART NO.	TABLE SLOT SIZE	A	B	C	D
CL-12-SLFK	12mm	.4724	1/2	3/8	.23
CL-14-SLFK	14mm	.5512	3/4	7/16	.41
CL-16-SLFK	16mm	.6299			
CL-18-SLFK	18mm	.7087			
CL-20-SLFK	20mm	.7874			
CL-22-SLFK	22mm	.8661			





REAMED-HOLE FIXTURE KEYS

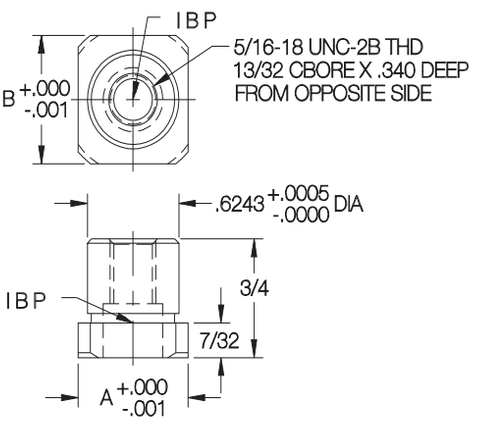
12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Each key fits two different table slots by turning 90°. Install in a 5/8 reamed hole. Fasten from above with a 5/16–18 Socket-Head Cap Screw, or from below with a 1/4–20 Socket-Head Cap Screw. Concentricity .0005 or better.

INCH

PART NO.	TABLE SLOT SIZES	A	B
CL-1-RFK	5/8 and 11/16	.6250	.6875
CL-2-RFK	5/8 and 3/4		.7500
CL-3-RFK	5/8 and 13/16		.8125
CL-4-RFK	11/16 and 3/4	.6875	.7500
CL-6-RFK	3/4 and 13/16	.7500	.8125



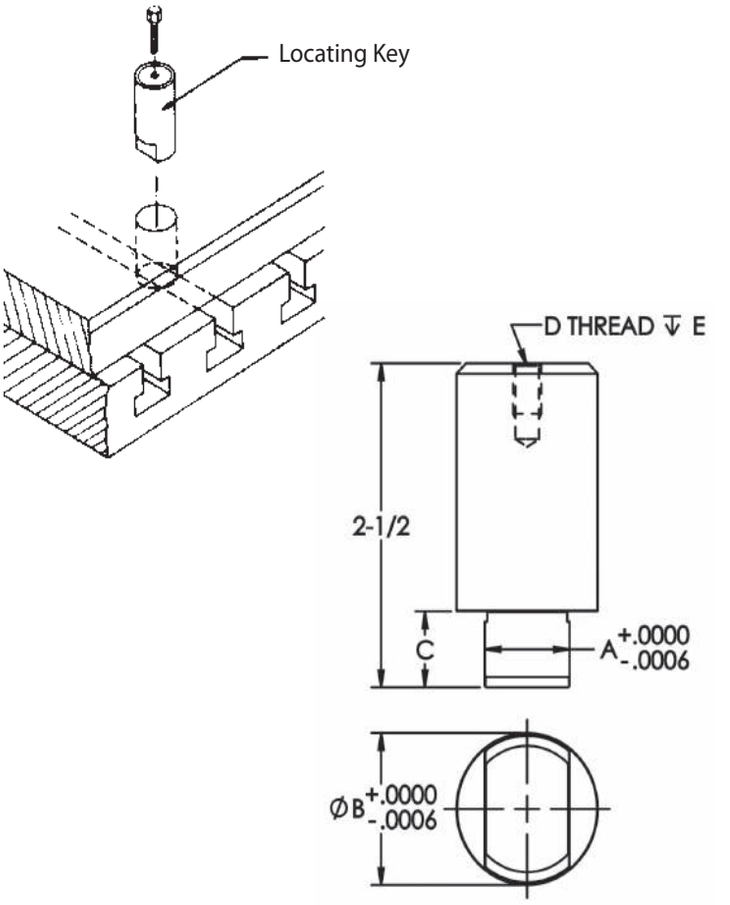
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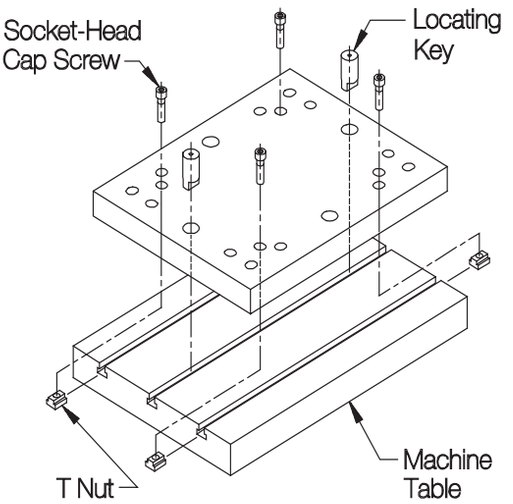
LOCATING KEYS

1144 OR 1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH



These heavy-duty removable-type keys are our standard fixture keys for large fixture plates. Locating keys are available in two body diameters — metric (30mm) and inch (-1/6″). These keys can be used for mounting all of our Rectangular Tooling Plates, blank and modular. Locating Keys can be inserted from above after placing the fixture plate on the machine table, to keep the top free of obstructions. If desired, Locating Keys can be removed before machining, after the fixture is fastened to the machine table. The tapped hole in the key's top surface makes insertion and removal easier. Locating flats are accurate to within .0005″ true position of the body diameter.





METRIC DIAMETER (30mm)

PART NO.	TABLE SLOT SIZE	A (mm)	B DIA (mm)	C (mm)	D THREAD	THREAD PITCH (mm)	E (mm)
CLM-14-LK	14mm	14	30	15	M6	1	10
CLM-6250-LK m	5/8″	15.88					
CLM-18-LK	18mm	18					
CLM-8125-LK	13/16″	20.64					
CLM-22-LK	22mm	22					
CLM-8750-LK	7/8″	22.23					

INCH DIAMETER (1-3/16″)

PART NO.	TABLE SLOT SIZE	A	B DIA	C	D THREAD	E
CL-MF10-4401	14mm	.5512	1.1875	5/8	1/4-20	3/8
CL-MF10-4406	9/16	.5625				
CL-MF10-4407	5/8	.6250				
CL-MF10-4402	16mm	.6299				
CL-MF10-4408	11/16	.6875				
CL-MF10-4403	18mm	.7087				
CL-MF10-4409	3/4	.7500				
CL-MF10-4404	20mm	.7874				
CL-MF10-4411	13/16	.8125				
CL-MF10-4405	22mm	.8661				
CL-MF10-4410	7/8	.8750				

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PALLET FIXTURE KEYS

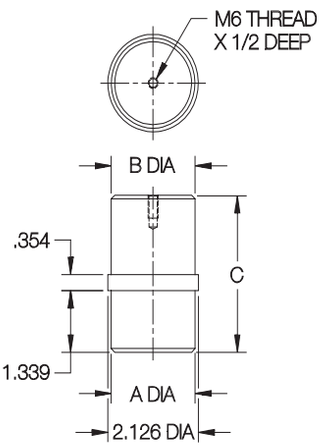
12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



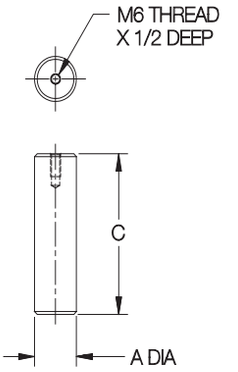
Center Pin



Radial Pin

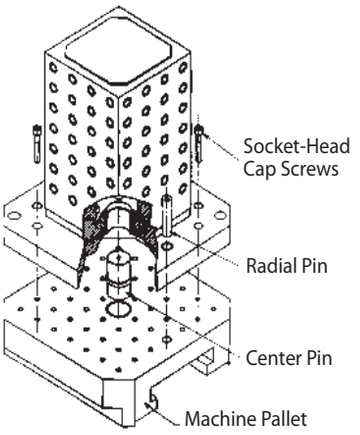


Center Pin



Radial Pin

Fixture keys for mounting tooling plates and blocks on standard DIN pallets. Each pallet requires one Center Pin and one Radial Pin (for orientation). The Radial Pin is usually removed after fastening the pallet to the machine table.



CENTER PINS

PART NO.	A DIA NOMINAL	A DIA ACTUAL	B DIA NOMINAL	B DIA ACTUAL	C
CLM-25-PFKC	50mm	1.9681/1.9676	25mm	.9839/.9835	2.87
CLM-30-PFKC			30mm	1.1808/1.1804	3.42
CLM-50-PFKC			50mm	1.9681/1.9676	

RADIAL PINS

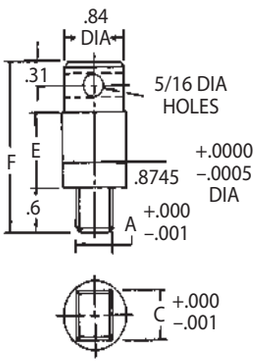
PART NO.	A DIA NOMINAL	A DIA ACTUAL	C
CLM-20-PFKR	20mm	.7871/.7867	3.50
CLM-25-PFKR	25mm	.9839/.9835	4.92

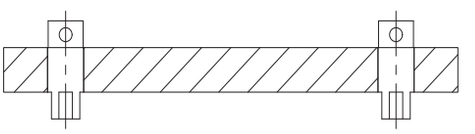
MILL FIXTURE KEYS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Can be removed from above after mounting fixture on machine. Fits either 11/16 or 13/16 table slots by turning 90°. Install in a 7/8 reamed hole. Concentricity .0005 or better.





INCH

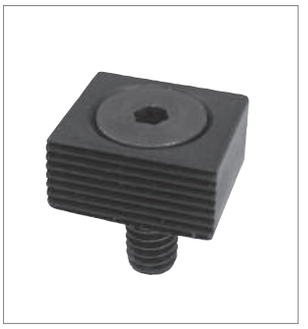
PART NO.	TABLE SLOT SIZES	A	C	E	F
CL-1-MFK-1	11/16 or 13/16	.6873	.8123	1.00	2.20
CL-1-MFK-2				3.20	4.40

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CLAMP STRAPS

TYPES



SLOTTED-HEEL CLAMP STRAPS
Popular Clamp Strap with a slot underneath to allow sliding it straight back for clear unloading. Two drill spots on the sides provide a secure grip for retracting the clamp. Available in steel or stainless steel with several strap lengths available for each size.



SLOTTED-HEEL GOOSENECK CLAMP STRAPS
Gooseneck version of our Slotted-Heel Clamp Straps. This design recesses the clamping nut to provide a low overall profile. An indentation at the rear of each side provides a secure finger grip for retracting the clamp. Also available as a complete assembly.



SLOTTED-HEEL PADDED CLAMP STRAPS
Slotted-Heel Clamp Strap that features a replaceable clamping pad attached with two screws (furnished). Clamp Strap also easily accepts custom pads or other attachments. Read end is tapped on either side for a Finger Pin.



TAPPED-HEEL CLAMP STRAPS
Popular Clamp Strap with a tapped heel tha accepts a clamping screw or rear support. Often used with a Guide Block to allow sliding the strap straight back for clear loading. Two drill spots on the sides provide a secure grip for retracting the clamp. Can also be used with a Stud Leveling Foot as a rear support.



TAPPED-HEEL PADDED CLAMP STRAPS
Tapped-Heel Clamp Strap that features a replaceable clamping pad attached with two screws (furnished). Clamp Strap also easily accepts custom pads or other attachments. Replacement pads and assemblies also available.



FORGED CLAMP STRAPS (TAPPED HEEL)
High-strength Tapped-Heel Clamp Strap available in straight or gooseneck design, with a locator nose or plain nose. Locator-nose version is ideal for workpieces with machined ends. The accurately machined notch ensures precise, repeatable clamp location for increased machining clearance.



TAPERED-NOSE CLAMP STRAPS (TAPPED HEEL)
Mini-size Tapped-Heel Clamp Strap with a tapered nose for clamping in tight spaces. Available in stainless steel. Also available as a complete assembly, where a Fixture Stud has a thread-locking interference thread at the bottom end to install permanently in a fixture plate.



WIDE-NOSE CLAMP STRAPS (TAPPED HEEL)
Mini-size Tapped-Heel Clamp Strap with an extra-wide nose. Available in stainless steel. Also available as a complete assembly, where a Fixture Stud has a thread-locking interference thread at the bottom end to install permanently in a fixture plate.



FORGED ADJUSTABLE CLAMPS
Rugged forged steel pivot clamp. Instant height adjustment without blocks or shims. One-piece assembly allows quick setups and eliminates lost clamp pieces. Clamp can swing 90˚ in either direction for loading clearance.

CONTINUED ON NEXT PAGE

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CLAMP STRAPS

TYPES



DOUBLE-END CLAMP STRAPS

Clamp Strap with two clamping ends, for holding two workpieces simultaneously. A complete Clamp-Strap Assembly is available as well. Order pieces individually. See product page for details. Also available in metric.



DOUBLE-END GOOSENECK CLAMP STRAPS

Gooseneck version of our Double-End Clamp Straps. This design recesses the clamping nut to provide a low overall profile. Double-End Clamps have two clamping ends, for holding two workpieces simultaneously. Turn strap 90° for clear loading.



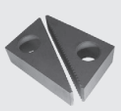
PLAIN CLAMPS

Plain Clamps are double-end, tapered-nose clamp straps that can be used for holding two workpieces simultaneously, or used with Step Blocks as a rear support for holding a single workpiece.



FORGED U CLAMPS

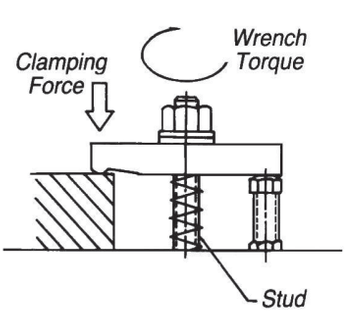
Open U end allows totally removing clamp strap when unclamped. Clamp tips are stepped to provide repeatable location. Cylindrical pin end minimizes contact area and is useful for clamping in horizontal holes.



STEP BLOCKS & CLAMPS

Serrated Blocks can be used individually or in pairs, as a clamp rest. Use a single block with Step Clamps, or a pair of blocks with Plain Clamps. All blocks and clamps are made from top-grade steel.

CLAMPING FORCE OF STANDARD CLAMP STRAPS



INCH

Stud Size	Recommended Torque* (ft-lbs)	Clamping Force (lbs)	Tensile Force in Stud (lbs)
#10-32	2	300	600
1/4-20	4	500	1000
5/16-18	9	900	1800
3/8-16	16	1300	2600
1/2-13	38	2300	4600
5/8-11	77	3700	7400
3/4-10	138	5500	11000
7/8-9	222	7600	15200
1"-8	333	10000	20000

METRIC

Stud Size	Recommended Torque* (ft-lbs)	Clamping Force (lbs)	Tensile Force in Stud (lbs)
M6	4	500	1000
M8	9	900	1800
M10	20	1500	3000
M12	35	2200	4400
M16	84	4000	8000
M20	165	6300	12600
M24	283	9000	18000

*Clean, dry clamping stud torqued to approximately 33% of its 100,000 psi yield strength (2:1 lever ratio).

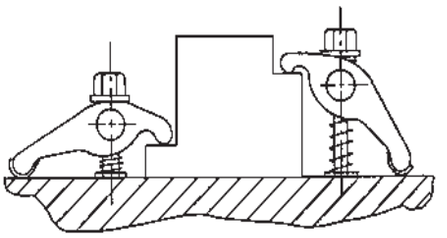
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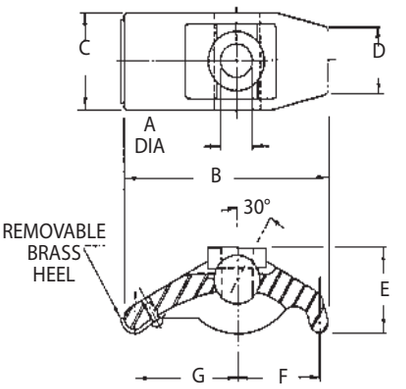
FORGED ADJUSTABLE CLAMPS

FORGED 1045 STEEL, BLACK OXIDE FINISH



Rugged forged steel pivot clamp. Instant height adjustment without blocks or shims. One-piece assembly allows quick setups and eliminates lost clamp pieces. Removable brass heel protects machine table. Clamp can swing 90° in either direction for loading clearance.





CLAMP STRAPS

PART NO.	STUD SIZE	CLAMPING RANGE	A DIA	B	C	D	E	F	G
CL-6-FAC	5/16, 3/8, M8, or M10	0 to 1-3/4	7/16	3-1/4	1-1/4	7/8	1	1-1/8	1-7/8
CL-8-FAC	1/2 or M12	0 to 2-1/16	9/16	4	1-5/8	1-1/8	1-7/16	1-7/16	2-5/16
CL-10-FAC	5/8 or M16	0 to 3	11/16	5-1/2	1-7/8	1-3/8	1-7/8	2	3-1/4
CL-12-FAC	3/4 or M20	0 to 4-1/4	13/16	6-1/4	2-5/8	2	2-1/4	2-1/8	3-1/2
CL-16-FAC	7/8,1, or M24	0 to 5-1/2	1-1/16	7	3-1/8	2-3/8	2-7/16	2-1/4	4

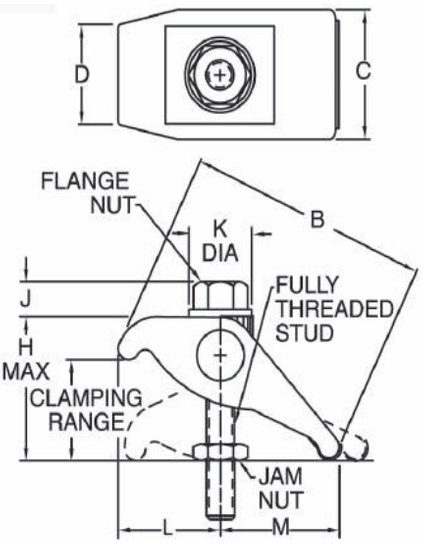
7



Assembly with Flange Nut
CL-x-FACA-FN



Assembly with Hand Knob
CL-x-FACA-HK



ASSEMBLIES (INCH)

PART NO.	STUD SIZE	CLAMPING RANGE	H	J	K DIA	L MIN	L MAX	M MIN	M MAX	FORGED ADJUSTABLE CLAMP	FULLY THREADED STUD	JAM NUT	FLANGE NUT
CL-5-FACA-FN	5/16-18	0 to 1-3/4	2-1/8	3/8	3/4	1-1/16	1-1/4	1-3/4	2	CL-6-FAC	CL-5/16-18x3.00-FTS	CL-5-JN	CL-9-FN
CL-6-FACA-FN	3/8-16			1/2	7/8						CL-3/8-16x3.00-FTS	CL-6-JN	CL-2-FN
CL-8-FACA-FN	1/2-13	0 to 2-1/16	2-5/8	11/16	1-1/8	1-3/8	1-9/16	2-1/8	2-7/16	CL-8-FAC	CL-1/2-13x4.00-FTS	CL-8-JN	CL-3-FN
CL-10-FACA-FN	5/8-11	0 to 3	3-3/4	13/16	1-3/8	1-13/16	2-1/8	2-15/16	3-3/8	CL-10-FAC	CL-5/8-11x5.00-FTS	CL-10-JN	CL-4-FN
CL-12-FACA-FN	3/4-10	0 to 4/1/4	5-3/8	1	1-5/8	2-1/8	2-7/16	3-5/16	3-13/16	CL-12-FAC	CL-3/4-10x7.00-FTS	CL-12-JN	CL-5-FN
CL-14-FACA-FN	7/8-9	0 to 5-1/2	7	1-1/8	1-3/4	2-1/4	2-5/8	3-13/16	4-3/8	CL-16-FAC	CL-7/8-9x8.00-FTS	CL-14-JN	CL-6-FN
CL-16-FACA-FN	1"-8			1-1/4	2						CL-1-8x8.00-FTS	CL-16-JN	CL-7-FN

ASSEMBLIES (METRIC)

CLM-5-FACA-FN	M8	0 to 1-3/4	2-1/8	.39	.75	1-1/16	1-1/4	1-3/4	2	CL-6-FAC	CLM-8x80-FTS	CLM-8-JN	CLM-8-FN
CLM-6-FACA-FN	M10			.51	.87						CLM-10x80-FTS	CLM-10-JN	CLM-10-FN
CLM-8-FACA-FN	M12	0 to 2-1/16	2-5/8	.67	1.10	1-3/8	1-9/16	2-1/8	2-7/16	CL-8-FAC	CLM-12x110-FTS	CLM-12-JN	CLM-12-FN
CLM-10-FACA-FN	M16	0 to 3	3-3/4	.83	1.34	1-13/16	2-1/8	2-15/16	3-3/8	CL-10-FAC	CLM-16x125-FTS	CLM-16-JN	CLM-16-FN
CLM-12-FACA-FN	M20	0 to 4/1/4	5-3/8	.98	1.61	2-1/8	2-7/16	3-5/16	3-13/16	CL-12-FAC	CLM-20x175-FTS	CLM-20-JN	CLM-20-FN
CLM-16-FACA-FN	M24	0 to 5-1/2	7	1.26	2.01	2-1/4	2-5/8	3-13/16	4-3/8	CL-16-FAC	CLM-24x200-FTS	CLM-24-JN	CLM-24-FN

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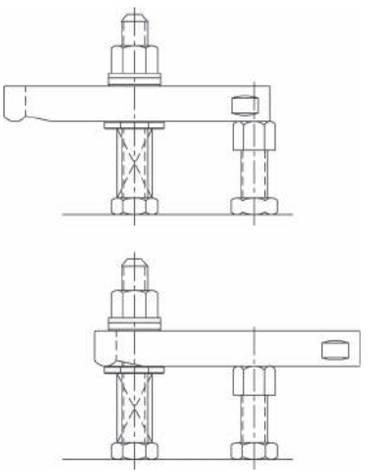
SLOTTED-HEEL CLAMP STRAPS

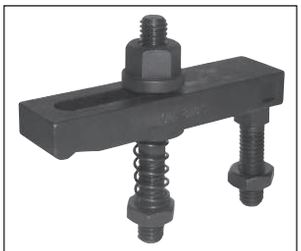
STEEL: 1018, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS STEEL: 300 SERIES



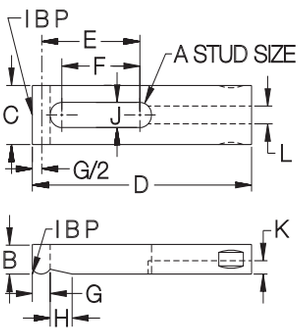
Steel and Stainless Steel

Popular Clamp Strap with a slot underneath to allow sliding it straight back for clear loading. Two drill spots on the sides provide a secure grip for retracting the clamp. Available in steel for 1/4-20 (M6) to 3/4-10 (M20) stud sizes, or stainless steel for #10-32 to 3/8-16 stud sizes. Each size is available in several strap lengths.





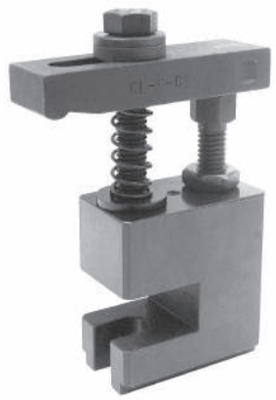
INFO+: See pages 264-266 for complete assemblies using these Clamp Straps.



7

STRAPS — STEEL

PART NO.	A	B	C	D	E	F	G	H	J	K	L
CL-0-CS	1/4-20 or M6	3/8	5/8	2	27/32	19/32	1/4	11/32	9/32	5/32	3/16
CL-1-CS				2-1/2	1-3/32	13/16					
CL-1A-CS	5/16-18 or M8	1/2	3/4	2-1/2	27/32	1/2	5/16	7/16	11/32	7/32	1/4
CL-1B-CS				3	1-11/32	1					
CL-2-CS	3/8-16 or M10	1/2	1-1/8	3	1-9/32	7/8	13/32	1/2	27/64	9/32	3/8
CL-3A-CS				3-1/2	1-17/32	1-1/8					
CL-3-CS				4	1-25/32	1-3/8					
CL-4-CS				5	2-9/32	1-7/8					
CL-5-CS				6	2-25/32	2-3/8					
CL-6A-CS	1/2-13 or M12	5/8	1-1/4	3-1/2	1-1/2	1-1/32	13/32	1/2	17/32	9/32	3/8
CL-6-CS				4	1-3/4	1-9/32					
CL-8-CS				5	2-1/4	1-25/32					
CL-10-CS				6	2-3/4	2-9/32					
CL-15A-CS	5/8-11 or M16	7/8	1-1/2	4	1-11/16	1-3/32	1/2	19/32	21/32	9/32	1/2
CL-16-CS				5	2-3/16	1-19/32					
CL-18-CS				6	2-11/16	2-3/32					
CL-18A-CS				6-1/2	2-15/16	2-11/32					
CL-19-CS	3/4-10 or M20	1	1-3/4	6	2-5/8	2	1/2	19/32	13/16	5/16	1/2
CL-21-CS				7	3-1/8	2-9/16					
CL-22A-CS				8	3-5/8	3-1/8					



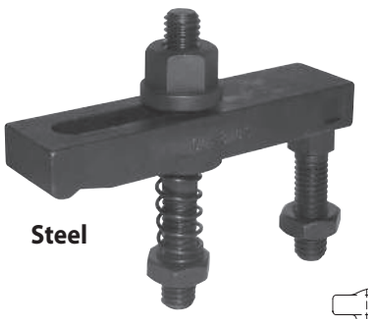
INFO+: See pages 442-443 for stackable high-rise clamp-strap assemblies.

STRAPS — STAINLESS, MINIATURE

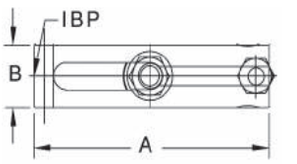
CL-17215	#10-32	1/4	1/2	1-1/2	21/32	15/32	3/16	5/16	7/32	3/32	7/32
CL-17325	1/4-20	3/8	5/8	2-1/2	1-1/8	15/16	1/4	3/8	9/32	1/8	9/32
CL-17425	5/16-18	3/8	3/4	2-1/2	1-3/32	27/32	5/16	7/16	11/32	5/32	11/32
CL-17540	3/8-16	1/2	1	4	1-13/16	1-1/2	3/8	1/2	13/32	3/16	13/32

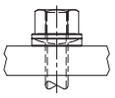
SLOTTED-HEEL CLAMP STRAPS

INFO+: SEE PAGES 100, 109, 263, 311-316, 318-319, 326, 327-330 FOR MATERIAL SPECIFICATIONS

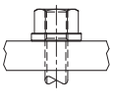


A complete clamp-strap assembly using a slotted-heel strap from (**INFO+** page 263). Select any of the six nut/knob combinations shown below by adding the appropriate suffix to the part number. Other Stud and Clamp Rest lengths are available (order pieces individually).

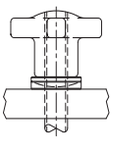




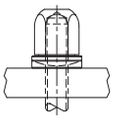
Spherical Nut & Washer CL-xx-SHA-1



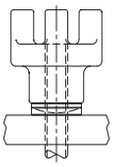
Flange Nut CL-xx-SHA-2



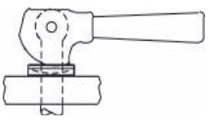
Hand Knob with Spherical Washer CL-xx-SHA-4



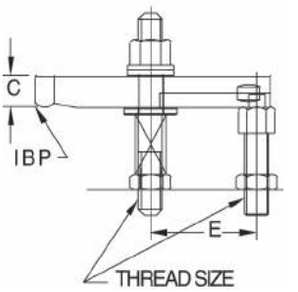
Acorn Nut with Spherical Washer CL-xx-SHA-5



Bar Knob with Spherical Washer* CL-xx-SHA-6



Cam Handle with Spherical Washer (**INFO+** page 265)



ASSEMBLIES — STEEL (INCH)

PART NO.	THREAD SIZE	A	B	C	E	CLAMP STRAP	CLAMP REST	SPRING	FLAT WASHER	STUD
CL-0-SHA-x	1/4-20	2	5/8	3/8	27/32	CL-0-CS	CL-1-CR	CL-5-SPG	CL-7-FW	CL-1/4-20x2.50-STUD
CL-1-SHA-x		2-1/2			1-3/32	CL-1-CS				
CL-1A-SHA-x	5/16-18	2-1/2	3/4	1/2	1-1/4	CL-1A-CS	CL-1A-CR	CL-6-SPG	CL-14-FW	CL-5/16-18x 3.00-STUD
CL-1B-SHA-x		3			1-11/32	CL-1B-CS				
CL-2-SHA-x	3/8-16	3	1-1/8	1/2	1-9/32	CL-2-CS	CL-2-CR	CL-7-SPG	CL-1-FW	CL-3/8-16x3.00-STUD
CL-3-SHA-x		3-1/2			1-17/32	CL-3A-CS				
CL-4-SHA-x		4			1-25/32	CL-3-CS				
CL-6-SHA-x		5			2-9/32	CL-4-CS				
CL-8-SHA-x		6			2-25/32	CL-5-CS				
CL-9-SHA-x	1/2-13	3-1/2	1-1/4	5/8	1-1/2	CL-6A-CS	CL-4-CR	CL-9-SPG	CL-2-FW	CL-1/2-13x4.00-STUD
CL-10-SHA-x		4			1-3/4	CL-6-CS				
CL-12-SHA-x		5			2-1/4	CL-8-CS				
CL-14-SHA-x		6			2-3/4	CL-10-CS				
CL-20-SHA-x	5/8-11	4	1-1/2	7/8	1-11/16	CL-15A-CS	CL-6-CR	CL-11-SPG	CL-3-FW	CL-5/8-11x4.50-STUD
CL-22-SHA-x		5			2-3/16	CL-16-CS				
CL-24-SHA-x		6			2-11/16	CL-18-CS				
CL-25-SHA-x		6-1/2			2-15/16	CL-18A-CS				
CL-27-SHA-x	3/4-10	6	1-3/4	1	2-5/8	CL-19-CS	CL-8-CR	CL-13-SPG	CL-4-FW	CL-3/4-10x5.00-STUD
CL-29-SHA-x		7			3-1/8	CL-21-CS				
CL-31-SHA-x		8			3-5/8	CL-22A-CS				

ASSEMBLIES — STEEL (METRIC)

CLM-0-SHA-x	M6	2	5/8	3/8	27/32	CL-0-CS	CLM-1-CR	CL-5-SPG	CL-7-FW	CLM-6x65-STUD
CLM-1-SHA-x		2-1/2			1-3/32	CL-1-CS				
CLM-1A-SHA-x	M8	2-1/2	3/4	1/2	1-1/4	CL-1A-CS	CLM-1A-CR	CL-6-SPG	CL-14-FW	CLM-8x80-STUD
CLM-1B-SHA-x		3			1-11/32	CL-1B-CS				
CLM-2-SHA-x	M10	3	1-1/8	1/2	1-9/32	CL-2-CS	CLM-2-CR	CL-7-SPG	CL-1-FW	CLM-1x80-STUD
CLM-3-SHA-x		3-1/2			1-17/32	CL-3A-CS				
CLM-4-SHA-x		4			1-25/32	CL-3-CS				
CLM-6-SHA-x		5			2-9/32	CL-4-CS				
CLM-8-SHA-x		6			2-25/32	CL-5-CS				
CLM-9-SHA-x	M12	3-1/2	1-1/4	5/8	1-1/2	CL-6A-CS	CLM-4-CR	CL-9-SPG	CL-2-FW	CLM-12x95-STUD
CLM-10-SHA-x		4			1-3/4	CL-6-CS				
CLM-12-SHA-x		5			2-1/4	CL-8-CS				
CLM-14-SHA-x		6			2-3/4	CL-10-CS				
CLM-20-SHA-x	M16	4	1-1/2	7/8	1-11/16	CL-15A-CS	CLM-5-CR	CL-11-SPG	CL-3-FW	CLM-16x110-STUD
CLM-22-SHA-x		5			2-3/16	CL-16-CS				
CLM-24-SHA-x		6			2-11/16	CL-18-CS				
CLM-25-SHA-x		6-1/2			2-15/16	CL-18A-CS				
CLM-27-SHA-x	M20	6	1-3/4	1	2-5/8	CL-19-CS	CLM-8-CR	CL-13-SPG	CLM-10-FW	CLM-20x125-STUD
CLM-29-SHA-x		7			3-1/8	CL-21-CS				
CLM-31-SHA-x		8			3-5/8	CL-22A-CS				

* Available in thread sizes 3/8-16 and above (M10 and above in metric).

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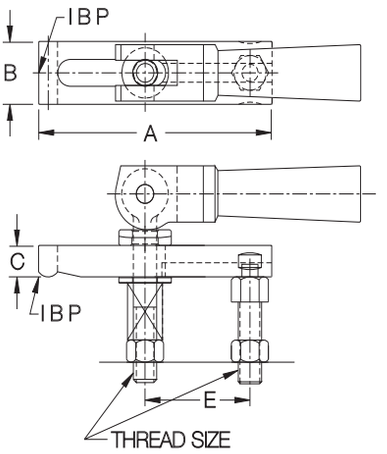
SLOTTED-HEEL CLAMP STRAPS

INFO+: SEE PAGES 100, 109, 263, 311-316, 318-319, 326, 327-330 FOR MATERIAL SPECIFICATIONS



Straddle Cam Steel

A complete clamp-strap assembly using (**INFO+**) a slotted-heel strap from page 263 along with a Double Cam and Eyebolt. Other Eyebolt and Clamp Rest lengths are available (order pieces individually).



ASSEMBLIES — STRADDLE CAM, STEEL (INCH)

PART NO.	THREAD SIZE	A	B	C	E	CLAMP STRAP	CLAMP REST	SPRING	EYE BOLT	CAM HANDLE AND CLEVIS PIN	FLAT WASHER	SPHERICAL WASHER
CL-0-SCA	1/4-20	2	5/8	3/8	27/32	CL-0-CS	CL-1-CR	CL-5-SPG	CL-25-EB	CL-11-CH CL-610-CLVP	CL-7-FW	CL-1-SW
CL-1-SCA		2-1/2			1-3/32	CL-1-CS						
CL-1A-SCA	5/16-18	2-1/2	3/4	1/2	1-1/4	CL-1A-CS	CL-1A-CR	CL-6-SPG	CL-31-EB	CL-11A-CH CL-810-CLVP	CL-14-FW	CL-11-SW
CL-1B-SCA		3			1-11/32	CL-1B-CS						
CL-2-SCA	3/8-16	3	1-1/8	1/2	1-9/32	CL-2-CS	CL-2-CR	CL-7-SPG	CL-38-EB	CL-12-CH CL-1014-CLVP	CL-1-FW	CL-2-SW
CL-2A-SCA		3-1/2			1-17/32	CL-3A-CS						
CL-3-SCA		4			1-25/32	CL-3-CS						
CL-4-SCA		5			2-9/32	CL-4-CS						
CL-5-SCA		6			2-25/32	CL-5-CS						
CL-6A-SCA	1/2-13	3-1/2	1-1/4	5/8	1-1/2	CL-6A-CS	CL-4-CR	CL-9-SPG	CL-50-EB	CL-13-CH CL-1218-CLVP	CL-2-FW	CL-3-SW
CL-6-SCA		4			1-3/4	CL-6-CS						
CL-8-SCA		5			2-1/4	CL-8-CS						
CL-9A-SCA		6			2-3/4	CL-10-CS						
CL-17-SCA	5/8-11	4	1-1/2	7/8	1-11/16	CL-15A-CS	CL-6-CR	CL-11-SPG	CL-62-EB	CL-14-CH CL-2020-CLVP	CL-3-FW	CL-4-SW
CL-19-SCA		5			2-3/16	CL-16-CS						
CL-21-SCA		6			2-11/16	CL-18-CS						
CL-22-SCA		6-1/2			2-15/16	CL-18A-CS						
CL-24-SCA	3/4-10	6	1-3/4	1	2-5/8	CL-19-CS	CL-8-CR	CL-13-SPG	CL-75-EB	CL-15-CH CL-2024-CLVP	CL-4-FW	CL-5-SW
CL-26-SCA		7			3-1/8	CL-21-CS						
CL-28-SCA		8			3-5/8	CL-22A-CS						

ASSEMBLIES — STRADDLE CAM, STEEL (METRIC)

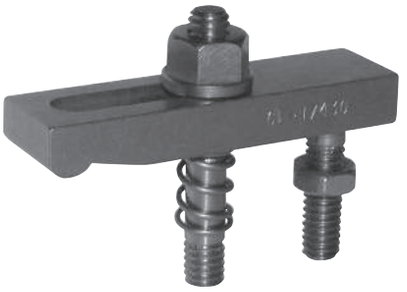
CLM-0-SCA	M6	2	5/8	3/8	27/32	CL-0-CS	CLM-1-CR	CL-5-SPG	CLM-25A-EB	CLM-11-CH CLM-616-CLVP	CL-7-FW	CL-1-SW
CLM-1-SCA		2-1/2			1-3/32	CL-1-CS						
CLM-2-SCA	M10	3	1-1/8	1/2	1-9/32	CL-2-CS	CLM-2-CR	CL-7-SPG	CLM-40-EB	CLM-12-CH CLM-1023-CLVP	CL-1-FW	CL-2-SW
CLM-2A-SCA		3-1/2			1-17/32	CL-3A-CS						
CLM-3-SCA		4			1-25/32	CL-3-CS						
CLM-4-SCA		5			2-9/32	CL-4-CS						
CLM-5-SCA		6			2-25/32	CL-5-CS						
CLM-6A-SCA	M12	3-1/2	1-1/4	5/8	1-1/2	CL-6A-CS	CLM-4-CR	CL-9-SPG	CLM-50A-EB	CLM-13-CH CLM-1229-CLVP	CL-2-FW	CL-3-SW
CLM-6-SCA		4			1-3/4	CL-6-CS						
CLM-8-SCA		5			2-1/4	CL-8-CS						
CLM-9A-SCA		6			2-3/4	CL-10-CS						
CLM-17-SCA	M16	4	1-1/2	7/8	1-11/16	CL-15A-CS	CLM-5-CR	CL-11-SPG	CLM-62-EB	CLM-14-CH CLM-1632-CLVP	CL-3-FW	CL-4-SW
CLM-19-SCA		5			2-3/16	CL-16-CS						
CLM-21-SCA		6			2-11/16	CL-18-CS						
CLM-22-SCA		6-1/2			2-15/16	CL-18A-CS						
CLM-24-SCA	M20	6	1-3/4	1	2-5/8	CL-19-CS	CLM-8-CR	CL-13-SPG	CLM-76A-EB	CLM-15-CH CLM-2038-CLVP	CLM-10-FW	CLM-20-SW
CLM-26-SCA		7			3-1/8	CL-21-CS						
CLM-28-SCA		8			3-5/8	CL-22A-CS						

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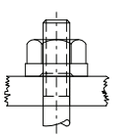
SLOTTED-HEEL CLAMP STRAPS

INFO+: SEE PAGES 123, 263, 311-316, 318-319, 329-330 FOR MATERIAL SPECIFICATIONS



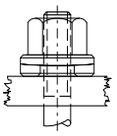
Stainless Steel (Miniature)

A complete clamp-strap assembly using (**INFO+**) a stainless steel slotted-heel strap from page 263. Select any of the four nut/knob combinations shown below by adding the appropriate suffix to the part number. Fixture Stud has a thread-locking interference thread at the bottom end to install permanently in a fixture plate.



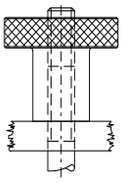
Flange Nut

CL-xxxx-1



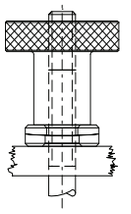
Spherical Nut and Washer

CL-xxxx-2



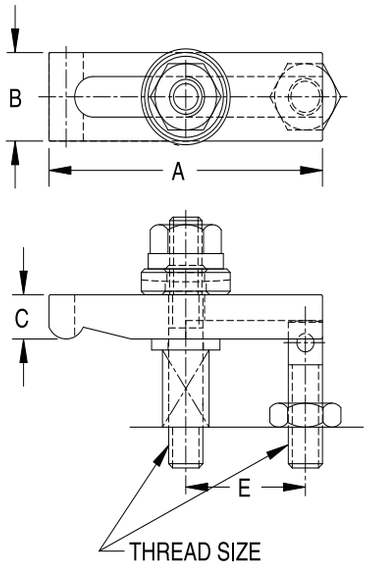
Knurled Knob

CL-xxxx-3



Knurled Knob and Spherical Washer

CL-xxxx-4



ASSEMBLIES — STAINLESS, MINIATURE (INCH)

PART NO.	THREAD SIZE	A	B	C	E	CLAMP STRAP	CLAMP REST	SPRING	FLAT WASHER	STUD	JAM NUT
CL-2715-x	#10-32	1-1/2	1/2	1/4	21/32	CL-17215	CL-13410	CL-2430.7	CL-254	CL-11415	CL-3-FJN-S
CL-2825-x	1/4-20	2-1/2	5/8	3/8	1-1/8	CL-17325	CL-13515	CL-2440.7	CL-255	CL-11520	CL-4-JN-S
CL-2925-x	5/16-18	2-1/2	3/4	3/8	1-3/32	CL-17425	CL-13615	CL-2450.7	CL-256	CL-11620	CL-5-JN-S
CL-3040-x	3/8-16	3	1	1/2	1-5/16	CL-17530	CL-13717	CL-2461.0	CL-257	CL-11725	CL-6-JN-S

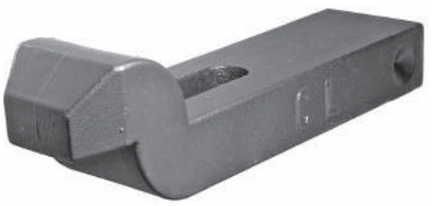
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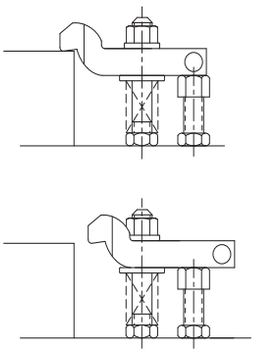
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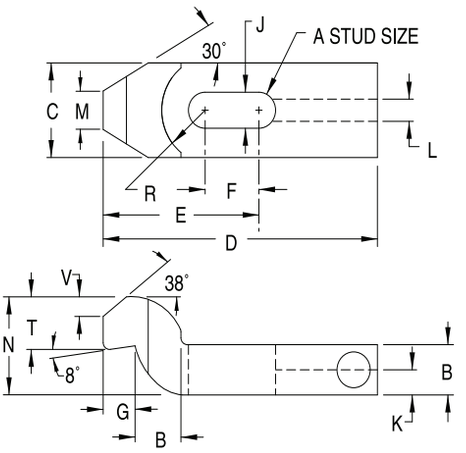
SLOTTED-HEEL GOOSENECK CLAMP STRAPS

STRAP: ALLOY STEEL, BLACK OXIDE FINISH
INFO+: SEE PAGES 101, 311-316, 318-319, 327, 329-330 FOR OTHER MATERIAL SPECIFICATIONS



Gooseneck version of our Slotted-Heel Clamp Straps. This design recesses the clamping nut to provide a low overall profile. Slotted-Heel Clamp Straps have a slot underneath to slide straight back for clear loading. An indentation at the rear of each side provides a secure finger grip for retracting the clamp. Available to fit 1/2-13 studs (M12 in metric).



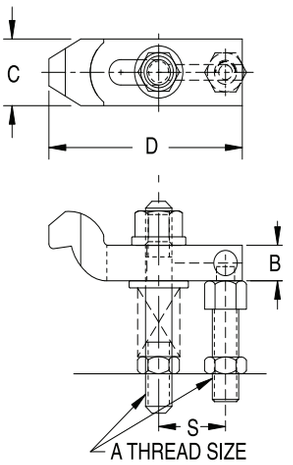


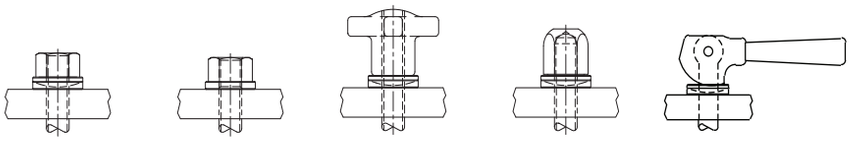
STRAPS – STEEL

PART NO.	A	B	C	D	E	F	G	J	K	L	M	N	R	T	V
CL-85-GCS	1/2 OR M12	.79	1.57	4.92	2.87	1.02	.63	.55	.34	.38	.79	1.57	.79	.90	.34



Slotted-Heel Gooseneck Clamp Straps are also available as a complete assembly. Select any of the five nut/knob combinations shown below by adding the appropriate suffix to the part number. Other lengths of Clamping Studs and Clamp Rests are available (order pieces individually).





Spherical Nut & Washer CL-xx-GCSA-1

Flange Nut CL-xx-GCSA-2

Hand Knob with Spherical Washer CL-xx-GCSA-4

Acorn Nut with Spherical Washer CL-xx-GCSA-5

Cam Handle with Spherical Washer CL-xx-GCSA-7

ASSEMBLIES – STEEL (INCH)

PART NO.	A	B	C	D	S	CLAMP STRAP	CLAMP REST	SPRING	FLAT WASHER	STUD	JAM NUT
CL-85-GCSA-x	1/2 OR M12	.79	1.57	5.91	2.75	CL-85-GCS	CL-4-CR	CL-9-SPG	CL-2-FW	CL-1/2-13X4.00-STUD	CL-8-JN

ASSEMBLIES – STEEL (METRIC)

PART NO.	A	B	C	D	S	CLAMP STRAP	CLAMP REST	SPRING	FLAT WASHER	STUD	JAM NUT
CLM-85-GCSA-x	1/2 OR M12	.79	1.57	5.91	2.75	CL-85-GCS	CLM-4-CR	CL-9-SPG	CL-2-FW	CLM-12X95-STUD	CLM-12-JN

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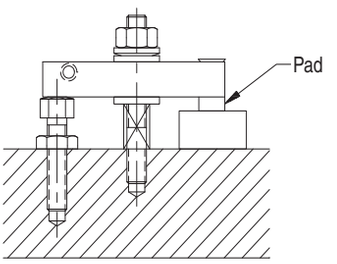
SLOTTED-HEEL PADDED CLAMP STRAPS

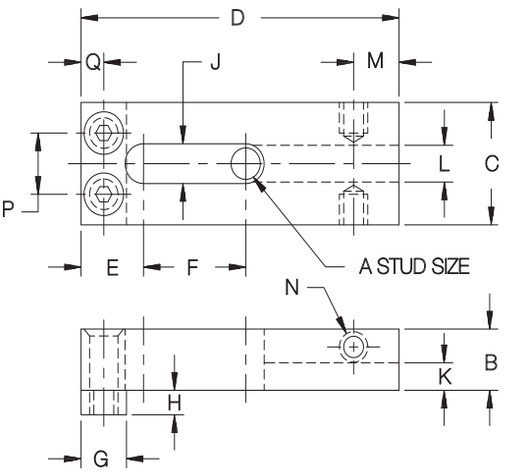
STRAP & PAD: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
INFO+: SEE PAGES 101, 311-316, 318, 329-330 FOR OTHER MATERIAL SPECIFICATIONS



Steel

Slotted-Heel Clamp Strap that features a replaceable clamping pad attached with two screws (furnished). Clamp Strap also easily accepts custom pads or other attachments. Rear end is tapped on either side for a Finger Pin (**INFO+** page 138). Available for 1/4-20 (M6) to 1/2-13 (M12) stud sizes, most in a choice of several strap lengths.

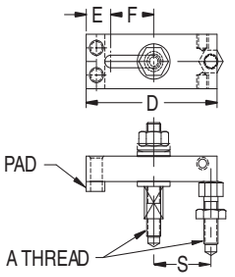


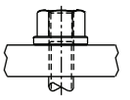


STRAPS — STEEL WITH STEEL PAD

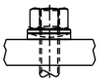
PART NO.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
CL-165-CS	1/4-20 or M6	3/8	5/8	2	3/8	5/8	1/4	1/8	9/32	5/32	1/4			11/32	9/64
CL-166-CS	3/8-16 or M10	5/8	1-1/4	3-1/2	11/16	1-1/8	1/2	1/4	27/64	9/32	3/8	1/2	5/16-18	5/8	1/4
CL-168-CS				4-1/2		1-5/8									
CL-169-CS	1/2-13 or M12	3/4	1-1/2	4-1/2	7/8	1-1/4	5/8	3/8	17/32	9/32	3/8	1/2	5/16-18	3/4	5/16
CL-170A-CS				6		2									

7

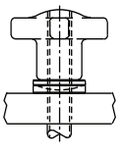




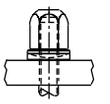
Spherical Nut & Washer CL-xx-SHPA-1



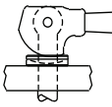
Flange Nut CL-xx-SHPA-2



Hand Knob with Spherical Washer CL-xx-SHPA-4



Acorn Nut with Spherical Washer CL-xx-SHPA-5

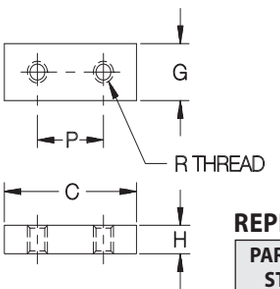


Cam Handle with Spherical Washer CL-xx-SHPA-7

ASSEMBLIES — STEEL WITH STEEL PAD (INCH)

PART NO.	A	D	E	F	S	CLAMP STRAP	CLAMP REST	SPRING	FLAT WASHER	CLAMPING STUD
CL-165-SHPA-x	1/4-20	2	3/8	5/8	7/8	CL-165-CS	CL-1-CR	CL-5-SPG	CL-7-FW	CL-1/4-20x2.50-STUD
CL-166-SHPA-x	3/8-16	3-1/2	11/16	1-1/8	1-7/16	CL-166-CS	CL-2-CR	CL-7-SPG	CL-1-FW	CL-3/8-16x3.00-STUD
CL-168-SHPA-x		4-1/2		1-5/8	1-15/16	CL-168-CS				
CL-169-SHPA-x	1/2-13	4-1/2	7/8	1-1/4	2-1/8	CL-169-CS	CL-4-CR	CL-9-SPG	CL-2-FW	CL-1/2-13x4.00-STUD
CL-170A-SHPA-x		6		2	2-7/8	CL-170A-CS				





Replacement or optional pads for the Clamp Straps shown above. Available in steel, reinforced plastic, or brass.

REPLACEMENT PADS

PART NO. STEEL PAD	PART NO. PLASTIC PAD	PART NO. BRASS PAD	STUD SIZE	C	G	H	P	R
CL-40-CP	CL-20-CP	CL-30-CP	1/4-20 or M6	5/8	1/4	1/8	11/32	#5-40
CL-42-CP	CL-22-CP	CL-32-CP	3/8-16 or M10	1-1/4	1/2	1/4	5/8	#10-24
CL-43-CP	CL-23-CP	CL-33-CP	1/2-13 or M12	1-1/2	5/8	3/8	3/4	1/4-20

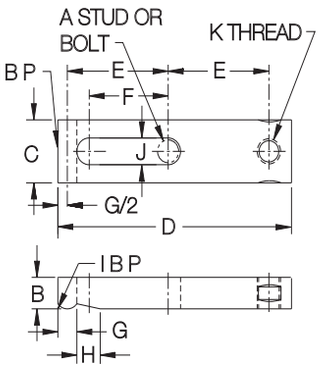
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TAPPED-HEEL CLAMP STRAPS

STEEL: 1018, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS STEEL: 300 SERIES

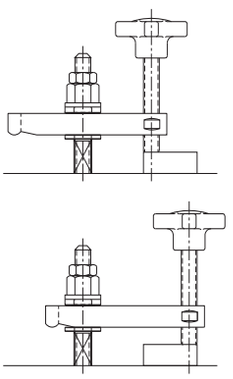


Steel and Stainless Steel



Popular Clamp Strap with a tapped heel that accepts a clamping screw or rear support. Often used with a Guide Block to allow sliding the strap straight back for clear loading. Two drill spots on the sides provide a secure grip for retracting the clamp. **INFO+**: Can also be used with a Stud Leveling Foot as a rear support (see page 205).

Available in steel for 1/4-20 to 3/4-10 stud sizes (M6 to M20 in metric), or stainless steel for #10-32 to 3/8-16 stud sizes. Each size is available in several strap lengths.





INFO+: See pages 270-272 for complete assemblies using these Clamp Straps.

STRAPS — STEEL (INCH)

PART NO.	A	B	C	D	E	F	G	H	J	K
CL-61-CS	1/4-20	3/8	5/8	2	13/16	9/16	1/4	11/32	9/32	1/4-20
CL-62-CS				2-1/2	1-1/16	13/16				
CL-63-CS	3/8-16	1/2	1-1/8	3	1-7/32	13/16	13/32	1/2	27/64	3/8-16
CL-65-CS				4	1-23/32	1-5/16				
CL-67-CS				5	2-7/32	1-13/16				
CL-69-CS				6	2-23/32	2-5/16				
CL-70-CS	1/2-13	5/8	1-1/4	3-1/2	1-13/32	15/16	13/32	1/2	17/32	1/2-13
CL-71-CS				4	1-21/32	1-3/16				
CL-72-CS				4-1/2	1-29/32	1-7/16				
CL-73-CS				5	2-5/32	1-11/16				
CL-74-CS				5-1/2	2-13/32	1-15/16				
CL-75-CS				6	2-21/32	2-3/16				
CL-81-CS	5/8-11	7/8	1-1/2	4	1-9/16	1	1/2	19/32	21/32	5/8-11
CL-77-CS				4-1/2	1-13/16	1-1/4				
CL-83-CS				5	2-1/16	1-1/2				
CL-85-CS				6	2-9/16	2				
CL-86-CS				6-1/2	2-13/16	2-1/4				
CL-88-CS	3/4-10	1	1-3/4	6	2-1/2	1-29/32	1/2	19/32	13/16	3/4-10
CL-90-CS				7	3	2-13/32				
CL-92-CS				8	3-1/2	2-29/32				

STRAPS — STEEL (METRIC)

CLM-61-CS	M6	3/8	5/8	2	13/16	9/16	1/4	11/32	9/32	M6
CLM-62-CS				2-1/2	1-1/16	13/16				
CLM-63-CS	M10	1/2	1-1/8	3	1-7/32	13/16	13/32	1/2	27/64	M10
CLM-65-CS				4	1-23/32	1-5/16				
CLM-67-CS				5	2-7/32	1-13/16				
CLM-70-CS	M12	5/8	1-1/4	3-1/2	1-13/32	15/16	13/32	1/2	17/32	M12
CLM-71-CS				4	1-21/32	1-3/16				
CLM-72-CS				4-1/2	1-29/32	1-7/16				
CLM-73-CS				5	2-5/32	1-11/16				
CLM-75-CS				6	2-21/32	2-3/16				
CLM-81-CS	M16	7/8	1-1/2	4	1-9/16	1	1/2	19/32	21/32	M16
CLM-83-CS				5	2-1/16	1-1/2				
CLM-85-CS				6	2-9/16	2				
CLM-88-CS	M20	1	1-3/4	6	2-1/2	1-29/32	1/2	19/32	13/16	M20
CLM-92-CS				8	3-1/2	2-29/32				

STRAPS — STAINLESS, MINIATURE (INCH)

CL-18215	#10-32	1/4	1/2	1-1/2	19/32	13/32	3/16	5/16	7/32	#10-32
CL-18220				2	27/32	21/32				
CL-18320	1/4-20	3/8	5/8	2	13/16	19/32	1/4	3/8	9/32	1/4-20
CL-18325				2-1/2	1-1/16	27/32				
CL-18420	5/16-18	3/8	3/4	2	3/4	1/2	5/16	7/16	11/32	5/16-18
CL-18425				2-1/2	1	3/4				
CL-18430				3	1-1/4	1				
CL-18535	3/8-16	1/2	1	3-1/2	1-15/32	1-1/8	3/8	1/2	27/64	3/8-16
CL-18540				4	1-23/32	1-3/8				

7

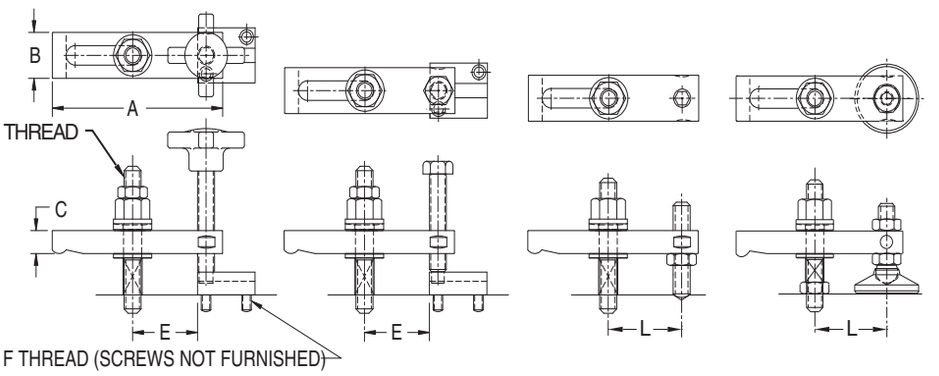
TAPPED-HEEL CLAMP STRAPS

INFO+: SEE PAGES 100-101, 269, 311-316, 318-319, 330 FOR MATERIAL SPECIFICATION



Steel

A complete clamp-strap assembly using a tapped-heel strap from (**INFO+** page 269). Select one of two clamping screws or a rear Clamp Rest, as shown below, by adding the appropriate suffix to the part number.



Hand-Knob Clamping Screw
CL-xx-THA-HK

Hex-Head Clamping Screw
CL-xx-THA-HH

Oval-Point Clamp Rest
CL-xx-THA-OP

Leveling Foot
CL-xx-THA-LF

ASSEMBLIES — STEEL (INCH)

PART NO.	THREAD SIZE	A	B	C	E	F	L	CLAMP STRAP	GUIDE BLOCK*	STUD & SPRING	NUTS	FLAT WASHER
CL-1-THA-xx	1/4-20	2	5/8	3/8	11/16	#6-32	13/16	CL-61-CS	CL-2-GB	CL-1/4-20x2.00-STUD CL-5-SPG	CL-4-JN CL-1-SNW	CL-7-FW
CL-2-THA-xx		2-1/2			15/16		1-1/16	CL-62-CS				
CL-3-THA-xx	3/8-16	3	1-1/8	1/2	1-1/32	#10-32	1-7/32	CL-63-CS	CL-4-GB	CL-3/8-16x3.00-STUD CL-7-SPG	CL-6-JN CL-2-SNW	CL-1-FW
CL-5-THA-xx		4			1-17/32		1-23/32	CL-65-CS				
CL-7-THA-xx		5			2-1/32		2-7/32	CL-67-CS				
CL-9-THA-xx		6			2-17/32		2-23/32	CL-69-CS				
CL-10-THA-xx	1/2-13	3-1/2	1-1/4	5/8	1-5/32	1/4-20	1-13/32	CL-70-CS	CL-6-GB	CL-1/2-13x4.00-STUD CL-9-SPG	CL-8-JN CL-3-SNW	CL-2-FW
CL-11-THA-xx		4			1-13/32		1-21/32	CL-71-CS				
CL-12-THA-xx		4-1/2			1-21/32		1-29/32	CL-72-CS				
CL-13-THA-xx		5			1-29/32		2-5/32	CL-73-CS				
CL-14-THA-xx		5-1/2			2-5/32		2-13/32	CL-74-CS				
CL-15-THA-xx		6			2-13/32		2-21/32	CL-75-CS				
CL-21-THA-xx	5/8-11	4	1-1/2	7/8	1-1/4	1/4-20	1-9/16	CL-81-CS	CL-8-GB	CL-5/8-11x4.00-STUD CL-11-SPG	CL-10-JN CL-4-SNW	CL-3-FW
CL-17-THA-xx		4-1/2			1-1/2		1-13/16	CL-77-CS				
CL-23-THA-xx		5			1-3/4		2-1/16	CL-83-CS				
CL-25-THA-xx		6			2-1/4		2-9/16	CL-85-CS				
CL-26-THA-xx		6-1/2			2-1/2		2-13/16	CL-86-CS				
CL-28-THA-xx	3/4-10	6	1-3/4	1	2-1/8	1/4-20	2-1/2	CL-88-CS	CL-11-GB	CL-3/4-10x5.00-STUD CL-13-SPG	CL-12-JN CL-5-SNW	CL-4-FW
CL-30-THA-xx		7			2-5/8		3	CL-90-CS				
CL-32-THA-xx		8			3-1/8		3-1/2	CL-92-CS				

ASSEMBLIES — STEEL (METRIC)

CLM-1-THA-xx	M6	2	5/8	3/8	11/16	M4	13/16	CLM-61-CS	CL-2-GB	CLM-6x65-STUD CL-5-SPG	CLM-6-JN CLM-6-SNW	CL-7-FW
CLM-2-THA-xx		2-1/2			15/16		1-1/16	CLM-62-CS				
CLM-3-THA-xx	M10	3	1-1/8	1/2	1-1/32	M5	1-1/16	CLM-63-CS	CL-4-GB	CLM-10x80-STUD CL-7-SPG	CLM-10-JN CLM-10-SNW	CL-1-FW
CLM-5-THA-xx		4			1-17/32		1-23/32	CLM-65-CS				
CLM-7-THA-xx		5			2-1/32		2-7/32	CLM-67-CS				
CLM-10-THA-xx	M12	3-1/2	1-1/4	5/8	1-5/32	M6	1-13/32	CLM-70-CS	CL-6-GB	CLM-12x95-STUD CL-9-SPG	CLM-12-JN CLM-12-SNW	CL-2-FW
CLM-11-THA-xx		4			1-13/32		1-21/32	CLM-71-CS				
CLM-12-THA-xx		4-1/2			1-21/32		1-29/32	CLM-72-CS				
CLM-13-THA-xx		5			1-29/32		2-5/32	CLM-73-CS				
CLM-15-THA-xx		6			2-13/32		2-21/32	CLM-75-CS				
CLM-21-THA-xx	M16	4	1-1/2	7/8	1-1/4	M6	1-9/16	CLM-81-CS	CL-8-GB	CLM-16x110-STUD CL-11-SPG	CLM-16-JN CLM-16-SNW	CL-3-FW
CLM-23-THA-xx		5			1-3/4		2-1/16	CLM-83-CS				
CLM-25-THA-xx		6			2-1/4		2-9/16	CLM-85-CS				
CLM-28-THA-xx	M20	6	1-3/4	1	2-1/8	M6	2-1/2	CLM-88-CS	CL-11-GB	CLM-20x125-STUD CL-13-SPG	CLM-20-JN CLM-20-SNW	CLM-10-FW
CLM-32-THA-xx		8			3-1/8		3-1/2	CLM-92-CS				

* Not included on oval-point version

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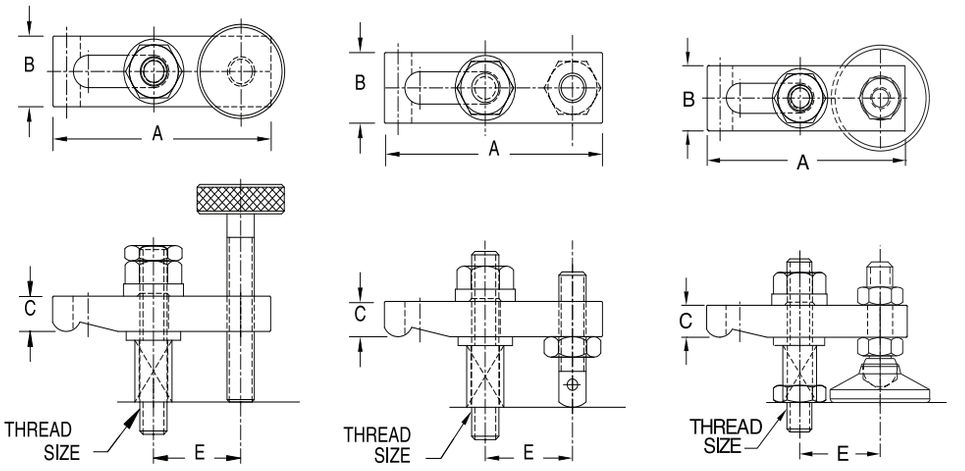
TAPPED-HEEL CLAMP STRAPS

INFO+: 119, 203, 271, 313, 316, 318-319, 329-330 SEE PAGES FOR MATERIAL SPECIFICATIONS



Stainless Steel (Miniature)

A complete clamp-strap assembly using (**INFO+**) a stainless steel Tapped-Heel Strap from page 269. Fixture Stud has a thread-locking interference thread at the bottom end to install permanently in a fixture plate. Standard assembly includes a Knurled-Head Screw. To order with a rear Clamp Rest instead, add "-1" to the part number (example: CL-3115-1). To order with a Leveling Foot instead, add "-2" to the part number (example: CL-3115-2).



Knurled-Head Screw CL-xxxx | Clamp Rest CL-xxxx-1 | Leveling Foot CL-xxxx-2

ASSEMBLIES — STAINLESS, MINIATURE (INCH)

PART NO. WITH KNURLED HEAD SCREW	THREAD SIZE	A	B	C	E	CLAMP STRAP	KNURLED HEAD SCREW	CLAMP REST	LEVELING FOOT	SPRING	FLAT WASHER	STUD	FLANGE NUT
CL-3115	#10-32	1-1/2	1/2	1/4	19/32	CL-18215	CL-23212	CL-13410	CL-3-SLF-S	CL-2430.7	CL-254	CL-11415	CL-124
CL-3120		2			27/32	CL-18220							
CL-3220	1/4-20	2	5/8	3/8	13/16	CL-18320	CL-23515	CL-13515	CL-4-SLF-S	CL-2440.7	CL-255	CL-11520	CL-125
CL-3225		2-1/2			1-1/16	CL-18325							
CL-3320	5/16-18	2	3/4	3/8	3/4	CL-18420	CL-23620	CL-13615	CL-5-SLF-S	CL-2450.7	CL-256	CL-11620	CL-126
CL-3325		2-1/2			1	CL-18425							
CL-3330		3			1-1/4	CL-18430							
CL-3435	3/8-16	3-1/2	1	1/2	1-15/32	CL-18535	CL-23820	CL-13717	CL-6-SLF-S	CL-2461.0	CL-257	CL-11725	CL-127
CL-3440		4			1-23/32	CL-18540							

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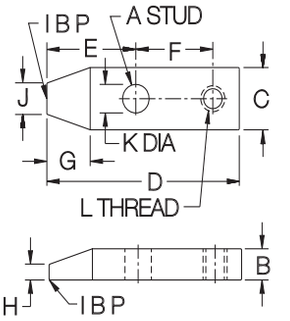
TAPERED-NOSE CLAMP STRAPS

STRAP: 300-SERIES STAINLESS STEEL
INFO+: SEE PAGES 117, 313, 316, 318-319, 329-330 FOR OTHER MATERIAL SPECIFICATIONS



Stainless Steel (Miniature)

Tapped-Heel Clamp Strap with a tapered nose for clamping in tight spaces. Available in stainless steel for #10-32 to 3/8-16 stud sizes.



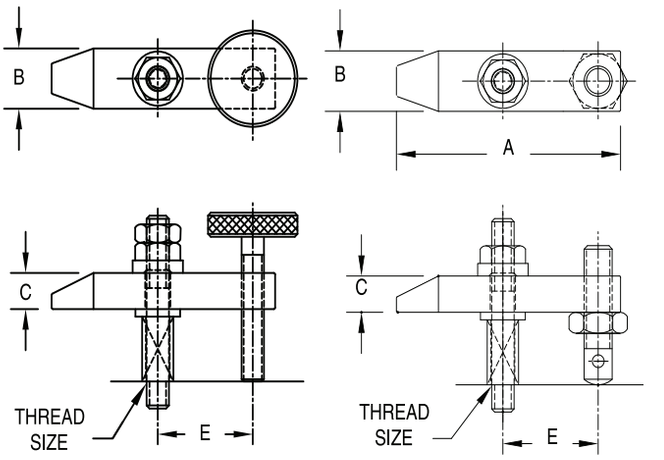
STRAPS — STAINLESS, MINIATURE (INCH)

PART NO.	A	B	C	D	E	F	G	H	J	K	L
CL-20215	#10-32	1/4	1/2	1-1/2	11/16	19/32	3/8	1/8	1/4	7/32	#10-32
CL-20220				2	15/16	27/32					
CL-20320	1/4-20	3/8	5/8	2	15/16	13/16	15/32	5/32	5/16	9/32	1/4-20
CL-20325				2-1/2	1-3/16	1-1/16					
CL-20425	5/16-18	3/8	3/4	2-1/2	1-5/32	1	9/16	3/16	3/8	11/32	5/16-18
CL-20535	3/8-16	1/2	1	3-1/2	1-21/32	1-15/32	3/4	1/4	1/2	27/64	3/8-16

7



Stainless Steel (Miniature)



Knurled-Head Screw
CL-xxxx

Clamp Rest
CL-xxxx-1

A complete clamp-strap assembly using one of the straps shown above. Fixture Stud has a thread-locking interference thread at the bottom end to install permanently in a fixture plate. Standard assembly includes a Knurled-Head Screw. To order with a rear Clamp Rest instead, add "-1" to the part number. Example: CL-3915-1.

ASSEMBLIES — STAINLESS, MINIATURE (INCH)

PART NO. WITH KNURLED HEAD SCREW	PART NO. WITH CLAMP REST	THREAD SIZE	A	B	C	E	CLAMP STRAP	KNURLED HEAD SCREW	CLAMP REST	SPRING	FLAT WASHER	STUD	FLANGE NUT
CL-3915	CL-3915-1	#10-32	1-1/2	1/2	1/4	19/32	CL-20215	CL-23212	CL-13410	CL-2430.7	CL-254	CL-11415	CL-124
CL-3920	CL-3920-1		2			27/32	CL-20220						
CL-4020	CL-4020-1	1/4-20	2	5/8	3/8	13/16	CL-20320	CL-23515	CL-13515	CL-2440.7	CL-255	CL-11520	CL-125
CL-4025	CL-4025-1		2-1/2			1-1/16	CL-20325						
CL-4125	CL-4125-1	5/16-18	2-1/2	3/4	3/8	1	CL-20425	CL-23620	CL-13615	CL-2450.7	CL-256	CL-11620	CL-126
CL-4235	CL-4235-1	3/8-16	3-1/2	1	1/2	1-15/32	CL-20535	CL-23820	CL-13717	CL-2461.0	CL-257	CL-11725	CL-127

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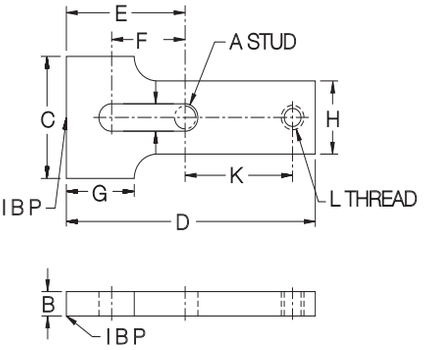
WIDE-NOSE CLAMP STRAPS

STRAP: 300-SERIES STAINLESS STEEL
INFO+: SEE PAGES 117, 203, 313, 316, 318-319, 329-330 FOR OTHER MATERIAL SPECIFICATIONS



Stainless Steel (Miniature)

Tapped-Heel Clamp Strap with an extra-wide nose. Available in stainless steel for 1/4-20 studs.



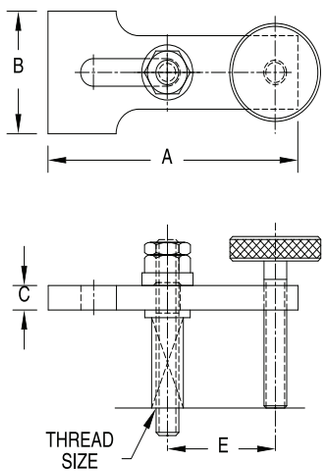


Stainless Steel (Miniature)

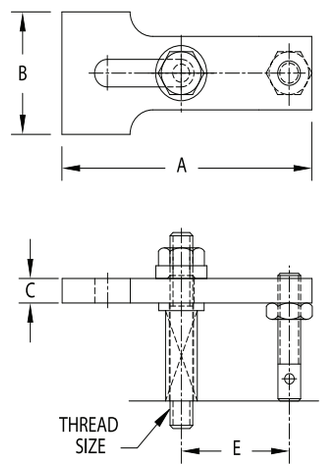
STRAPS — STAINLESS, MINIATURE (INCH)

PART NO.	A	B	C	D	E	F	G	H	J	K	L
CL-22227	1/4-20	1/4	1-1/4	2-3/4	1-5/16	13/16	3/4	3/4	9/32	1-3/16	1/4-20

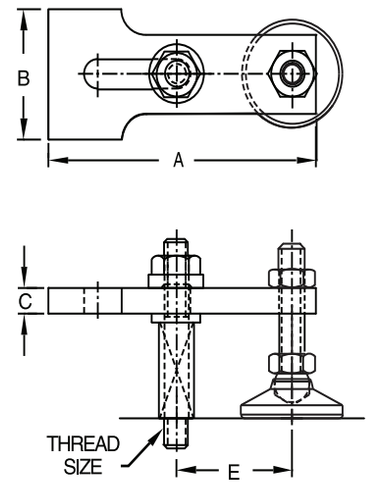
A complete Clamp-Strap assembly using the Clamp Strap shown above. Fixture stud has a thread-locking interference thread at the bottom end to install permanently in a fixture plate. Standard assembly includes a Knurled-Head Screw. To order with a rear Clamp Rest instead, add "-1" to the part number (CL-44227-1). To order with a levelling foot instead, add "-2" to the part number (CL-44227-2).



Knurled-Head Screw
CL-xxxx



Clamp Rest
CL-xxxx-1



Levelling Foot
CL-xxxx-2

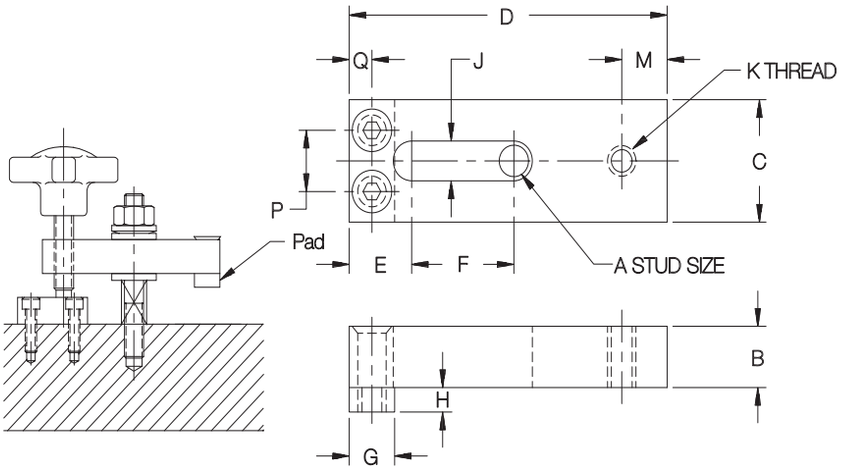
ASSEMBLIES — STAINLESS, MINIATURE (INCH)

PART NO. WITH KNURLED HEAD SCREW	THREAD SIZE	A	B	C	E	CLAMP STRAP	KNURLED HEAD SCREW	CLAMP REST	LEVELING FOOT	SPRING	FLAT WASHER	STUD	FLANGE NUT
CL-44227	1/4-20	2-3/4	1-1/4	1/4	1-3/16	CL-22227	CL-23515	CL-13515	CL-13515	CL-2440.7	CL-255	CL-11520	CL-125

TAPPED-HEEL PADDED CLAMP STRAPS

STRAP & PAD: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
INFO+: SEE PAGES 101, 203, 312, 315-316, 318, 330 FOR OTHER MATERIAL SPECIFICATIONS

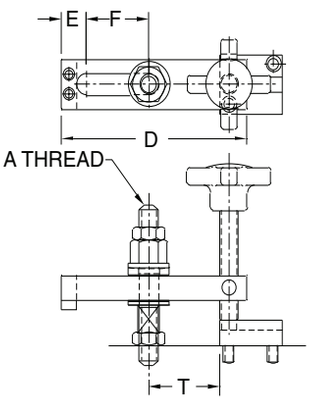




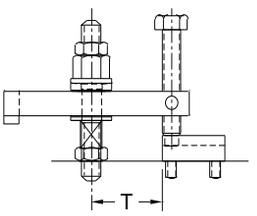
Tapped-Heel Clamp Strap that features a replaceable clamping pad attached with two screws (furnished). Clamp Strap also easily accepts custom pads or other attachments. Available for 1/4-20 to 1/2-13 stud sizes, most in a choice of several strap lengths.

STRAPS — STEEL WITH STEEL PAD (INCH)

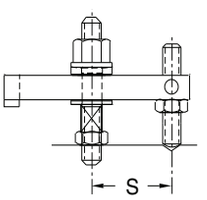
PART NO.	A	B	C	D	E	F	G	H	J	K	M	P	Q
CL-157-CS	1/4-20	3/8	5/8	2	3/8	5/8	1/4	1/8	9/32	1/4-20	7/32	11/32	9/64
CL-158A-CS	5/16-18	1/2	7/8	2-1/2	9/16	3/4	3/8	3/16	11/32	5/16-18	1/4	1/2	3/16
CL-159A-CS				3-1/2		1-1/4							
CL-160A-CS	3/8-16	5/8	1-1/4	3-1/2	11/16	1-1/8	1/2	1/4	27/64	3/8-16	3/8	5/8	1/4
CL-162A-CS				4-1/2		1-5/8							
CL-163A-CS	1/2-13	3/4	1-1/2	4-1/2	7/8	1-1/4	5/8	3/8	17/32	1/2-13	7/16	3/4	5/16
CL-164A-CS				6		2							



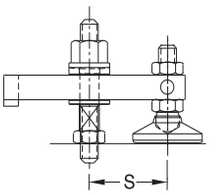
Hand-Knob Clamping Screw
CL-xx-THPA-HK



Hex-Head Clamping Screw
CL-xx-THPA-HH



Oval-Point Clamp Rest
CL-xx-THPA-OP

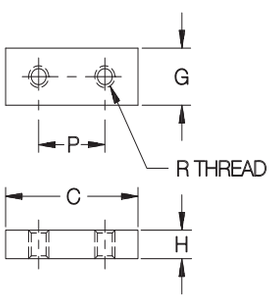


Leveling Foot
CL-xx-THPA-LF

ASSEMBLIES — STEEL WITH STEEL PAD (INCH)

PART NO.	A	D	E	F	S	T	CLAMP STRAP	GUIDE BLOCK	SPRING	CLAMPING STUD	NUTS	FLAT WASHER
CL-157-THPA-xx	1/4-20	2	3/8	5/8	25/32	21/32	CL-157-CS	CL-2-GB	CL-5-SPG	CL-1/4-20x2.00-STUD	CL-4-JN CL-1-SNW	CL-7-FW
CL-160A-THPA-xx	3/8-16	3-1/2	11/16	1-1/8	1-5/16	1-1/8	CL-160A-CS	CL-4-GB	CL-7-SPG	CL-3/8-16x3.00-STUD	CL-6-JN CL-2-SNW	CL-1-FW
CL-162A-THPA-xx		4-1/2		1-5/8	1-13/16	1-5/8	CL-162A-CS					
CL-163A-THPA-xx	1/2-13	4-1/2	7/8	1-1/4	1-15/16	1-11/16	CL-163A-CS	CL-8-GB	CL-9-SPG	CL-1/2-13x4.00-STUD	CL-8-JN CL-3-SNW	CL-2-FW
CL-164A-THPA-xx		6		2	2-11/16	2-7/16	CL-164A-CS					





Replacement or optional pads for the Clamp Straps shown above. Available in steel, reinforced plastic, or brass.

REPLACEMENT PADS

PART NO. STEEL PAD	PART NO. PLASTIC PAD	PART NO. BRASS PAD	STUD SIZE	C	G	H	P	R
CL-40-CP	CL-20-CP	CL-30-CP	1/4-20	5/8	1/4	1/8	11/32	#5-40
CL-41-CP	CL-21-CP	CL-31-CP	5/16-18	7/8	3/8	3/16	1/2	#8-32
CL-42-CP	CL-22-CP	CL-32-CP	3/8-16	1-1/4	1/2	1/4	5/8	#10-24
CL-43-CP	CL-23-CP	CL-33-CP	1/2-13	1-1/2	5/8	3/8	3/4	1/4-20

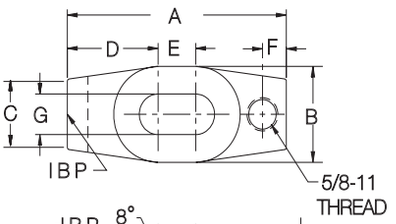
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FORGED CLAMP STRAPS

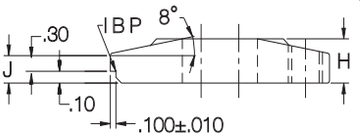
FORGED STEEL, 70,000 PSI YIELD STRENGTH, BLACK OXIDE FINISH



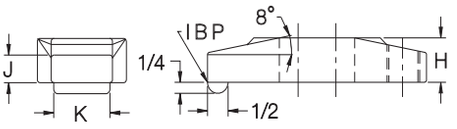
Straight Locator Nose



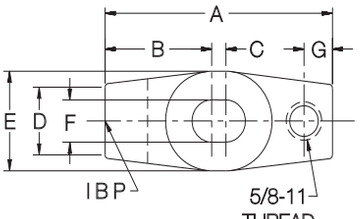
Straight Plain Nose

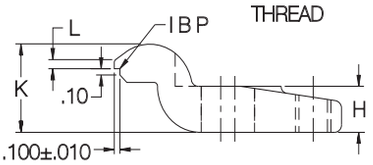


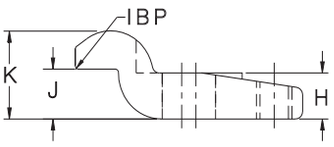
Gooseneck Locator Nose



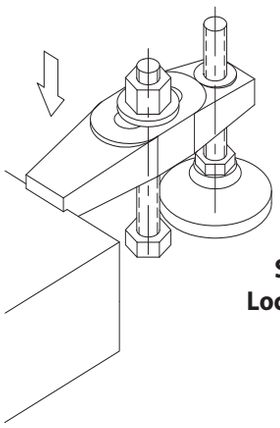
Gooseneck Plain Nose



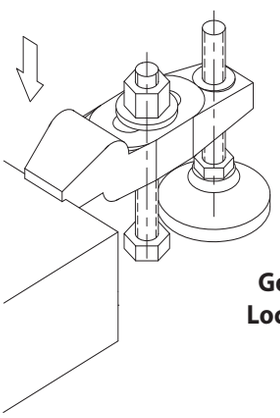




High-strength Tapped-Heel Clamp Strap available in straight or gooseneck design, with locator nose or plain nose. Locator-nose version is ideal for workpieces with machined sides. The accurately machined notch ensures precise, repeatable clamp location for increased machining clearance. **INFO+**: For rear Clamp Rests, see Stud Leveling Feet on page 205.



Straight Locator Nose Clamp



Gooseneck Locator Nose Clamp

STRAIGHT — LOCATOR NOSE (INCH)

PART NO.	STUD SIZE	A	B	C	D	E	F	G	H	J	K
CL-4-FSCS	5/8-11	4	1-5/8	1-3/16	1-21/32	11/16	7/16	11/16	3/4	1/2	-
CL-6-FSCS		6	1-3/4	1-1/4	2-5/16	1-3/8	9/16		7/8	9/16	-
CL-8-FSCS	3/4-10	8	2-1/8	1-1/2	3	2	11/16	13/16	1-1/8	3/4	-

STRAIGHT — PLAIN NOSE (INCH)

CL-4-FRCS	5/8-11	4	1-5/8	1-3/16	1-21/32	11/16	7/16	11/16	3/4	1/2	1
CL-6-FRCS		6	1-3/4	1-1/4	2-5/16	1-3/8	9/16		7/8	9/16	
CL-8-FRCS	3/4-10	8	2-1/8	1-1/2	3	2	11/16	13/16	1-1/8	3/4	1-1/4

GOOSENECK — LOCATOR NOSE (INCH)

PART NO.	STUD SIZE	A	B	C	D	E	F	G	H	J	K	L
CL-40-FGNS	5/8-11	4	1-31/32	3/16	1-3/16	1-3/4	11/16	1/2	3/4	3/4	1-7/16	.15
CL-60-FGNS		6	2-17/32	1	1-1/4	1-3/4		5/8	7/8	15/16	1-9/16	.25
CL-80-FGNS	3/4-10	8	3-9/32	1-5/8	1-9/16	2-1/4	13/16	1	1-1/8	1-1/8	2	.35

GOOSENECK — PLAIN NOSE (INCH)

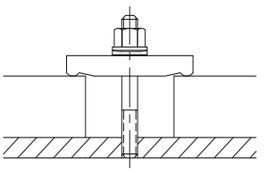
CL-4-FGNS	5/8-11	4	1-31/32	3/16	1-3/16	1-3/4	11/16	1/2	3/4	3/4	1-7/16	-
CL-6-FGNS		6	2-17/32	1	1-1/4	1-3/4		5/8	7/8	15/16	1-9/16	-
CL-8-FGNS	3/4-10	8	3-9/32	1-5/8	1-9/16	2-1/8	13/16	1	1-1/8	1-1/8	2	-

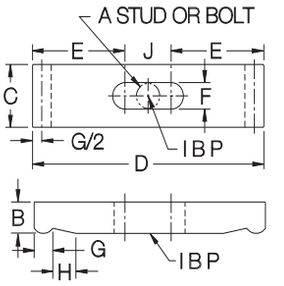
DOUBLE-END CLAMP STRAPS

STRAP: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
INFO+: SEE PAGES 101, 109, 311-316, 318-319, 327-330 FOR OTHER MATERIAL SPECIFICATIONS



Steel

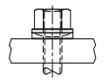




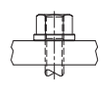
Clamp strap with two clamping ends, for holding two workpieces simultaneously. Available for 1/4-20 (M6) to 3/4-10 (M20) stud sizes, each in several strap lengths.

STRAPS — STEEL

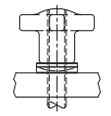
PART NO.	A	B	C	D	E	F	G	H	J
CL-23B-CS	1/4-20 or M6	3/8	5/8	2-1/2	7/8	9/32	1/4	11/32	3/4
CL-23D-CS	5/16-18 or M8	1/2	3/4	3	1-1/2	3/8	5/16	7/16	0
CL-23-CS	3/8-16 or M10	1/2	1-1/8	3	1	27/64	13/32	1/2	1
CL-30-CS	1/2-13 or M12	5/8	1-1/4	6	2-1/2	17/32	13/32	1/2	1
CL-33-CS	5/8-11 or M16	7/8	1-1/2	6	2-3/8	21-32	1/2	19/32	1-1/4
CL-39-CS	3/4-10 or M20	1	1-3/4	6	3-1/8	13/16	1/25	19/32	1/3/4



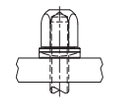
Spherical Nut & Washer CL-xx-DEA-1



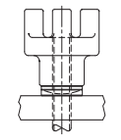
Flange Nut CL-xx-DEA-2



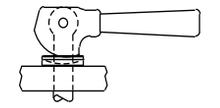
Hand Knob with Spherical Washer CL-xx-DEA-4



Acorn Nut with Spherical Washer CL-xx-DEA-5



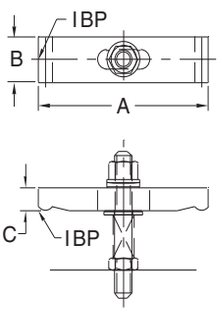
Bar Knob with Spherical Washer* CL-xx-DEA-6



Cam Handle with Spherical Washer CL-xx-DEA-7



Steel



A complete clamp-strap assembly using one of the straps shown above. Select any of the six nut/knob combinations shown above by adding the appropriate suffix to the part number. Other stud lengths are available (order pieces individually).

ASSEMBLIES — STEEL (INCH)

PART NO.	THREAD SIZE	A	B	C	CLAMP STRAP	FLAT WASHER	SPRING & STUD
CL-1-DEA-x	1/4-20	2-1/2	5/8	3/8	CL-23B-CS	CL-7-FW	CL-1/4-20x2.50-STUD CL-5-SPG
CL-1B-DEA-x	5/16-18	3	3/4	1/2	CL-23D-CS	CL-14-FW	CL-5/16-18x3.00-STUD CL-6-SPG
CL-2-DEA-x	3/8-16	3	1-1/8	1/2	CL-23-CS	CL-1-FW	CL-3/8-16x3.00-STUD CL-7-SPG
CL-12-DEA-x	1/2-13	6	1-1/4	5/8	CL-30-CS	CL-2-FW	CL-1/2-13x4.00-STUD CL-9-SPG
CL-13-DEA-x	5/8-11	6	1-1/2	7/8	CL-33-CS	CL-3-FW	CL-5/8-11x4.50-STUD CL-11-SPG
CL-23-DEA-x	3/4-10	8	1-3/4	1	CL-39-CS	CL-4-FW	CL-3/4-10x5.00-STUD CL-13-SPG

ASSEMBLIES — STEEL (METRIC)

CLM-1-DEA-x	M6	2-1/2	5/8	3/8	CL-23B-CS	CL-7-FW	CLM-6x65-STUD CL-5-SPG
CLM-1B-DEA-x	M8	3	3/4	1/2	CL-23D-CS	CL-14-FW	CLM-8x80-STUD CL-6-SPG
CLM-2-DEA-x	M10	3	1-1/8	1/2	CL-23-CS	CL-1-FW	CLM-10x80-STUD CL-7-SPG
CLM-12-DEA-x	M12	6	1-1/4	5/8	CL-30-CS	CL-2-FW	CLM-12x95-STUD CL-9-SPG
CLM-13-DEA-x	M16	6	1-1/2	7/8	CL-33-CS	CL-3-FW	CLM-16x110-STUD CL-11-SPG
CLM-23-DEA-x	M20	8	1-3/4	1	CL-39-CS	CLM-10-FW	CLM-20x125-STUD CL-13-SPG

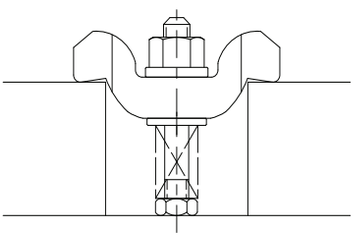
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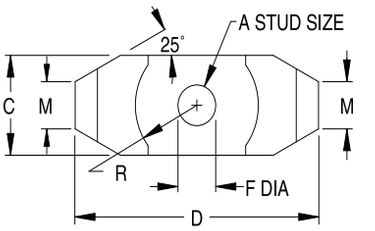
DOUBLE-END GOOSENECK CLAMP STRAPS

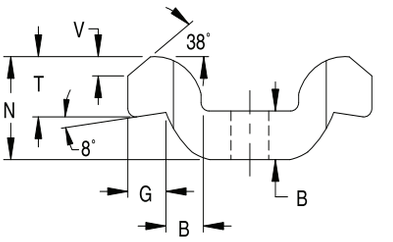
STRAP: ALLOY STEEL, BLACK OXIDE FINISH
INFO+: SEE PAGES 101, 311-316, 318, 329-330 FOR OTHER MATERIAL SPECIFICATIONS



Steel







Gooseneck version of our Double-End Clamp Straps. This design recesses the clamping nut to provide a low overall profile. Double-End Clamps have two clamping ends, for holding two workpieces simultaneously. Turn strap 90˚ for clear loading. Available to fit 1/2-13 and 5/8-11 studs (M12 and M16 in metric).

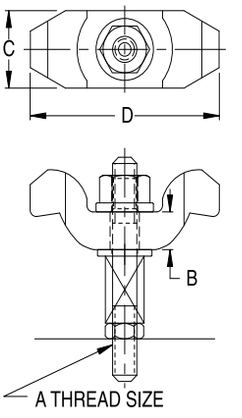
STRAPS – STEEL

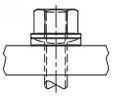
PART NO.	A	B	C	D	F	G	M	N	R	T	V
CL-842-GCS	1/2-13, 5/8-11, M12, or M16	.79	1.58	3.94	.67	.63	.79	1.58	.94	.90	.34

7

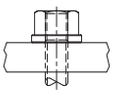


Double-End Gooseneck Clamp Straps are also available as a complete assembly. Select any of the four nut/knob combinations shown below by adding the appropriate suffix to the part number. Other lengths of Clamping Studs and Clamp Rests are available (order pieces individually).

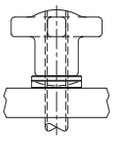




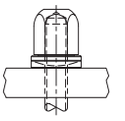
Spherical Nut & Washer CL-xx-GCSA-1



Flange Nut CL-xx-GCSA-2



Hand Knob with Spherical Washer CL-xx-GCSA-4



Acorn Nut with Spherical Washer CL-xx-GCSA-5

ASSEMBLIES – STEEL (INCH)

PART NO.	A	B	C	D	CLAMP STRAP	FLAT WASHER	CLAMP SPRING	CLAMPING STUD	JAM NUT
CL-842-GCSA-x	1/2-13	.79	1.58	3.94	CL-842-GCS	CL-2-FW	CL-9-SPG	CL-1/2-13X4.00-STUD	CL-8-JN
CL-1042-GCSA-x	5/8-11					CL-3-FW	CL-11-SPG	CL-5/8-11X4.50-STUD	CL-10-JN

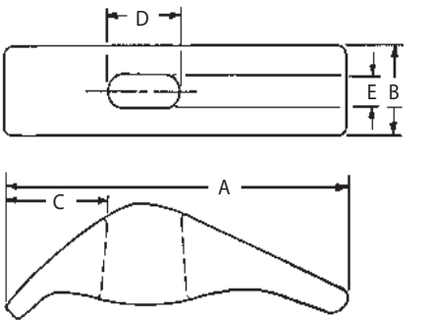
ASSEMBLIES – STEEL (METRIC)

PART NO.	A	B	C	D	CLAMP STRAP	FLAT WASHER	CLAMP SPRING	CLAMPING STUD	JAM NUT
CLM-842-GCSA-x	M12	.79	1.58	3.94	CL-842-GCS	CL-2-FW	CL-9-SPG	CLM-12X95-STUD	CLM-12-JN
CLM-1042-GCSA-x	M16					CL-3-FW	CL-11-SPG	CLM-16X10-STUD	CLM-16-JN

ALUMINUM ADJUSTABLE CLAMPS

TENZALOY ALUMINUM ALLOY





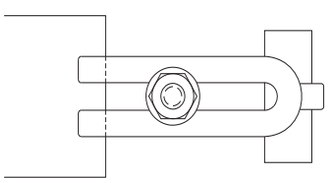
Simple, economical aluminum clamp, (**INFO+**) similar in function to the Forged Adjustable Clamps shown on page 262.

PART NO.	STUD SIZE	CLAMPING RANGE	A	B	C	D	E
CL-8-VAC	3/8 or M10	0 to 2"	4-7/8	1-1/4	1-3/8	1	13/32
CL-10-VAC	1/2 or M12	0 to 2-1/2"	5-1/2	1-1/2	1-1/2	1-1/8	17/32

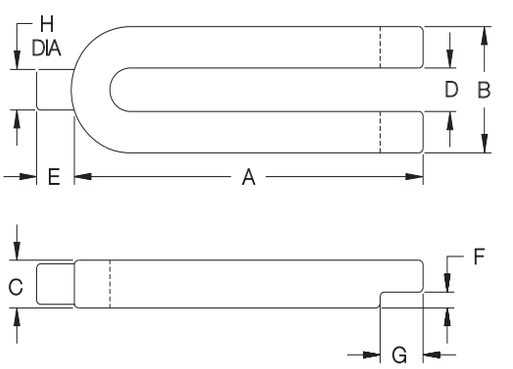
FORGED U CLAMPS

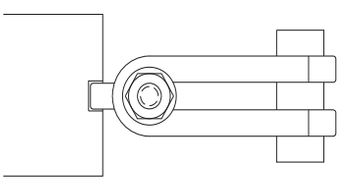
FORGED STEEL, 70,000 PSI YIELD STRENGTH, BLACK OXIDE FINISH





Open U end allows totally removing clamp strap when unclamped. Clamp tips are stepped to provide repeatable location.





Cylindrical pin end minimizes contact area and is useful for clamping in horizontal holes.

PART NO.	BOLT SIZE	A	B	C	D	E	F	G	H
CL-6-FUC	5/8-11 or M16	5-7/16	2-1/4	7/8	11/16	3/4	5/16	3/4	3/4
CL-8-FUC	3/4-10 or M20	7-3/8	2-5/8	1-1/8	13/16	27/32	3/8	1-1/32	13/16
CL-12-FUC	1"-8 or M24	10-15/16	3-3/16	1-3/8	1-1/16	1-3/32	1/2	1-3/16	1-1/32

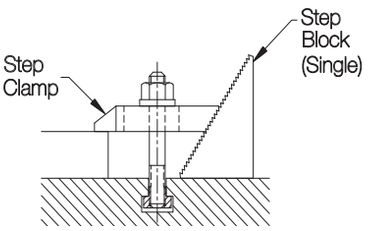
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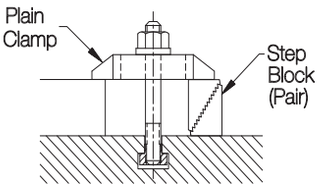
STEP BLOCKS & CLAMPS

1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH

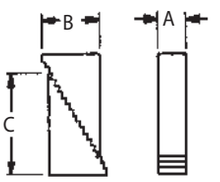


Step Blocks (pair)





Serrated block that can be used individually or in pairs, as a clamp rest. (One part number consists of a pair of blocks). Use a single block with Step Clamps, or a pair of blocks with Plain Clamps. All blocks and clamps are made from top-grade steel.



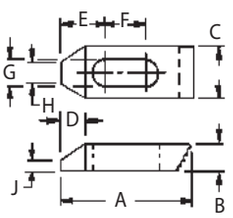
STEP BLOCKS (PAIR)

PART NO.	A	B	C	HEIGHT RANGE
CL-10-BS	1	.681	1.104	3/4 to 1-1/2
CL-20-BS		1.068	1.747	1-1/8 to 2-1/2
CL-30-BS		2.355	3.980	2-1/2 to 6
CL-40-BS	1-1/2	1.454	2.390	1-3/4 to 3-3/4
CL-50-BS		2.355	3.890	2-1/2 to 6
CL-60-BS		3.385	5.604	3-1/2 to 9
CL-80-BS	2	2.355	3.890	2-1/2 to 6
CL-90-BS		3.385	5.604	3-1/2 to 9

7



Step Clamp

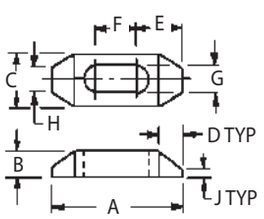


STEP CLAMPS

PART NO.	STUD SIZE	A	B	C	D	E	F	G	H	J
CL-32-STC	3/8 or M10	2-1/2	1/2	1	7/16	7/8	13/16	7/16	7/16	1/4
CL-34-STC		4	5/8		11/16	1-3/16	1-5/16		1/4	
CL-36-STC		6	3/4	1-1/8	3/4	1-1/8	2-3/16		3/8	5/16
CL-42-STC	1/2 or M12	2-1/2	1/2	1-1/8	7/16	29/32	11/16	9/16	9/16	3/16
CL-44-STC		4	3/4	1-1/4	11/16	1-7/32	1-3/16		1/2	1/4
CL-46-STC		6	7/8		3/4	1-5/32	2-1/8		7/16	5/16
CL-52-STC	5/8 or M16	2-1/2	5/8	1-1/4	3/8	15/16	9/16	11/16	3/4	3/8
CL-54-STC		4	3/4	1-1/2	11/16	1-1/4	1-1/16		11/16	
CL-56-STC		6	7/8		3/4	1-9/32	1-15/16		9/16	7/16
CL-64-STC	3/4 or M20	4	3/4	1-1/2	3/4	1-5/16	15/16	13/16	5/8	5/16
CL-66-STC		6	1		13/16	1-1/4	1-7/8			1/2
CL-68-STC		8		1-3/4	3/4	1-7/8	2-3/16		3/4	5/8



Plain Clamp

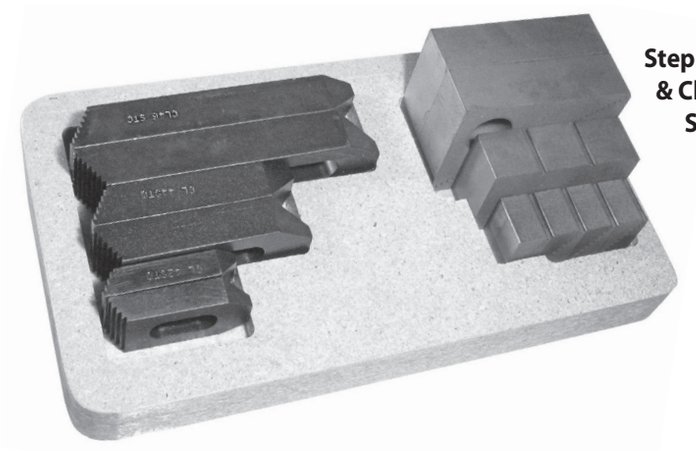


PLAIN CLAMPS

PART NO.	STUD SIZE	A	B	C	D	E	F	G	H	J
CL-32-PC	3/8 or M10	2-1/2	1/2	1	7/16	27/32	13/16	7/16	7/16	1/4
CL-34-PC		4	5/8		11/16	1-1/32	1-7/16		1/4	
CL-36-PC		6	3/4	1-1/8	3/4	1-5/32	2-3/16		3/8	5/16
CL-42-PC	1/2 or M12	2-1/2	1/2	1-1/8	7/16	29/32	11/16	9/16	9/16	3/16
CL-44-PC		4	3/4	1-1/4	11/16	1-5/32	1-5/16		1/2	1/4
CL-46-PC		6	7/8		3/4	1-9/32	2-1/16		7/16	5/16
CL-52-PC	5/8 or M16	2-1/2	5/8	1-1/4	3/8	31/32	9/16	11/16	3/4	3/8
CL-54-PC		4	3/4		11/16	1-9/32	1-3/16		11/16	
CL-56-PC		6	7/8	1-1/2	3/4	1-13/32	1-15/16		9/16	7/16
CL-64-PC	3/4 or M20	4	3/4	1-1/2	3/4	1-11/32	1-1/16	13/16	5/8	5/16
CL-66-PC		6	1		13/16	1-15/32	1-15/16			1/2
CL-68-PC		8	1-1/8	1-3/4	3/4	1-29/32	2-3/16		3/4	5/8

STEP BLOCKS & CLAMPS

11L17 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Step Block & Clamp Set

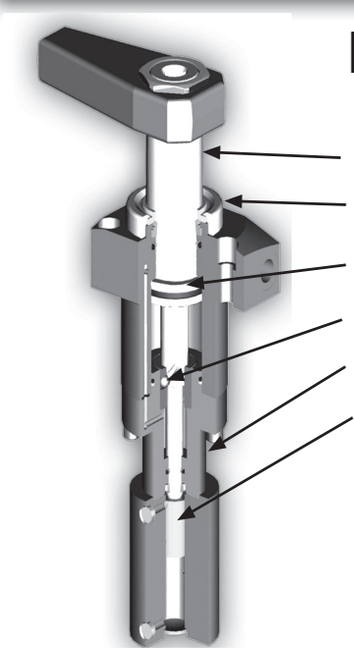
An assortment of Step Clamps and Step Blocks in a handy wooden holder. Available for stud sizes from 3/8-16 to 3/4-10 (M10 to M20 metric studs).

STEP BLOCK & CLAMP SETS

PART NO.	STUD SIZE	STEP CLAMPS (2) EACH	STEP BLOCK PAIRS (2) EACH		HOLDER
CL-10-SBC	3/8-16 or M10	CL-32-STC, CL-34-STC, CL-36-STC	STANDARD	CL-10-BS, CL-20-BS, CL-30-BS	CL-1-BSH
CL-20-SBC	1/2-13 or M12	CL-42-STC, CL-44-STC, CL-46-STC	STANDARD	CL-10-BS, CL-20-BS, CL-30-BS	CL-1-BSH
CL-40-SBC			HIGH-RISE	CL-40-BS, CL-50-BS, CL-60-BS	CL-2-BSH
CL-30-SBC	5/8-11 or M16	CL-52-STC, CL-54-STC, CL-56-STC	STANDARD	CL-10-BS, CL-20-BS, CL-30-BS	CL-1-BSH
CL-50-SBC			HIGH-RISE	CL-40-BS, CL-50-BS, CL-60-BS	CL-2-BSH
CL-60-SBC	3/4-10 or M20	CL-64-STC, CL-66-STC, CL-68-STC	HIGH-RISE	CL-40-BS, CL-50-BS, CL-60-BS	CL-3-BSH

7

Why Carr Lane Roemheld Swing Clamps?



Designed for 1,000,000 cycles

2,000,000+ cycles tested at full load

- Rod diameter 30% larger to eliminate part deflection
- Viton wiper is standard (metal wiper optional)
- Exclusive safety clutch design available to prevent damage to part, fixture, or operator
- Reinforced swivel mechanism with 2 or 3 helix paths depending on size for longer life
- Up to 7500 psi maximum pressure for more compact clamp design
- Position monitoring available, either inductive or pneumatic via movable sensing bolt
- Over 1000 different standard sizes and styles available with clamping forces from 130 lb. to 8265 lb. stroke up to 2"
- Special stroke and clamping forces available upon request.

See Page 628-638

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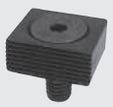
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EDGE CLAMPS

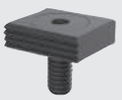
TYPES



TINY VISE® EDGE CLAMPS
Mini edge clamps grip the side of a workpiece to keep the top clear for machining. Only Tiny Vise® Edge Clamps truly exert down thrust force on the workpiece, to prevent it from lifting. A thrust washer underneath the clamp engages a mating offset countersink to provide downward action.



TINY VISE® M-SERIES EDGE CLAMPS
Our Tiny Vise® M-Series incorporates a modular jaw design for greater adjustability. This modular system allows adjusting your workpiece engagement point by adding or removing spacers. This is useful when using the same fixture for machining a family of parts, or when workpiece size can vary somewhat between batches.



TINY VISE® LOW-PROFILE EDGE CLAMPS
Low-profile Tiny Vise® clamps are ideal for thin workpieces, and whenever downthrust action is not required. These mini edge clamps securely grip the side of a workpiece to keep the top clear for machining. Patented design. Made in USA.



TINY VISE® DOUBLE EDGE CLAMPS
Double edge clamps allow clamping two workpieces at the same time with equal force. These mini edge clamps grip the side of a workpiece to keep the top clear for machining. Patented design provides strong, reliable clamping force with the easy turn of a hex wrench.



TINY VISE® V-JAW & DOUBLE V-JAW EDGE CLAMPS
The V-Jaw and Double V-Jaw versions of our popular Tiny Vise is ideal for clamping round workpieces. The 90° V-Jaw can also be used to clamp to a rectangular workpiece from two directions with a single clamp at its corner. Double V-Jaws allow clamping two workpieces at the same time with equal force.



SERRATED EDGE CLAMPS
This low-profile clamp is ideal for gripping the side of a workpiece to keep the top clear for machining. Clamps both forward and down simultaneously, by tightening the socket-head screw in the sliding nose with a hex wrench. V-groove in nose is excellent for clamping round parts of corners.



CAM EDGE CLAMPS
Pivoting-nose edge clamp operated by a cam handle for fast action. Smooth spiral cam locks positively anywhere within its 180 throw. Choice of two sizes. Available with either a standard base for fixed-position mounting, or a slotted base for adjustable mounting.



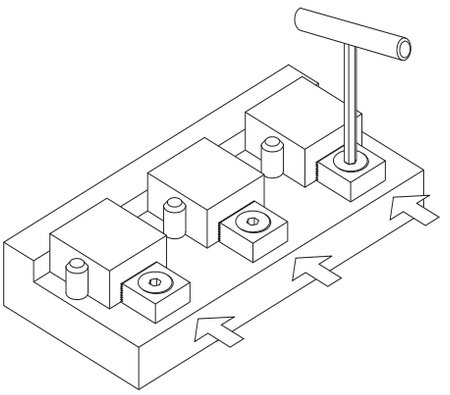
PIVOTING EDGE CLAMPS
These edge clamps are well suited for holding large castings and other tall workpieces. The pivoting jaw is actuated by a large thrust screw, exerting clamping force forward and downward at the same time. The slotted base provides adjustability.

TINY VISE® EDGE CLAMPS

BODY: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
THRUST WASHER: 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH
FLAT-HEAD SOCKET SCREW: STEEL, BLACK OXIDE FINISH



Flat Jaw
(Reversible, Serrated or Smooth)



Clamping force is applied by positive screw action with the easy turn of a hex wrench.

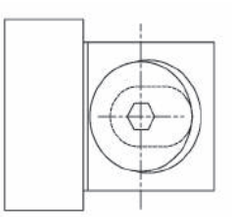
Perfect for high-density machining! These mini edge clamps grip the side of a workpiece to keep the top clear for machining. Patented design features a slotted countersink to provide strong, reliable clamping force with the easy turn of a hex wrench. These compact clamps are ideal for fixturing multiple parts, small or large. Each clamp has both a serrated face (for maximum gripping) and a smooth face (to avoid marring finished parts). These clamps look so simple, but work amazingly well, with major advantages over earlier designs. **Patent no. 5,624,106.** Made in USA.

Clamping force is applied by positive screw action with the easy turn of a hex wrench (not with an unreliable, unsafe eccentric cam as used in other designs). A high-strength Flat-Head Socket Screw engages a mating offset countersink to exert strong clamping force. Much more durable than other designs.

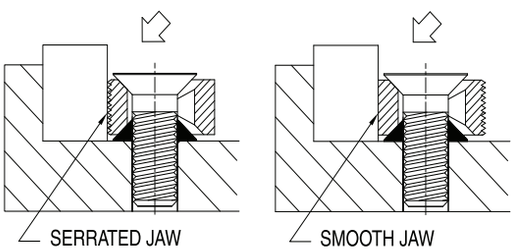
Only Tiny Vise® Edge Clamps truly exert down thrust force on the workpiece, to prevent it from lifting. A thrust washer underneath the clamp engages a mating offset countersink to provide downward action.

Available in a wide range of sizes, from a miniature #8-32 thread size, up to a powerful 1"-8 thread size with 2500 lbs clamping force.

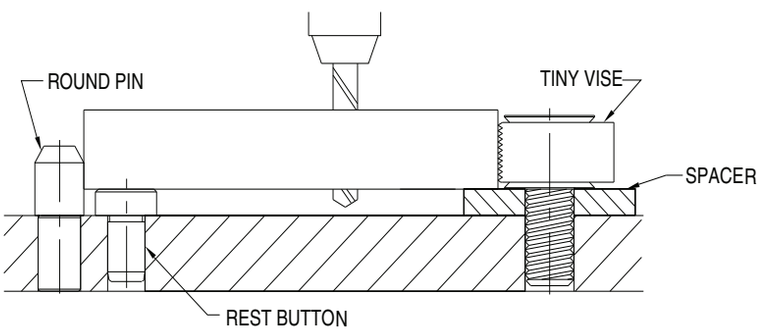
Tiny Vise® clamps are designed to provide strong clamping force when tightened by hand. Do not exceed the recommended tightening torque.



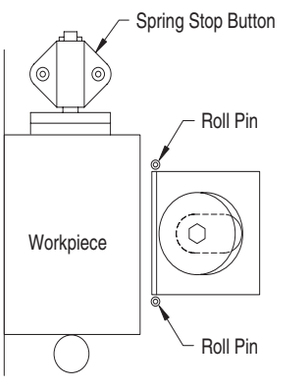
Patented design features a slotted countersink.



The serrated face provides maximum gripping, while the smooth face (turn 180º) helps avoid marring finished parts.

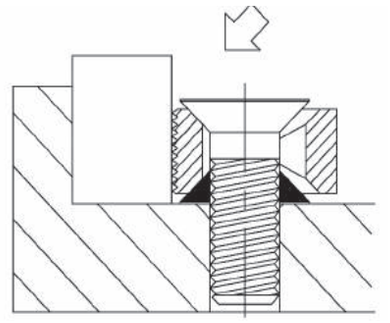


For a small amount of cutting-tool clearance, Tiny Vise® Edge Clamps can be mounted with a spacer underneath, using a longer screw. For greater clearance, clamps should be mounted into a tapped riser block fastened to the plate, to reduce bending stress on the screw.



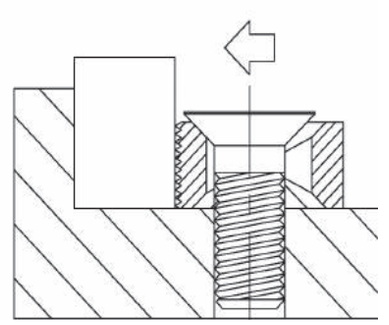
Roll pins can be installed to keep the Tiny Vise® perfectly aligned for workpiece loading (especially helpful on horizontal machining centers).

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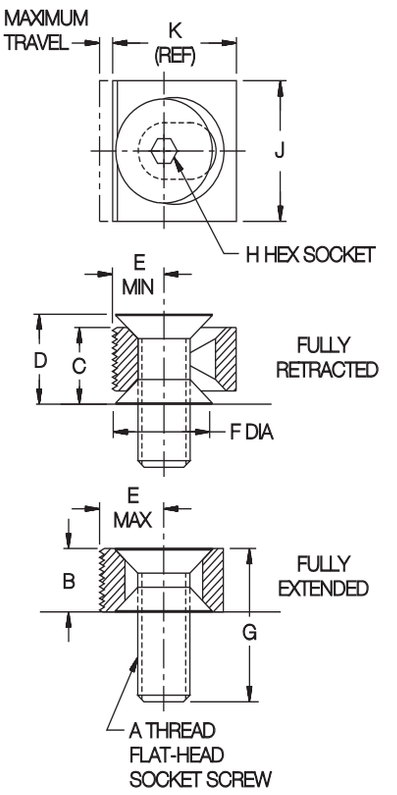
Setup for Downthrust Force
(with Bottom Thrust Washer)

All clamps are supplied with an optional Bottom Thrust Washer (shown in black). Installing this washer under the clamp will raise the clamp slightly and provide downthrust force during clamping.



Setup for Horizontal Force
(without Bottom Thrust Washer)

If no downthrust force is required, install the clamp without the Bottom Thrust Washer. Doing so will improve clamping speed because fewer screw turns are required.



7

FLAT JAW (INCH)
SETUP FOR DOWNTHRUST FORCE

PART NO.	A	B	C	D	E MIN	E MID RANGE	E MAX	F DIA	G	H	J	K	MAX TRAVEL	RECOMMENDED TORQUE (FT-LBS)*	APPROX. HORIZONTAL CLAMPING FORCE AT RECOMMENDED TORQUE (LBS)*
CL-2-TV	#8-32	.250	319	.382	.175	.205	.235	.335	5/8	3/32	9/16	.470	.060	.20	60
CL-3-TV	#10-32	.312	.390	.459	.208	.242	.274	.390	3/4	1/8	5/8	.550	.066	.25	75
CL-4-TV	1/4-20	.375	.467	.552	.280	.320	.360	.510	7/8	5/32	7/8	.720	.080	.50	130
CL-5-TV	5/16-18	.438	.550	.652	.338	.386	.434	.640	1	3/16	1	.870	.096	1.2	240
CL-6-TV	3/8-16	.500	.627	.746	.390	.445	.500	.742	1-1/8	7/32	1-1/8	1.000	.110	2.3	370
CL-8-TV	1/2-13	.562	.702	.833	.474	.534	.594	.897	1-3/8	5/16	1-1/4	1.187	.120	6.6	800
CL-10-TV	5/8-11	.750	.901	1.039	.620	.685	.750	1.148	1-5/8	3/8	1-5/8	1.500	.130	12	1,200
CL-12-TV	3/4-10	.875	1.059	1.234	.740	.820	.900	1.394	2	1/2	2	1.800	.160	23	1,800
CL-16-TV	1"-8	1.125	1.355	1.573	.988	1.088	1.188	1.890	2-1/2	5/8	2-1/2	2.375	.200	42	2,500

FLAT JAW (INCH)
SETUP FOR HORIZONTAL FORCE

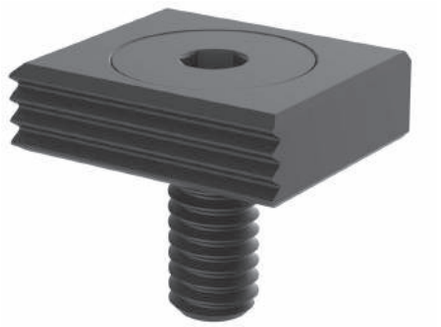
CL-2-TV	#8-32	.250	.250	.313	.175	.205	.235	.335	5/8	3/32	9/16	.470	.060	.40	60
CL-3-TV	#10-32	.312	.312	.381	.208	.242	.274	.390	3/4	1/8	5/8	.550	.066	.50	75
CL-4-TV	1/4-20	.375	.375	.460	.280	.320	.360	.510	7/8	5/32	7/8	.720	.080	1.0	130
CL-5-TV	5/16-18	.438	.438	.540	.338	.386	.434	.640	1	3/16	1	.870	.096	2.4	240
CL-6-TV	3/8-16	.500	.500	.619	.390	.445	.500	.742	1-1/8	7/32	1-1/8	1.000	.110	4.6	370
CL-8-TV	1/2-13	.562	.652	.693	.474	.534	.594	.897	1-3/8	5/16	1-1/4	1.187	.120	13	800
CL-10-TV	5/8-11	.750	.750	.888	.620	.685	.750	1.148	1-5/8	3/8	1-5/8	1.500	.130	24	1,200
CL-12-TV	3/4-10	.875	.875	1.050	.740	.820	.900	1.394	2	1/2	2	1.800	.160	46	1,800
CL-16-TV	1"-8	1.125	1.125	1.343	.988	1.088	1.188	1.890	2-1/2	5/8	2-1/2	2.375	.200	84	2,500

*Recommended torque and clamping force are at 1/3 of yield strength, leaving 2/3 of holding capacity to resist external cutting forces, etc.

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TINY VISE® EDGE CLAMPS

BODY: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
THRUST WASHER: 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH
FLAT-HEAD SOCKET SCREW: STEEL, BLACK OXIDE FINISH



Low Profile
(Reversible — Serrated or Smooth Jaw)



Compare the amazing low-profile Tiny Vise® clamp (right) with our standard Tiny Vise® clamp (left).

Low-Profile Version!

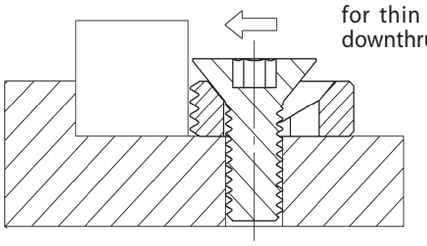
Low-profile Tiny Vise® clamps are ideal for thin workpieces, and whenever downthrust action is not required. These mini edge clamps securely grip the side of a workpiece to keep the top clear for machining. Patented design features a slotted countersink to provide strong, reliable clamping force with the easy turn of a hex wrench. These compact clamps are ideal for fixturing multiple parts, small or large. Each clamp has both a serrated face (for maximum gripping) and a smooth face (to avoid marring finished parts). These clamps look so simple, but work amazingly well, with major advantages over earlier designs. **Patent no. 5,624,106.** Made in USA.

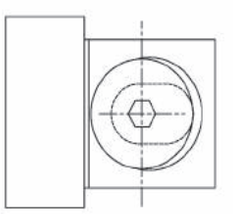
Clamping force is applied by positive screw action with the easy turn of a hex wrench (not with an unreliable, unsafe eccentric cam as used in other designs). A high-strength Flat-Head Socket Screw engages a mating slotted countersink to exert strong clamping force. Much more durable than other designs.

Available in a wide range of sizes, from a miniature #8-32 thread size, up to a powerful 1"-8 thread size with 2500 lbs clamping force. Tiny Vise® clamps are designed to provide strong clamping force when tightened by hand. Do not exceed the recommended tightening torque.

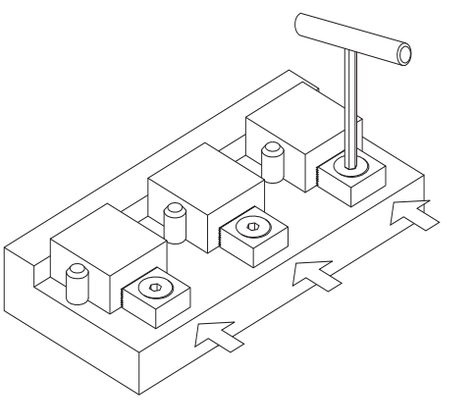
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These low-profile clamps are ideal for thin workpieces, and whenever downthrust action is not required.

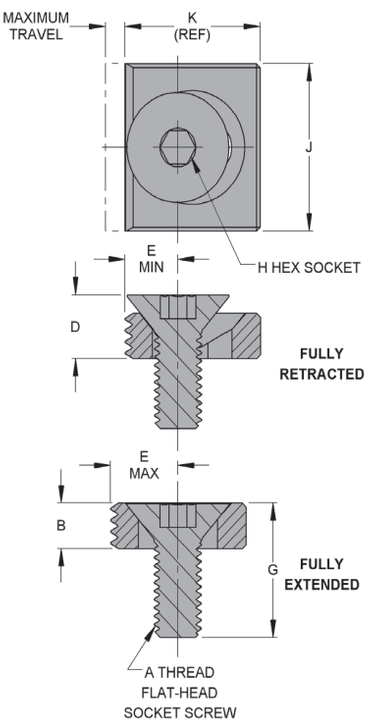




Patented design features a slotted countersink.



Clamping force is applied by positive screw action with the easy turn of a hex wrench.



LOW PROFILE (INCH)

PART NO.	A	B	D	E MIN	E MID RANGE	E MAX	G	H	J	K	MAX TRAVEL	RECOMMENDED TORQUE (FT-LBS)*	APPROX. HORIZONTAL CLAMPING FORCE AT RECOMMENDED TORQUE (LBS)*
CL-2-TVLP	#8-32	.150	.213	.175	.205	.235	1/2	3/32	9/16	.470	.060	.40	60
CL-3-TVLP	#10-32	.200	.269	.208	.242	.274	5/8	1/8	5/8	.550	.066	.50	75
CL-4-TVLP	1/4-20	.225	.310	.280	.320	.360	3/4	5/32	7/8	.720	.080	1.0	130
CL-5-TVLP	5/16-18	.250	.352	.338	.386	.434	7/8	3/16	1	.870	.096	2.4	240
CL-6-TVLP	3/8-16	.300	.419	.390	.445	.500	1	7/32	1-1/8	1.000	.110	4.6	370
CL-8-TVLP	1/2-13	.325	.456	.474	.534	.594	1-1/4	5/16	1-1/4	1.187	.120	13	800
CL-10-TVLP	5/8-11	.425	.563	.620	.685	.750	1-1/2	3/8	1-5/8	1.500	.130	24	1,200
CL-12-TVLP	3/4-10	.500	.675	.740	.820	.900	1-3/4	1/2	2	1.800	.160	46	1,800
CL-16-TVLP	1"-8	.750	.968	.988	1.088	1.188	2	5/8	2-1/2	2.375	.200	84	2,500

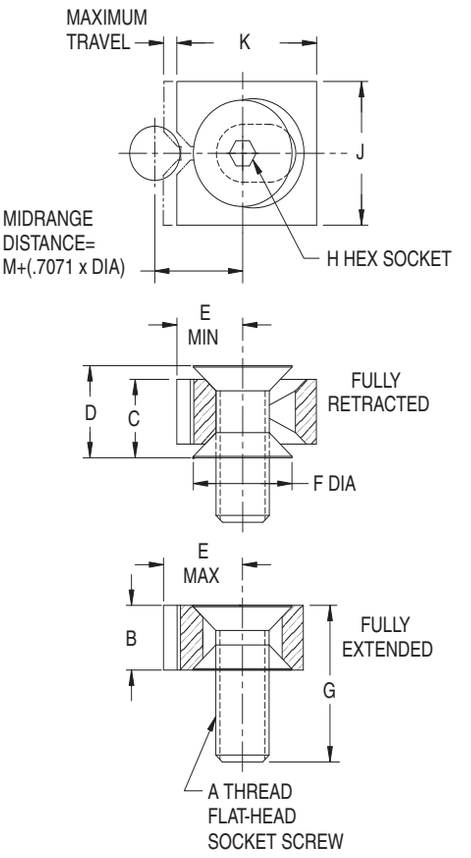
*Recommended torque and clamping force are at 1/3 of yield strength, leaving 2/3 of holding capacity to resist external cutting forces, etc.

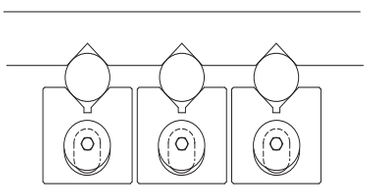
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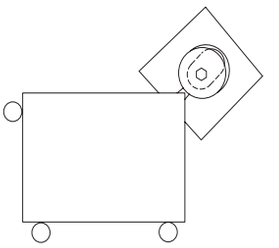
V-Jaw

The V-Jaw version of our popular Tiny Vise® is ideal for clamping round workpieces. The 90° V-Jaw can also be used to clamp a rectangular workpiece from two directions with a single clamp at its corner.





Multiple workpieces can be clamped extremely close together.



A rectangular workpiece can be clamped from two directions with a single clamp.

V-JAW (INCH)
SETUP FOR DOWNTHRUST FORCE

PART NO.	A	B	C	D	E MIN	E MID RANGE	E MAX	F DIA	G	H	J	K	M	MAXIMUM WORKPIECE DIAMETER	MAXIMUM TRAVEL	RECOM-MENDED TORQUE (FT-LBS)*	APPROX. HORIZONTAL CLAMPING FORCE AT RECOMMENDED TORQUE (LBS)*
CL-2-TVR	#8-32	.250	.319	.382	.292	.322	.352	.335	5/8	3/32	.625	.620	.212	3/8	.060	.20	60
CL-3-TVR	#10-32	.312	.390	.459	.375	.407	.940	.390	3/4	1/8	.750	.750	.253	1/2	.066	.25	75
CL-4-TVR	1/4-20	.375	.467	.552	.453	.493	.533	.510	7/8	5/32	.875	.900	.315	19/32	.080	.50	130
CL-5-TVR	5/16-18	.438	.550	.652	.562	.611	.660	.640	1	3/16	1.000	1.100	.410	11/16	.096	1.2	240
CL-6-TVR	3/8-16	.500	.627	.746	.687	.742	.797	.742	1-1/8	7/32	1.250	1.300	.454	15/16	.110	2.3	370
CL-8-TVR	1/2-13	.562	.702	.833	.812	.872	.932	.897	1-3/8	5/16	1.500	1.530	.557	1-1/32	.120	6.6	800
CL-10-TVR	5/8-11	.750	.901	1.039	1.124	1.157	1.254	1.148	1-5/8	3/8	2.000	2.100	.692	1-9/16	.130	12	1,200
CL-12-TVR	3/4-10	.875	1.059	1.234	1.344	1.424	1.504	1.394	2	1/2	2.500	2.500	.848	1-13/16	.160	23	1,800
CL-16-TVR	1"-8	1.125	1.355	1.573	1.687	1.782	1.887	1.890	2-1/2	5/8	3.000	3.200	1.137	2-1/16	.200	42	2,500

V-JAW (INCH)
SETUP FOR HORIZONTAL FORCE

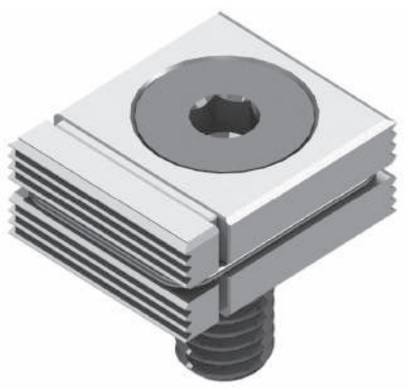
CL-2-TVR	#8-32	.250	.250	.313	.292	.322	.352	.335	5/8	3/32	.625	.620	.212	3/8	.060	.40	60
CL-3-TVR	#10-32	.312	.312	.381	.375	.407	.940	.390	3/4	1/8	.750	.750	.253	1/2	.066	.50	75
CL-4-TVR	1/4-20	.375	.375	.460	.453	.493	.533	.510	7/8	5/32	.875	.900	.315	19/32	.080	1.0	130
CL-5-TVR	5/16-18	.438	.438	.540	.562	.611	.660	.640	1	3/16	1.000	1.100	.410	11/16	.096	2.4	240
CL-6-TVR	3/8-16	.500	.500	.619	.687	.742	.797	.742	1-1/8	7/32	1.250	1.300	.454	15/16	.110	4.6	370
CL-8-TVR	1/2-13	.562	.652	.693	.812	.872	.932	.897	1-3/8	5/16	1.500	1.530	.557	1-1/32	.120	13	800
CL-10-TVR	5/8-11	.750	.750	.888	1.124	1.157	1.254	1.148	1-5/8	3/8	2.000	2.100	.692	1-9/16	.130	24	1,200
CL-12-TVR	3/4-10	.875	.875	1.050	1.344	1.424	1.504	1.394	2	1/2	2.500	2.500	.848	1-13/16	.160	46	1,800
CL-16-TVR	1"-8	1.125	1.125	1.343	1.687	1.782	1.887	1.890	2-1/2	5/8	3.000	3.200	1.137	2-1/16	.200	84	2,500

*Recommended torque and clamping force are at 1/3 of yield strength, leaving 2/3 of holding capacity to resist external cutting forces, etc.

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TINY VISE® EDGE CLAMPS

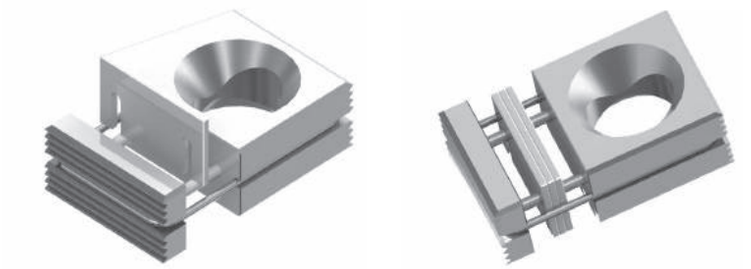
BODY: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
JAW: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH (OR DELRIN)
THRUST WASHER: 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH
FLAT-HEAD SOCKET SCREW: STEEL, BLACK OXIDE FINISH



Modular Jaw



Modular jaw design allows adjustment for workpiece-size variations.

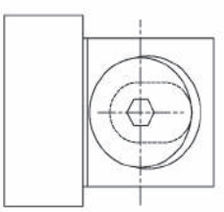


These M-series clamps have a 1/4"-thick modular jaw that can be easily extended to insert or remove spacers. Up to three 1/16" spacers can be inserted to provide adjustment.



Serrated | Smooth | Smooth (Delrin®) | Carbide Abrasive

Choice of four modular jaw faces: 1) Serrated hardened steel, for maximum gripping bite; 2) Smooth hardened steel, to avoid marring on finished surfaces; 3) Smooth Delrin®, to further protect finished surfaces when less clamping force is required; 4) Carbide-abrasive-coated steel, for strong gripping with minimal surface penetration. Any of the four jaws can be mounted on the same body.



Patented design features a slotted countersink.

Available with a choice of jaw faces, including carbide abrasive!

Our Tiny Vise® M-series incorporates a modular jaw design for greater adjustability. This new modular system allows adjusting your workpiece engagement point by adding or removing spacers. This is useful when using the same fixture for machining a family of parts, or when workpiece size can vary somewhat between batches. Just like our original Tiny Vise®, these mini edge clamps grip the side of a workpiece to keep the top clear for machining. The patented design features a slotted countersink to provide strong, reliable clamping force with the easy turn of a hex wrench These compact clamps are ideal for fixturing multiple parts, small or large. They look so simple, but work amazingly well! **Patent No. 10,179,393 B2.** Made in USA.

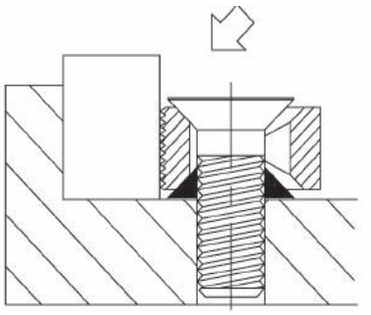
The M-series clamp body, without a jaw, is the same size as a standard Tiny Vise® — with the same reversible jaw faces (one serrated and one smooth). The 1/4"-thick serrated modular jaw mounts into the smooth face, and each spacer adds another 1/16". Up to three spacers can be inserted to provide adjustment. The modular jaw assembly is held together securely by a tough, durable O-ring, recessed in a protective groove. The modular jaw can be easily extended to insert or remove the slotted spacers.

Clamping force is applied by positive screw action with the easy turn of a hex wrench (not with an unreliable, unsafe eccentric cam as used in other designs). A high-strength Flat-Head Socket Screw engages a mating offset countersink to exert strong clamping force. Much more durable than other designs.

Clamps can be set up to apply force either at a downward angle or straight horizontally. All clamps are supplied with an optional bottom thrust washer. Installing this washer under the clamp will raise the clamp slightly and provide downthrust force during clamping. If no downthrust force is required, install the clamp without the bottom thrust washer. Doing so will improve clamping speed because fewer screw turns are required.

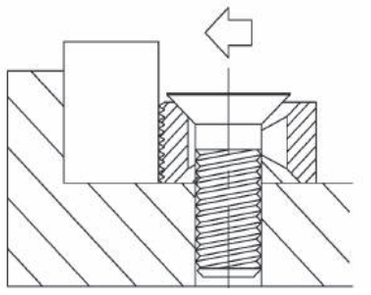
Available in two sizes, 5/16-18 thread size (240 lbs clamping force) and 1/2-13 thread size (800 lbs clamping force). Tiny Vise® clamps are designed to provide strong clamping force when tightened by hand. Do not exceed the recommended tightening torque.

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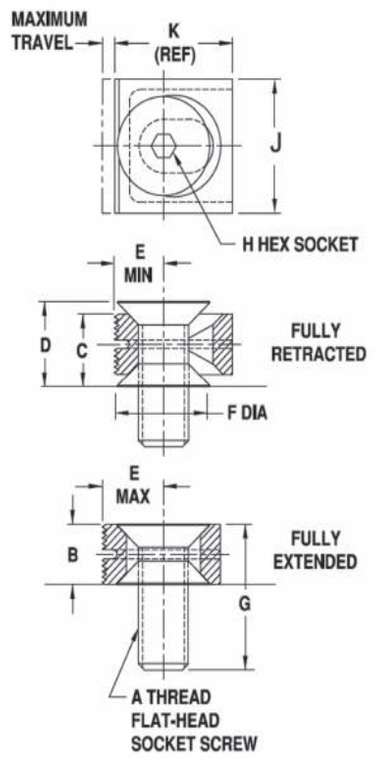
Setup for Downthrust Force
(with Bottom Thrust Washer)

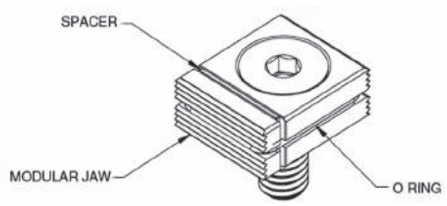
All clamps are supplied with an optional Bottom Thrust Washer (shown in black). Installing this washer under the clamp will raise the clamp slightly and provide downthrust force during clamping.

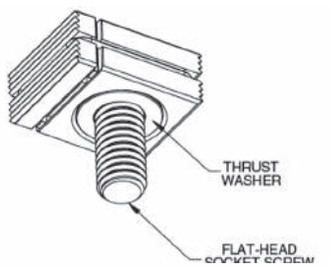


Setup for Horizontal Force
(without Bottom Thrust Washer)

If no downthrust force is required, install the clamp without the Bottom Thrust Washer. Doing so will improve clamping speed because fewer screw turns are required.







7

MODULAR JAW (INCH)
SETUP FOR DOWNTHRUST FORCE

PART NO.	JAW TYPE	A	B	C	D	E MIN	E MID RANGE	E MAX	F DIA	G	H	J	K	MAX TRAVEL	RECOMMENDED TORQUE (FT-LBS)*	APPROX. HORIZONTAL CLAMPING FORCE AT RECOMMENDED TORQUE (LBS)*
CL-5-TVM	Serrated	5/16-18	.438	.550	.652	.338	.386	.434	.640	1	3/16	1	.870	.096	1.2	240
CL-5-TVMS	Smooth															
CL-5-TVMN	Smooth (Delrin®)															
CL-5-TVMC	Carbide Abrasive															
CL-8-TVM	Serrated	1/2-13	.562	.702	.833	.474	.534	.594	.897	1-3/8	5/16	1-1/4	1.187	.120	6.6	800
CL-8-TVMS	Smooth															
CL-8-TVMN	Smooth (Delrin®)															
CL-8-TVMC	Carbide Abrasive															

MODULAR JAW (INCH)
SETUP FOR HORIZONTAL FORCE

CL-5-TVM	Serrated	5/16-18	.438	.438	.540	.338	.386	.434	.640	1	3/16	1	.870	.096	2.4	240
CL-5-TVMS	Smooth															
CL-5-TVMN	Smooth (Delrin®)															
CL-5-TVMC	Carbide Abrasive															
CL-8-TVM	Serrated	1/2-13	.562	.652	.693	.474	.534	.594	.897	1-3/8	5/16	1-1/4	1.187	.120	13	800
CL-8-TVMS	Smooth															
CL-8-TVMN	Smooth (Delrin®)															
CL-8-TVMC	Carbide Abrasive															

*Recommended torque and clamping force are at 1/3 of yield strength, leaving 2/3 of holding capacity to resist external cutting forces, etc.

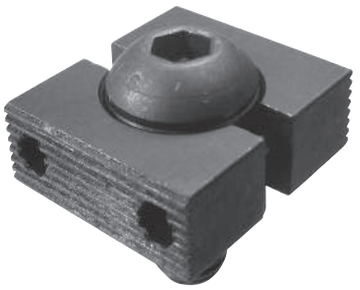
SPARE PARTS

COMPLETE CLAMP PART NO.	MODULAR JAW				SPACER	O RING	THRUST WASHER	FLAT-HEAD SOCKET SCREW
	SERRATED	SMOOTH	SMOOTH (DELRIN®)	CARBIDE ABRASIVE				
CL-5-TVM	5-TVM-JAW-ASSY	5-TVMS-JAW-ASSY	5-TVMN-JAW-ASSY	5-TVMC-JAW-ASSY	5-TVM-SPAC	5-TVM-ORING	CL-5-TV-WASH	CL-5/16-18X1.00-FHSS
CL-8-TVM	8-TVM-JAW-ASSY	8-TVMS-JAW-ASSY	8-TVMN-JAW-ASSY	8-TVMC-JAW-ASSY	8-TVM-SPAC	8-TVM-ORING	CL-8-TV-WASH	CL-1/2-13X1.38-FHSS

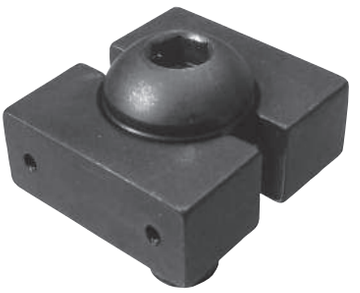
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TINY VISE® DOUBLE EDGE CLAMPS

BODY: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH. SPRINGS: 302 STAINLESS STEEL
GUIDE PINS: 17 4-PH STAINLESS STEEL. THRUST WASHER: 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH
SOCKET-HEAD CAP SCREW: STEEL, BLACK OXIDE FINISH



Two Serrated Flat Jaws



Two Smooth Flat Jaws

Double edge clamps allow clamping two workpieces at the same time with equal force. These mini edge clamps grip the side of a workpiece to keep the top clear for machining. Patented design provides strong, reliable clamping force with the easy turn of a hex wrench. These compact clamps are ideal for fixturing multiple parts, small or large. Available with serrated jaws (for maximum gripping) or smooth jaws (to avoid marring finished parts). These clamps look so simple, but work amazingly well, with major advantages over earlier designs. **Patent no. 5,961,108.** Made in USA.

Clamping force is applied by positive screw action with the easy turn of a hex wrench (not with an unreliable, unsafe eccentric cam as used in other designs). A high-strength cap screw and Thrust Washer engage a mating offset countersink to exert strong clamping force. Much more durable than other designs.

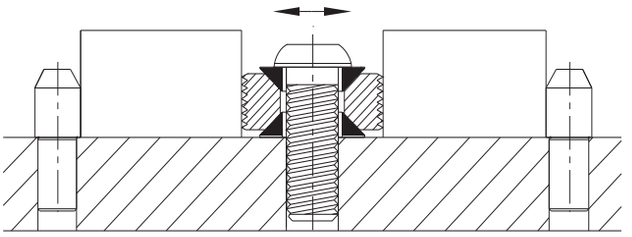
Only Tiny Vise® Mini Edge Clamps truly exert down thrust force on the workpiece, to prevent it from lifting. A Thrust Washer underneath the clamp engages a mating offset countersink to provide downward action.

Only Tiny Vise® Double Edge Clamps compensate for size variation when clamping two workpieces. Thrust Washers have ID clearance to enable them to float horizontally, allowing both clamping jaws to contact their part simultaneously. This ensures that both parts are securely clamped with equal force.

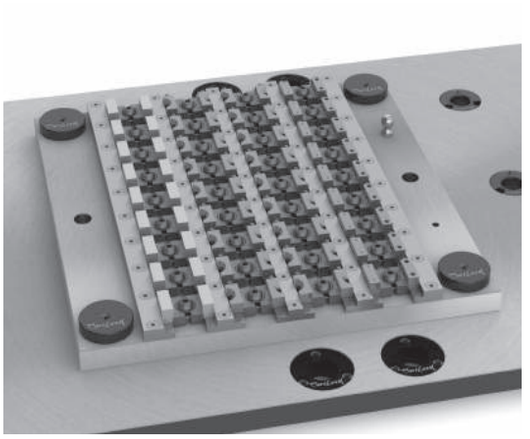
Available in four sizes, from 5/16-18 up to a powerful 1"-8 thread size with 4500 lbs clamping force (M8 to M24 in metric).

Please note: Tiny Vise® clamps are designed to provide strong clamping force when tightened by hand. Do not exceed the recommended tightening torque. Double edge clamps should always be used to hold two workpieces, not just one; otherwise recommended torque and clamping force will be significantly reduced.

7



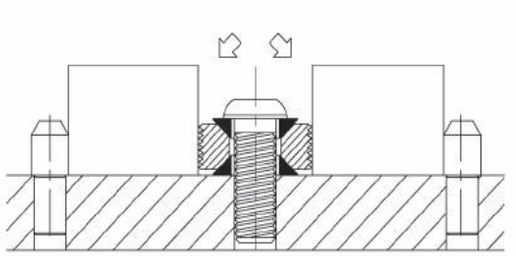
Thrust Washers have ID clearance to enable them to float horizontally, allowing both clamping jaws to contact their workpiece simultaneously even if parts are slightly different in size. This ensures that both parts are securely clamped with equal force.



Tiny Vise® Edge Clamps are ideal for high-density machining. This quick-change Carr Lock® fixture holds 72 parts using 36 Double Edge Clamps.

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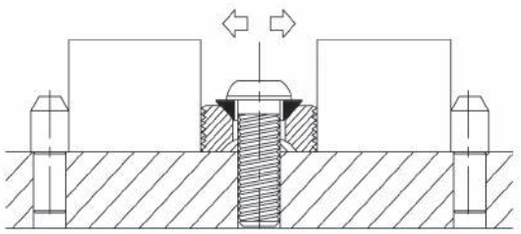
TINY VISE® DOUBLE EDGE CLAMPS



Setup for Downthrust Force

(with Bottom Thrust Washer)

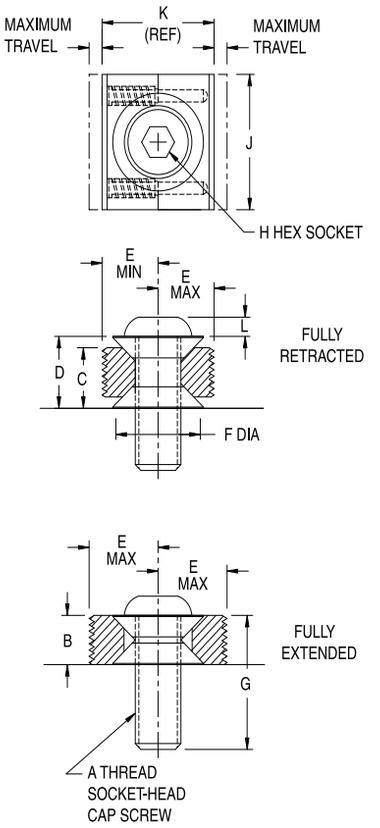
All clamps are supplied with two Thrust Washers (shown in black). The Bottom Thrust Washer is optional. Installing this washer will raise the clamp slightly and provide downthrust force during clamping.



Setup for Horizontal Force

(without Bottom Thrust Washer)

If no downthrust force is required, install the clamp without the Bottom Thrust Washer. Doing so will improve clamping speed because fewer screw turns are required.



7

DOUBLE FLAT JAWS (INCH) — SETUP FOR DOWNTHRUST FORCE

PART NO. SERRATED JAWS	PART NO. SMOOTH JAWS	A	B	C	D	E			F DIA	G	H	J	K	L	ALLOWABLE WORKPIECE SIZE DIFFERENTIAL	MAXIMUM TRAVEL (WITH NO SIZE DIFFERENTIAL)	RECOMMENDED TORQUE (FT-LBS)*	APPROX. HORIZONTAL CLAMPING FORCE AT RECOMMENDED TORQUE (LBS)*
						MIN	MID RANGE	MAX										
CL-50-TV	CL-55-TV	5/16-18	.375	.486	.597	.422	.470	.518	.625	1	3/16	1	.844	.16	.048	.096	4.5	450
CL-60-TV	CL-65-TV	3/8-16	.438	.570	.684	.520	.572	.625	.750	1-1/8	7/32	1-1/4	1.250	.19	.052	.105	8	650
CL-80-TV	CL-85-TV	1/2-13	.500	.635	.770	.641	.698	.755	.875	1-1/4	5/16	1-3/8	1.282	.26	.060	.114	19	1200
CL-100-TV	CL-105-TV	5/8-11	.625	.765	.905	.690	.750	.810	1.125	1-1/2	3/8	1-1/2	1.380	.32	.078	.120	38	1800
CL-160-TV	CL-165-TV	1"-8	1.000	1.159	1.318	1.109	1.178	1.247	1.875	2-1/4	3/4	2-1/2	2.218	1.00	.094	.138	150	4500

DOUBLE FLAT JAWS (INCH) — SETUP FOR HORIZONTAL FORCE

CL-50-TV	CL-55-TV	5/16-18	.375	.375	.486	.422	.470	.518	.625	1	3/16	1	.844	.16	.048	.096	9	450
CL-60-TV	CL-65-TV	3/8-16	.438	.438	.552	.520	.572	.625	.750	1-1/8	7/32	1-1/4	1.250	.19	.052	.105	16	650
CL-80-TV	CL-85-TV	1/2-13	.500	.500	.635	.641	.698	.755	.875	1-1/4	5/16	1-3/8	1.282	.26	.060	.114	38	1200
CL-100-TV	CL-105-TV	5/8-11	.625	.625	.765	.690	.750	.810	1.125	1-1/2	3/8	1-1/2	1.380	.32	.078	.120	76	1800
CL-160-TV	CL-165-TV	1"-8	1.000	1.000	1.159	1.109	1.178	1.247	1.875	2-1/4	3/4	2-1/2	2.218	1.00	.094	.138	300	4500

DOUBLE FLAT JAWS (METRIC) — SETUP FOR DOWNTHRUST FORCE

CLM-50-TV	CLM-55-TV	M8	.375	.486	.597	.422	.470	.518	.625	1	5mm	1	.844	.16	.048	.096	4.5	450
CLM-60-TV	CLM-65-TV	M10	.438	.570	.684	.520	.572	.625	.750	1-1/8	6mm	1-1/4	1.250	.19	.052	.105	10	750
CLM-80-TV	CLM-85-TV	M12	.500	.635	.770	.641	.698	.755	.875	1-1/4	8mm	1-3/8	1.282	.26	.060	.114	18	1100
CLM-100-TV	CLM-105-TV	M16	.625	.765	.905	.690	.750	.810	1.125	1-1/2	10mm	1-1/2	1.380	.32	.078	.120	42	2000
CLM-160-TV	CLM-160-TV	M24	1.000	1.000	1.318	1.109	1.178	1.247	1.875	2-1/4	19mm	2-1/2	2.218	1.00	.094	.138	130	4000

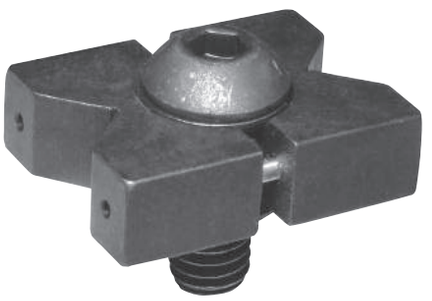
DOUBLE FLAT JAWS (METRIC) — SETUP FOR HORIZONTAL FORCE

CLM-50-TV	CLM-55-TV	M8	.375	.375	.486	.422	.470	.518	.625	1	5mm	1	.844	.16	.048	.096	9	450
CLM-60-TV	CLM-65-TV	M10	.438	.438	.570	.520	.572	.625	.750	1-1/8	6mm	1-1/4	1.250	.19	.052	.105	20	750
CLM-80-TV	CLM-85-TV	M12	.500	.500	.635	.641	.698	.755	.875	1-1/4	8mm	1-3/8	1.282	.26	.060	.114	35	1100
CLM-100-TV	CLM-105-TV	M16	.625	.625	.765	.690	.750	.810	1.125	1-1/2	10mm	1-1/2	1.380	.32	.078	.120	84	2000
CLM-160-TV	CLM-160-TV	M24	1.000	1.000	1.159	1.109	1.178	1.247	1.875	2-1/4	19mm	2-1/2	2.218	1.00	.094	.138	260	4000

*Recommended torque and clamping force are at 1/3 of yield strength, leaving 2/3 of holding capacity to resist external cutting forces, etc.

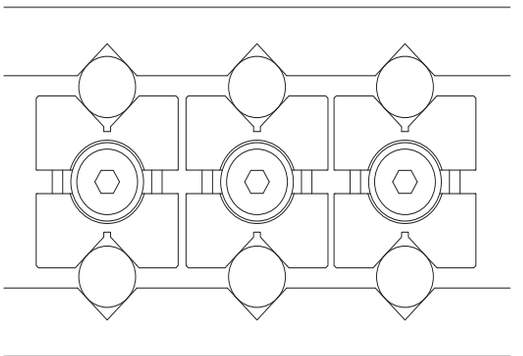
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TINY VISE® DOUBLE EDGE CLAMPS

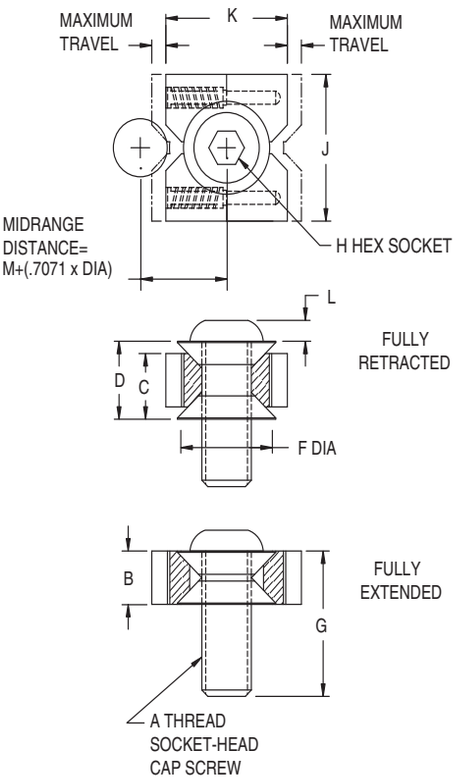


Two V-Jaws

The V-Jaw version of our popular Tiny Vise® is ideal for clamping round workpieces. The 90° V-Jaw can also be used to clamp a rectangular workpiece from two directions with a single clamp at its corner. Double edge clamps allow clamping two workpieces at the same time with equal force.



Multiple workpieces can be clamped extremely close together.



7

DOUBLE V-JAWS (INCH) — SETUP FOR DOWNTHRUST FORCE

PART NO.	A	B	C	D	F DIA	G	H	J	K	L	M	MAXIMUM WORKPIECE DIAMETER	ALLOWABLE WORKPIECE SIZE DIFFERENTIAL	MAX. TRAVEL (WITH NO SIZE DIFFERENTIAL)	RECOM-MENDED TORQUE (FT-LBS)*	APPROX. HORIZONTAL CLAMPING FORCE AT RECOMMENDED TORQUE (LBS)*
CL-50-TVR	5/16-18	.375	.486	.597	.625	1	3/16	1-1/4	1.308	.16	.421	3/4	.048	.096	4.5	450
CL-60-TVR	3/8-16	.438	.570	.684	.750	1-1/8	7/32	1-3/8	1.478	.19	.482	27/32	.052	.105	8	650
CL-80-TVR	1/2-13	.500	.635	.770	.875	1-1/4	5/16	1-1/2	1.706	.26	.569	15/16	.060	.114	19	1200
CL-100-TVR	5/8-11	.625	.765	.905	1.125	1-1/2	3/8	1-3/4	2.104	.32	.706	1-1/8	.078	.120	38	1800
CL-160-TVR	1"-8	1.000	1.159	1.318	1.875	2-1/4	3/4	2-1/2	3.350	1.00	1.119	1-3/4	.094	.138	150	4500

DOUBLE V-JAWS (INCH) — SETUP FOR HORIZONTAL FORCE

CL-50-TVR	5/16-18	.375	.375	.486	.625	1	3/16	1-1/4	1.308	.16	.421	3/4	.048	.096	9	450
CL-60-TVR	3/8-16	.438	.438	.570	.750	1-1/8	7/32	1-3/8	1.478	.19	.482	27/32	.052	.105	16	650
CL-80-TVR	1/2-13	.500	.500	.635	.875	1-1/4	5/16	1-1/2	1.706	.26	.569	15/16	.060	.114	38	1200
CL-100-TVR	5/8-11	.625	.625	.765	1.125	1-1/2	3/8	1-3/4	2.104	.32	.706	1-1/8	.078	.120	76	1800
CL-160-TVR	1"-8	1.000	1.000	1.159	1.875	2-1/4	3/4	2-1/2	3.350	1.00	1.119	1-3/4	.094	.138	300	4500

DOUBLE V-JAWS (METRIC) — SETUP FOR DOWNTHRUST FORCE

CLM-50-TVR	M8	.375	.486	.597	.625	1	3/16	1-1/4	1.308	.16	.421	3/4	.048	.096	4.5	450
CLM-60-TVR	M10	.438	.570	.684	.750	1-1/8	7/32	1-3/8	1.478	.19	.482	27/32	.052	.105	10	750
CLM-80-TVR	M12	.500	.635	.770	.875	1-1/4	5/16	1-1/2	1.706	.26	.569	15/16	.060	.114	18	1100
CLM-100-TVR	M16	.625	.765	.905	1.125	1-1/2	3/8	1-3/4	2.104	.32	.706	1-1/8	.078	.120	42	2000
CLM-160-TVR	M24	1.000	1.159	1.318	1.875	2-1/4	3/4	2-1/2	3.350	1.00	1.119	1-3/4	.094	.138	130	4000

DOUBLE V-JAWS (METRIC) — SETUP FOR HORIZONTAL FORCE

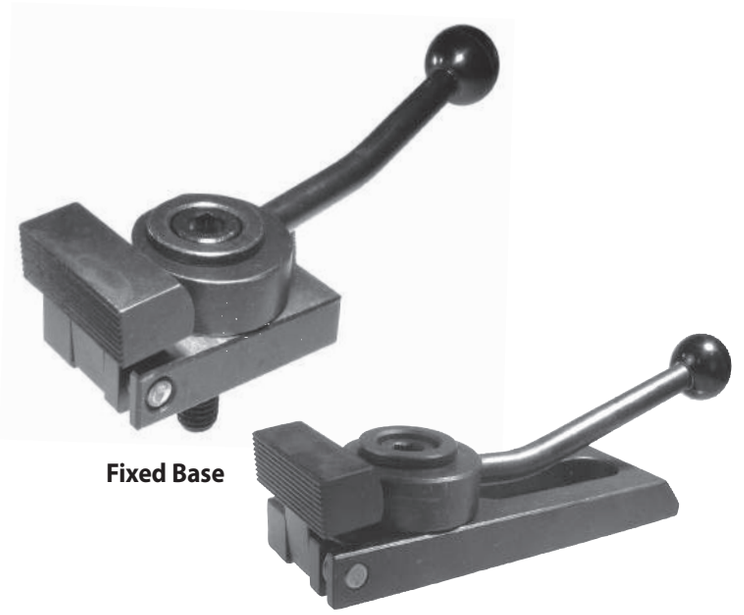
CLM-50-TVR	M8	.375	.375	.486	.625	1	3/16	1-1/4	1.308	.16	.421	3/4	.048	.096	9	450
CLM-60-TVR	M10	.438	.438	.570	.750	1-1/8	7/32	1-3/8	1.478	.19	.482	27/32	.052	.105	20	750
CLM-80-TVR	M12	.500	.500	.635	.875	1-1/4	5/16	1-1/2	1.706	.26	.569	15/16	.060	.114	35	1100
CLM-100-TVR	M16	.625	.625	.765	1.125	1-1/2	3/8	1-3/4	2.104	.32	.706	1-1/8	.078	.120	84	2000
CLM-160-TVR	M24	1.000	1.000	1.159	1.875	2-1/4	3/4	2-1/2	3.350	1.00	1.119	1-3/4	.094	.138	260	4000

*Recommended torque and clamping force are at 1/3 of yield strength, leaving 2/3 of holding capacity to resist external cutting forces, etc.

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CAM EDGE CLAMPS

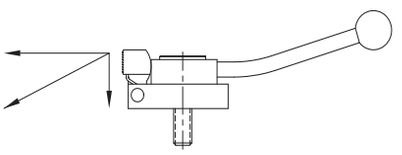
BODY: STEEL, WEAR SURFACES HARDENED, BLACK OXIDE FINISH
BALL HANDLE: BLACK PHENOLIC PLASTIC



Fixed Base

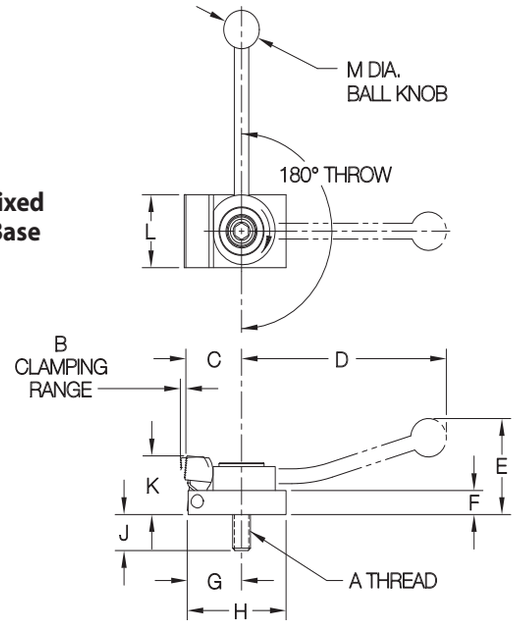
Slotted Base

Pivoting-nose edge clamp operated by a cam handle for fast action. Smooth spiral cam locks positively anywhere within its 180° throw. Choice of two sizes. Available with either a standard base for fixed-position mounting, or a slotted base for adjustable mounting. Choice of clockwise or counterclockwise handle rotation to clamp.

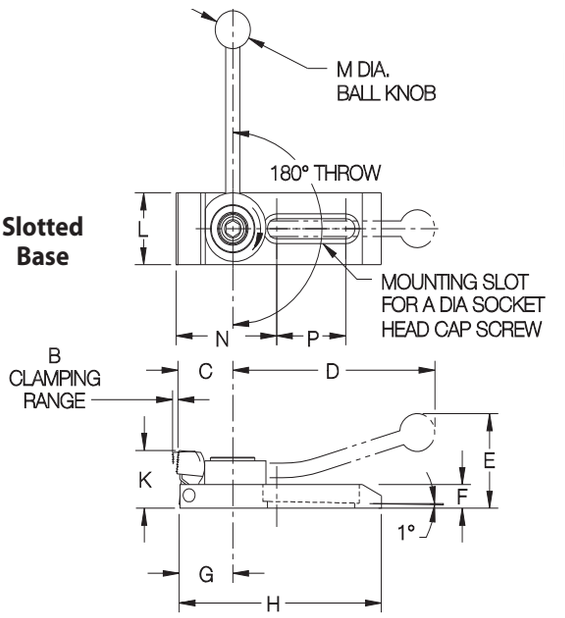


Nose pivots to exert clamping force forward and downward at the same time.

Fixed Base



Slotted Base



7

FIXED BASE (INCH)

PART NO.											K						MAX CLAMPING FORCE (LBS)	
CLOCKWISE CLAMPING	CCW CLAMPING	A	B	C	D	E	F	G	H	J	MIN	MAX	L	M	N	P	HORIZONTAL	VERTICAL
CL-MF25-5601	CL-MF25-5602	5/16-18	5/32	1-1/8	3-15/16	1-5/8	7/16	15/16	1-3/4	11/16	7/8	1	1-1/4	3/4	—	—	750	50
CL-MF40-5601	CL-MF40-5602	1/2-13	7/32	1-9/16	5-3/4	2-1/2	5/8	1-1/2	2-3/4	15/16	1-5/16	1-1/2	1-7/8	1	—	—	1500	100

FIXED BASE (METRIC)

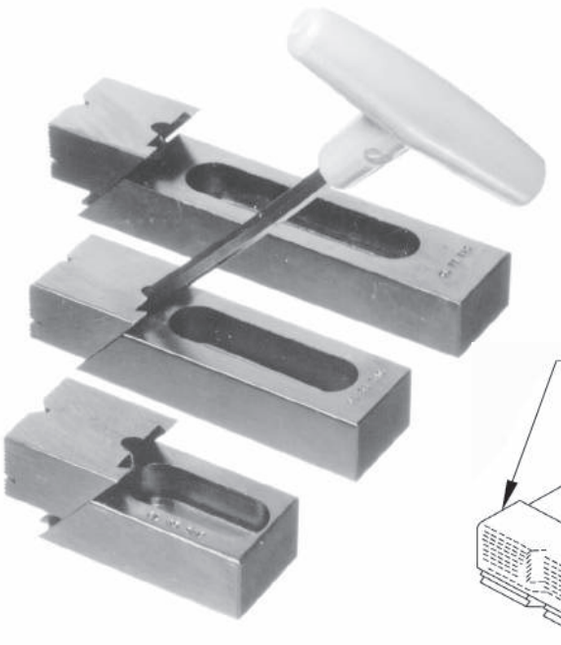
CL-MF08-5601	CL-MF08-5602	M8	5/32	1-1/8	3-15/16	1-5/8	7/16	15/16	1-3/4	.31	7/8	1	1-1/4	3/4	—	—	750	50
CL-MF12-5601	CL-MF12-5602	M12	7/32	1-9/16	5-3/4	2-1/2	5/8	1-1/2	2-3/4	.47	1-5/16	1-1/2	1-7/8	1	—	—	1500	100

SLOTTED BASE

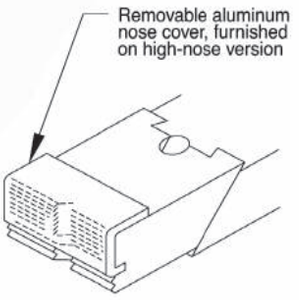
CL-MF25-5611	CL-MF25-5612	5/16-18 or M8	5/32	1-1/8	3-15/16	1-5/8	7/16	15/16	3-1/2	—	7/8	1	1-1/4	3/4	2	1	750	50
CL-MF40-5611	CL-MF40-5612	1/2-13 or M12	7/32	1-9/16	5-3/4	2-1/2	5/8	1-1/2	6	—	1-5/16	1-1/2	1-7/8	1	2-15/16	2	1500	100

SERRATED EDGE CLAMPS

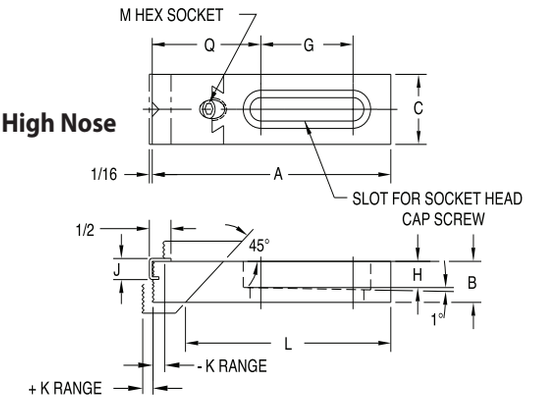
BODY AND NOSE: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
CLAMPING SCREW: 4140 STEEL, HEAT TREATED RC 43-45, BLACK OXIDE FINISH
NOSE COVER: ALUMINUM



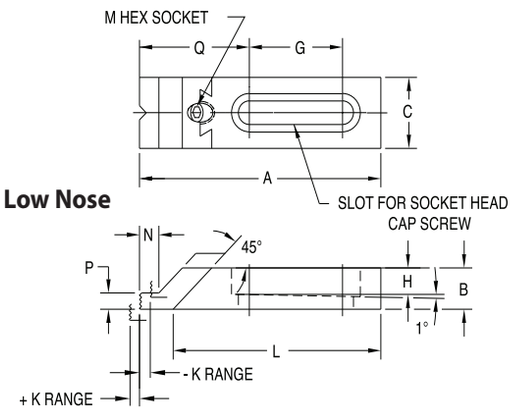
Serrated Adjustable Edge Clamp (High Nose)



High Nose

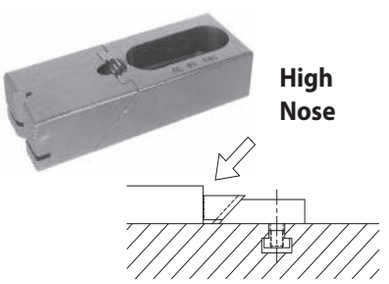


Low Nose



7

This low-profile clamp is ideal for gripping the side of a workpiece to keep the top clear for machining. Clamps both forward and down simultaneously, by tightening the socket-head screw in the sliding nose with a hex wrench. V-groove in nose is excellent for clamping round parts or corners. Choice of five sizes, each available in several slot lengths. Slot is tapered to prevent the clamp from backing off under heavy forces. Use two mounting screws on longer clamps.

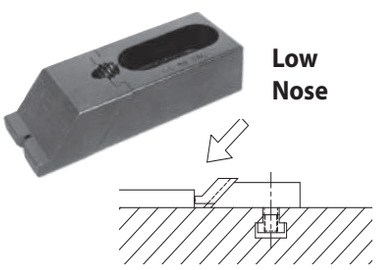


High Nose

High-nose version is best for most applications. Gripping high up on the workpiece, close to the machining plane, provides maximum clamping rigidity. A removable aluminum nose cover is furnished for clamping soft or machined parts without damage.

ADJUSTABLE — HIGH NOSE

PART NO.	MOUNTING SCREW SIZE	A	B	C	G	H	J	K	L	M	N	P	Q
CL-1-SAC	5/16-18 or M8	2	5/8	1	1/4	9/32	7/16	1/4	1-1/2	5/32	—	—	1-3/8
CL-5-SAC		3			1-1/4				2-1/2				
CL-15-SAC	3/8-16 or M10	3	5/8	1-1/4	13/16	3/8	7/16	1/4	2-3/8	3/16	—	—	1-11/16
CL-25-SAC		4-1/4			1-7/16				3-5/8				2-1/16
CL-35-SAC		5			2-1/8				4-3/8				1-7/8
CL-45-SAC	1/2-13 or M12	4	7/8	1-1/2	1-1/4	1/2	5/8	5/16	3-3/16	1/4	—	—	2-1/4
CL-55-SAC		5-1/2			2-1/8				4-11/16				2-1/2
CL-65-SAC		7-1/8			3				6-5/16				2-9/16
CL-75-SAC	5/8-11 or M16	5-1/2	1-1/4	1-3/4	1-3/8	5/8	3/4	5/16	4-1/2	5/16	—	—	3-9/32
CL-95-SAC		8-1/4			4				7-1/4				3
CL-105-SAC	3/4-10 or M20	5-1/2	1-1/4	1-3/4	1-3/8	3/4	3/4	5/16	4-1/2	5/16	—	—	3-9/32
CL-125-SAC		8-1/4			4				7-1/4				3



Low Nose

Low-nose version is ideal for thin parts, with its extra machining clearance.

ADJUSTABLE — LOW NOSE

CL-0-SAC	5/16-18 or M8	2	5/8	1	1/4	9/32	—	1/4	1-1/2	5/32	1/8	1/8	1-3/8
CL-00-SAC		3			1-1/4				2-1/2				
CL-10-SAC	3/8-16 or M10	3	5/8	1-1/4	13/16	3/8	—	1/4	2-3/8	3/16	1/4	1/4	1-11/16
CL-20-SAC		4-1/4			1-7/16				3-5/8				2-1/16
CL-30-SAC		5			2-1/8				4-3/8				1-7/8
CL-40-SAC	1/2-13 or M12	4	7/8	1-1/2	1-1/4	1/2	—	5/16	3-3/16	1/4	1/4	1/4	2-1/4
CL-50-SAC		5-1/2			2-1/8				4-11/16				2-1/2
CL-60-SAC		7-1/8			3				6-5/16				2-9/16
CL-70-SAC	5/8-11 or M16	5-1/2	1-1/4	1-3/4	1-3/8	5/8	—	5/16	4-1/2	5/16	5/16	3/8	3-9/32
CL-90-SAC		8-1/4			4				7-1/4				3
CL-100-SAC	3/4-10 or M20	5-1/2	1-1/4	1-3/4	1-3/8	3/4	—	5/16	4-1/2	5/16	5/16	3/8	3-9/32
CL-120-SAC		8-1/4			4				7-1/4				3

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SERRATED EDGE CLAMPS

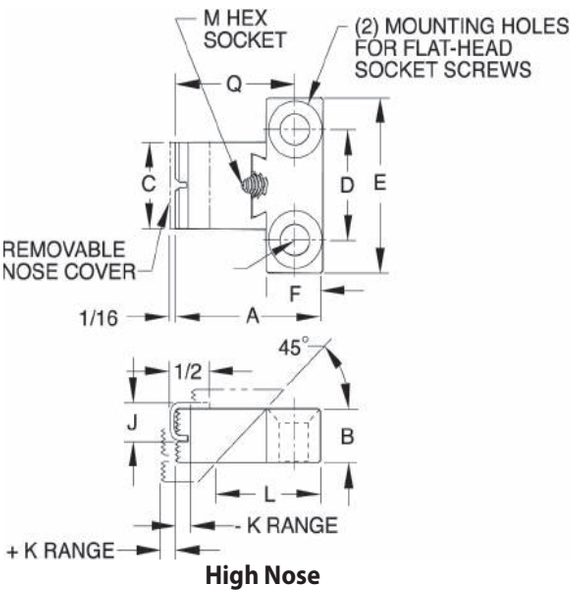
BODY AND NOSE: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
CLAMPING SCREW: 4140 STEEL, HEAT TREATED RC 43-45, BLACK OXIDE FINISH
NOSE COVER: ALUMINUM



Serrated Fixed Edge Clamp (High Nose)

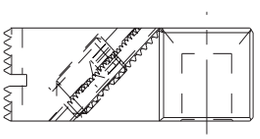


Serrated Fixed Edge Clamp (Low Nose)

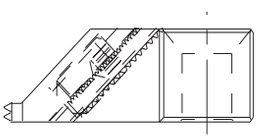


High Nose

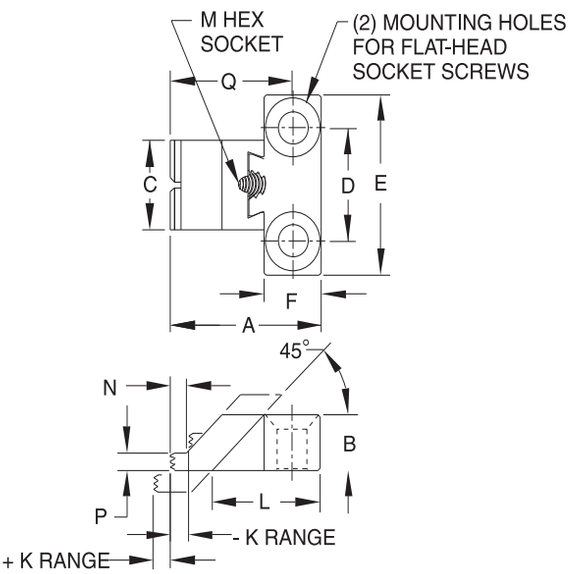
Serrated Fixed Edge Clamps mount in a fixed position, rather than having a slot for adjustment. This makes the clamps more compact and ensures that they are mounted in the correct location without requiring adjustment. The fixed version is usually better for permanent fixtures, while the adjustable version is better for machine-table mounting. The Flat-Head Socket Screws used for mounting absolutely hold proper location (order separately). Choice of three clamp sizes, with either a high nose or low nose.



High Nose



Low Nose



Low Nose

FIXED POSITION — HIGH NOSE

PART NO.	MOUNTING SCREW SIZE	A	B	C	D	E	F	J	K	L	M	N	P	Q	FLAT-HEAD SOCKET SCREWS (2 REQ'D) ORDER SEPARATELY
CL-5-SFC	5/16-18	1-13/16	5/8	1	1	1-3/4	11/16	7/16	1/4	1-5/16	5/32	—	—	1-15/32	CL-5/16-18x1.00-FHSS
CL-45-SFC	1/2-13	2-11/16	7/8	1-1/2	2	3	1	5/8	5/16	1-7/8	1/4	—	—	2-3/16	CL-1/2-13x1.38-FHSS
CL-75-SFC	5/8-11	3-1/2	1-1/4	1-3/4	2	3-1/4	1-1/4	3/4	5/16	2-1/2	5/16	—	—	2-7/8	CL-5/8-11x2.00-FHSS

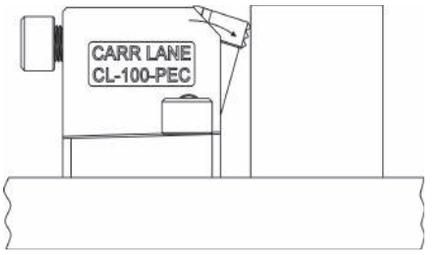
FIXED POSITION — LOW NOSE

CL-0-SFC	5/16-18	1-13/16	5/8	1	1	1-3/4	11/16	7/16	1/4	1-5/16	5/32	1/8	1/8	1-15/32	CL-5/16-18x1.00-FHSS
CL-40-SFC	1/2-13	2-11/16	7/8	1-1/2	2	3	1	5/8	5/16	1-7/8	1/4	1/4	1/4	2-3/16	CL-1/2-13x1.38-FHSS
CL-70-SFC	5/8-11	3-1/2	1-1/4	1-3/4	2	3-1/4	1-1/4	3/4	5/16	2-1/2	5/16	5/16	3/8	2-7/8	CL-5/8-11x2.00-FHSS

PIVOTING EDGE CLAMPS

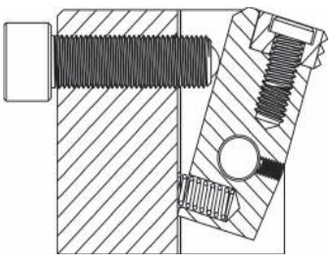
BODY & JAW: 1018 STEEL, BLACK OXIDE FINISH
EDGE GRIPPER: M-2 TOOL STEEL, HEAT TREATED Rc 60-62, BLACK OXIDE FINISH
DOWEL PIN: 4140 ALLOY STEEL

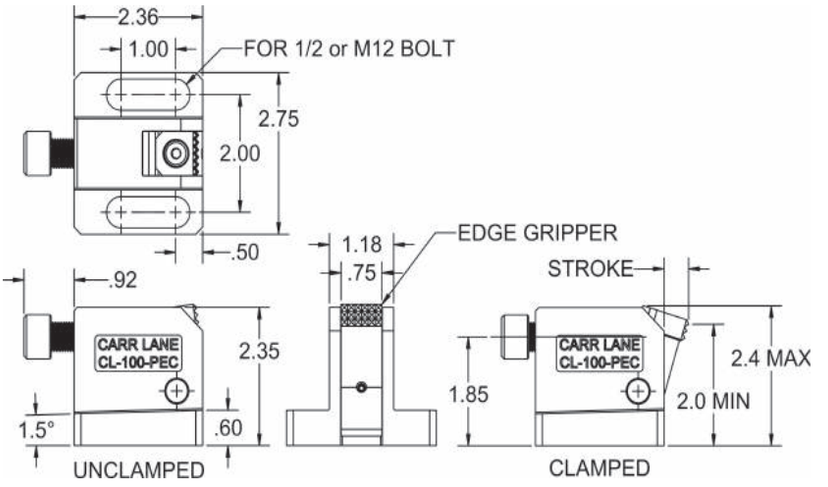




New item!

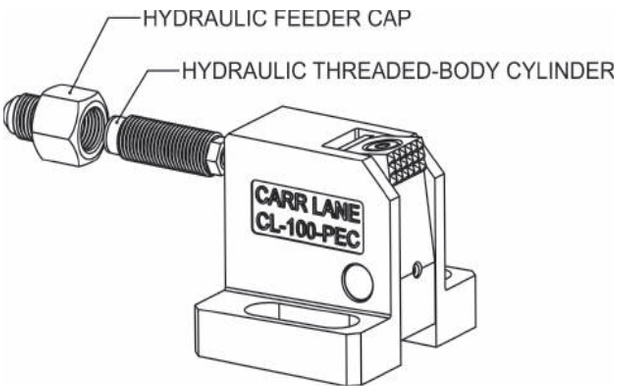
This edge clamp is well suited for holding large castings and other tall workpieces. The pivoting jaw exerts clamping force forward and downward at the same time. The jaw has a replaceable serrated gripper made of hardened tool steel for high-production durability. The slotted base provides adjustability and has a tapered top surface to prevent the clamp from moving. Fasten with two Socket-Head Cap Screws.





PIVOTING EDGE CLAMP

PART NO.	MAXIMUM CLAMPING STROKE	MOUNTING SCREW SIZE	THRUST SCREW SIZE	BALL-END THRUST SCREW (FURNISHED)	EDGE GRIPPER (FURNISHED)
CL-100-PEC	1/2	1/2-13 or M12	1/2-20	CL-80-BTS-1.75	CL-12-EG-6



These Pivoting Edge Clamps can be easily converted to hydraulic operation by replacing the standard thrust screw with a Threaded-Body Cylinder and Feeder Cap, then connecting to a hydraulic pressure source. Please see table below for the required conversion accessories. Maximum clamping stroke is reduced to 1/4" when the clamp is converted to hydraulic operation.

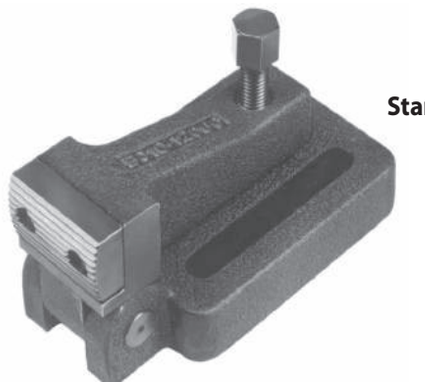
HYDRAULIC CONVERSION ACCESSORIES

PART NO.	ITEM DESCRIPTION	MAXIMUM HYDRAULIC PRESSURE (psi)
CLR-802-TB	Hydraulic Threaded-Body Cylinder	7250
CLR-308-TBA	Hydraulic Feeder Cap	7250

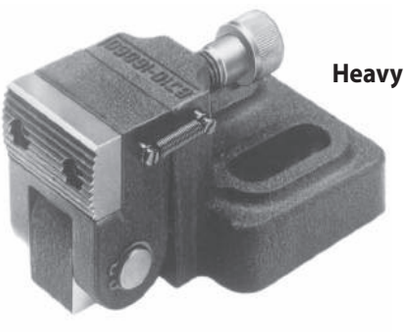
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PIVOTING EDGE CLAMPS

BODY: GRAY CAST IRON, ASTM CLASS 40, BLACK OXIDE FINISH
JAW: 1045 STEEL, HEAT TREATED RC 40-45, BLACK OXIDE FINISH
BOLT: 4135 STEEL, HEAT TREATED, BLACK OXIDE FINISH

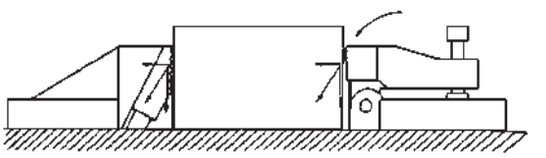


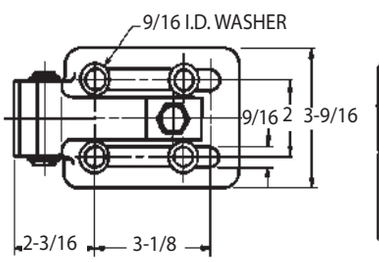
Standard

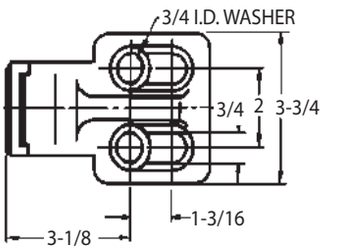


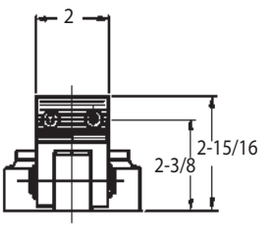
Heavy

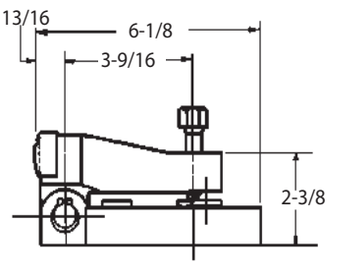
Large edge clamp that is ideal for tall workpieces. Pivoting nose pushes forward and downward simultaneously. Can be used to clamp against fixed locators, or against the Downthrust Backstops shown below. Replacement jaws are available.



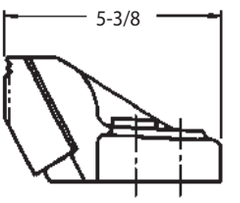








Standard



Heavy

PIVOTING EDGE CLAMPS

SIZE	PART NO.	MAX. CLAMPING FORCE (LBS)		SOCKET-HEAD CAP SCREWS (2 OR 4 REQD)	REPLACEMENT JAW
		HORIZ	VERT		
STANDARD	CL-MF40-1001	2000	220	(4) CL-1/2-13x2.25-SHCS	CL-MF40-1011
HEAVY	CL-MF50-1001	4200	730	(2) CL-5/8-11x3.00-SHCS	CL-MF40-1011

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SWING CLAMPS

TYPES



HOOK CLAMPS – SHORT ARM
Extremely compact swing clamp that mounts in a reamed hole. Compact assembly is ideal for installation in tight spaces and where high clamping forces are required. Choice of socket head (counterbored) or hex-nut type.



HOOK CLAMPS – LONG ARM
Long-arm Hook Clamps are available with either a plain or tapped arm. The tapped-arm version accepts a wide variety of contact bolts or spindles to increase clamping-height range (the tapped arm is slightly longer). Ideal in tight spaces where high clamping force is required.



HOOK CLAMPS – CAM HANDLE
The tapped-arm version is optionally available with a cam handle, to allow clamping without a separate wrench.



ONE-TOUCH QUICK-ACTING SWING CLAMP – HORIZONTAL CAM LEVER
One-Touch Swing Clamps are manually operated clamps that first rotate 70° clockwise into position, then clamp straight down in one continuous motion. The Horizontal Cam Lever is operated by a radial cam lever that swings in an horizontal arc.



ONE-TOUCH QUICK-ACTING SWING CLAMP – VERTICAL CAM LEVER
One-Touch Swing Clamps are manually operated clamps that first rotate 70° clockwise into position, then clamp straight down in one continuous motion. The Vertical Cam Lever is operated by a radial cam lever that swings in a vertical arc. Ideal for confined spaces with no room fo a horizontal handle swing.



ONE-TOUCH QUICK-ACTING SWING CLAMP – HEX DRIVE
One-Touch Swing Clamps are manually operated clamps that first rotate 70° clockwise into position, then clamp straight down in one continuous motion. The Hex Drive is operated by a screw mechanism with a hex drive nut. This allows for exact clamping-force control using a torque wrench.



FLOATING CLAMPS
Floating Clamps are position-flexible clamping devices. The top jaw and bottom jaw together provide a floating clamping point that adjusts to the workpiece before locking, to prevent deformation.



SWING CLAMP ASSEMBLIES
Long-reach swing clamp that can be hand-tightened for medium clamping force.



UP-THRUST CLAMP
Combination clamp and locator with a unique upward clamping action. Pushing down the cam handle pulls the lower jaw upward. This clamps the workpiece against the stationary upper jaw, whose bottom surface is a precision-ground locator.

SEE ALSO:

ROEMHELD
HILMA ▪ STARK

AIR-POWERED:
pp. 628-629



HYDRAULIC:
pp. 630-638



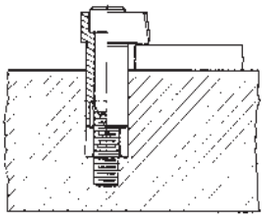
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CLAMP BODY: 12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Standard Arm Socket Head

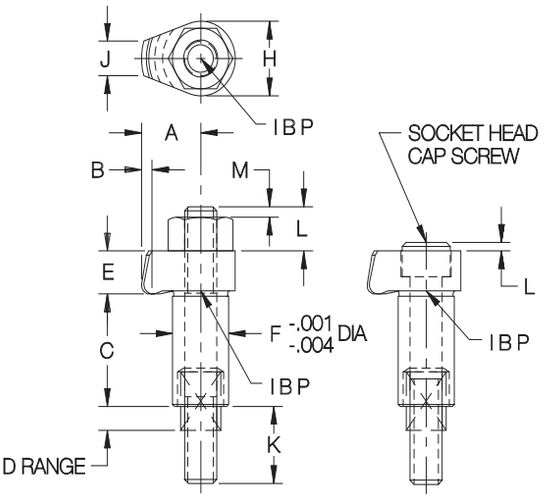
Extremely compact swing clamp that mounts in a reamed hole. Ideal in tight spaces and where high clamping forces are required. Choice of socket head (counterbored) or hex-nut type.

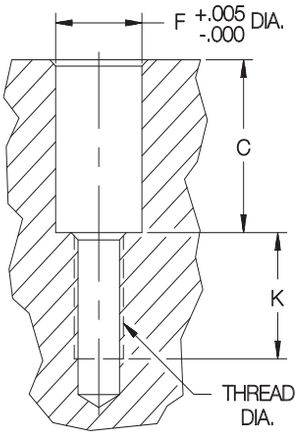


Compact assembly is easy to install in tight spaces. Socket-head type shown above offers a very low profile.



Standard Arm Hex Nut





Installation Hole

STANDARD ARM, SOCKET HEAD (INCH)

PART NO.	THREAD DIA	A	B	C	D CLAMPING RANGE	E	F DIA	H DIA	J	K	L	M
CL-1-CAC	5/16-18	.67	.08	.93	.25	.55	.625	.80	.40	.69		
CL-2-CAC	1/2-13	.92	.12	1.63	.50	.63	.875	1.08	.50	1.13	.12	—
CL-3-CAC	5/8-11	1.30	.18	1.83	.70	.90	1.125	1.38	.75	1.25		

STANDARD ARM, SOCKET HEAD (METRIC)

CLM-1-CAC	M8	.67	.08	.93	.25	.55	.625	.80	.40	.66		
CLM-2-CAC	M12	.92	.12	1.63	.50	.63	.875	1.08	.50	1.28	.12	—
CLM-3-CAC	M16	1.30	.18	1.83	.70	.90	1.125	1.38	.75	1.31		

STANDARD ARM, HEX NUT (INCH)

CL-1-CA	5/16-18	.67	.08	.93	.25	.55	.625	.80	.40	1.14	.30	.06
CL-2-CA	1/2-13	.92	.12	1.63	.50	.63	.875	1.08	.50	1.19	.48	.08
CL-3-CA	5/8-11	1.30	.18	1.83	.70	.90	1.125	1.38	.75	1.57	.61	.09

STANDARD ARM, HEX NUT (METRIC)

CLM-1-CA	M8	.67	.08	.93	.25	.55	.625	.80	.40	.69	.32	.05
CLM-2-CA	M12	.92	.12	1.63	.50	.63	.875	1.08	.50	1.02	.47	.07
CLM-3-CA	M16	1.30	.18	1.83	.70	.90	1.125	1.38	.75	1.48	.63	.08

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HOOK CLAMPS

CLAMP BODY: 4135 STEEL, HEAT TREATED, BLACK OXIDE FINISH
SOCKET-HEAD CAP SCREW, BLACK OXIDE FINISH
SPRING: SPRING STEEL, BLACK OXIDE FINISH



Long Arm Socket Head



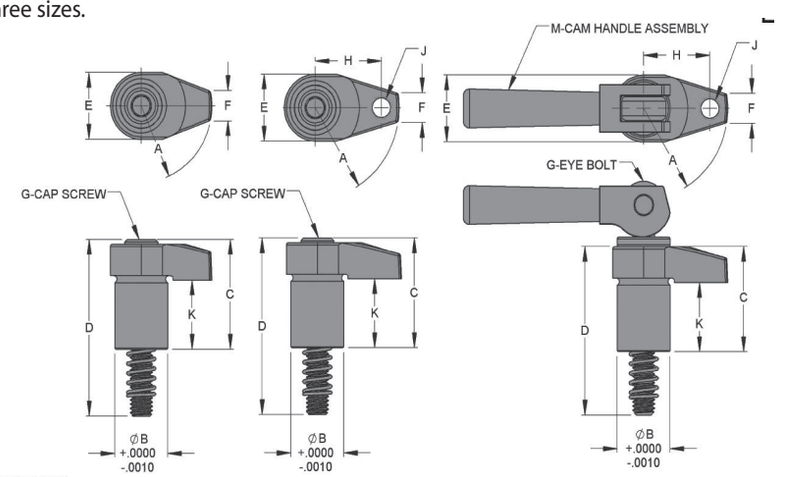
Tapped Long Arm Socket Head

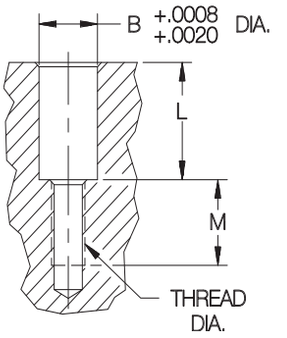


Tapped Long Arm Cam Handle

Long-arm Hook Clamps available with either a plain or tapped arm. The tapped-arm version accepts a wide variety of contact bolts or spindles to increase clamping-height range (the tapped arm is also slightly longer). Mounts in a reamed hole or in a Hook-Clamp Mounting Block or Holder (order separately). Ideal in tight spaces where high clamping force is required. Available in three sizes.

The tapped-arm version is optionally available with a cam handle, to allow clamping without a separate wrench. Use with an adjustable contact bolt to utilize maximum cam travel.





Installation Hole

LONG ARM (INCH)

PART NO.																
SOCKET HEAD	CAM HANDLE	THREAD DIA	A	B	C	D	E	F	G	H	J	K	L	M	MAXIMUM ALLOWABLE TORQUE (FT-LBS)	MAXIMUM CLAMPING FORCE (LBS)
CL-MF25-5002	--	5/16-18	1	.7500	1-7/16	2-5/16	7/8	3/8	5/16-18	—	—	29/32	15/16	15/16	22	2200
CL-MF40-5002	--	1/2-13	2	1.0000	2-1/2	3-1/2	1-1/4	11/16	1/2-13	—	—	1-17/32	1-9/16	1	34	2700
CL-MF50-5002	--	5/8-11	2	1.2500	2-7/8	3-7/8	1-7/16	7/8	5/8-11	—	—	1-17/32	1-9/16	1	59	3700

TAPPED LONG ARM (INCH)

CL-MF25-5013	CL-MF25-5020	5/16-18	1-3/16	.7500	1-7/16	2-5/16	7/8	3/8	5/16-18	15/16	5/16-18	29/32	15/16	15/16	22	2200
CL-MF40-5013	CL-MF40-5020	1/2-13	2-3/8	1.0000	2-1/2	3-1/2	1-1/4	11/16	1/2-13	1-13/16	1/2-13	1-17/32	1-9/16	1	34	2700
CL-MF50-5014	CL-MF50-5020	5/8-11	2-3/8	1.2500	2-7/8	3-7/8	1-7/16	7/8	5/8-11	1-13/16	5/8-11	1-17/32	1-9/16	1	59	3700

LONG ARM (METRIC)

CL-MF08-5002	--	M8	1	.7087(18mm)	1.46	2.28	.87	.39	M8	—	—	.91	.98	.84	22	2200
CL-MF12-5002	--	M12	2	.9843(25mm)	2.68	3.62	1.25	.69	M12	—	—	1.54	1.57	.96	34	2700
CL-MF16-5002	--	M16	2	1.2598(32mm)	2.95	3.98	1.44	.87	M16	—	—	1.54	1.57	.96	59	3700

TAPPED LONG ARM (METRIC)

CL-MF08-5013	CL-MF08-5020	M8	1.19	.7087(18mm)	1.46	2.28	.87	.39	M8	.94	M8	.98	.79	.84	22	2200
CL-MF12-5013	CL-MF12-5020	M12	2.38	.9843(25mm)	2.68	3.62	1.25	.69	M12	1.81	M12	1.54	1.57	.96	34	2700
CL-MF16-5013	CL-MF16-5020	M16	2.38	1.2598(32mm)	2.95	3.98	1.44	.87	M16	1.81	M12	1.54	1.57	.96	59	3700

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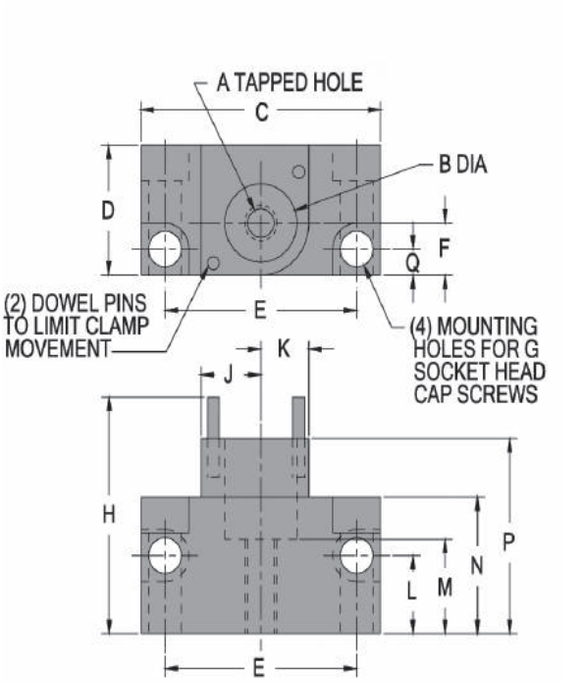
HOOK-CLAMP MOUNTING BLOCKS

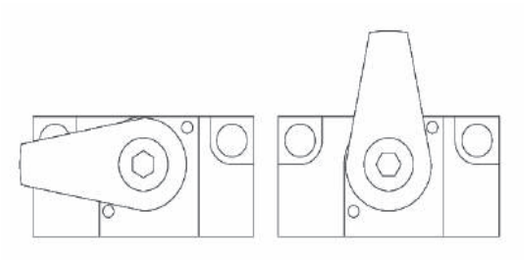
1018 STEEL, BLACK OXIDE FINISH



Hook-Clamp Mounting Block
(order Hook-Clamp separately)

These mounting blocks for long-arm Hook Clamps have built-in 90˚ stops that provide consistent arm positioning in both clamped and unclamped position. Two sets of mounting holes allow either base mounting or side mounting. Precision bored hole for smooth swing action. Available for all three sizes of long-arm Hook Clamps.





7

HOOK-CLAMP MOUNTING BLOCKS (INCH)

PART NO.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
CL-MF25-5801	5/16-18	.7500	2-1/2	1-1/4	2	1/2	5/16-18 or M8	2-1/2	5/8	1/2	3/4	29/32	1-5/16	1-7/8	1/4
CL-MF40-5801	1/2-13	1.0000	2-3/4	2	2	1	1/2-13 or M12	3-3/4	1	3/4	1	1-5/32	1-7/8	2-3/4	3/8
CL-MF50-5801	5/8-11	1.2500	5	2	4	1	5/8-11 or M16	3-3/4	1	1	1-1/4	1-5/32	2-1/4	2-3/4	1/2

HOOK-CLAMP MOUNTING BLOCKS (METRIC)

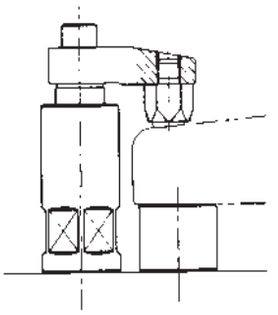
CL-MF08-5801	M8	.7087 (18mm)	1.97	1.00	1.50	.47	M6 or 1/4-20	2.50	.55	.55	.71	.91	.98	1.87	.25
CL-MF12-5801	M12	.9843 (25mm)	2.95	1.50	2.17	.65	M10 or 3/8-16	3.64	.79	.79	.94	1.16	1.38	2.64	.35
CL-MF16-5801	M16	1.2598 (32mm)	3.46	1.75	2.56	.77	M12 or 1/2-13	4.43	.94	.94	1.26	1.16	1.77	3.43	.39

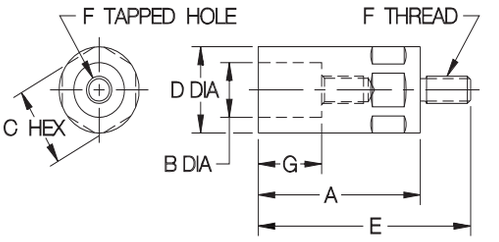
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HOOK-CLAMP HOLDERS

1045 STEEL, BLACK OXIDE FINISH







HOOK-CLAMP HOLDERS (INCH)

PART NO.	F THREAD DIA	A	B DIA	C	D DIA	E	G
CL-MF25-5101	5/16-18	2-1/4	.7500	7/8	1	3	15/16
CL-MF40-5101	1/2-13	3-1/8	1.0000	1-7/16	1-9/16	4-3/8	1-9/16
CL-MF40-5102		4				5-1/4	
CL-MF50-5101	5/8-11	3-1/8	1.2500	1-3/4	2	4-3/8	1-9/16
CL-MF50-5102		4				5-1/4	

HOOK-CLAMP HOLDERS (METRIC)

CL-MF08-5101	M8	2.17	.7087 (18mm)	.87 (22mm)	.94	2.91	.98
CL-MF12-5101	M12	3.15	.9843 (25mm)	1.42 (36mm)	1.57	4.33	1.57
CL-MF16-5101	M16	3.15	1.2598 (32mm)	1.81 (46mm)	1.97	4.33	1.57

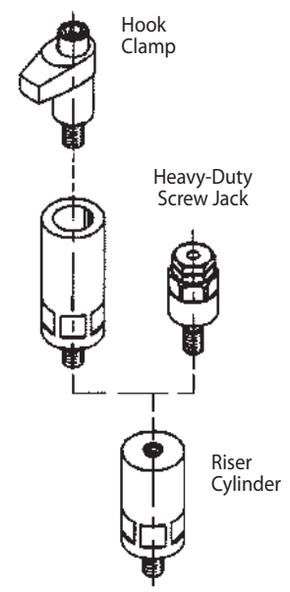
Compact mounting adapter for long-arm Hook-Clamps. Precision bored hole for smooth swing action.

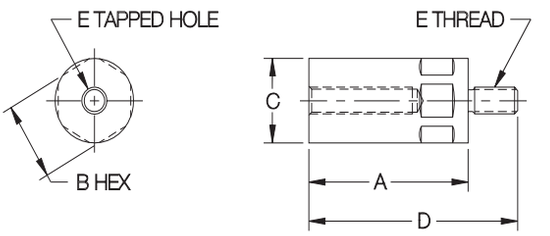
7

RISER CYLINDERS

1045 STEEL, BLACK OXIDE FINISH







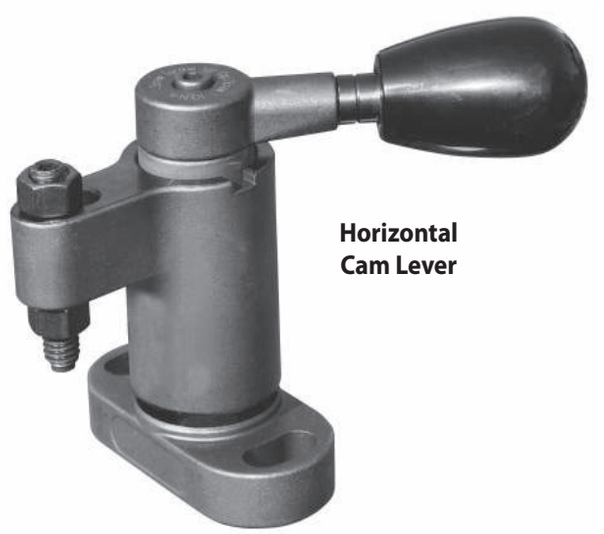
PART NO.	A	B	C DIA	D	E
CL-MF25-5201	1-1/4	7/8	1	2	5/16-18
CL-MF25-5202	1-1/2			2-1/4	
CL-MF25-5203	2			2-3/4	
CL-MF40-5201	2	1-7/16	1-9/16	3-1/4	1/2-13
CL-MF40-5203	3-1/8			4-3/8	
CL-MF40-5204	4			5-1/4	
CL-MF50-5201	2	1-13/16	2	3-1/4	5/8-11
CL-MF50-5203	3-1/8			4-3/8	
CL-MF50-5204	4			5-1/4	

Provides additional height without taking up much space. Useful with Hook Clamps (**INFO+** pages 297-298), and Heavy-Duty Screw Jacks (**INFO+** page 231).

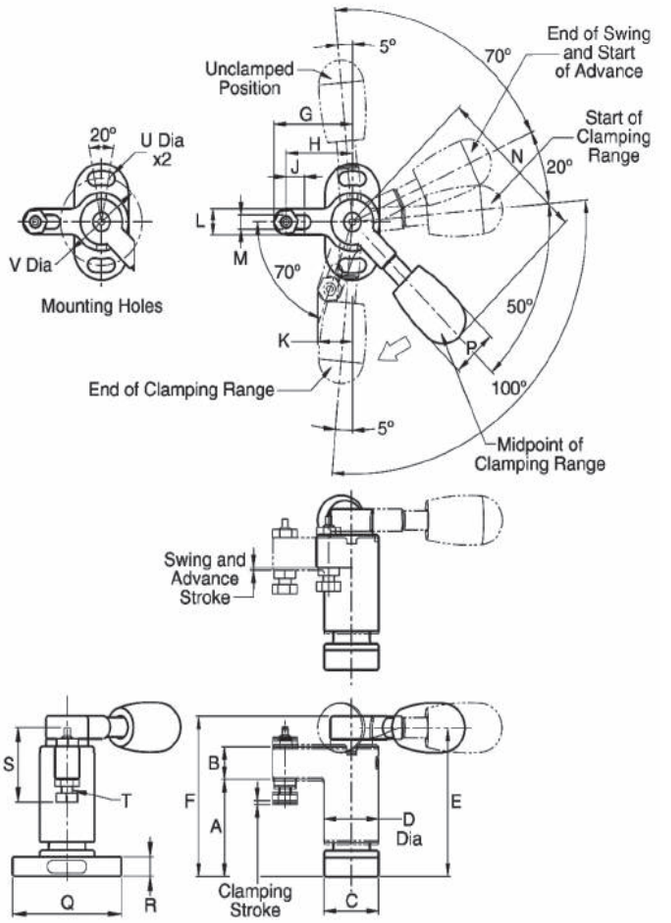
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ONE-TOUCH QUICK-ACTING SWING CLAMPS

BASE, SPINDLE, AND LEVER: 1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH
CLAMPING-ARM BODY AND SPIRAL-CAM SHAFT: ALLOY STEEL, HEAT TREATED, BLACK OXIDE FINISH
KNOB HANDLE: BLACK PHENOLIC PLASTIC



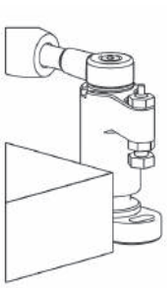
Horizontal Cam Lever



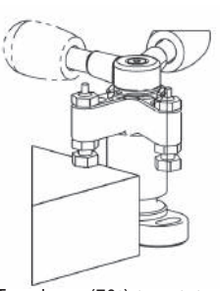
One-Touch Swing Clamps are manually operated clamps that first rotate 70° clockwise into position then clamp straight down in one continuous motion. The version shown here is operated by a radial cam lever that swings in an horizontal arc. Available in four sizes.

Starting with the clamping arm swung away for loading, turn the lever to rotate the arm into clamping position and automatically move the arm downward to apply clamping force. A small portion of the total vertical stroke is used to swing, and slightly advance the clamping arm, then the remaining stroke is available as the clamping range. To unclamp, reverse the lever movement to lift the arm straight up and automatically return the arm to its original position for loading.

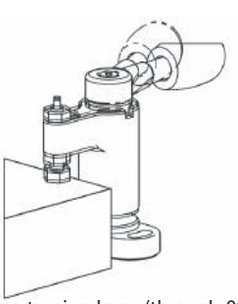
Mount clamp with two socket-head cap screws using the two mounting slots. To allow for workpiece variation, adjust spindle extension so that full clamping force is achieved approximately in the middle of the lever's 100° clamping range.



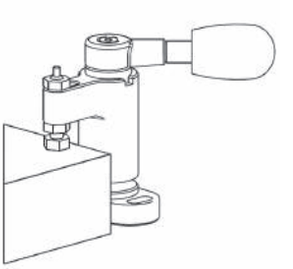
1. Starting position, with clamping arm swung away for loading.



2. Turn lever (70°) to rotate the arm into clamping position.



3. Continue turning lever (through 90°) to advance the arm toward the workpiece.



4. Continue turning lever (90° to 190°) until full clamping force is applied.

HORIZONTAL CAM LEVER (INCH)

PART NO.	MAX CLAMPING FORCE (LBS)	MAX. ALLOWABLE TORQUE (FT-LBS)	SWING AND ADVANCE STROKE	CLAMPING STROKE (MAX.)	A			B	C	D DIA	E	F	G	H	J	K	L	M	N	P DIA	Q	R	S	T SOCKET SET-SCREW	U DIA	V DIA
					UN-CLAMPED POSITION	START OF CLAMPING RANGE	END OF CLAMPING RANGE																			
CL-100-QSCR	250	4	.03	.04	1.21	1.18	1.14	.39	.71	.71	1.80	1.93	1.02	1.02	.24	.45	.31	.169	1.97	.59	1.42	.24	.88	#8-32	.169	1.063
CL-150-QSCR	400	7	.04	.06	1.62	1.58	1.52	.55	.91	.91	2.41	2.60	1.38	1.18	.31	.60	.39	.209	2.48	.79	1.77	.31	1.00	#10-24	.209	1.339
CL-200-QSCR	500	12	.05	.06	2.02	1.97	1.91	.71	1.18	1.18	3.01	3.23	1.77	1.46	.31	.81	.63	.331	3.15	1.02	2.56	.47	1.50	5/16-18	.331	1.890
CL-300-QSCR	800	23	.07	.07	2.43	2.36	2.29	.87	1.57	1.57	3.66	3.94	2.17	1.77	.31	1.00	.79	.409	3.94	1.30	3.35	.59	2.00	3/8-16	.409	2.520

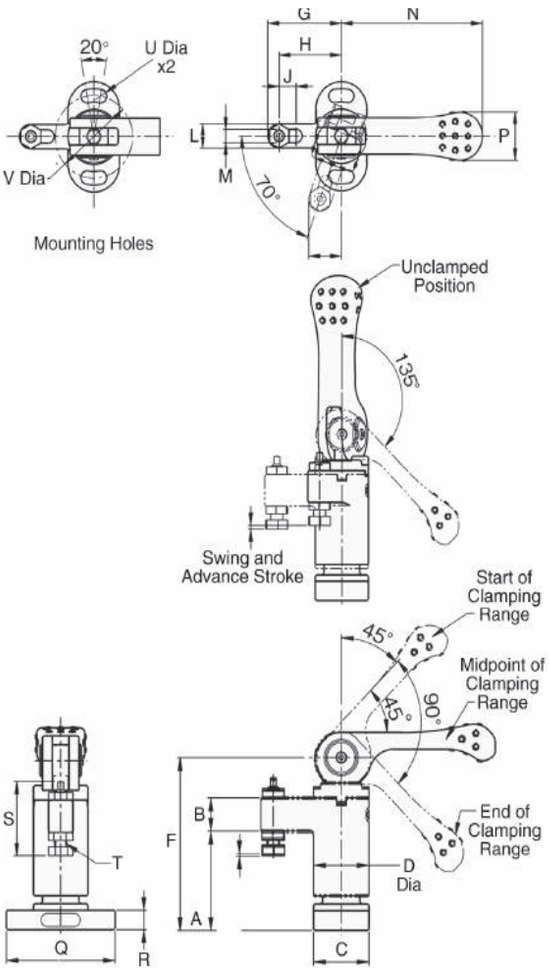
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ONE-TOUCH QUICK-ACTING SWING CLAMPS

BASE, WASHER, AND SPINDLE: 1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH
CLAMPING-ARM BODY AND CAM HANDLE: ALLOY STEEL, HEAT TREATED, BLACK OXIDE FINISH



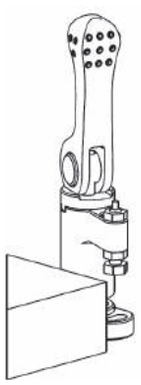
Vertical Cam Handle



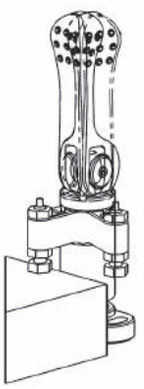
One-Touch Swing Clamps are manually operated clamps that first rotate 70° clockwise into position then clamp straight down in one continuous motion. The version shown here is operated by a cam handle that swings in a vertical arc. Ideal for confined spaces with no room for a horizontal handle swing. Available in four sizes.

Starting with the handle upright and the clamping arm swung away for loading, first twist the handle to rotate the arm into clamping position, then push the handle downward to lower the arm and apply clamping force. A small portion of the total vertical stroke is used to swing, and slightly advance the clamping arm, then the remaining stroke is available as the clamping range. Reverse the process to unclamp and return the arm to its original position for loading.

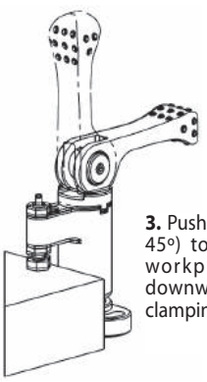
Mount clamp with two socket-head cap screws using the two mounting slots. To allow for workpiece variation, adjust spindle extension so that full clamping force is achieved approximately in the middle of the lever's 100° clamping range.



1. Starting position, with handle upright and clamping arm swung away for loading.



2. Twist handle (70°) to rotate the arm into clamping position.



3. Push handle downward (through 45°) to advance the arm to the workpiece. Continue pushing downward (45° to 135°) until full clamping force is applied.

VERTICAL CAM HANDLE (INCH)

PART NO.	MAX CLAMPING FORCE (LBS)	MAX. ALLOWABLE TORQUE (FF-LBS)	SWING AND ADVANCE STROKE	CLAMPING STROKE (MAX.)	A			B	C	D DIA	F	G	H	J	K	L	M	N	P	Q	R	S	T SOCKET SET-SCREW	U DIA	V DIA
					UN-CLAMPED POSITION	START OF CLAMPING RANGE	END OF CLAMPING RANGE																		
CL-100-QSCV	180	4	.03	.04	1.21	1.18	1.14	.39	.71	.71	2.05	1.02	.87	.24	.45	.31	.169	1.97	.63	1.42	.24	.88	#8-32	.169	1.063
CL-150-QSCV	340	7	.04	.06	1.62	1.58	1.52	.55	.91	.91	2.68	1.38	1.18	.31	.60	.39	.209	2.48	.75	1.77	.31	1.00	#10-24	.209	1.339
CL-200-QSCV	470	12	.05	.06	2.02	1.97	1.91	.71	1.18	1.18	3.43	1.77	1.46	.31	.81	.63	.331	3.15	.94	2.56	.47	1.50	5/16-18	.331	1.890
CL-300-QSCV	630	22	.07	.07	2.43	2.36	2.29	.87	1.57	1.57	4.21	2.17	1.77	.31	1.00	.79	.409	3.94	1.8	3.35	.59	2.00	3/8-16	.409	2.520

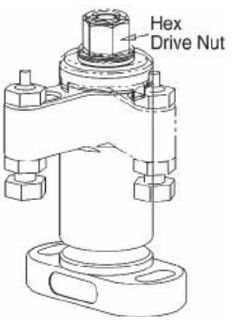
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ONE-TOUCH QUICK-ACTING SWING CLAMPS

BASE, WASHER, SPINDLE, AND HEX DRIVE NUT: 1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH
CLAMPING-ARM BODY: ALLOY STEEL, HEAT TREATED, BLACK OXIDE FINISH



Hex Drive

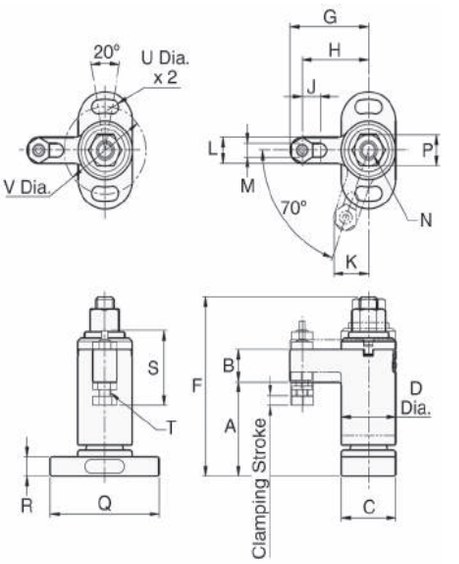


Starting with the clamping arm swung away for loading, tighten the flange nut to rotate the arm into clamping position and automatically move the arm downward to apply clamping force.

One-Touch Swing Clamps are manually operated clamps that first rotate 70° clockwise into position then clamp straight down in one continuous motion. The version shown here is operated by a screw mechanism with a hex drive nut. This allows for exact clamping-force control using a torque wrench. The screw mechanism also provides a longer clamping stroke and greater clamping force than the versions with cam locking. Available in four sizes.

Starting with the clamping arm swung away for loading, tighten the hex drive nut to rotate the arm into clamping position and automatically move the arm downward to apply clamping force. A small portion of the total vertical stroke is used to swing the clamping arm, then the remaining stroke is available as the clamping range. To unclamp, turn the flange nut counterclockwise to lift the arm straight up and automatically return the arm to its original position for loading.

Mount clamp with two socket-head cap screws using the two mounting slots. To allow for workpiece variation, adjust spindle extension so that full clamping force is achieved approximately in the middle of the lever's 100° clamping range.



7

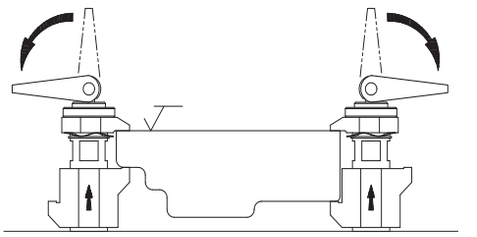
HEX DRIVE (INCH)

PART NO.	MAX CLAMPING FORCE (LBS)	MAX. ALLOWABLE TORQUE (FF-LBS)	SWING AND ADVANCE STROKE	CLAMPING STROKE (MAX.)	A			B	C	D DIA	F	G	H	J	K	L	M	N	P	Q	R	S	T SOCKET SET-SCREW	U DIA	V DIA
					UN-CLAMPED POSITION	START OF CLAMPING RANGE	END OF CLAMPING RANGE																			
CL-100-QSCH	500	4.5	.02	.12	1.16	1.14	1.02	.39	.71	.71	2.22	1.02	.87	.24	.45	.31	.169	1/4-20	7/16	1.42	.24	.88	#8-32	.169	1.063
CL-150-QSCH	800	8	.02	.16	1.56	1.54	1.38	.55	.91	.91	2.89	1.38	1.18	.31	.60	.39	.209	5/16-18	1/2	1.77	.31	1.00	#10-24	.209	1.339
CL-200-QSCH	1300	21	.03	.16	1.92	1.89	1.73	.71	1.18	1.18	3.58	1.77	1.46	.31	.81	.63	.331	3/8-16	9/16	2.56	.47	1.50	5/16-18	.331	1.890
CL-300-QSCH	1700	33	.03	.20	2.31	2.28	2.08	.87	1.57	1.57	4.49	2.17	1.77	.31	1.00	.79	.409	1/2-13	3/4	3.35	.59	2.00	3/8-16	.409	2.520

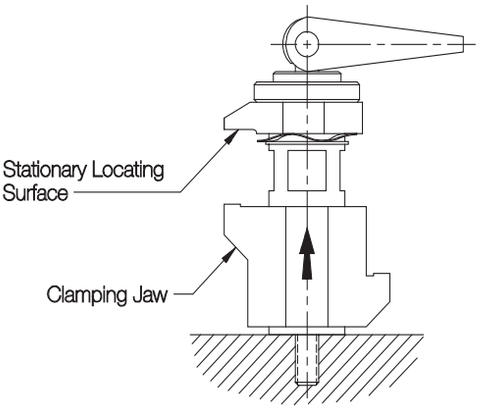
UP-THRUST CLAMPS

STEEL, WEAR SURFACES HARDENED, BLACK OXIDE FINISH



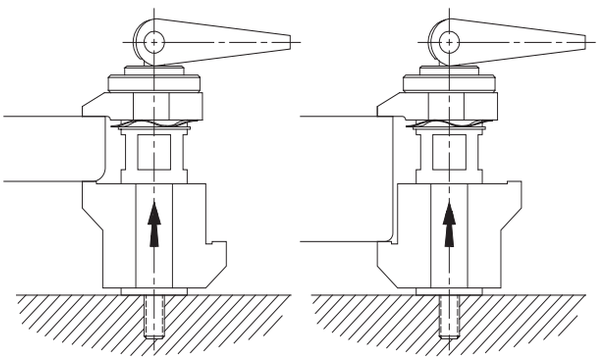


Up-Thrust Clamps locate off of the part's top surface and clamp up from below.

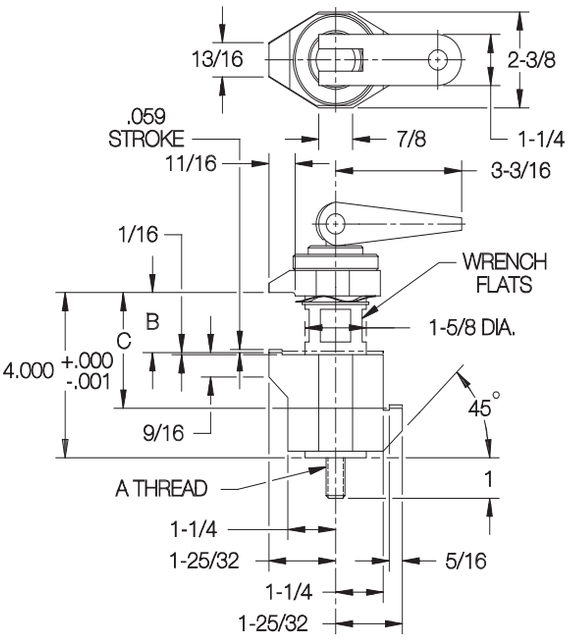


7

Combination clamp and locator with a unique upward clamping action. Pushing down the cam handle pulls the lower jaw upward. This clamps the workpiece against the stationary upper jaw, whose bottom surface is a precision-ground locator.



The lower jaw has two clamping surfaces 180° apart, one for thinner parts, the other for thicker parts. The cam handle rotates to screw the lower jaw up or down for fine adjustment.



PART NO.	A	B RANGE MIN	B RANGE MAX	C RANGE MIN	C RANGE MAX	MAX CLAMPING FORCE (LBS)
CL-MF40-5301	1/2-13	0	1-3/8	1-3/8	2-3/4	2200

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FLOATING CLAMPS

HOUSING: ALUMINUM, ANODIZED GREEN.
BODY: STEEL, CASE HARDENED & NITRIDED, MANGANESE PHOSPHATE TREATED AND GROUND.
CLAMPING JAWS: STEEL, CASE HARDENED & NITRIDED, MANGANESE PHOSPHATE TREATED.

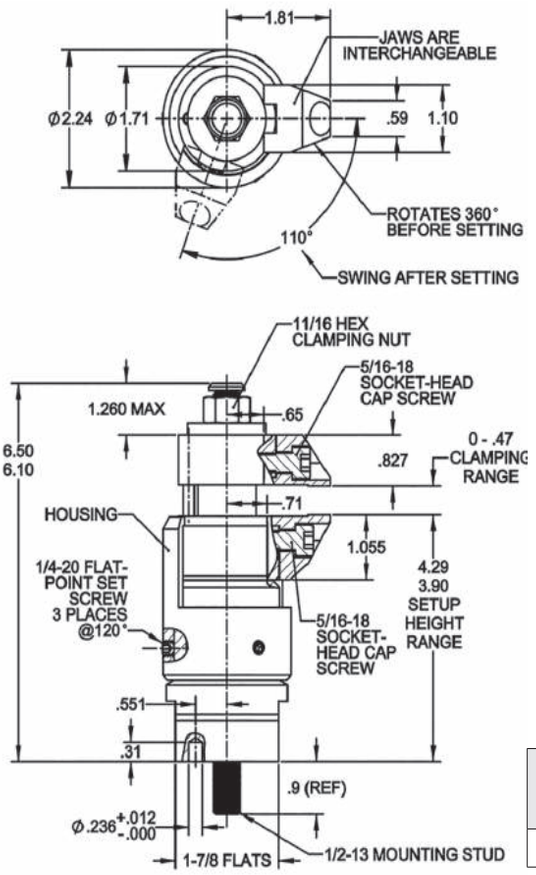


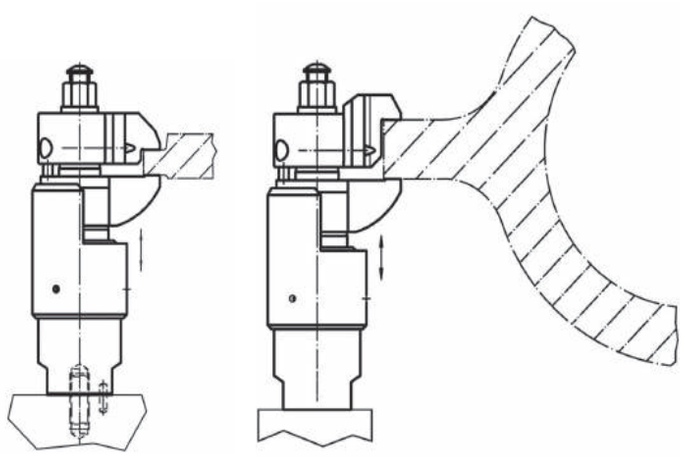
Floating Clamps are position-flexible clamping devices. The top jaw and bottom jaw together provide a floating clamping point that adjusts to the workpiece before locking, to prevent deformation. These combination clamp/supports are often used in conjunction with primary locators and clamps, providing additional support points to reduce machining vibration. Floating Clamps are especially useful for clamping forgings, ribbed or flanged castings, and other larger parts.

Install the clamp in a 1/2-13 threaded mounting hole by tightening using the body wrench flats. Adjust the height-limit stop and the swing range with the three setscrews in the green housing. When setting the height limit, consider the full range of workpiece tolerance.

To initiate clamping, push the Floating Clamp downward, then immediately swing the jaws into clamping position. The clamping jaws will automatically rise so that the bottom jaw contacts the workpiece with a light spring force. Next, tighten the top hex nut 11 ft-lbs minimum to 22 ft-lbs maximum, depending on the support load capacity desired. During the tightening process, the workpiece is clamped and simultaneously supported. Releasing is done in reverse order.

For more information and videos, see our online catalog at carrlane.com.



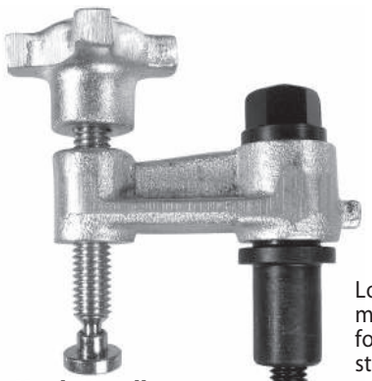


For custom applications, the standard upper clamping jaw supplied can be replaced by a special clamping jaw.

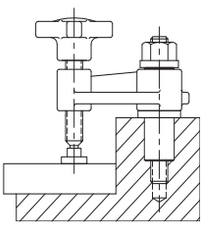
PART NO.	MOUNTING STUD	SUPPORT LOAD CAPACITY AT MINIMUM TIGHTENING TORQUE	SUPPORT LOAD CAPACITY AT MAXIMUM TIGHTENING TORQUE
CL-800-FLC	1/2-13	450 lbs @ 11 ft-lbs	1800 lbs @ 22 ft-lbs

SWING CLAMP ASSEMBLIES

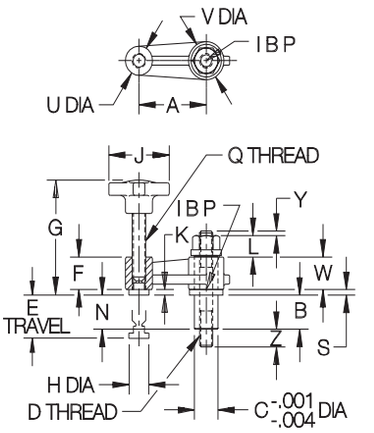
ARM: NODULAR IRON PER ASTM A536 GRADE 65-45-12, ZINC PLATED CLEAR CHROMATE
ALL OTHER PARTS: MILD STEEL, BLACK OXIDE FINISH



Knob Handle
Post Mounted



Long-reach swing clamp that can be hand tightened for medium clamping force. The post-mounted version is ideal for tight spaces, with a long mounting post for increased strength. Swing arm can be turned over for more clearance underneath. Install in a reamed hole. To order with a Delrin® foot instead of steel, add "N" to the part number. Example: CL-1-SWA-1N.



KNOB HANDLE, POST MOUNTED (INCH)

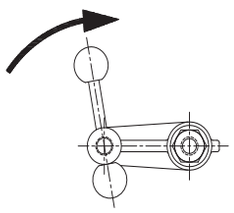
PART NO.	D THREAD SIZE	A	B	C DIA NOMINAL	C DIA ACTUAL	E	F	G	H DIA	J	K	L	N	Q	S	U DIA	V DIA	W	Y	Z
CL-1-SWA-1	5/16-18	1-1/2	.80	9/16	.563	.69	3/4	2.45	1/2	1-3/4	5/32	3/8	.68	5/16-18	.16	11/16	15/16	3/4	.11	.80
CL-4-SWA-1	1/2-13	2	1.18	7/8	.875	1.50	1-1/8	3.88	3/4	2-1/8	3/16	11/16	.99	1/2-13	.19	1	1-5/16	1-1/8	.15	.67
CL-5-SWA-1		2-1/2																		
CL-2-SWA-1	5/8-11	3	1.55	1-1/8	1.125	1.59	1-5/16	4.56	15/16	2-3/4	7/32	13/16	1.33	5/8-11	.22	1-5/16	1-3/4	1-1/2	.18	.74
CL-3-SWA-1		4																		

KNOB HANDLE, POST MOUNTED (METRIC)

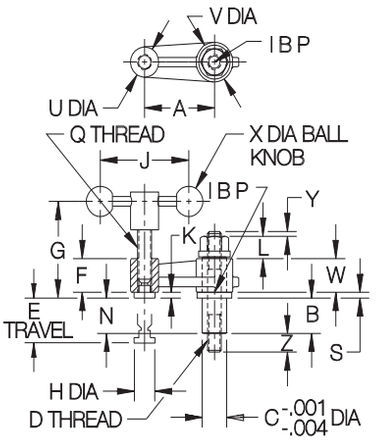
CLM-1-SWA-1	M8	1-1/2	.80	14mm	.551	.69	3/4	2.45	1/2	1-3/4	5/32	.39	.68	5/16-18	.16	11/16	15/16	3/4	.10	.95
CLM-4-SWA-1	M12	2	1.18	22mm	.866	1.50	1-1/8	3.88	3/4	2-1/8	3/16	.67	.99	1/2-13	.19	1	1-5/16	1-1/8	.14	1.01
CLM-5-SWA-1		2-1/2																		
CLM-2-SWA-1	M16	3	1.55	28mm	1.102	1.59	1-5/16	4.56	15/16	2-3/4	7/32	.83	1.33	5/8-11	.22	1-5/16	1-3/4	1-1/2	.16	.66
CLM-3-SWA-1		4																		



Ball Handle
Post Mounted



Same as above, except with a sliding ball handle for increased leverage.



BALL HANDLE, POST MOUNTED (INCH)

PART NO.	D THREAD SIZE	A	B	C DIA NOMINAL	C DIA ACTUAL	E	F	G	H DIA	J	K	L	N	Q	S	U DIA	V DIA	W	X	Y	Z
CL-1-SWA-2	5/16-18	1-1/2	.80	9/16	.563	.88	3/4	2.39	1/2	2-1/4	5/32	3/8	.68	5/16-18	.16	11/16	15/16	3/4	3/4	.11	.80
CL-4-SWA-2	1/2-13	2	1.18	7/8	.875	.96	1-1/8	3.53	3/4	2-5/8	3/16	11/16	.99	1/2-13	.19	1	1-5/16	1-1/8	1	.15	.67
CL-5-SWA-2		2-1/2																			
CL-2-SWA-2	5/8-11	3	1.55	1-1/8	1.125	1.65	1-5/16	4.50	15/16	3	7/32	13/16	1.33	5/8-11	.22	1-5/16	1-3/4	1-1/2	1-3/8	.18	.74
CL-3-SWA-2		4																			

BALL HANDLE, POST MOUNTED (METRIC)

CLM-1-SWA-2	M8	1-1/2	.80	14mm	.551	.88	3/4	2.39	1/2	2-1/4	5/32	.39	.68	5/16-18	.16	11/16	15/16	3/4	3/4	.10	.95
CLM-4-SWA-2	M12	2	1.18	22mm	.866	.96	1-1/8	3.53	3/4	2-5/8	3/16	.67	.99	1/2-13	.19	1	1-5/16	1-1/8	1	.14	1.01
CLM-5-SWA-2		2-1/2																			
CLM-2-SWA-2	M16	3	1.55	28mm	1.102	1.65	1-1/2	4.50	15/16	3	7/32	.83	1.33	5/8-11	.22	1-5/16	1-3/4	1-1/2	1-3/8	.16	.66
CLM-3-SWA-2		4																			

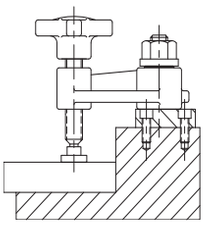
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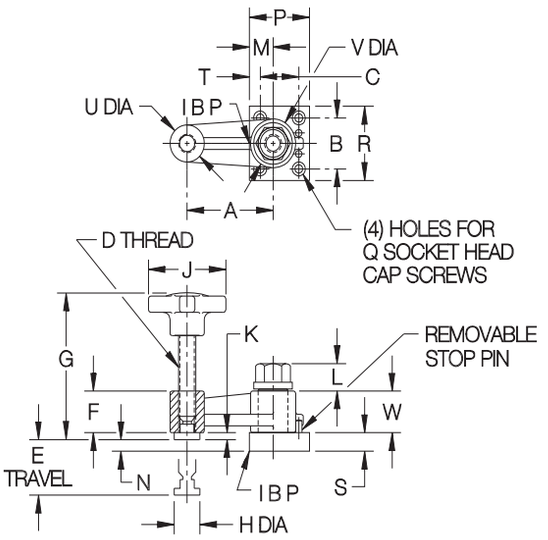
SWING CLAMP ASSEMBLIES

ARM: NODULAR IRON PER ASTM A536 GRADE 60-40-18, ZINC PLATED CLEAR CHROMATE
ALL OTHER PARTS: MILD STEEL, BLACK OXIDE FINISH



Knob Handle
Flange Mounted





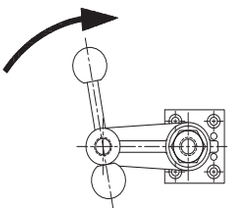
Long-reach swing clamp that can be hand tightened for medium clamping force. The flange-mounted version is ideal for mounting on flat surfaces. The stop pin furnished can be installed on either side for clockwise or counterclockwise rotation. Swing arm can be turned over for more clearance underneath. To order with a Delrin® foot instead of steel, add "N" to the part number. Example: CL-1-SWA-3N.

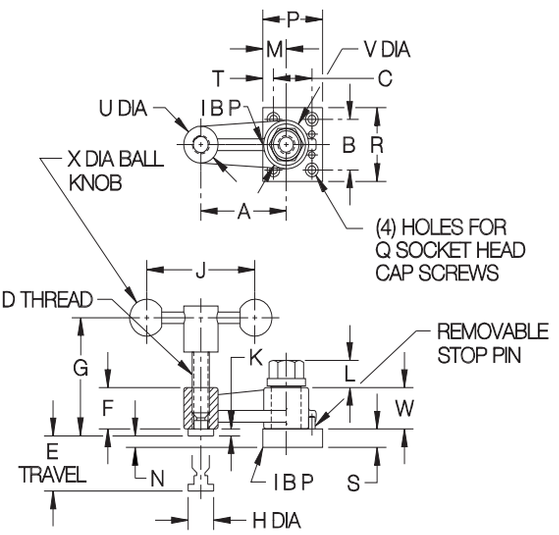
KNOB HANDLE, FLANGE MOUNTED

PART NO.	D THREAD SIZE	A	B	C	E	F	G	H DIA	J	K	L	M	N	P	Q	R	S	T	U	V	W
CL-1-SWA-3	5/16-18	1-1/2	1	3/4	.69	3/4	2.45	1/2	1-3/4	5/32	.33	1/2	.25	1-1/4	#10 or M5	1-1/2	3/8	1/4	11/16	15/16	3/4
CL-4-SWA-3	1/2-13	2	1-3/8	1-1/8	1.50	1-1/8	3.88	3/4	2-1/8	3/16	.44	11/16	.31	1-3/4	1/4 or M6	2	1/2	5/16	1	1-5/16	1-1/8
CL-5-SWA-3		2-1/2																			
CL-2-SWA-3	5/8-11	3	1-1/2	1-1/4	1.59	1-5/16	4.56	15/16	2-3/4	7/32	.58	1	.53	2-1/4	3/8 or M10	2-1/4	3/4	3/8	1-5/16	1-3/4	1-1/2
CL-3-SWA-3		4																			



Ball Handle
Flange Mounted





Same as above, except with a sliding ball handle for increased leverage.

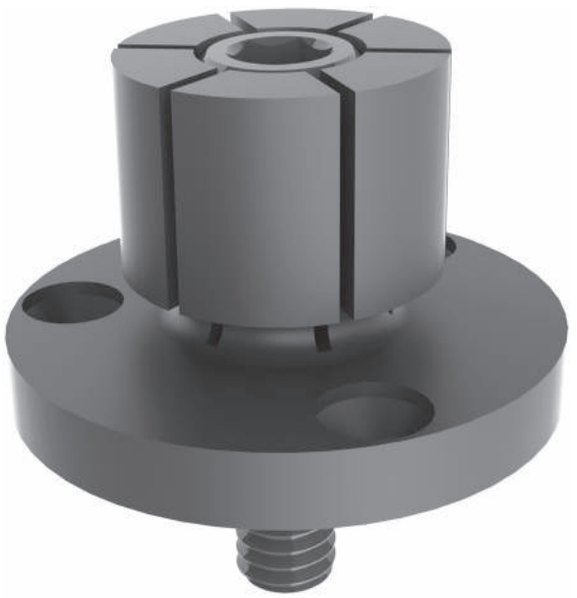
BALL HANDLE, FLANGE MOUNTED

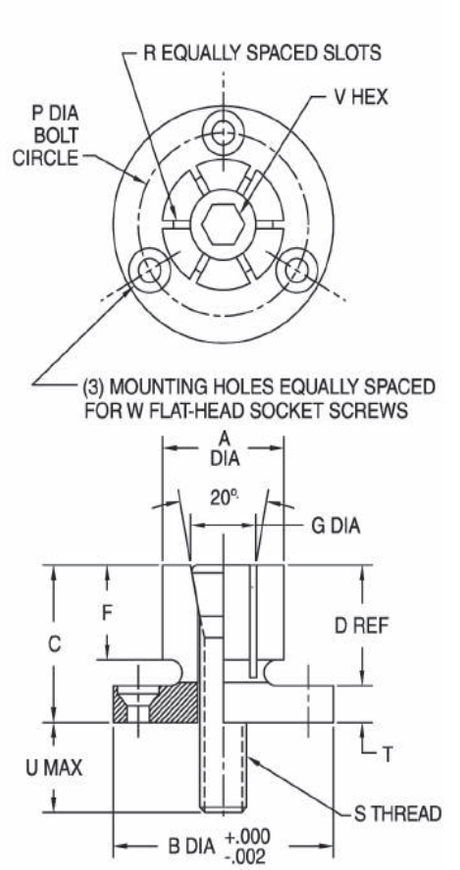
PART NO.	D THREAD SIZE	A	B	C	E	F	G	H DIA	J	K	L	M	N	P	Q	R	S	T	U	V	W	X
CL-1-SWA-4	5/16-18	1-1/2	1	3/4	.88	3/4	2.39	1/2	2-1/4	5/32	.33	1/2	.25	1-1/4	#10 or M5	1-1/2	3/8	1/4	11/16	15/16	3/4	3/4
CL-4-SWA-4	1/2-13	2	1-3/8	1-1/8	.96	1-1/8	3.53	3/4	2-5/8	3/16	.44	11/16	.31	1-3/4	1/4 or M6	2	1/2	5/16	1	1-5/16	1-1/8	1
CL-5-SWA-4		2-1/2																				
CL-2-SWA-4	5/8-11	3	1-1/2	1-1/4	1.65	1-5/16	4.50	15/16	3	7/32	.58	1	.53	2-1/4	3/8 or M10	2-1/4	3/4	3/8	1-5/16	1-3/4	1-1/2	1-3/8
CL-3-SWA-4		4																				

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ID CLAMPS

BODY: 12L14 STEEL, BLACK OXIDE FINISH
CENTER SCREW: ALLOY STEEL, BLACK OXIDE FINISH
MOUNTING SCREWS: ALLOY STEEL, BLACK OXIDE FINISH





ID Clamps expand to self-center and clamp on the inside diameter of a workpiece, leaving the outside clear for machining. Tightening the tapered center screw with a hex wrench pushes the clamping segments outward, and slightly downward, to exert force on the workpiece's internal bore. These clamps are designed to have their outside diameter finish machined by the customer to suit the bore size, because maximum diameter expansion is limited (.006 to .025", depending on the size). ID Clamps allow close mounting for multi-part machining on vertical and horizontal machining centers. Available in seven sizes to hold any inside diameter from .26" to 2.06". Made in USA.

For maximum locational accuracy, machine a recess in the fixture base to fit exactly with the clamp's close-tolerance flange diameter. Flat-head mounting screws are furnished. Please note, ID Clamps provide mostly radial clamping force; therefore the workpiece must be firmly supported underneath – by resting directly on the clamp's mounting flange, the fixture base, or fixed rest pads.

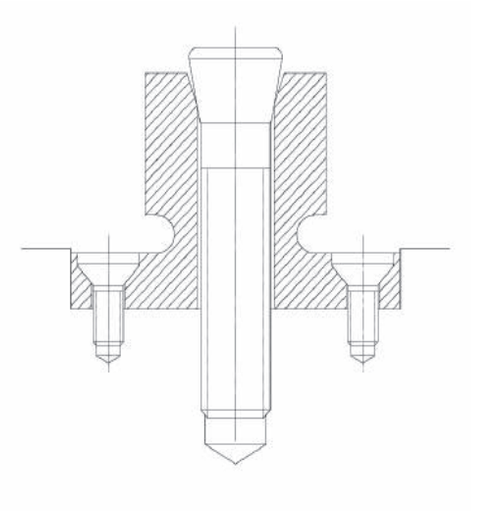
Before finish machining the clamp's outside diameter on a lathe or milling machine, expand the clamp slightly (.002 - .003") from its relaxed diameter by tightening the tapered center screw. Secure with a jam nut if necessary. Reduce the outside diameter only as much as required to achieve smooth workpiece loading, always staying within the expansion range for that clamp size.

INCH

PART NO.	A DIA		B DIA	C	D	F	G DIA	P DIA	R	S	T	U	V	W	DIAMETER EXPANSION RANGE	RECOM-MENDED TORQUE (FT-LBS)	RADIAL HOLDING FORCE (LBS)
	BEFORE MACHINING	MINIMUM AFTER MACHINING															
CL-8-IDC	.500	.260	1.170	.86	.63	.57	.24	.825	4	#8-32	.230	.29	7/64	#6-32	.006	3.6	950
CL-10-IDC	.625	.370	1.240	.99	.76	.58	.36	.910	4	1/4-20	.230	.53	3/16	#6-32	.008	13	1900
CL-13-IDC	.813	.440	1.476	1.00	.77	.59	.43	1.140	6	5/16-18	.230	.60	1/4	#6-32	.010	28	2500
CL-18-IDC	1.125	.580	1.968	1.14	.90	.69	.57	1.550	6	3/8-16	.245	.77	5/16	#8-32	.014	49	4500
CL-22-IDC	1.390	.710	2.205	1.25	1.00	.81	.70	1.790	6	1/2-13	.250	.78	3/8	#8-32	.017	120	5900
CL-27-IDC	1.688	.910	2.736	1.56	1.25	1.06	.87	2.200	6	5/8-11	.310	.84	1/2	#10-32	.020	224	10000
CL-33-IDC	2.063	.910	2.972	1.56	1.25	1.06	.87	2.515	6	5/8-11	.310	.85	1/2	#10-32	.025	224	10000

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BODY: 12L14 STEEL, BLACK OXIDE FINISH
CENTER SCREW: ALLOY STEEL, BLACK OXIDE FINISH
MOUNTING SCREWS: ALLOY STEEL, BLACK OXIDE FINISH



For maximum locational accuracy, machine a recess in the fixture base to fit exactly with the clamp's close-tolerance flange diameter. Flat-head mounting screws are furnished.



Each of these workpieces is clamped by two ID Clamps – a large clamp in the large bore and a small clamp in the slot. The large clamp is also the primary locator, so would be tightened first. The small clamp is also the secondary (radial or "clocking") locator, so would be tightened second. By using ID Clamps, the workpiece's entire outer surface is accessible for machining.

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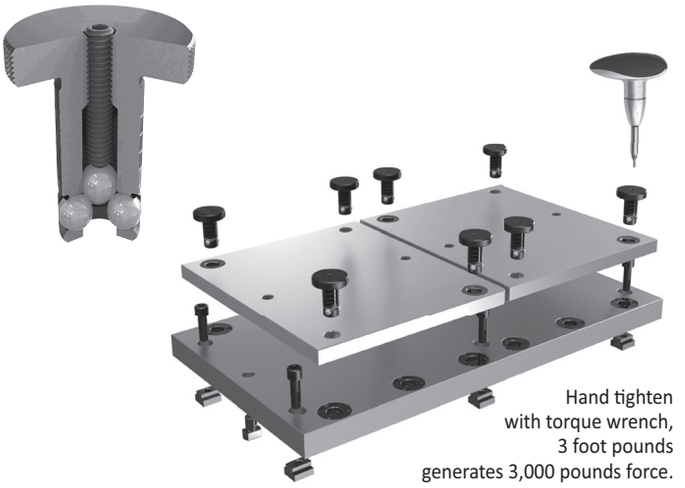
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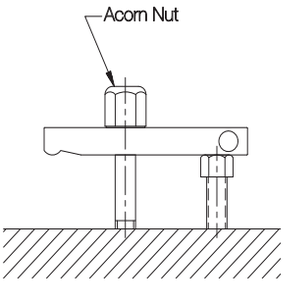
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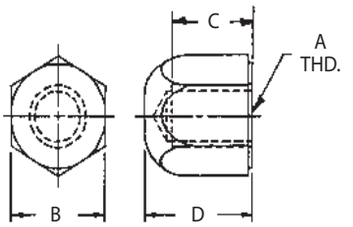
ACORN NUTS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Closed end covers the end of a stud to prevent snags or thread damage.





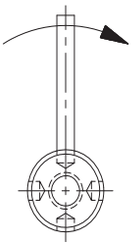
INCH

PART NO.	A	B	C	D
CL-0-AN	1/4-20	1/2	3/8	1/2
CL-1-AN	5/16-18	5/8	13/32	5/8
CL-5-AN	3/8-16	3/4	7/16	3/4
CL-2-AN	1/2-13	7/8	9/16	15/16
CL-3-AN	5/8-11	1-1/16	13/16	1-3/16
CL-4-AN	3/4-10	1-1/4	1	1-3/8

KNURLED NUTS

12L14 STEEL, BLACK OXIDE FINISH





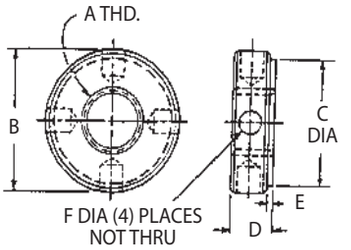
Heavy lock nut that can be tightened by hand or with an extension rod (1/4" or 6mm diameter). Large contact surface.

INCH

PART NO.	A	B DIA	C DIA	D	E	F DIA
CL-0-KN	1/4-20	1-1/8	1	7/16	1/16	.257
CL-00-KN	5/16-18					
CL-1-KN	3/8-16					
CL-2-KN	1/2-13					
CL-3-KN	5/8-11	1-3/8				

METRIC

CLM-6-KN	M6	1.12	.98	.43	.80	.256
CLM-8-KN	M8					
CLM-10-KN	M10					
CLM-12-KN	M12					
CLM-16-KN	M16	1.38				



KNURLED CHECK NUTS

12L14 STEEL, BLACK OXIDE FINISH



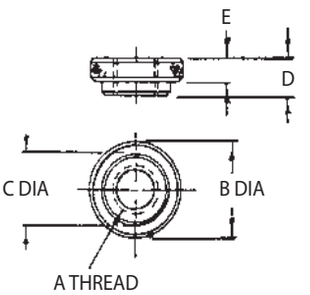
Multipurpose lock nut for finger tightening.

INCH

PART NO.	A	B DIA	C DIA	D	E
CL-1024-TSJN	#10-24	3/4	1/2	1/4	3/16
CL-1032-TSJN	#10-32				
CL-1420-TSJN	1/4-20				
CL-51618-TSJN	5/16-18			5/16	1/4
CL-3816-TSJN	3/8-16				
CL-1213-TSJN	1/2-13	1	3/4	3/8	1/4
CL-5811-TSJN	5/8-11				

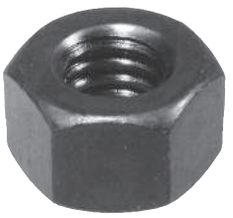
METRIC

CLM-5-TSJN	M5	.75	.51	.24	.20
CLM-6-TSJN	M6				
CLM-8-TSJN	M8			.31	.28
CLM-10-TSJN	M10				
CLM-12-TSJN	M12	.98	.75	.39	.31
CLM-16-TSJN	M16				

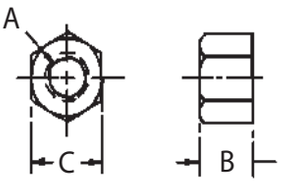


HEX NUTS

STEEL: MILD STEEL, BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES, PASSIVATE FINISH



High-quality heavy Hex Nut, available in steel or stainless steel.



INCH

STEEL PART NO.	STAINLESS STEEL PART NO.	A THREAD	B	C
CL-4-HN	CL-4-HN-S	1/4-20	15/64	1/2
CL-5-HN	CL-5-HN-S	5/16-18	19/64	9/16
CL-6-HN	CL-6-HN-S	3/8-16	23/64	11/16
CL-8-HN	CL-8-HN-S	1/2-13	31/64	7/8
CL-10-HN	CL-10-HN-S	5/8-11	39/64	1-1/16
CL-12-HN	CL-12-HN-S	3/4-10	47/64	1-1/4
CL-14-HN	—	7/8-9	55/64	1-7/16
CL-16-HN	—	1"-8	63/64	1-5/8
CL-20-HN	—	1-1/4"-7	1-7/32	2

INCH FINE

CL-4-FHN	CL-4-FHN-S	1/4-28	7/32	7/16
CL-5-FHN	CL-5-FHN-S	5/16-24	17/64	1/2
CL-6-FHN	CL-6-FHN-S	3/8-24	21/64	9/16
CL-8-FHN	CL-8-FHN-S	1/2-20	7/16	3/4
CL-10-FHN	—	5/8-18	35/64	15/16
CL-12-FHN	—	3/4-16	41/64	1-1/8

METRIC

STEEL PART NO.	STAINLESS STEEL PART NO.	A THREAD	B	C
CLM-6-HN	—	M6	.20	10mm
CLM-8-HN	—	M8	.26	13mm
CLM-10-HN	—	M10	.31	17mm
CLM-12-HN	—	M12	.39	19mm
CLM-16-HN	—	M16	.51	24mm
CLM-20-HN	—	M20	.63	30mm
CLM-24-HN	—	M24	.75	36mm
CLM-30-HN	—	M30	.94	46mm

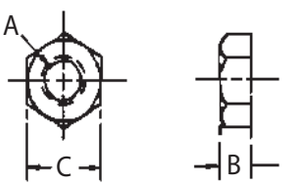
7

JAM NUTS

STEEL: MILD STEEL, BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES, PASSIVATE FINISH



High-quality heavy Jam Nut, available in steel or stainless steel.



INCH

STEEL PART NO.	STAINLESS STEEL PART NO.	A THREAD	B	C
—	CL-2-JN-S	#8-32	1/8	11/32
—	CL-3-JN-S	#10-24	1/8	3/8
CL-4-JN	CL-4-JN-S	1/4-20	11/64	1/2
CL-5-JN	CL-5-JN-S	5/16-18	13/64	9/16
CL-6-JN	CL-6-JN-S	3/8-16	15/64	11/16
CL-8-JN	—	1/2-13	19/64	7/8
CL-10-JN	—	5/8-11	23/64	1-1/16
CL-12-JN	—	3/4-10	27/64	1-1/4
CL-14-JN	—	7/8-9	31/64	1-7/16
CL-16-JN	—	1"-8	35/64	1-5/8

INCH FINE

CL-3-FJN	CL-3-FJN-S	#10-32	1/8	3/8
CL-4-FJN	CL-4-FJN-S	1/4-28	5/32	7/16
CL-5-FJN	CL-5-FJN-S	5/16-24	3/16	1/2
CL-6-FJN	CL-6-FJN-S	3/8-24	7/32	9/16

METRIC

STEEL PART NO.	STAINLESS STEEL PART NO.	A THREAD	B	C
—	CLM-4-JN-S	M4	.08	7mm
—	CLM-5-JN-S	M5	.10	8mm
CLM-6-JN	CLM-6-JN-S	M6	.13	10mm
CLM-8-JN	CLM-8-JN-S	M8	.16	13mm
CLM-10-JN	CLM-10-JN-S	M10	.20	17mm
CLM-12-JN	CLM-12-JN-S	M12	.24	19mm
CLM-16-JN	CLM-16-JN-S	M16	.31	24mm
CLM-20-JN	CLM-20-JN-S	M20	.39	30mm
CLM-24-JN	—	M24	.47	36mm

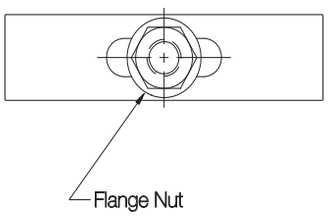
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FLANGE NUTS

STEEL: 12L14, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES, PASSIVATE FINISH

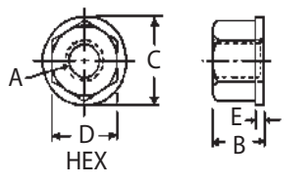


Flanged face provides a large bearing surface to avoid damaging the part underneath, especially when clamping over a slot. Precision machined from one solid piece of steel for extra strength.



INCH

STEEL PART NO.	STAINLESS STEEL PART NO.	A	B	C DIA	D	E
—	CL-123	#10-24	5/16	1/2	3/8	.08
—	CL-125	1/4-20	5/16	9/16	7/16	
CL-1-FN	—			5/8	1/2	.12
—	CL-126	5/16-18	3/8	11/16	9/16	.09
CL-9-FN	—			3/4		.12
CL-2-FN	CL-127	3/8-16	1/2	7/8	11/16	.12
CL-3-FN	CL-128	1/2-13	11/16	1-1/8	7/8	.20
CL-4-FN	CL-129	5/8-11	13/16	1-3/8	1-1/16	
CL-5-FN	—	3/4-10	1	1-5/8	1-1/4	.25
CL-6-FN	—	7/8-9	1-1/8	1-3/4	1-7/16	.32
CL-7-FN	—	1"-8	1-1/4	2	1-5/8	.28
CL-10-FN	—	1-1/4"-7	1-3/8	2-1/4	1-13/16	.25



INCH FINE

—	CL-124	#10-32	5/16	1/2	3/8	.08
CL-1-FFN	—	1/4-28		5/8	1/2	.12
CL-2-FFN	—	3/8-24	1/2	7/8	11/16	
CL-3-FFN	—	1/2-20	11/16	1-1/8	7/8	.20
CL-4-FFN	—	5/8-18	13/16	1-3/8	1-1/16	
CL-5-FFN	—	3/4-16	1	1-5/8	1-1/4	.25
CL-7-FFN	—	1"-14	1-1/4	2	1-5/8	.25

METRIC

CLM-6-FN	—	M6	.31	.63	10mm	.12
CLM-8-FN	—	M8	.39	.75	13mm	
CLM-10-FN	—	M10	.51	.87	17mm	
CLM-12-FN	—	M12	.67	1.10	19mm	.20
CLM-16-FN	—	M16	.83	1.34	24mm	
CLM-20-FN	—	M20	.98	1.61	30mm	.24
CLM-24-FN	—	M24	1.26	2.01	36mm	.28

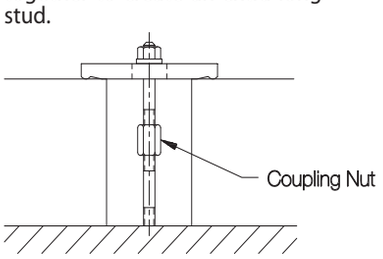
7

COUPLING NUTS

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



For joining two or more studs together to create an extra-long stud.

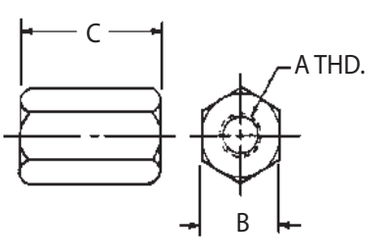


INCH

PART NO.	A	B	C
CL-0-CN	1/4-20	1/2	5/8
CL-00-CN	5/16-18	9/16	7/8
CL-1-CN	3/8-16	11/16	1
CL-2-CN	1/2-13	7/8	1-1/4
CL-3-CN	5/8-11	1-1/16	1-5/8
CL-4-CN	3/4-10	1-1/4	1-7/8
CL-6-CN	1"-8	1-5/8	2-1/2

METRIC

CLM-6-CN	M6	10mm	.71
CLM-8-CN	M8	13mm	.79
CLM-10-CN	M10	17mm	.98
CLM-12-CN	M12	19mm	1.18
CLM-16-CN	M16	24mm	1.57
CLM-20-CN	M20	30mm	1.97

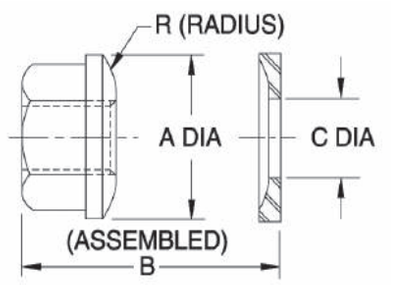


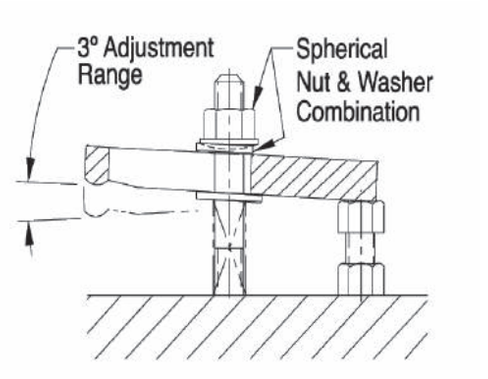
SPHERICAL NUTS AND WASHERS

STEEL: 12L14, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES, PASSIVATED



Combination nut and washer that compensates whenever a stud and clamp strap are not perpendicular. The nut has a convex spherical radius, while the washer has a matching concave spherical radius.





STEEL (INCH)

PART NO.	THREAD	HEX	A DIA	B	C DIA	R
CL-1-SNW	1/4-20	1/2	5/8	15/32	5/16	3/4
CL-9-SNW	5/16-18	9/16	3/4	17/32	3/8	1
CL-2-SNW	3/8-16	11/16	7/8	19/32	7/16	1-1/4
CL-3-SNW	1/2-13	7/8	1-1/8	7/8	9/16	1-1/2
CL-4-SNW	5/8-11	1-1/16	1-3/8	1	11/16	1-3/4
CL-5-SNW	3/4-10	1-1/4	1-5/8	1-3/16	7/8	2-1/4
CL-6-SNW	7/8-9	1-7/16	1-3/4	1-5/16	1	2-1/2
CL-7-SNW	1"-8	1-5/8	2	1-7/16	1-1/8	2-3/4

STAINLESS STEEL (INCH)

PART NO.	THREAD	HEX	A DIA	B	C DIA	R
CL-1-SNW-S	1/4-20	1/2	5/8	15/32	5/16	3/4
CL-9-SNW-S	5/16-18	9/16	3/4	17/32	3/8	1
CL-2-SNW-S	3/8-16	11/16	7/8	19/32	7/16	1-1/4
CL-3-SNW-S	1/2-13	7/8	1-1/8	7/8	9/16	1-1/2
CL-4-SNW-S	5/8-11	1-1/16	1-3/8	1	11/16	1-3/4
CL-5-SNW-S	3/4-10	1-1/4	1-5/8	1-3/16	7/8	2-1/4

STEEL (METRIC)

PART NO.	THREAD	HEX	A DIA	B	C DIA	R
CLM-6-SNW	M6	10mm	5/8	.47	5/16	3/4
CLM-8-SNW	M8	13mm	3/4	.55	3/8	1
CLM-10-SNW	M10	17mm	7/8	.69	7/16	1-1/4
CLM-12-SNW	M12	19mm	1-1/8	.87	9/16	1-1/2
CLM-16-SNW	M16	24mm	1-3/8	.98	11/16	1-3/4
CLM-20-SNW	M20	30mm	1-5/8	1.18	7/8	2-1/4
CLM-24-SNW	M24	36mm	2	1.41	1	2-3/4

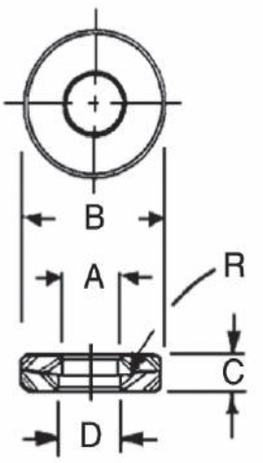
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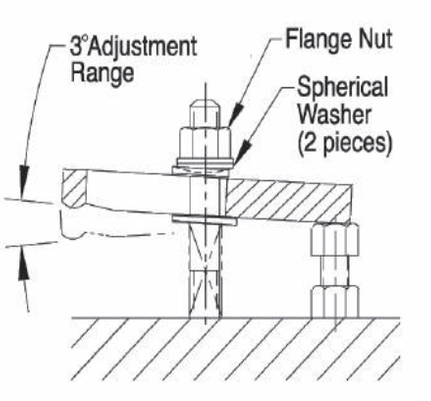
SPHERICAL WASHERS

STEEL: 12L14, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES, PASSIVATED



Two-piece washer that compensates whenever a stud and clamp strap are not perpendicular. The top washer has a convex spherical radius, while the bottom washer has a matching concave spherical radius.





STEEL

PART NO.	BOLT SIZE	A DIA	B DIA	C	D DIA	R
CL-1-SW	1/4 & M6	9/32	5/8	3/16	5/16	3/4
CL-11-SW	5/16 & M8	11/32	3/4	1/4	3/8	1
CL-2-SW	3/8 & M10	13/32	7/8	1/4	7/16	1-1/4
CL-3-SW	1/2 & M12	17/32	1-1/8	5/16	9/16	1-1/2
CL-4-SW	5/8 & M16	21/32	1-3/8		11/16	1-3/4
CL-5-SW	3/4 & M18	25/32	1-5/8	3/8	7/8	2-1/4
CLM-20-SW	M20	.83			7/8	
CL-6-SW	7/8 & M22	15/16	1-3/4		1	2-1/2
CL-7-SW	1 & M24	1-1/16	2	1/2	1-1/8	2-3/4
CL-8-SW	1-1/8	1-3/16	2-1/4		1-1/4	3
CL-9-SW	1-1/4 & M30	1-5/16	2-5/8		1-3/8	
CL-10-SW	1-1/2 & M36	1-9/16	2-7/8		1-5/8	

STAINLESS STEEL

PART NO.	BOLT SIZE	A DIA	B DIA	C	D DIA	R
CL-144	#10 & M5	7/32	1/2	1/8	1/4	3/4
CL-145	1/4 & M6	9/32	5/8	3/16	5/16	
CL-146	5/16 & M8	11/32	13/16	7/32	3/8	1
CL-147	3/8 & M10	13/32	1	1/4	7/16	1-1/4
CL-148	1/2 & M12	17/32	1-1/8	5/16	9/16	1-1/2
CL-149	5/8 & M16	21/32	1-3/8		11/16	1-3/4
CL-150	3/4 & M18	25/32	1-5/8	3/8	7/8	2-1/4

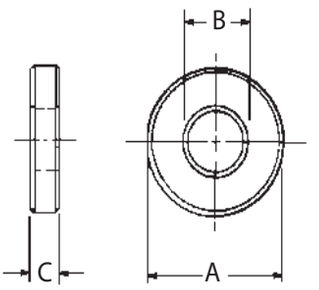
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FLAT WASHERS

STEEL: 1010, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES



Thick, heavy-duty washer with both faces held flat and parallel. Available in steel or stainless steel.



INCH & METRIC

STEEL PART NO.	STAINLESS STEEL PART NO.	BOLT SIZE	A DIA	B DIA	C
—	CL-254	#10 or M5	7/16	7/32	5/64
—	CL-255	1/4 or M6	1/2	9/32	5/64
CL-7-FW	—		5/8		1/8
—	CL-256	5/16 or M8	5/8	11/32	3/32
CL-14-FW	—		3/4		1/8
—	CL-257	3/8 or M10	3/4	13/32	3/32
CL-1-FW	—		7/8		1/8
CL-8-FW	—		1		3/16
CL-2-FW	—	1/2 or M12	1-1/8	17/32	1/8
CL-9-FW	CL-258				3/16
CL-3-FW	—	5/8 or M16	1-3/8	21/32	1/8
CL-10-FW	CL-259				3/16
CL-4-FW	—	3/4 or M18	1-5/8	25/32	5/32
CL-11-FW	CL-260				1/4
CLM-10-FW	—	M20	1-5/8	.827	1/4
CL-13-FW	—	7/8 or M22	1-3/4	29/32	1/4
CL-12-FW	—	1	2	1-1/32	9/32

7

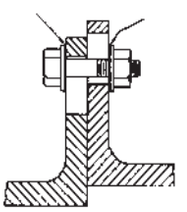
KNURLED-FACE WASHERS

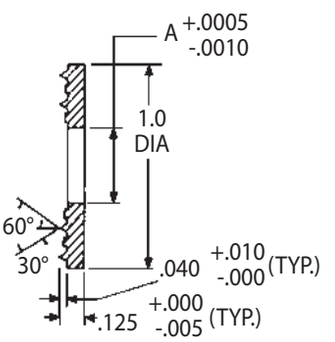
4130 STEEL, HEAT TREATED 125,000-140,000 PSI PER MIL-H-6875, ZINC PLATED YELLOW CHROMATE

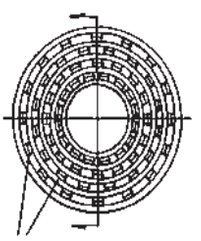


Flat washer with a serrated face to prevent two parts from sliding in relation to each other. Close tolerance on washer ID prevents the stud from slipping.

Serrated Washers
Teeth Facing Inward







64 TEETH, 16 EQUALLY SPACED
ON EACH DIAMETER WITH
ALTERNATE ROWS STAGGERED

INCH

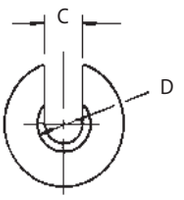
PART NO.	BOLT DIA	A DIA
CL-3-KFW	#10	.1935
CL-4-KFW	1/4	.2500

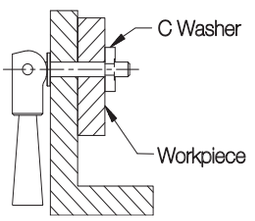
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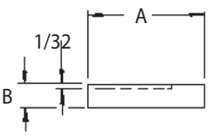
C WASHERS

STEEL: 12L14, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES









FINE KNURL
ON STAINLESS
WASHERS

Washer that slides in and out of position for clear loading. Can be used with a nut, or by sliding it into a radial groove on a drawbar. Available in steel or stainless steel.

INCH & METRIC

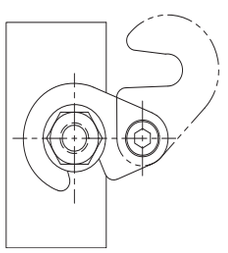
STEEL PART NO.	STAINLESS STEEL PART NO.	BOLT SIZE	A DIA	B	C	D DIA
CL-1-CW	—	#10 or M5	1/2	3/16	13/64	11/32
CL-3-CW	—	1/4 or M6	3/4	1/4	17/64	13/32
—	CL-155		7/8	3/16	9/32	25/64
CL-18-CW	—		1	1/4	17/64	13/32
CL-5-CW	—	5/16 or M8	1	3/16	21/64	1/2
—	CL-157	3/8 or M10	1-1/4	5/16	13/32	5/8
CL-6-CW	—			3/8		23/32
CL-7-CW	—		1-1/2	3/8		23/32
CL-22-CW	—		1-3/4	1/4		
CL-8-CW	—	1/2 or M12	1-7/8	3/8	17/32	29/32
CL-24-CW	—		2-1/4			
CL-9-CW	—	5/8 or M16	2-1/8	3/8	21/32	1-3/32
CL-26-CW	—		2-1/2	7/16		
CL-11-CW	—	3/4 or M18	2-1/2	7/16	25/32	1-9/32
CL-12-CW	—	1 or M24	2-1/2	7/16	1-1/32	1-21/32
CL-15-CW	—		1/2	1/2	1-1/32	1-21/32

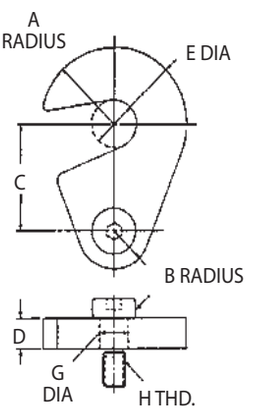
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SWING C WASHERS

1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH







Permanently attached C washer that swings out of the way for clear loading. Can be reversed to swing into position either clockwise or counterclockwise. Shoulder Screw furnished.

INCH

PART NO.	STUD SIZE	A	B	C	D	E DIA	G DIA	H	SHOULDER SCREW (FURNISHED)
CL-1-SCW	3/8	3/4	3/8	1	1/4	13/32	3/8	5/16-18	CL-24-SS
CL-2-SCW	1/2	1	1/2	1-1/4	3/8	17/32			CL-2-SS
CL-3-SCW	5/8	1-1/8	9/16	1-1/2	3/8	21/32	1/2	3/8-16	CL-3-SS
CL-4-SCW	3/4	1-1/4	5/8	1-3/4	1/2	13/16			CL-4-SS

METRIC

CLM-1-SCW	M10	3/4	3/8	1	.236	13/32	10mm	M8	CLM-1006-SS
CLM-2-SCW	M12	1	1/2	1-1/4	.375	17/32			CLM-1010-SS

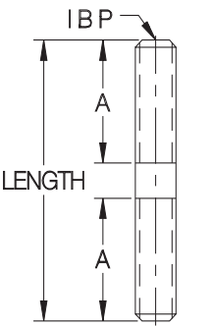
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CLAMPING STUDS

STEEL: 1144 STEEL, 100,000 PSI MIN. YIELD, 115,000 PSI MIN. TENSILE, BLACK OXIDE FINISH
STAINLESS STEEL: 300 SERIES



High-strength general-purpose Clamping Stud, for use with a T Nut, or for installation directly into a fixture plate. Available in thread sizes from 1/4-20 to 1″-8 (M6 to M20 in metric), each in a choice of several lengths. Now also available in stainless steel, in 3/8-16, 1/2-13, and 5/8-11 thread sizes (**INFO+**: for smaller stainless sizes, see Fixture Studs, page 319).



STEEL (INCH)

PART NO.	THREAD SIZE	LENGTH	A
CL-1/4-20X1.50-STUD	1/4-20	1.50	5/8
CL-1/4-20X2.00-STUD		2.00	7/8
CL-1/4-20X2.50-STUD		2.50	1
CL-1/4-20X3.00-STUD		3.00	
CL-1/4-20X3.50-STUD		3.50	
CL-1/4-20X4.00-STUD		4.00	
CL-5/16-18X1.50-STUD	5/16-18	1.50	9/16
CL-5/16-18X2.00-STUD		2.00	13/16
CL-5/16-18X2.50-STUD		2.50	1-1/16
CL-5/16-18X3.00-STUD		3.00	1-1/8
CL-5/16-18X3.50-STUD		3.50	
CL-5/16-18X4.00-STUD		4.00	
CL-5/16-18X6.00-STUD		6.00	
CL-3/8-16X1.50-STUD	3/8-16	1.50	9/16
CL-3/8-16X2.00-STUD		2.00	13/16
CL-3/8-16X2.50-STUD		2.50	1-1/16
CL-3/8-16X3.00-STUD		3.00	1-1/4
CL-3/8-16X3.50-STUD		3.50	
CL-3/8-16X4.00-STUD		4.00	
CL-3/8-16X4.50-STUD		4.50	
CL-3/8-16X5.00-STUD		5.00	
CL-3/8-16X5.50-STUD		5.50	
CL-3/8-16X6.00-STUD		6.00	
CL-3/8-16X7.00-STUD		7.00	
CL-3/8-16X8.00-STUD		8.00	
CL-1/2-13X2.00-STUD	1/2-13	2.00	3/4
CL-1/2-13X2.50-STUD		2.50	1
CL-1/2-13X3.00-STUD		3.00	1-1/4
CL-1/2-13X3.50-STUD		3.50	1-1/2
CL-1/2-13X4.00-STUD		4.00	
CL-1/2-13X4.50-STUD		4.50	
CL-1/2-13X5.00-STUD		5.00	
CL-1/2-13X5.50-STUD		5.50	
CL-1/2-13X6.00-STUD		6.00	
CL-1/2-13X6.50-STUD		6.50	
CL-1/2-13X7.00-STUD		7.00	
CL-1/2-13X7.50-STUD		7.50	
CL-1/2-13X8.00-STUD		8.00	
CL-1/2-13X9.00-STUD		9.00	2
CL-1/2-13X12.00-STUD		12.00	

STEEL (INCH) (Cont.)

PART NO.	THREAD SIZE	LENGTH	A
CL-5/8-11X2.50-STUD	5/8-11	2.50	15/16
CL-5/8-11X3.00-STUD		3.00	1-3/16
CL-5/8-11X3.50-STUD		3.50	1-7/16
CL-5/8-11X4.00-STUD		4.00	1-11/16
CL-5/8-11X4.50-STUD		4.50	1-3/4
CL-5/8-11X5.00-STUD		5.00	
CL-5/8-11X5.50-STUD		5.50	
CL-5/8-11X6.00-STUD		6.00	
CL-5/8-11X6.50-STUD		6.50	
CL-5/8-11X7.00-STUD		7.00	
CL-5/8-11X7.50-STUD		7.50	
CL-5/8-11X8.00-STUD		8.00	
CL-5/8-11X9.00-STUD		9.00	2
CL-5/8-11X10.00-STUD		10.00	
CL-5/8-11X12.00-STUD		12.00	
CL-5/8-11X14.00-STUD		14.00	
CL-3/4-10X3.00-STUD	3/4-10	3.00	1-1/8
CL-3/4-10X3.50-STUD		3.50	1-3/8
CL-3/4-10X4.00-STUD		4.00	1-5/8
CL-3/4-10X5.00-STUD		5.00	2
CL-3/4-10X6.00-STUD		6.00	
CL-3/4-10X7.00-STUD		7.00	
CL-3/4-10X8.00-STUD		8.00	
CL-3/4-10X9.00-STUD		9.00	
CL-3/4-10X10.00-STUD		10.00	
CL-3/4-10X12.00-STUD		12.00	
CL-7/8-9X5.00-STUD	7/8-9	5.00	2-1/16
CL-1-8X5.00-STUD	1″-8	5.00	2
CL-1-8X6.00-STUD		6.00	2-1/2
CL-1-8X8.00-STUD		8.00	
CL-1-8X10.00-STUD		10.00	

STAINLESS STEEL (INCH)

PART NO.	THREAD SIZE	LENGTH	A
CL-1/2-13X2.00-STUD-S	1/2-13	2.00	3/4
CL-1/2-13X3.00-STUD-S		3.00	1-1/4
CL-1/2-13X4.00-STUD-S		4.00	1-1/2
CL-1/2-13X5.00-STUD-S		5.00	

STEEL (METRIC)

CLM-6X-50-STUD	M6	1.97 (50mm)	.87
CLM-6X-65-STUD		2.56 (65mm)	1.06
CLM-8X-50-STUD	M8	1.97 (50mm)	.83
CLM-8X-65-STUD		2.56 (65mm)	1.14
CLM-8X-80-STUD		3.15 (80mm)	1.22
CLM-10X-50-STUD	M10	1.97 (50mm)	.79
CLM-10X-80-STUD		3.15 (80mm)	1.38
CLM-10X-95-STUD		3.74 (95mm)	
CLM-10X-110-STUD		4.33 (110mm)	
CLM-10X-125-STUD		4.92 (125mm)	
CLM-10X-150-STUD		5.91 (150mm)	
CLM-10X-175-STUD		6.89 (175mm)	
CLM-10X-200-STUD		7.87 (200mm)	
CLM-12X-65-STUD	M12	2.56 (65mm)	1.04
CLM-12X-80-STUD		3.15 (80mm)	1.34
CLM-12X-95-STUD		3.74 (95mm)	1.54
CLM-12X-110-STUD		4.33 (110mm)	
CLM-12X-125-STUD		4.92 (125mm)	
CLM-12X-150-STUD		5.91 (150mm)	
CLM-12X-175-STUD		6.89 (175mm)	
CLM-12X-200-STUD		7.87 (200mm)	
CLM-16X-80-STUD	M16	3.15 (80mm)	1.26
CLM-16X-95-STUD		3.74 (95mm)	1.56
CLM-16X-110-STUD		4.33 (110mm)	1.85
CLM-16X-125-STUD		4.92 (125mm)	
CLM-16X-150-STUD		5.91 (150mm)	
CLM-16X-175-STUD		6.89 (175mm)	
CLM-16X-200-STUD		7.87 (200mm)	
CLM-20X-80-STUD	M20	3.15 (80mm)	1.18
CLM-20X-95-STUD		3.74 (95mm)	1.48
CLM-20X-110-STUD		4.33 (110mm)	1.77
CLM-20X-125-STUD		4.92 (125mm)	2.07
CLM-20X-150-STUD		5.91 (150mm)	2.17
CLM-20X-175-STUD		6.89 (175mm)	
CLM-20X-200-STUD		7.87 (200mm)	

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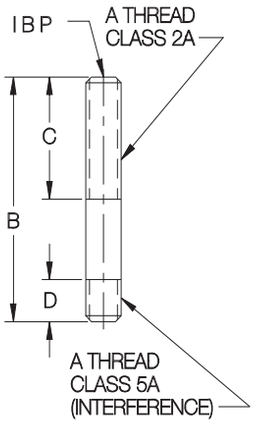
FIXTURE STUDS

300-SERIES STAINLESS STEEL, PASSIVATED



Stainless Steel

Fixture Studs have a thread-locking interference thread at the bottom end to install permanently in a fixture plate. These small sizes are designed specifically for mini-size stainless clamp straps. Available in thread sizes from #10-32 to 3/8-16, each in a choice of several lengths.

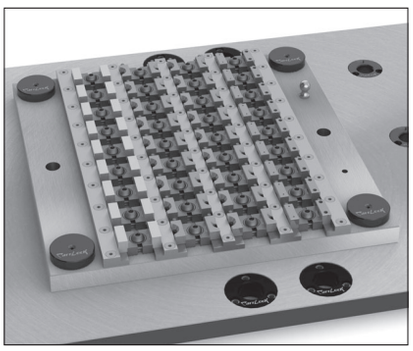


INCH

PART NO.	A	B	C	D
CL-11415	#10-32	1-1/2	3/4	7/32
CL-11515	1/4-20	1-1/2	5/8	9/32
CL-11520		2	3/4	
CL-11530		3	1	
CL-11615	5/16-18	1-1/2	5/8	11/32
CL-11620		2	1	
CL-11625		2-1/2	1-1/4	
CL-11715	3/8-16	1-1/2	3/4	11/32
CL-11725		2-1/2	1-1/4	
CL-11730		3	1-3/8	
CL-11740		4	1-1/2	

TINY VISE® Edge Clamps

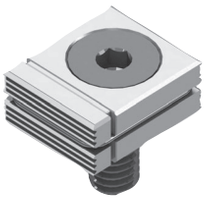
Perfect for High Density Machining!



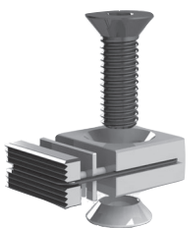
Strong Clamping Action For Fixturing Small Parts

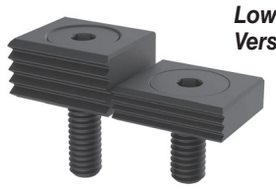
- Clamping force is applied with the easy turn of a hex wrench
- Only Tiny Vise® Edge Clamps truly exert down thrust force on the workpiece, to prevent it from lifting
- Patented, more durable than similar clamps
- Wide range of sizes. Standard versions include regular single, v-jaw single, regular double, and v-jaw double.
- Newer versions include low profile and modular jaw styles.





Modular Jaw Version





Low Profile Version

See Pages 282-290

Get quote

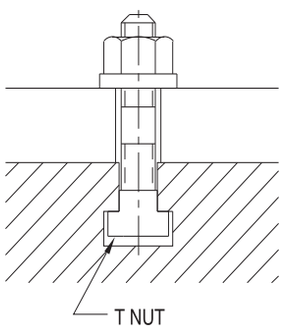
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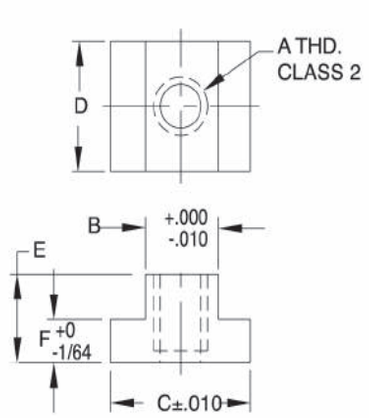
T NUTS

STEEL: MILD STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS: 300-SERIES STAINLESS STEEL, PASSIVATED



Sizes for all standard machine tables. Safety-stop feature prevents breaking the machine-table slot. Threads stop one short of going through T Nut to prevent a stud from jacking the nut out of the table.





STEEL (INCH)

PART NO.	TABLE SLOT SIZE	A	B	C	D	E	F
CL-26-TN	5/16 or 8mm	1/4-20	.307	9/16	9/16	1/4	3/16
CL-18-TN	3/8 or 10mm	1/4-20	.370	5/8	7/8	7/16	7/32
CL-19-TN		5/16-18					
CL-20-TN	7/16	5/16-18	.432	11/16	7/8	1/2	
CL-00-TN		3/8-16					
CL-12-TN	12mm	3/8-16	.467	3/4	3/4	1/2	17/64
CL-21-TN	1/2	5/16-18	.495	7/8	7/8	1/2	9/32
CL-0-TN		3/8-16					
CL-1-TN	9/16 or 14mm	3/8-16	.550		7/8	1/2	5/16
CL-9-TN		1/2-13			1-1/8	5/8	11/32
CL-16-TN	5/8 or 16mm	3/8-16	.620	1	1-1/8	5/8	11/32
CL-2-TN		1/2-13					
CL-3-TN	11/16 or 18mm	1/2-13	.682	1-1/8	1-1/4	3/4	7/16
CL-10-TN		5/8-11	.682		1-1/4	3/4	7/16
CL-10A-TN			.675		1-1/2	1-1/8	15/32
CL-17-TN	3/4	1/2-13	.745	1-1/4	1-1/4	3/4	15/32
CL-4-TN		5/8-11					
CL-14-TN	20mm	5/8-11	.782			7/8	
CL-5-TN	13/16	5/8-11	.807	1-1/4	1-1/2	1	9/16
CL-11-TN		3/4-10					
CL-15-TN	22mm	3/4-10	.861	1-1/4	1-1/2	1	1/2
CL-6-TN	7/8	3/4-10	.870	1-1/2			9/16
CL-7-TN	1	3/4-10	.995	1-5/8	1-3/4	1	5/8
CL-22-TN		7/8-9					
CL-8-TN	1-1/16	3/4-10	1.057		2	1-1/8	11/16
CL-23-TN		7/8-9					
CL-24-TN	1-1/8	7/8-9	1.120	1-3/4	2	1-1/2	3/4
CL-25-TN		1"-8					

STAINLESS STEEL (INCH)

PART NO.	TABLE SLOT SIZE	A	B	C	D	E	F
CL-00-STN	7/16	3/8-16	.432	11/16	7/8	1/2	7/32
CL-0-STN	1/2		.495	7/8	7/8	1/2	9/32
CL-1-STN	9/16 or 14mm	3/8-16	.550	7/8	7/8	1/2	5/16
CL-9-STN		1/2-13			1-1/8	5/8	11/32
CL-2-STN	5/8 or 16mm	1/2-13	.620	1	1-1/8	5/8	11/32
CL-3-STN	11/16 or 18mm	1/2-13	.682	1-1/8	1-1/4	3/4	7/16
CL-10-STN		5/8-11					

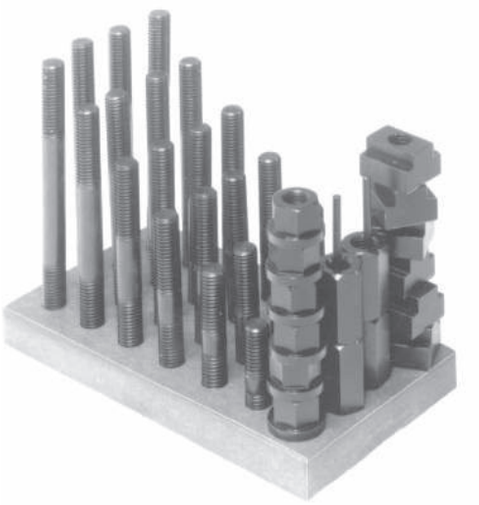
STEEL (METRIC)

PART NO.	TABLE SLOT SIZE	A	B	C	D	E	F
CLM-26-TN	5/16 or 8mm	M6	.307	9/16	9/16	1/4	3/16
CLM-18-TN	3/8 or 10mm	M6	.370	5/8	7/8	7/16	7/32
CLM-19-TN		M8					
CLM-00-TN	12mm	M10	.467	3/4	3/4	1/2	17/64
CLM-0-TN	1/2		.495	7/8	7/8	1/2	9/32
CLM-1-TN	9/16 or 14mm	M10	.546	7/8	7/8	5/8	5/16
CLM-9-TN		M12					
CLM-2-TN	5/8 or 16mm	M12	.620	1	1-1/8	5/8	11/32
CLM-3-TN	11/16 or 18mm	M12	.682	1-1/8	1-1/4	3/4	7/16
CLM-10-TN		M16					
CLM-4-TN	20mm	M16	.782	1-1/4	1-1/4	7/8	15/32
CLM-5-TN	13/16		.807		1-1/2	1	9/16
CLM-6-TN	22mm	M20	.861	1-1/4	1-1/2	1	1/2

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T NUT & STUD SETS

INFO+: SEE PAGES 305, 310 AND 312 FOR MATERIAL SPECIFICATIONS





40-piece set includes a complete range of stud lengths with matching T Nuts, Flange Nuts, and Coupling Nuts — all mounted in a handy wooden holder.

Set includes:
- (4) Studs of each length 3", 4", 5", 6", 7", 8", or 80, 95, 125, 150, 175, 200mm
- (6) T Nuts
- (6) Flange Nuts
- (4) Coupling Nuts
- (1) Handy Holder

INCH

PART NO.	TABLE SLOT SIZE	STUDS (24)	T NUTS (6)	FLANGE NUTS (6)	COUPLING NUTS (4)	HOLDER (1)
CL-1-TNS	7/16	3/8-16	CL-00-TN	CL-2-FN	CL-1-CN	CL-1-TNH
CL-14-TNS	12mm		CL-12-TN			
CL-2-TNS	1/2		CL-0-TN			
CL-3-TNS	9/16 or 14mm	3/8-16	CL-1-TN	CL-2-FN	CL-1-CN	CL-1-TNH
CL-4-TNS		1/2-13	CL-9-TN	CL-3-FN	CL-2-CN	CL-2-TNH
CL-17-TNS	5/8 or 16mm	3/8-16	CL-16-TN	CL-2-FN	CL-1-CN	CL-1-TNH
CL-5-TNS		1/2-13	CL-2-TN	CL-3-FN	CL-2-CN	CL-2-TNH
CL-6-TNS	11/16 or 18mm	1/2-13	CL-3-TN	CL-3-FN	CL-2-CN	CL-2-TNH
CL-7-TNS		5/8-11	CL-10-TN	CL-4-FN	CL-3-CN	CL-3-TNH
CL-18-TNS	3/4	1/2-13	CL-17-TN	CL-3-FN	CL-2-CN	CL-2-TNH
CL-8-TNS		5/8-11	CL-4-TN	CL-4-FN	CL-3-CN	CL-3-TNH
CL-15-TNS	20mm		CL-14-TN			
CL-9-TNS	13/16	5/8-11	CL-5-TN	CL-4-FN	CL-3-CN	CL-3-TNH
CL-10-TNS		3/4-10	CL-11-TN	CL-5-FN	CL-4-CN	CL-4-TNH
CL-16-TNS	22mm	3/4-10	CL-15-TN	CL-5-FN	CL-4-CN	CL-4-TNH
CL-11-TNS	7/8		CL-6-TN			
CL-12-TNS	1		CL-7-TN			
CL-13-TNS	1-1/16		CL-8-TN			

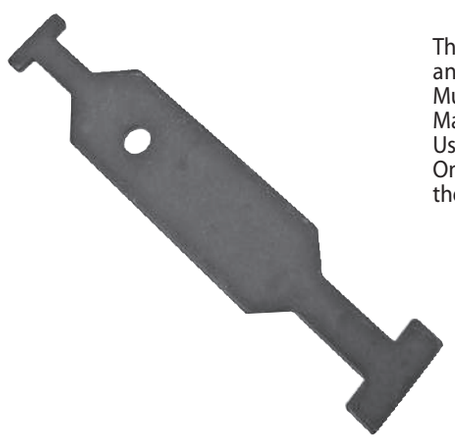
METRIC

CLM-1-TNS	12mm	M10	CLM-00-TN	CLM-10-FN	CLM-10-CN	CL-1-TNH
CLM-2-TNS	1/2		CLM-0-TN			
CLM-3-TNS	9/16 or 14mm	M10	CLM-1-TN	CLM-10-FN	CLM-10-CN	CL-1-TNH
CLM-4-TNS		M12	CLM-9-TN	CLM-12-FN	CLM-12-CN	CL-2-TNH
CLM-5-TNS	5/8 or 16mm	M12	CLM-2-TN	CLM-12-FN	CLM-12-CN	CL-2-TNH
CLM-6-TNS	11/16 or 18mm	M12	CLM-3-TN	CLM-12-FN	CLM-12-CN	CL-2-TNH
CLM-7-TNS		M16	CLM-10-TN	CLM-16-FN	CLM-16-CN	CL-3-TNH
CLM-8-TNS	20mm	M16	CLM-4-TN	CLM-16-FN	CLM-16-CN	CL-3-TNH
CLM-9-TNS	13/16		CLM-5-TN			
CLM-11-TNS	22mm	M20	CLM-6-TN	CLM-20-FN	CLM-20-CN	CL-4-TNH

7

T-SLOT CLEANERS

MILD STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



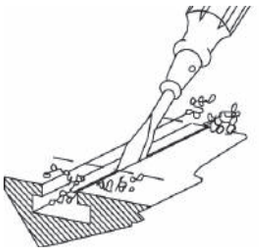
This handy tool is ideal for cleaning chips and debris out of machine-table T Slots. Much safer than blowing chips out with air. Made of heat treated steel, a full .109" thick. Use for any T Slot 3/8" (10mm) and above. One end is sized for smaller T Slots, while the other end is sized for larger T Slots.

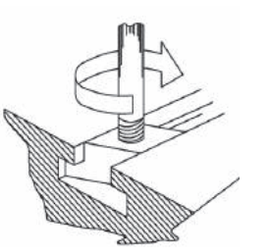
PART NO.	OVERALL LENGTH	THICKNESS
CL-1-TSCL	6	.109

ROTARY T NUTS

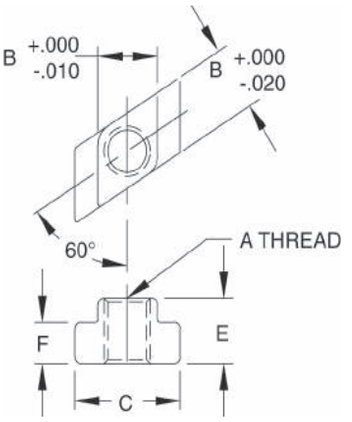
ALLOY STEEL, RC 40-45, BLACK OXIDE FINISH







Rotary T Nuts can be inserted into the top of a T slot, unlike normal T Nuts, which must be inserted at the end of the slot. This allows adding T Nuts and Studs anywhere for a new setup, without tearing down any existing setups. Make sure that the area where the Rotary T Nut will be inserted is clear of debris, to allow the T Nut to rotate a full 60 degrees. Same safety-stop thread feature as standard T Nuts.



INCH

PART NO.	TABLE SLOT SIZE	A	B	C	E	F
CL-0-RTN	1/2	3/8-16	.495	7/8	1/2	9/32
CL-9-RTN	9/16	1/2-13	.560	7/8	5/8	11/32
CL-2-RTN	5/8 or 16mm	1/2-13	.620	1	5/8	11/32
CL-3-RTN	11/16 or 18mm	1/2-13	.682	1-1/8	3/4	7/16
CL-10-RTN		5/8-11				
CL-4-RTN	3/4 or 20mm	5/8-11	.745	1-1/4	3/4	15/32
CL-7-RTN	1	3/4-10	.995	1-5/8	1	5/8

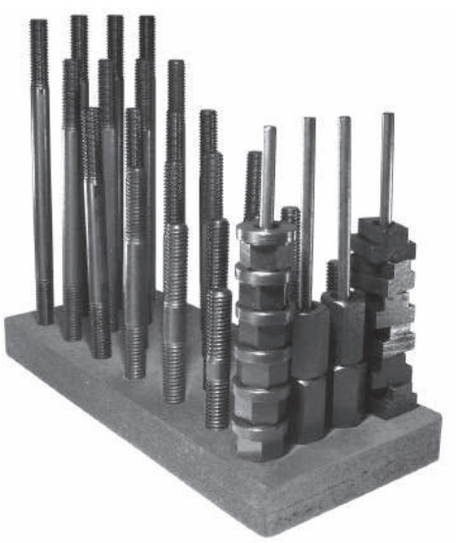
METRIC

CLM-0-RTN	1/2	M10	.495	7/8	1/2	9/32
CLM-9-RTN	9/16 or 14mm	M12	.550	7/8	5/8	11/32
CLM-2-RTN	5/8 or 16mm	M12	.620	1	5/8	11/32
CLM-3-RTN	11/16 or 18mm	M12	.682	1-1/8	3/4	7/16
CLM-10-RTN		M16				
CLM-4-RTN	3/4 or 20mm	M16	.745	1-1/4	3/4	15/32

7

ROTARY T NUT AND STUD SETS

INFO+: SEE PAGES 313, 318 AND 320 FOR MATERIAL SPECIFICATIONS



40-piece set includes a complete range of stud lengths with matching T Nuts, Flange Nuts, and Coupling Nuts — all mounted in a handy wooden holder. Set includes:

- (4) Studs of each length 3", 4", 5", 6", 7" and 8" (80, 95, 125, 150, 175, and 200mm in metric)
- (6) Rotary T Nuts
- (6) Flange Nuts
- (4) Coupling Nuts

INCH

PART NO.	TABLE SLOT SIZE	STUDS (24)	ROTARY T NUTS (6)	FLANGE NUTS (6)	COUPLING NUTS (4)	HOLDER (1)
CL-2-RTNS	1/2	3/8-16	CL-0-RTN	CL-2-FN	CL-1-CN	CL-1-TNH
CL-4-RTNS	9/16 or 14mm	1/2-13	CL-9-RTN	CL-3-FN	CL-2-CN	CL-2-TNH
CL-5-RTNS	5/8 or 16mm	1/2-13	CL-2-RTN	CL-3-FN	CL-2-CN	CL-2-TNH
CL-6-RTNS	11/16 or 18mm	1/2-13	CL-3-RTN	CL-3-FN	CL-2-CN	CL-2-TNH
CL-7-RTNS		5/8-11	CL-10-RTN	CL-4-FN	CL-3-CN	CL-3-TNH
CL-8-RTNS	3/4 or 20mm	5/8-11	CL-4-RTN	CL-4-FN	CL-3-CN	CL-3-TNH
CL-12-RTNS	1	3/4-10	CL-7-RTN	CL-5-FN	CL-4-CN	CL-4-TNH

METRIC

CLM-2-RTNS	1/2	M10	CLM-0-RTN	CLM-10-FN	CLM-10-CN	CL-1-TNH
CLM-4-RTNS	9/16 or 14mm	M12	CLM-9-RTN	CLM-12-FN	CLM-12-CN	CL-2-TNH
CLM-5-RTNS	5/8 or 16mm	M12	CLM-2-RTN	CLM-12-FN	CLM-12-CN	CL-2-TNH
CLM-6-RTNS	11/16 or 18mm	M12	CLM-3-RTN	CLM-12-FN	CLM-12-CN	CL-2-TNH
CLM-7-RTNS		M16	CLM-10-RTN	CLM-16-FN	CLM-16-CN	CL-3-TNH
CLM-8-RTNS	3/4 or 20mm	M16	CLM-4-RTN	CLM-16-FN	CLM-16-CN	CL-3-TNH

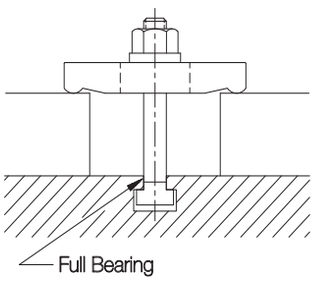
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T-SLOT BOLTS

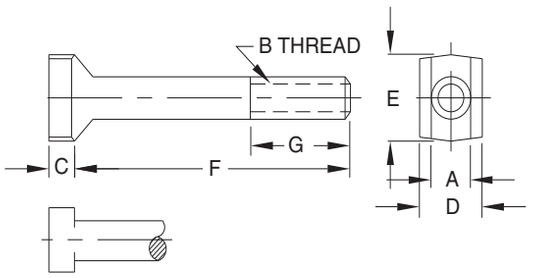
FORGED 1045 STEEL, BLACK OXIDE FINISH



T-Slot Bolt

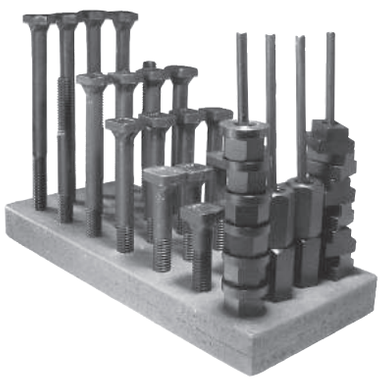


High-strength bolt for T-slotted machine tables. Full bearing surfaces prevent twisting or jamming in table slots. Available in thread sizes from 3/8-16 to 3/4-10, each in a choice of several lengths.



T-SLOT BOLTS (INCH)

PART NO.	B THREAD	A	FITS TABLE SLOTS	C	D	E	F LENGTH	G
CL-6-TSB-1.00	3/8-16	3/8	3/8 7/16 1/2 10mm 12mm	3/16	5/8	13/16	1.00	.62
CL-6-TSB-1.50							1.50	1.00
CL-6-TSB-2.00							2.00	1.25
CL-6-TSB-2.50							2.50	1.50
CL-6-TSB-3.00							3.00	
CL-6-TSB-3.50							3.50	
CL-6-TSB-4.00							4.00	
CL-8-TSB-1.50	1/2-13	1/2	1/2 9/16 5/8 14mm 16mm	1/4	13/16	15/16	1.50	1.00
CL-8-TSB-2.00							2.00	1.25
CL-8-TSB-2.50							2.50	1.50
CL-8-TSB-3.00							3.00	
CL-8-TSB-3.50							3.50	
CL-8-TSB-4.00							4.00	
CL-8-TSB-5.00							5.00	
CL-8-TSB-6.00							6.00	2.00
CL-10-TSB-1.50	5/8-11	5/8	5/8 11/16 3/4 18mm 20mm	5/16	1-1/32	1-3/16	1.50	1.00
CL-10-TSB-2.00							2.00	1.25
CL-10-TSB-2.50							2.50	1.50
CL-10-TSB-3.00							3.00	
CL-10-TSB-3.50							3.50	
CL-10-TSB-4.00							4.00	
CL-10-TSB-5.00							5.00	
CL-10-TSB-6.00							6.00	2.00
CL-10-TSB-8.00							8.00	3.00
CL-12-TSB-3.00	3/4-10	3/4	3/4 13/16 20mm 22mm	3/8	1-1/4	1-7/16	3.00	1.50
CL-12-TSB-3.50							3.50	
CL-12-TSB-4.00							4.00	
CL-12-TSB-5.00							5.00	
CL-12-TSB-6.00							6.00	2.00
CL-12-TSB-8.00							8.00	3.00



T-Slot Bolt Kit

34-piece set includes a complete range of T-Slot Bolt lengths, with matching extension Studs, Flange Nuts, and Coupling Nuts. Set includes:

- (4) T-Slot Bolts in each of five different lengths
- (4) Studs
- (6) Flange Nuts
- (4) Coupling Nuts
- (1) Handy Holder

T-SLOT BOLT KITS (INCH)

PART NO.	FITS TABLE SIZES	T-SLOT BOLTS (4 EACH)	STUDS (4)	FLANGE NUTS (6)	COUPLING NUTS (4)	HOLDER (1)
CL-6-TSBK	3/8, 7/16, 1/2 10mm, 12mm	CL-6-TSB-1.50 CL-6-TSB-2.00 CL-6-TSB-2.50 CL-6-TSB-3.00 CL-6-TSB-4.00	CL-3/8-16X4.00-STUD	CL-2-FN	CL-1-CN	CL-1-TNH
CL-8-TSBK	1/2, 9/16, 5/8 14mm, 16mm	CL-8-TSB-2.00 CL-8-TSB-3.00 CL-8-TSB-4.00 CL-8-TSB-5.00 CL-8-TSB-6.00	CL-1/2-13X5.00-STUD	CL-3-FN	CL-2-CN	CL-2-TNH
CL-10-TSBK	5/8, 11/16, 3/4 16mm, 18mm	CL-10-TSB-3.00 CL-10-TSB-4.00 CL-10-TSB-5.00 CL-10-TSB-6.00 CL-10-TSB-8.00	CL-5/8-11X6.00-STUD	CL-4-FN	CL-3-CN	CL-3-TNH
CL-12-TSBK	3/4, 13/16 20mm, 22mm	CL-12-TSB-3.00 CL-12-TSB-4.00 CL-12-TSB-5.00 CL-12-TSB-6.00 CL-12-TSB-8.00	CL-3/4-10X7.00-STUD	CL-5-FN	CL-4-CN	CL-4-TNH

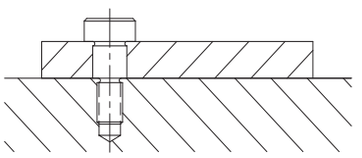
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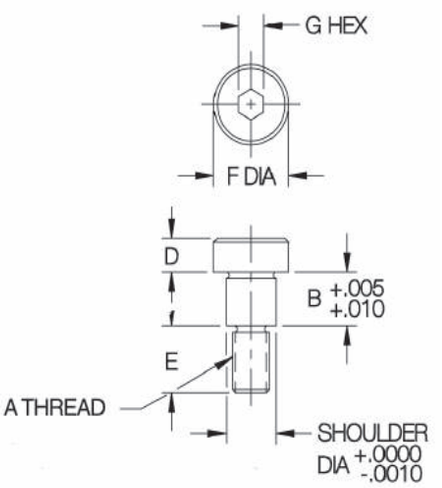
SHOULDER SCREWS

ALLOY STEEL, HEAT TREATED RC 32-43, BLACK OXIDE FINISH



Precision close-tolerance Shoulder Screw. Shoulder diameter is ground to a closer tolerance than ordinary stripper bolts for better bearing action. Shoulder length is held to a plus tolerance to allow a nominal-size plate to rotate freely underneath the head.





INCH

PART NO.	SHOULDER DIA NOMINAL	SHOULDER DIA ACTUAL	A	B NOMINAL	B ACTUAL	D	E	F DIA	G
CL-5-SS	1/4	.2500	#10-24	1/4	.2500	3/16	3/8	3/8	1/8
CL-12-SS				3/8	.3750				
CL-13-SS				1/2	.500				
CL-37-SS				5/8	.6250				
CL-15-SS				3/4	.750				
CL-16-SS				1	1.0000				
CL-1-SS	5/16	.3125	1/4-20	1/4	.2500	7/32	7/16	7/16	5/32
CL-6-SS				5/16	.3125				
CL-11-SS				3/8	.3750				
CL-20-SS				1/2	.5000				
CL-21-SS				5/8	.6250				
CL-7-SS				3/4	.7500				
CL-8-SS				1	1.0000				
CL-24-SS	3/8	.3750	5-16-18	1/4	.2500	1/4	1/2	9/16	3/16
CL-2-SS				3/8	.3750				
CL-14-SS				1/2	.5000				
CL-9-SS				5/8	.6250				
CL-10-SS				3/4	.7500				
CL-47-SS				1	1.0000				
CL-3-SS	1/2	.5000	3/8-16	3/8	.3750	5/16	5/8	3/4	1/4
CL-4-SS				1/2	.5000				
CL-31-SS				5/8	.6250				
CL-32-SS				3/4	.7500				
CL-46-SS				1	1.0000				
CL-33-SS	5/8	.6250	1/2-13	1/2	.5000	3/8	3/4	7/8	5/16
CL-34-SS				5/8	.6250				
CL-35-SS				3/4	.7500				
CL-36-SS				1	1.0000				
CL-38-SS	3/4	7.500	5/8-11	1/2	.5000	1/2	7/8	1	3/8
CL-39-SS				3/4	.7500				
CL-40-SS				1	1.0000				

METRIC

CLM-806-SS	8mm	.3150	M6	6mm	.2362	.22	.44	.51	4mm
CLM-808-SS				8mm	.3150				
CLM-810-SS				10mm	.3937				
CLM-812-SS				12mm	.4724				
CLM-816-SS				16mm	.6299				
CLM-820-SS				20mm	.7874				
CLM-1006-SS	10mm	.3937	M8	6mm	.2362	.28	.52	.63	5mm
CLM-1008-SS				8mm	.3150				
CLM-1010-SS				10mm	.3937				
CLM-1012-SS				12mm	.4724				
CLM-1016-SS				16mm	.6299				
CLM-1020-SS				20mm	.7874				
CLM-1310-SS	13mm	.5118	M10	10mm	.3937	.35	.65	.71	6mm
CLM-1312-SS				12mm	.4724				
CLM-1316-SS				16mm	.6299				
CLM-1320-SS				20mm	.7874				
CLM-1610-SS	16mm	.6299	M12	10mm	.3937	.43	.72	.94	8mm
CLM-1612-SS				12mm	.4724				
CLM-1616-SS				16mm	.6299				
CLM-1620-SS				20mm	.7874				
CLM-2016-SS	20mm	.7874	M16	16mm	.6299	.55	.88	1.18	10mm
CLM-2020-SS				20mm	.7874				
CLM-2025-SS				25mm	.9843				

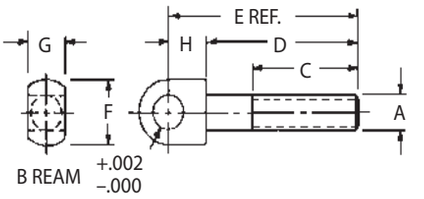
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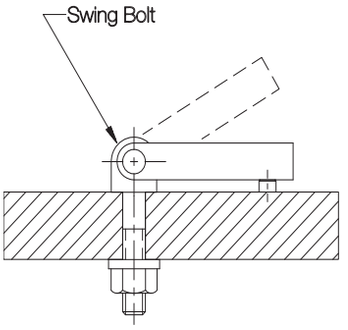
SWING BOLTS

STEEL: 1144, 115,000 PSI MIN. TENSILE STRENGTH, 100,000 PSI MIN. YIELD STRENGTH, BLACK OXIDE FINISH



Shoulder-type Eye Bolt that can be used as a stationary hinge point. Reamed hole for smooth bearing.





INCH

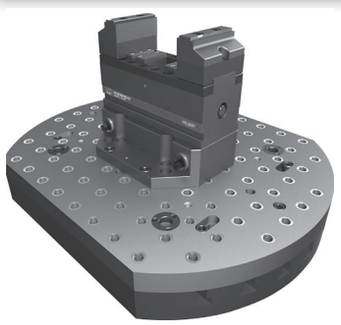
PART NO.	A	B DIA NOMINAL	B DIA ACTUAL	C	D	E	F DIA	G NOMINAL	G ACTUAL	H
CL-00-SB	1/4-20	1/4	.250	3/4	1-3/16	1-1/2	1/2	5/16	.312	5/16
CL-0-SB	5/16-18	5/16	.312	1	1-5/8	2	5/8	3/8	.375	3/8
CL-1-SB	3/8-16	3/8	.375	1-3/8	2	2-1/2	3/4	1/2	.500	1/2
CL-2-SB	1/2-13	1/2	.500	1-3/4	2-1/2	3-1/8	1	5/8	.625	5/8
CL-2A-SB				2-1/4	3-1/2	4-1/8				
CL-3-SB	5/8-11	5/8	.625	1-3/4	2-3/4	3-1/2	1-1/4	3/4	.750	3/4
CL-3A-SB				2-1/2	4	4-3/4				

METRIC

CLM-00-SB	M6	6mm	.236	.79	1.18	1.57	.47	8mm	.315	.39
CLM-0-SB	M8	8mm	.315	.98	1.57	1.96	.63	10mm	.394	
CLM-1-SB	M10	10mm	.394	1.38	1.97	2.56	.79	12mm	.472	.59
CLM-2B-SB	M12	12mm	.472	1.77	2.56	3.15	.94	14mm	.551	.59
CLM-2C-SB				2.17	3.54	4.13				
CLM-3-SB	M16	16mm	.630	1.77	2.76	3.55	1.26	18mm	.709	.79
CLM-3A-SB				2.56	3.94	4.73				

7

5-Axis Workholding



Quick-Change With No Adaptor Plates, Blocks Or Pallets Necessary

- Quintus fixture plates available as blank, or with multi-function holes
- German-built, extremely accurate precision vises
- Allows unrestricted tool access for multiple-side machining
- Numerous jaw types and sizes available

SEE PAGES 373-394

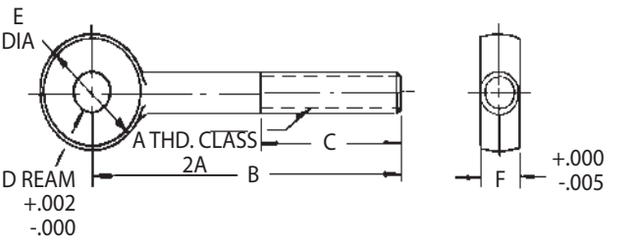
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EYE BOLTS

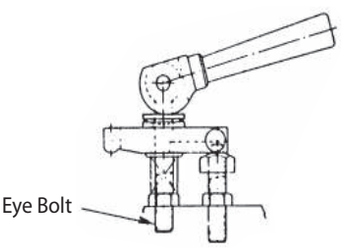
STEEL: 1144, 115,000 PSI MIN. TENSILE STRENGTH, 100,000 PSI MIN. YIELD STRENGTH, BLACK OXIDE FINISH
STAINLESS STEEL: 300 SERIES





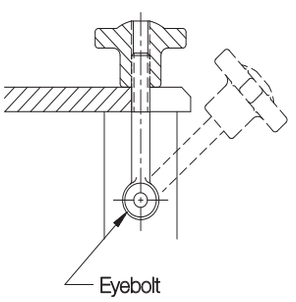
High-strength Eye Bolt with a reamed bearing hole. High-carbon steel, fully machined from solid barstock. Also available in stainless steel. Available in other lengths and materials as a special.

7



INCH

PART NO. STEEL	PART NO. STAINLESS STEEL	A	D DIA NOMINAL	D DIA ACTUAL	B	C	E	F NOMINAL	F ACTUAL
CL-25-EB	CL-25-EB-S	1/4-20	3/16	.188	2	3/4	1/2	1/4	.250
CL-26-EB	CL-26-EB-S				3	1-1/4			
CL-31-EB	CL-31-EB-S	5/16-18	1/4	.250	3	1-1/2	5/8	5/16	.312
CL-32-EB	—				4	2			
CL-38-EB	—	3/8-16	5/16	.312	3	1-1/2	3/4	3/8	.375
CL-40-EB	CL-40-EB-S		3/8	.375	3	1-1/2			
CL-37-EB	—				3-3/4	2			
CL-39-EB	CL-39-EB-S				5	2-1/2			
CL-50-EB	CL-50-EB-S	1/2-13	3/8	.375	3-3/4	1-1/2	1	1/2	.500
CL-51-EB	CL-51-EB-S				5	2			
CL-62-EB	—	5/8-11	5/8	.625	4-1/2	2	1-1/4	5/8	.625
CL-63-EB	—				6	2-1/2			
CL-75-EB	—	3/4-10	5/8	.625	6	2-1/2	1-1/2	3/4	.750
CL-76-EB	—		3/4	.750	6	2-1/2			



METRIC

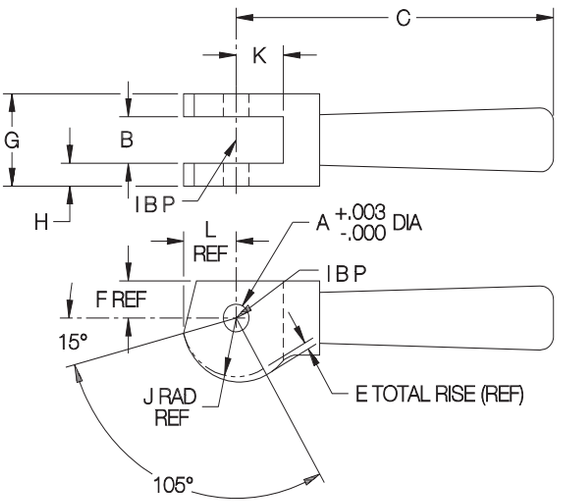
CLM-25A-EB	—	M6	6mm	.236	1.97	.79	.47	6mm	.236
CLM-26A-EB	—				2.95	1.18			
CLM-31A-EB	—	M8	8mm	.315	2.95	1.57	.63	8mm	.315
CLM-40-EB	—	M10	10mm	.394	—	—	.79	10mm	.394
CLM-37-EB	—				3.94	1.97			
CLM-39-EB	—				4.92	2.56			
CLM-50A-EB	—	M12	12mm	.472	3.94	1.57	.94	12mm	.472
CLM-51A-EB	—				4.92	1.97			
CLM-62-EB	—	M16	16mm	.630	4.53	1.97	1.26	16mm	.630
CLM-76A-EB	—	M20	20mm	.787	5.91	2.56	1.57	20mm	.787

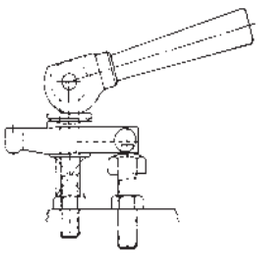
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1020 STEEL, CARBURIZED-HARDENED BLACK OXIDE FINISH

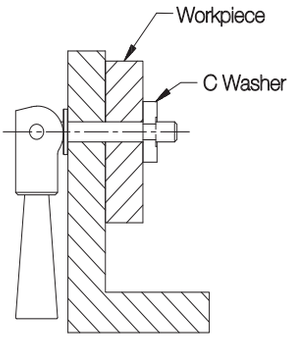


Straddle-type cam handle that can be used with an Eyebolt or custom-made drawbar. Continuous-rise spiral cam locks securely in any position. Available in six inch and five metric sizes.





Double Cams are used with Eyebolts on Slotted-Heel Clamp Assemblies. **INFO+**: See page 265.



INCH

PART NO.	MATCHING EYEBOLT SIZE	A DIA NOMINAL	A DIA ACTUAL	B NOMINAL	B ACTUAL	C	E	F	G	H	J	K	L	CLEVIS PIN REQD
CL-11-CH	1/4-20	3/16	.188	1/4	.266	2-17/32	.046	1/4	5/8	3/16	.40	.33	.38	CL-610-CLVP
CL-11A-CH	5/16-18	1/4	.250	5/16	.328					5/32				CL-810-CLVP
CL-12-CH	3/8-16	5/16	.313	3/8	.390	3-13/16	.062	5/16	7/8	1/4	.52	.54	.50	CL-1014-CLVP
CL-13-CH	1/2-13	3/8	.376	1/2	.516	4-5/8	.094	1/2	1-1/8	5/16	.79	.69	.76	CL-1218-CLVP
CL-14-CH	5/8-11	5/8	.626	5/8	.641	4-15/16	.109	9/16	1-1/4		.92	.85	.89	CL-2020-CLVP
CL-15-CH	3/4-10	5/8	.626	3/4	.766	5-1/8	.141	5/8	1-1/2	3/8	1.19	1.00	1.15	CL-2024-CLVP

METRIC

CLM-11-CH	M6	6mm	.237	6mm	.266	2-17/32	.046	1/4	5/8	3/16	.40	.33	.38	CLM-616-CLVP
CLM-12-CH	M10	10mm	.395	10mm	.409	3-13/16	.062	5/16	7/8	1/4	.52	.54	.50	CLM-1023-CLVP
CLM-13-CH	M12	12mm	.473	12mm	.516	4-5/8	.094	1/2	1-1/8	5/16	.79	.69	.76	CLM-1229-CLVP
CLM-14-CH	M16	16mm	.631	16mm	.641	4-15/16	.109	9/16	1-1/4		.92	.85	.89	CLM-1632-CLVP
CLM-15-CH	M20	20mm	.788	20mm	.803	5-1/8	.141	5/8	1-1/2	3/8	1.19	1.00	1.15	CLM-2038-CLVP

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See Pages 222-223

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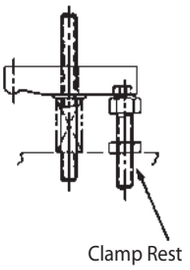
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CLAMP RESTS

STEEL: 12L14, CARBURIZED-HARDENED, BLACK OXIDE FINISH
STAINLESS STEEL: 300 SERIES



Steel



Rear support for Slotted-Heel Clamp Straps. Steel version has a hex head for adjustment, and is furnished with a Jam Nut. Stainless steel version has a drilled hole for turning with a rod.



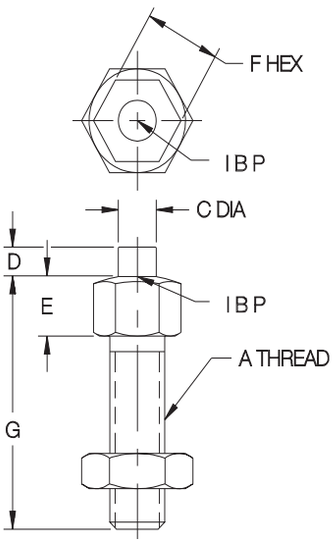
Stainless Steel

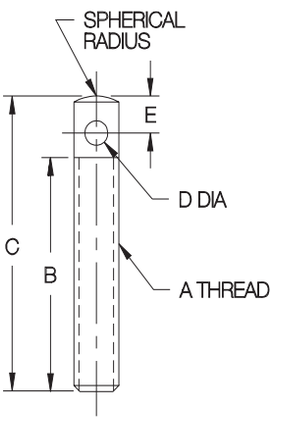
STEEL (INCH)

PART NO.	A	C DIA	D	E	F	G
CL-1-CR	1/4-20	5/32	1/8	1/4	7/16	1-1/8
CL-1A-CR	5/16-18	7/32	3/16	5/16	1/2	1-11/16
CL-1A-CR						2-7/16
CL-2-CR	3/8-16	11/32	7/32	3/8	9/16	2-1/32
CL-3-CR						3-21/32
CL-4-CR	1/2-13	11/32	1/4	1/2	11/16	2-1/8
CL-4A-CR						3-5/8
CL-5-CR	5/8-11	15/32	1/4	5/8	7/8	2-3/8
CL-7-CR						3-5/8
CL-8-CR	3/4-10	15/32	1/4	5/8	1-1/16	2-1/2
CL-9-CR						3-5/8

STEEL (METRIC)

PART NO.	A	C DIA	D	E	F	G
CLM-1-CR	M6	.157	.118	.20	10mm	1.06
CLM-1A-CR	M8	.217	.157	.31	13mm	1.77
CLM-2-CR	M10	.343	.236	.39	17mm	1.93
CLM-3-CR						3.70
CLM-4-CR	M12	.343	.236	.59	19mm	2.13
CLM-4A-CR						3.70
CLM-5-CR	M16	.472	.236	.59	24mm	2.13
CLM-7-CR						3.70
CLM-8-CR	M20	.472	.276	.59	30mm	2.48
CLM-9-CR						3.66





STAINLESS STEEL (INCH)

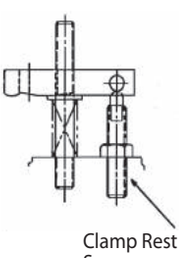
PART NO.	A	B	C	D DIA	E
CL-13410	#10-32	3/4	1	3/32	1/8
CL-13515	1/4-20	1-3/16	1-1/2	1/8	3/16
CL-13615	5/16-18	1-1/8	1-1/2	5/32	3/16
CL-13717	3/8-16	1-3/8	1-3/4	3/16	3/16

7

CLAMP REST SCREWS

STEEL: 12L14, CARBURIZED-HARDENED, BLACK OXIDE FINISH

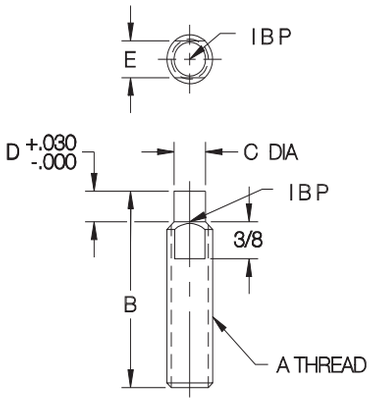




Rear support for Drill-Spot-Heel Clamp Straps.

INCH

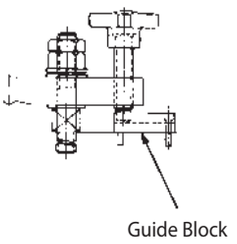
PART NO.	A	B	C DIA	D	E
CL-1-CRS	3/8-16	2	.250	.313	1/4
CL-2-CRS		2-12	.344	.313	3/8
CL-3-CRS		3			
CL-4-CRS	1/2-13	2			
CL-5-CRS		2-1/2			
CL-6-CRS		3			

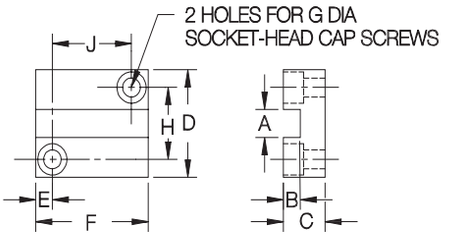


GUIDE BLOCKS

1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH







Rear slide block for Tapped-Heel Clamp Straps. Guides Clamp Strap straight back for loading.

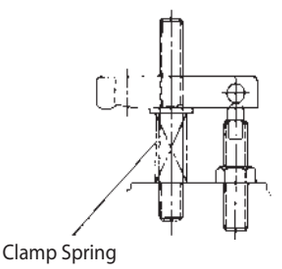
PART NO.	FITS STUD SIZE	A	B	C	D	E	F	G	H	J
CL-2-GB	1/4-20 or M6	.198	.10	1/4	3/4	13/64	1-3/16	#6-32 or M4	15/32	25/32
CL-4-GB	3/8-16 or M10	.265	.20	1/2	1-1/8	7/32	2	#10-32 or M5	3/4	1-9/16
CL-6-GB	1/2-13 or M12	.390	.25	5/8	1-1/2	1/4	1-11/16	1/4-20 or M6	1	1-3/16
CL-8-GB	5/8-11 or M16	.515					1-5/8			1-1/8
CL-11-GB	3/4-10 or M20	.640	.37	3/4	1-3/4		2-13/32		1-1/4	1-29/32

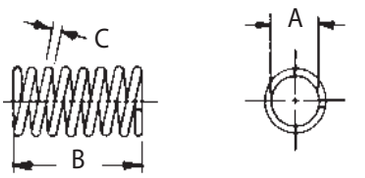
7

CLAMP SPRINGS

STEEL: SPRING STEEL, BLACK OXIDE FINISH
STAINLESS STEEL: 300-SERIES







Sturdy spring that holds up a Clamp Strap for clear loading.

STEEL

PART NO.	FITS STUD SIZE	A DIA	B	C DIA	NO. OF COILS
CL-5-SPG	1/4-20 or M6	19/64	1-1/8	.062	7
CL-6-SPG	5/16-18 or M8	23/64	1-7/32		6
CL-7-SPG	3/8-16 or M10	7/16	1-9/16		8
CL-9-SPG	1/2-13 or M12	9/16	1-11/16		7
CL-11-SPG	5/8-11 or M16	11/16	1-3/4	.091	5
CL-13-SPG	3/4-10 or M20	13/16	2-1/2		6-1/2

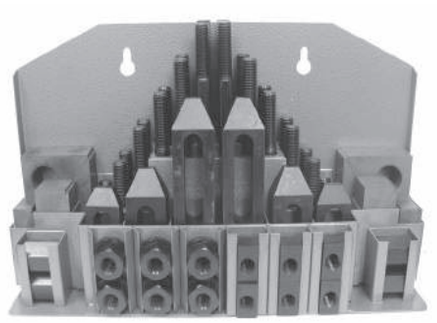
STAINLESS STEEL

CL-2430.7	#10-32 or M5	13/64	.7	.042	5-1/2
CL-2440.7	1/4-20 or M6	17/64			
CL-2450.7	5/16-18 or M8	21/64	.7	.049	5
CL-2461.0	3/8-16 or M10	13/32	1.0		7

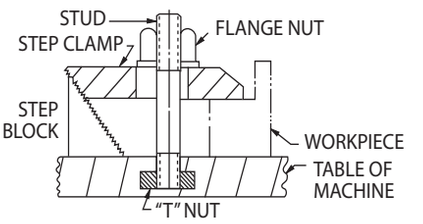
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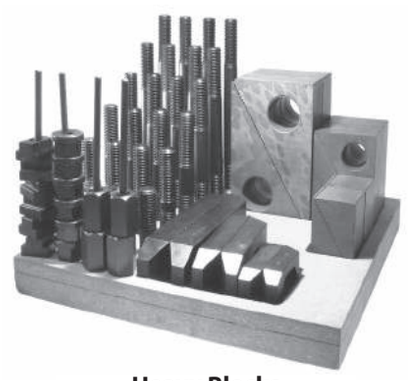
CLAMPING KITS

SEE CATALOG PAGE OF EACH COMPONENT FOR MATERIAL SPECIFICATIONS



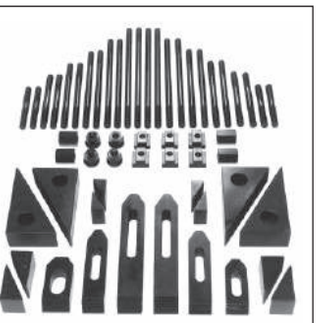
Standard Blocks
Metal Holder





Heavy Blocks
Wooden Holder

Economical Clamping Kit with a wide assortment of Step Clamps and Blocks. Fully machined from top-grade steel. Available with standard Step Blocks in a metal holder (for wall or machine mounting), or with wider heavy blocks in a wooden holder.



Each Kit Contains:
(24) Studs
(6) T-Slot Nuts
(6) Flange Nuts
(4) Coupling Nuts
(6) Step Blocks
(6) Step Clamps

7

STANDARD BLOCKS (INCH)

PART NO.	STUD SIZE	TABLE SLOT SIZE	T-NUT & STUD SET (1)	STEP CLAMPS (2) EACH	STEP BLOCK PAIRS (2) EACH	HOLDER (1)
CL-1-CK	3/8-16	7/16	CL-1-TNS	CL-32-STC CL-34-STC CL-36-STC	CL-10-BS CL-20-BS CL-30-BS	CL-1-CKMH
CL-20-CK		12mm	CL-14-TNS			
CL-2-CK		1/2	CL-2-TNS			
CL-3-CK		9/16 or 14mm	CL-3-TNS			
CL-24-CK		5/8 or 16mm	CL-17-TNS			CL-2-CKMH
CL-4-CK	1/2-13	9/16 or 14mm	CL-4-TNS	CL-42-STC CL-44-STC CL-46-STC	CL-10-BS CL-20-BS CL-30-BS	CL-2-CKMH
CL-5-CK		5/8 or 16mm	CL-5-TNS			
CL-6-CK		11/16 or 18mm	CL-6-TNS			
CL-25-CK		3/4	CL-18-TNS			CL-3-CKMH
CL-7-CK	5/8-11	11/16 or 18mm	CL-7-TNS	CL-52-STC CL-54-STC CL-56-STC	CL-10-BS CL-20-BS CL-30-BS	CL-3-CKMH
CL-8-CK		3/4	CL-8-TNS			
CL-21-CK		20mm	CL-15-TNS			
CL-9-CK		13/16	CL-9-TNS			

HEAVY BLOCKS (INCH)

PART NO.	STUD SIZE	TABLE SLOT SIZE	T-NUT & STUD SET (1)	STEP CLAMPS (2) EACH	STEP BLOCK PAIRS (2) EACH	HOLDER (1)
CL-10-CK	1/2-13	7/16	CL-4-TNS	CL-42-STC CL-44-STC CL-46-STC	CL-40-BS CL-50-BS CL-60-BS	CL-4-CKH
CL-11-CK		12mm	CL-5-TNS			
CL-12-CK		1/2	CL-6-TNS			
CL-26-CK		9/16 or 14mm	CL-18-TNS			
CL-13-CK	5/8-11	5/8 or 16mm	CL-7-TNS	CL-52-STC CL-54-STC CL-56-STC	CL-40-BS CL-50-BS CL-60-BS	CL-5-CKH
CL-14-CK		9/16 or 14mm	CL-8-TNS			
CL-22-CK		5/8 or 16mm	CL-15-TNS			
CL-15-CK		11/16 or 18mm	CL-9-TNS			
CL-16-CK	3/4-10	3/4	CL-10-TNS	CL-64-STC CL-66-STC CL-68-STC	CL-40-BS CL-50-BS CL-60-BS	CL-6-CKH
CL-23-CK		11/16 or 18mm	CL-16-TNS			
CL-17-CK		3/4	CL-11-TNS			
CL-18-CK		20mm	CL-12-TNS			
CL-19-CK		13/16	CL-13-TNS			

STANDARD BLOCKS (METRIC)

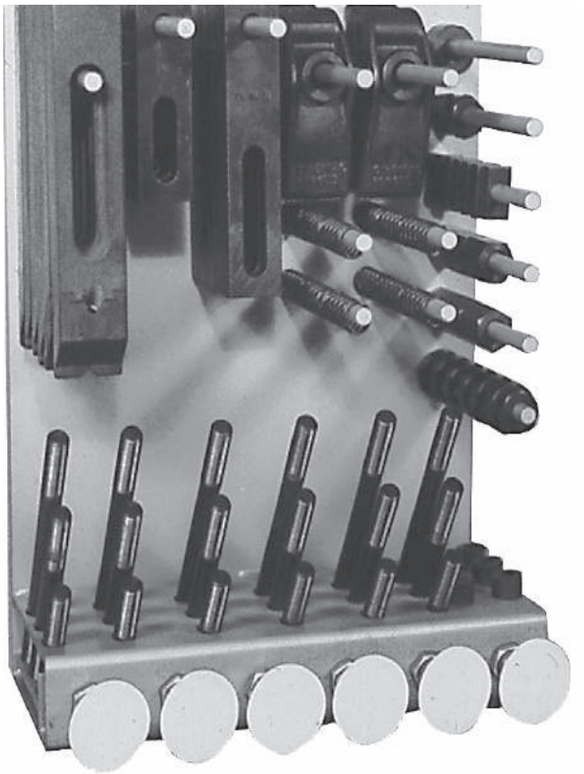
CLM-1-CK	M10	2mm	CLM-1-TNS	CL-32-STC CL-34-STC CL-36-STC	CL-10-BS CL-20-BS CL-30-BS	CL-1-CKMH
CLM-2-CK		1/2	CLM-2-TNS			
CLM-3-CK		9/16 or 14mm	CLM-3-TNS			
CLM-4-CK	M12	9/16 or 14mm	CLM-4-TNS	CL-42-STC CL-44-STC CL-46-STC	CL-10-BS CL-20-BS CL-30-BS	CL-2-CKMH
CLM-5-CK		5/8 or 16mm	CLM-5-TNS			
CLM-6-CK		11/16 or 18mm	CLM-6-TNS			
CLM-7-CK	M16	11/16 or 18mm	CLM-7-TNS	CL-52-STC CL-54-STC CL-56-STC	CL-10-BS CL-20-BS CL-30-BS	CL-3-CKMH
CLM-8-CK		20mm	CLM-8-TNS			
CLM-9-CK		13/16	CLM-9-TNS			

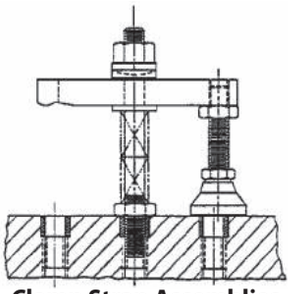
HEAVY BLOCKS (METRIC)

CLM-10-CK	M12	9/16 or 14mm	CLM-4-TNS	CL-42-STC CL-44-STC CL-46-STC	CL-40-BS CL-50-BS CL-60-BS	CL-4-CKH
CLM-11-CK		5/8 or 16mm	CLM-5-TNS			
CLM-12-CK		11/16 or 18mm	CLM-6-TNS			
CLM-13-CK	M16	11/16 or 18mm	CLM-7-TNS	CL-52-STC CL-54-STC CL-56-STC	CL-40-BS CL-50-BS CL-60-BS	CL-5-CKH
CLM-14-CK		20mm	CLM-8-TNS			
CLM-15-CK		13/16	CLM-9-TNS			
CLM-17-CK	M20	22mm	CLM-11-TNS	CL-64-STC CL-66-STC CL-68-STC	CL-40-BS CL-50-BS CL-60-BS	CL-6-CKH

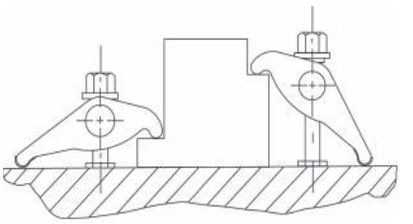
DELUXE CLAMPING KITS

SEE CATALOG PAGE OF EACH COMPONENT FOR MATERIAL SPECIFICATIONS
HOLDER: STEEL, ENAMEL PAINT

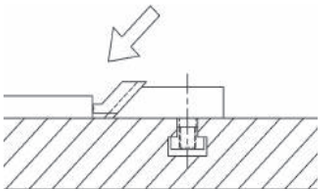




Clamp Strap Assemblies



Forged Adjustable Clamps



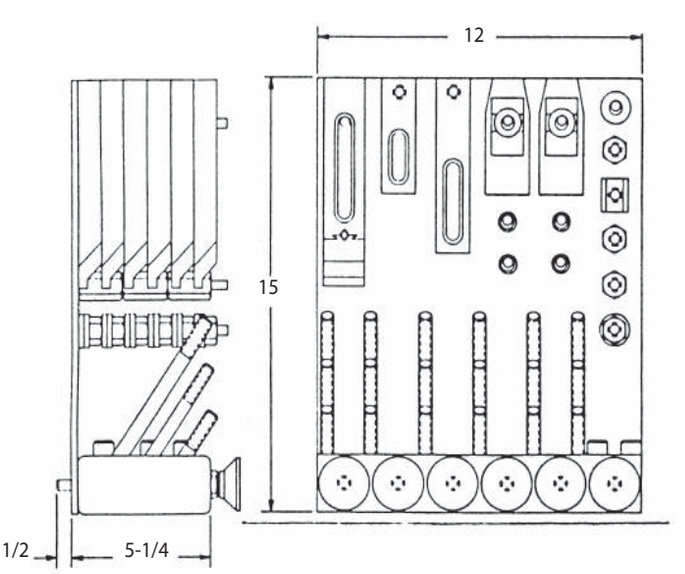
Serrated Edge Clamps

New, improved Clamping Kit with three different types of clamps. Safer and less cumbersome than sets using Step Blocks and Clamps. This 94-piece set includes:

- (12) Tapped-Heel Clamp Straps, short and long
- (4) Forged Adjustable Clamps
- (6) Serrated Edge Clamps
- (6) Stud Leveling Feet
- (6) T Nuts
- (6) Short Clamping Studs
- (6) Medium Clamping Studs
- (6) Long Clamping Studs
- (6) Spherical Nuts & Washers
- (6) Coupling Nuts
- (6) Jam Nuts
- (6) Flat Washers
- (12) Clamp Springs
- (6) Socket-Head Cap Screws
- (1) Sturdy Steel Rack

Available to fit table-slot sizes from 7/16" to 13/16" (12mm to 20mm in metric), in thread sizes from 3/8"-16 to 5/8"-11 (M10 to M16 in metric).

The Stud Leveling Feet in these kits serve as the rear supports for Tapped-Heel Clamp Straps. These leveling feet are optionally available with Delrin® pads to avoid marring the table when less clamping force is required, such as when used on coordinate measuring machines.



Get quote
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DELUXE CLAMPING KITS



(6) Short Clamp Straps



(6) Long Clamp Straps



(4) Forged Adjustable Clamps



(6) Serrated Adjustable Clamps



(6) Short Studs



(6) Medium Studs



(6) Long Studs



(6) Stud Leveling Feet



(6) T Nuts



(6) Coupling Nuts



(6) Spherical Nuts & Washers



(6) Jam Nuts



(6) Flat Washers



(12) Springs



(6) Socket Head Cap Screws

7

INCH

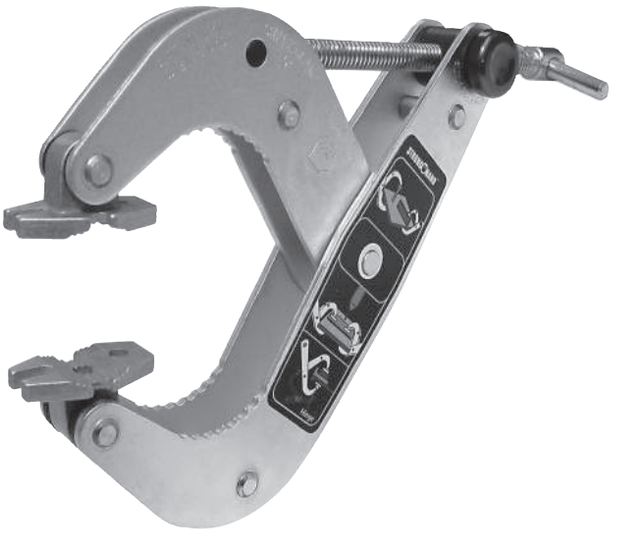
PART NO. STEEL PADS	PART NO. DELRIN® PADS	TABLE SLOT SIZE	STUD SIZE	CLAMP STRAPS (6 EACH)	FORGED ADJ. CLPS. (4)	SERR. ADJ. CLPS. (4)	STUDS (6 EACH)	LEVELING FEET (6)	T NUTS (6)	NUTS & WASHERS (6 EACH)	SPRINGS (12)	SOCKET-HEAD CAP SCREWS (6)
CL-1-DCK	CL-1-DCKN	7/16	3/8-16	CL-63-CS CL-67-CS	CL-6-FAC	CL-30-SAC	CL-3/8-16x3.00-STUD CL-3/8-16x5.00-STUD CL-3/8-16x7.00-STUD	CL-6-SLF-BO or CL-6-SLFN	CL-00-TN	CL-1-CN CL-2-SNW CL-6-JN CL-1-FW	CL-9-SPG	CL-3/8-16x1.25-SHCS
CL-20-DCK	CL-20-DCKN	12mm							CL-12-TN			
CL-2-DCK	CL-2-DCKN	1/2							CL-0-TN			
CL-3-DCK	CL-3-DCKN	9/16 or 14mm							CL-1-TN			
CL-24-DCK	CL-24-DCKN	5/8 or 16mm							CL-16-TN			
CL-4-DCK	CL-4-DCKN	9/16 or 14mm	1/2-13	CL-71-CS CL-75-CS	CL-8-FAC	CL-60-SAC	CL-1/2-13x4.00-STUD CL-1/2-13x6.00-STUD CL-1/2-13x8.00-STUD	CL-8-SLF-BO or CL-8-SLFN	CL-9-TN	CL-2-CN CL-3-SNW CL-8-JN CL-2-FW	CL-9-SPG	CL-1/2-13x1.50-SHCS
CL-5-DCK	CL-5-DCKN	5/8 or 16mm							CL-2-TN			
CL-6-DCK	CL-6-DCKN	11/16 or 18mm							CL-3-TN			
CL-7-DCK	CL-7-DCKN	3/4							CL-17-TN			
CL-27-DCK	CL-27-DCKN	11/16 or 18mm	5/8-11	CL-81-CS CL-85-CS	CL-10-FAC	CL-90-SAC	CL-5/8-11x4.00-STUD CL-5/8-11x6.00-STUD CL-5/8-11x8.00-STUD	CL-10-SLF-BO or CL-10-SLFN	CL-10-TN	CL-10-TN CL-4-SNW CL-10-JN CL-3-FW	CL-9-SPG	CL-5/8-11x1.50-SHCS
CL-8-DCK	CL-8-DCKN	3/4							CL-4-TN			
CL-21-DCK	CL-21-DCKN	20mm							CL-14-TN			
CL-9-DCK	CL-9-DCKN	13/16							CL-5-TN			

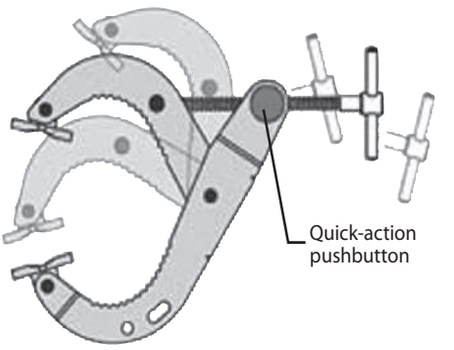
METRIC

CLM-1-DCK	CLM-1-DCKN	12mm	M10	CLM-63-CS CLM-67-CS	CL-6-FAC	CL-30-SAC	CLM-10x80-STUD	CLM-10-SLF-BO or CLM-10-SLFN	CLM-00-TN	CLM-10-CN CLM-10-SNW CLM-10-JN	CL-7-SPG	CLM-10x30-SHCS
CLM-2-DCK	CLM-2-DCKN	1/2					CLM-10x125-STUD		CLM-0-TN			
CLM-3-DCK	CLM-3-DCKN	9/16 or 14mm					CLM-10x175-STUD		CLM-1-TN			
CLM-4-DCK	CLM-4-DCKN	9/16 or 14mm	M12	CLM-71-CS CLM-75-CS	CL-8-FAC	CL-60-SAC	CLM-12x95-STUD	CLM-12-SLF-BO or CLM-12-SLFN	CLM-9-TN	CLM-12-CN CLM-12-SNW CLM-12-JN	CL-9-SPG	CLM-12x40-SHCS
CLM-5-DCK	CLM-5-DCKN	5/8 or 16mm					CLM-12x150-STUD		CLM-2-TN			
CLM-6-DCK	CLM-6-DCKN	11/16 or 18mm					CLM-12x200-STUD		CLM-3-TN			
CLM-7-DCK	CLM-7-DCKN	11/16 or 18mm	M16	CLM-81-CS CLM-85-CS	CL-10-FAC	CL-90-SAC	CLM-16x110-STUD	CLM-16-SLF-BO or CLM-16-SLFN	CLM-10-TN	CLM-16-CN CLM-16-SNW CLM-16-JN	CL-11-SPG	CLM-16x40-SHCS
CLM-8-DCK	CLM-8-DCKN	20mm					CLM-16x150-STUD		CLM-4-TN			
CLM-9-DCK	CLM-9-DCKN	13/16					CLM-16x200-STUD		CLM-5-TN			

SHARK CLAMPS

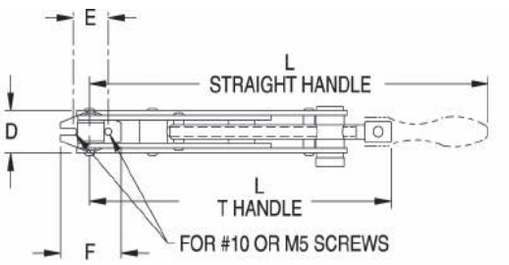
BODY: STEEL, ZINC PLATED CLEAR CHROMATE
CLAMPING SCREW: STEEL, COPPER PLATED

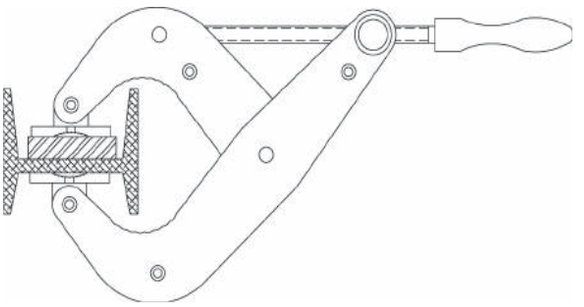


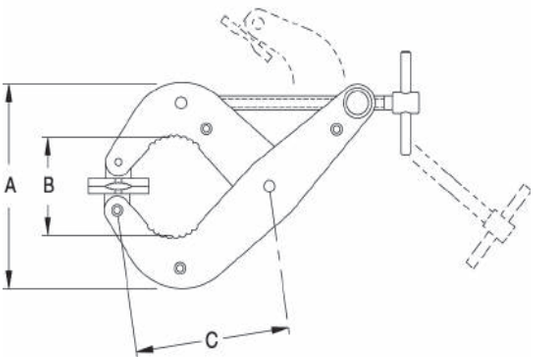


Heavy-duty quick-acting jaw clamp. Simply press the side pushbutton to allow sliding the handle freely in and out. The clamping screw is copper plated to resist spatter in welding applications. The two pivoting contact pads have mounting holes to allow attaching custom clamping pads or for stationary mounting. Optional no-mar rubber pads are available separately. Choose either a T handle (for maximum tightening torque) or a screwdriver-type straight handle (for more comfortable handling). Available in two sizes. **Patent no. 6,893,012.**

To clamp, simply press the quick-action pushbutton to slide the handle forward, moving the jaws into clamping position, then release the button and turn the handle to apply clamping force. To unclamp, turn the handle to release clamping force, then press the pushbutton to slide the handle back.







Wide throat allows clamping over flanges.

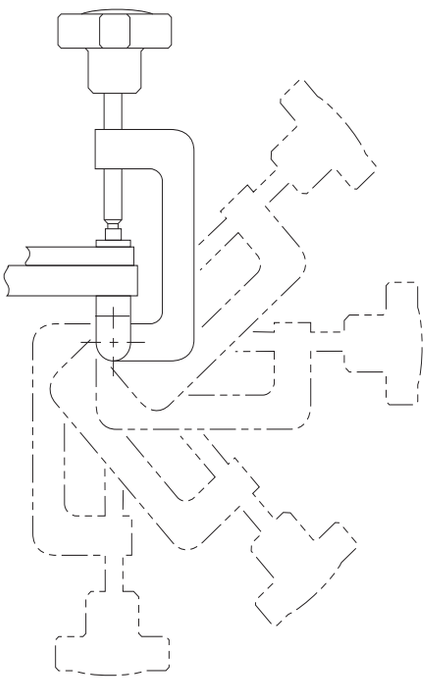
PART NO.	MAX OPENING	HANDLE TYPE	A	B	C	D	E	F	L	MAXIMUM CLAMPING FORCE (LBS)	NO-MAR PADS (SET OF 4)
CL-500-SHRK	5	T	5.50	2.64	4.40	1.12	1.00	1.75	8.5	1000	CL-1-SHRK-P-SETOF4
CL-501-SHRK		STRAIGHT							12	200	
CL-650-SHRK	6-1/2	T	6.00	3.15	5.30	1.12	1.00	1.75	10.5	1000	
CL-651-SHRK		STRAIGHT							14	200	

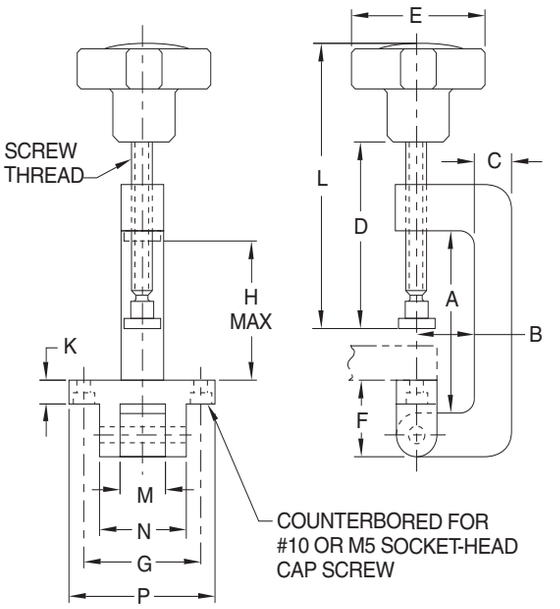
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SWING C CLAMPS

FRAME & MOUNTING PAD: MILD STEEL, ZINC PLATED CLEAR CHROMATE
KNOB: 319 ALUMINUM ALLOY
SCREW: 12L14 STEEL, NICKEL PLATED
FOOT: 12L14 STEEL, ZINC PLATED YELLOW CHROMATE





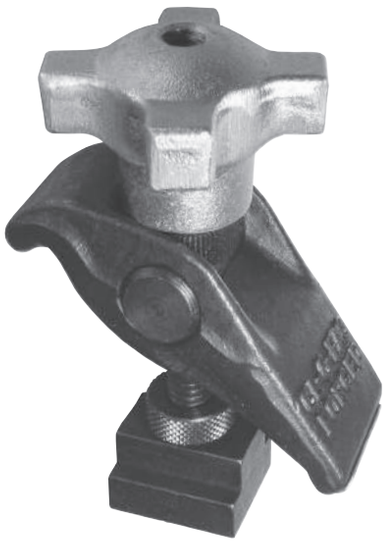


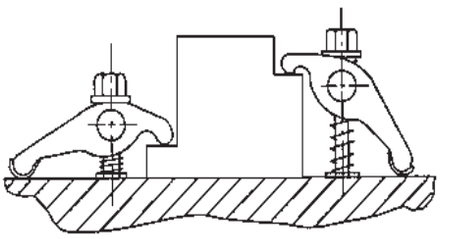
These unique C Clamps have a hinged pad for fastening permantently to a fixture, allowing them to swing clear for workpiece loading. The hinged mounting pad bolts to the fixture with two Socket-Head Cap Screws. Four-Prong Knob provides a firm grip for applications requiring quick tightening and high torque. Clamping screw is cast securely in the knob and has a removable swivel foot. Available in four sizes.

Swing C Clamps use our patented left-hand-thread swivel-foot system. The ball end of the body screws into the foot for easy installation and removal. Once the ball threads pass beyond the foot threads, the foot can rotate and pivot freely (20° total angle). Foot threads are left-hand to positively prevent accidental black out during use. For other foot types, including Delrin® feet, see Feet for Swivel Screws (order separately).

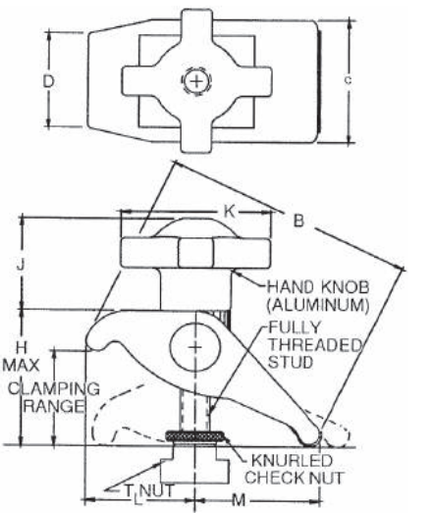
PART NO.	SCREW THREAD	A	B	C	D	E	F	G	H	K	L	M	N	P
CL-520-SCC	5/16-18	2	3/4	1/2	2-1/4	1-3/4	7/8	1-1/2	1-15/32	5/16	3-1/4	1/2	1	2
CL-525-SCC		2-1/2							1-31/32					
CL-625-SCC	3/8-16	2-1/2	1	5/8	2-13/16	2-1/8	1	1-3/4	1-15/16	5/16	4-1/16	5/8	1-1/4	2-1/4
CL-635-SCC		3-1/2			3-9/16				2-15/16		4-13/16			

FORGED ADJUSTABLE DRILL-PRESS CLAMPS





Handy hold-down clamp assembly that includes a Forged Adjustable Clamp, ideal for clamping on T-slotted drill presses and tapped drill-jig plates. This rugged forged steel pivot clamp provides instant height adjustment without blocks or shims. Removable brass heel protects machine table. Available with stud sizes from 5/16-18 to 1/2-13 (M8 to M12 in metric), fitting T-slots from 3/8 to 3/4 (10mm to 18mm in metric). **INFO+**: For additional sizes of Forged Adjustable Clamps, see page 262.



7

GENERAL DIMENSIONS

STUD SIZE	CLAMPING RANGE	B	C	D	H	J	K	L		M	
								MIN	MAX	MIN	MAX
5/16-18 or M8	0 to 1-3/4	3-1/4	1-1/4	7/8	2-1/8	1-3/8	2-1/8	1-1/16	1-1/4	1-3/4	2
3/8-16 or M10											
1/2-13 or M12	0 to 2-1/16	4	1-5/8	1-1/8	2-5/8	1-5/8	2-1/2	1-3/8	1-9/16	2-1/8	2-7/16

ASSEMBLY COMPONENTS (INCH)

PART NO.	STUD SIZE	TABLE-SLOT SIZE	T NUT	FORGED ADJUSTABLE CLAMP	FULLY THREADED STUD	KNURLED CKECK NUT	HAND KNOB
CL-5-FACA-HKA	5/16-18	TAPPED	NONE	CL-6-FAC	CL-5/16-18x3.00-FTS	CL-51618-TSJN	CL-2-HK-4A
CL-5-FACA-HKA-19		3/8 or 10mm	CL-19-TN				
CL-5-FACA-HKA-20		7/16	CL-20-TN				
CL-5-FACA-HKA-21		1/2	CL-21-TN				
CL-6-FACA-HKA	3/8-16	TAPPED	NONE	CL-6-FAC	CL-3/8-16x3.00-FTS	CL-3816-TSJN	CL-3-HK-4A
CL-6-FACA-HKA-00		7/16	CL-00-TN				
CL-6-FACA-HKA-12		12mm	CL-12-TN				
CL-6-FACA-HKA-0		1/2	CL-0-TN				
CL-6-FACA-HKA-1		9/16 or 14mm	CL-1-TN				
CL-6-FACA-HKA-16		5/8 or 16mm	CL-16-TN				
CL-8-FACA-HKA	1/2-13	TAPPED	NONE	CL-8-FAC	CL-1/2-13x4.00-FTS	CL-1213-TSJN	CL-9-HK-9A
CL-8-FACA-HKA-9		9/16 or 14mm	CL-9-TN				
CL-8-FACA-HKA-2		5/8 or 16mm	CL-2-TN				
CL-8-FACA-HKA-3		11/16 or 18mm	CL-3-TN				
CL-8-FACA-HKA-17		3/4	CL-17-TN				

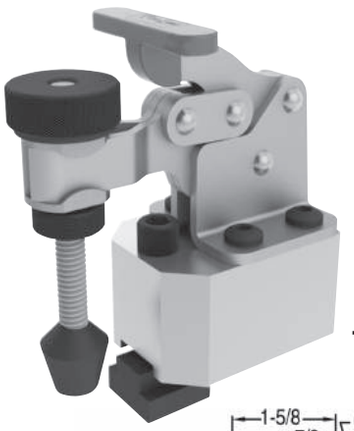
ASSEMBLY COMPONENTS (METRIC)

CLM-5-FACA-HKA	M8	TAPPED	NONE	CL-6-FAC	CLM-8x80-FTS	CLM-8-TSJN	CLM-2-HK-4A
CLM-5-FACA-HKA-19		3/8 or 10mm	CLM-19-TN				
CLM-6-FACA-HKA	M10	TAPPED	NONE	CL-6-FAC	CLM-10x80-FTS	CLM-10-TSJN	CLM-3-HK-4A
CLM-6-FACA-HKA-00		12mm	CLM-00-TN				
CLM-6-FACA-HKA-0		1/2	CLM-0-TN				
CLM-6-FACA-HKA-1		9/16 or 14mm	CLM-1-TN				
CLM-8-FACA-HKA	M12	TAPPED	NONE	CL-8-FAC	CLM-12x110-FTS	CLM-12-TSJN	CLM-9-HK-9A
CLM-8-FACA-HKA-9		9/16 or 14mm	CLM-9-TN				
CLM-8-FACA-HKA-2		5/8 or 16mm	CLM-2-TN				
CLM-8-FACA-HKA-3		11/16 or 18mm	CLM-3-TN				

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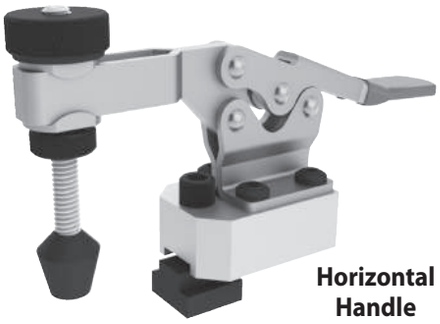
DRILL-PRESS TOGGLE CLAMPS

DRILL-PRESS ADAPTOR: 6061 ALUMINUM
OTHER COMPONENTS: SEE CATALOG PAGE FOR EACH SPECIFIC ITEM

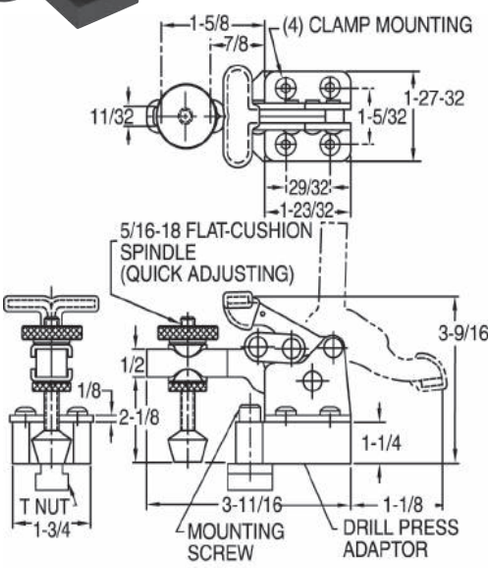


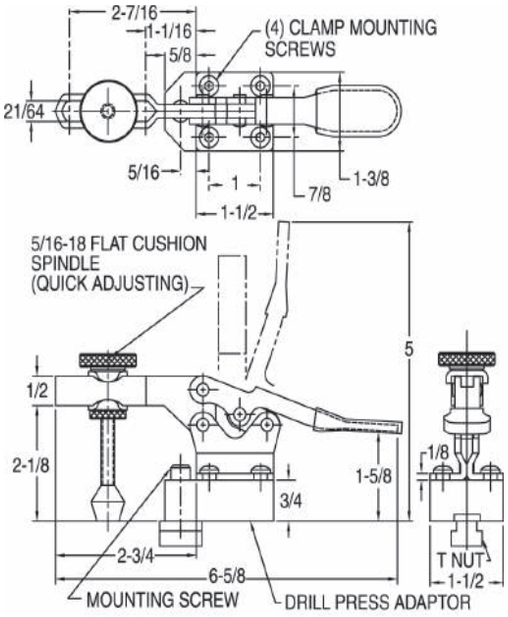
Vertical T Handle

These hold-down Toggle Clamps are ideal for clamping on drill presses, with an adaptor base for slotted tables and a quick adjusting spindle. Choose either a compact, easy-opening vertical T handle, or a low-profile horizontal handle. Open arm provides adjustable spindle location. Supplied with two quick-adjusting Flat-Cushion Spindles, one short and one long. Choose T Nut size to fit table slots from 3/8 to 5/8" (10 to 16mm in metric).



Horizontal Handle





7

VERTICAL T HANDLE (INCH)

PART NO.	MOUNTING SCREW SIZE	TABLE-SLOT SIZE	T NUT	DRILL-PRESS ADAPTOR	MOUNTING SCREW	CLAMP MOUNTING SCREW(4)	QUICK-ADJUSTING SPINDLE	HOLDING CAPACITY (LBS)
CL-300-VTCD-5	5/16-18	TAPPED	NONE	CL-300-VTCA-6	CL-5/16-18x1.75-SHCS	CL-1/4-20x.50-BHCS	CL-516212-FCQA	350
CL-300-VTCD-5-19		3/8 or 10mm	CL-19-TN		CL-5/16-18x1.50-SHCS			
CL-300-VTCD-5-20		7/16	CL-20-TN					
CL-300-VTCD-5-21		1/2	CL-21-TN					
CL-300-VTCD-6	3/8-16	TAPPED	NONE		CL-3/8-16x1.75-SHCS			
CL-300-VTCD-6-00		7/16	CL-00-TN		CL-3/8-16x1.50-SHCS			
CL-300-VTCD-6-12		12mm	CL-12-TN					
CL-300-VTCD-6-0		1/2	CL-0-TN					
CL-300-VTCD-6-1		9/16 or 14mm	CL-1-TN					
CL-300-VTCD-6-16		5/8 or 16mm	CL-16-TN					

HORIZONTAL HANDLE (INCH)

CL-450-HTCD-5	5/16-18	TAPPED	NONE	CL-450-HTCA-6	CL-5/16-18x1.75-SHCS	CL-1/4-20x.50-BHCS	CL-516212-FCQA	500
CL-450-HTCD-5-19		3/8 or 10mm	CL-19-TN		CL-5/16-18x1.50-SHCS			
CL-450-HTCD-5-20		7/16	CL-20-TN					
CL-450-HTCD-5-21		1/2	CL-21-TN					
CL-450-HTCD-6	3/8-16	TAPPED	NONE		CL-3/8-16x1.75-SHCS			
CL-450-HTCD-6-00		7/16	CL-00-TN		CL-3/8-16x1.50-SHCS			
CL-450-HTCD-6-12		12mm	CL-12-TN					
CL-450-HTCD-6-0		1/2	CL-0-TN					
CL-450-HTCD-6-1		9/16 or 14mm	CL-1-TN					
CL-450-HTCD-6-16		5/8 or 16mm	CL-16-TN					

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CARR LANE SIMPLEX HAMMERS

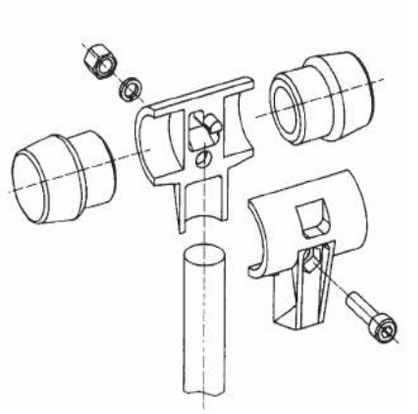
SEE COMPONENT PAGES FOR MATERIAL SPECIFICATIONS

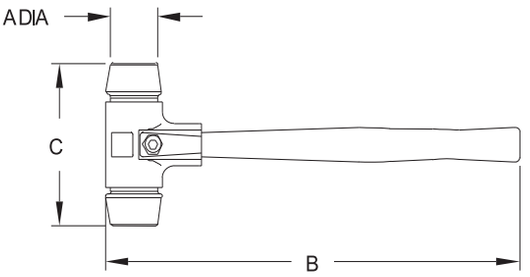


Wooden Handle



Fiberglass Handle





Design your own custom hammers. These soft-face mallets can be customized for specific applications by selecting the proper hammer inserts. Choose the same type of insert for both sides, or build a multi-purpose hammer with a different type of insert for each face. The Simplex system uses a patented hammer housing with 3-point clamping that ensures a safe hammer assembly.

Available in four sizes, with a choice of eight different insert materials:
Type A Blue Thermoplastic (Soft)
Type B Gray Thermoplastic (Medium Soft)
Type C Black Rubber (Medium Soft)
Type D White Superplastic (Medium Hard)
Type E Red Plastic (Hard)
Type F White Nylon (Hard)
Type G Soft Metal (Hard)
Type H Copper (Hard) Fiberglass Handle Only

To order a 30mm hammer with a wooden handle, one black rubber insert (C) and one white nylon insert (F) specify:
CL-30-SPH-W-CF

Observe all appropriate safety precautions. Always wear safety goggles when using a hammer or any striking tool. Bystanders must also wear safety goggles. Never strike the hammer with or against another striking tool, hardened nail, or any other hard object that could cause damage. Chipping could occur, resulting in possible eye or other injury. Discard any chipped or damaged hammer. If assembling the hammer yourself, ensure that all parts are properly fitted into the handle housing and that the screw is tightened to the specified torque. Check hammer before each use. Using a hammer with loose or improperly fitted parts could result in serious injury. Use only genuine Simplex replacement components.

SIMPLEX HAMMER ASSEMBLY — WOODEN HANDLE

PART NO.	A DIA	B	C	WEIGHT (LBS)
CL-30-SPH-W-xx	30mm (1.18)	11.81	3.54	0.7-0.9
CL-40-SPH-W-xx	40mm (1.57)	12.99	4.33	1.3-1.6
CL-50-SPH-W-xx	50mm (1.96)	13.78	5.32	2.4-3.0
CL-60-SPH-W-xx	60mm (2.36)	15.95	5.71	3.1-4.3

SIMPLEX HAMMER ASSEMBLY — FIBERGLASS HANDLE

CL-30-SPH-F-xx	30mm (1.18)	11.81	3.54	0.9-1.5
CL-40-SPH-F-xx	40mm (1.57)	12.99	4.33	1.8-3.1
CL-50-SPH-F-xx	50mm (1.96)	13.78	5.32	3.3-4.0
CL-60-SPH-F-xx	60mm (2.36)	15.95	5.71	3.5-5.5

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CARR LANE SIMPLEX HAMMERS



Type A Inserts
Blue Thermoplastic
(Soft)

Blue thermoplastic inserts are soft and non-smudging. Applications include assembly operations, dent removal, woodworking, furniture assembly, window and door construction, joiner's work, and floor tiling. Hardness 60-70 Shore A.

PART NO.	HAMMER SIZE (FACE DIA)
CL-30-SPH-A	30mm (1.18)
CL-40-SPH-A	40mm (1.57)
CL-50-SPH-A	50mm (1.96)
CL-60-SPH-A	60mm (2.36)



Type C Inserts
Black Rubber
(Medium Soft)

Black Rubber inserts are medium soft. Applications include assembly operations, dent removal, prefabricated housing construction, carpenter's work, paving, masonry work, concrete-form setup, scaffold construction, gardening, landscaping, and interior construction. Hardness 90-100 Shore A.

PART NO.	HAMMER SIZE (FACE DIA)
CL-30-SPH-C	30mm (1.18)
CL-40-SPH-C	40mm (1.57)
CL-50-SPH-C	50mm (1.96)
CL-60-SPH-C	60mm (2.36)



Type E Inserts
Red Plastic
(Hard)

Red plastic inserts (cellulose acetate) are hard, semi-transparent, and grease and oil resistant. Applications include automotive assembly and repair work, sheet metal working, dent removal, concrete-form setup, and scaffold construction. Hardness 65-75 Shore D.

PART NO.	HAMMER SIZE (FACE DIA)
CL-30-SPH-E	30mm (1.18)
CL-40-SPH-E	40mm (1.57)
CL-50-SPH-E	50mm (1.96)
CL-60-SPH-E	60mm (2.36)



Type G Inserts
Soft Metal
(Hard)

Soft metal inserts are made of an aluminum-copper alloy which is hard and resistant to heat. Excellent alternative to old-fashioned lead hammers, to eliminate the risk of lead contamination. Applications include metalworking, tooling, automotive assembly and repair work, straightening work, car body work, and mold construction.

PART NO.	HAMMER SIZE (FACE DIA)
CL-30-SPH-G	30mm (1.18)
CL-40-SPH-G	40mm (1.57)
CL-50-SPH-G	50mm (1.96)
CL-60-SPH-G	60mm (2.36)



Type B Inserts
Grey Thermoplastic
(Medium Soft)

Gray thermoplastic inserts are medium soft and non-smudging. Applications include assembly operations, car-body work, woodworking, furniture assembly, window and door construction, joiner's work, floor tiling, paving, and interior construction. Hardness 85-95 Shore A.

PART NO.	HAMMER SIZE (FACE DIA)
CL-30-SPH-B	30mm (1.18)
CL-40-SPH-B	40mm (1.57)
CL-50-SPH-B	50mm (1.96)
CL-60-SPH-B	60mm (2.36)



Type D Inserts
White Superplastic
(Medium Hard)

White superplastic inserts (UHMW polyethylene) are medium hard, durable, impact resistant, acid and lye resistant, grease and oil resistant, and ideal for striking sharp edges. Applications include assembly operations, automotive assembly and repair work, repair and maintenance work, car body work, sheet metal working, dent removal, assembly of sharp-edged workpieces, paving, masonry work, scaffold construction, gardening, and landscaping. Hardness 60-70 Shore D.

PART NO.	HAMMER SIZE (FACE DIA)
CL-30-SPH-D	30mm (1.18)
CL-40-SPH-D	40mm (1.57)
CL-50-SPH-D	50mm (1.96)
CL-60-SPH-D	60mm (2.36)



Type F Inserts
White Nylon
(Hard)

White nylon inserts are hard, grease and oil resistant, highly elastic, and have superior strike effectiveness. Applications include assembly operations, metalworking, tooling, automotive assembly and repair work, joining of workpieces, sheet metal working, dent removal, mold construction, assembly of sharp-edged workpieces, and scaffold construction. Hardness 68-78 Shore D.

PART NO.	HAMMER SIZE (FACE DIA)
CL-30-SPH-F	30mm (1.18)
CL-40-SPH-F	40mm (1.57)
CL-50-SPH-F	50mm (1.96)
CL-60-SPH-F	60mm (2.36)



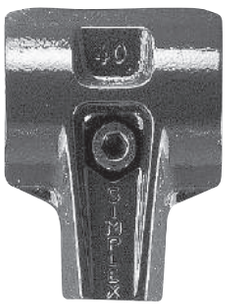
Type H Inserts
Copper
(Hard)

Copper inserts are hard and provide maximum impact. Plastic socket provides for secure mounting of the copper insert in the hammer. Applications include machine construction, automotive assembly and repair work, repair and maintenance work, and vehicle service stations.

PART NO.	HAMMER SIZE (FACE DIA)
CL-30-SPH-H	30mm (1.18)
CL-40-SPH-H	40mm (1.57)

CARR LANE SIMPLEX HAMMERS

HOUSINGS: CAST IRON, FURNISHED WITH SOCKET-HEAD CAP SCREW, SPRING WASHER, AND NUT
HANDLES: EUROPEAN BLACK LOCUST WOOD, OR FIBERGLASS WITH ERGONOMIC RUBBER GRIP





Rugged cast iron housing (red), furnished with a high-strength Socket-Head Cap Screw, spring washer, and nut. Premium quality hardwood handle. Use wooden handles only with red housings.

HOUSING & HANDLE — WOODEN HANDLE

HOUSING PART NO.	HANDLE PART NO.	HAMMER SIZE (FACE DIA)	TIGHTENING TORQUE (FT-LBS)	
			PLASTIC INSERTS	METAL INSERTS
CL-30-SPH-HWH	CL-30-SPH-WH	30mm (1.18)	11	15
CL-40-SPH-HWH	CL-40-SPH-WH	40mm (1.57)	18	30
CL-50-SPH-HWH	CL-50-SPH-WH	50mm (1.96)	22	37
CL-60-SPH-HWH	CL-60-SPH-WH	60mm (2.36)	30	48

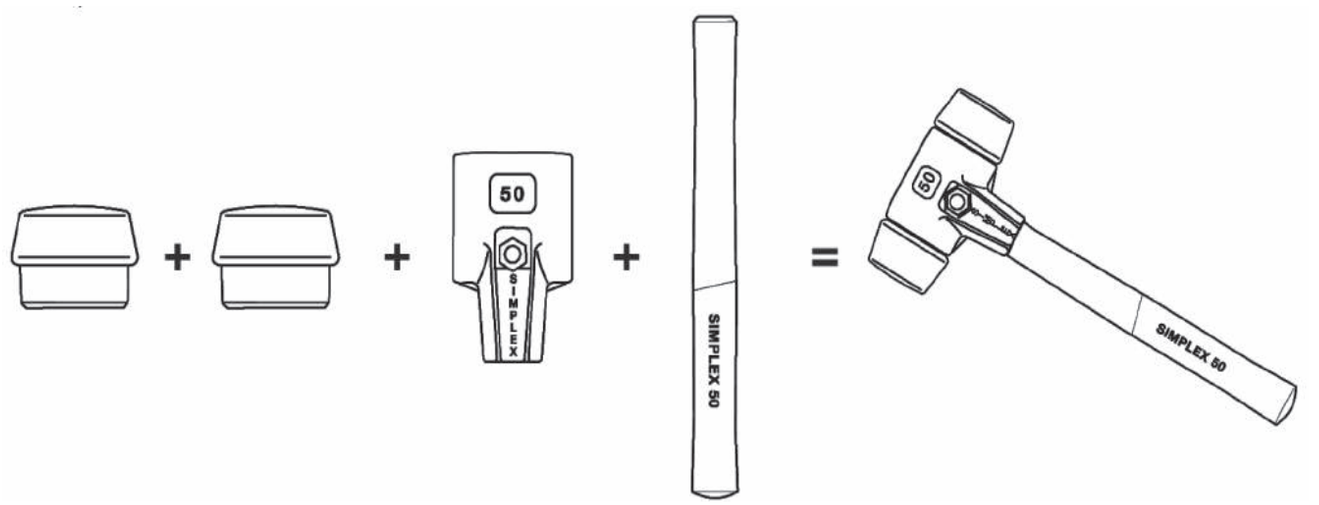




Heavy-duty cast iron housing (black), reinforced for use with a fiberglass handle, furnished with a high-strength Socket-Head Cap Screw, spring washer, and nut. High-strength fiberglass handle with an ergonomic rubber grip. Use fiberglass handles only with black housings.

HOUSING & HANDLE — FIBERGLASS HANDLE

HOUSING PART NO.	HANDLE PART NO.	HAMMER SIZE (FACE DIA)	TIGHTENING TORQUE (FT-LBS)	
			PLASTIC INSERTS	METAL INSERTS
CL-30-SPH-HFH	CL-30-SPH-FH	30mm (1.18)	18	30
CL-40-SPH-HFH	CL-40-SPH-FH	40mm (1.57)	22	44
CL-50-SPH-HFH	CL-50-SPH-FH	50mm (1.96)	30	52
CL-60-SPH-HFH	CL-60-SPH-FH	60mm (2.36)	44	59

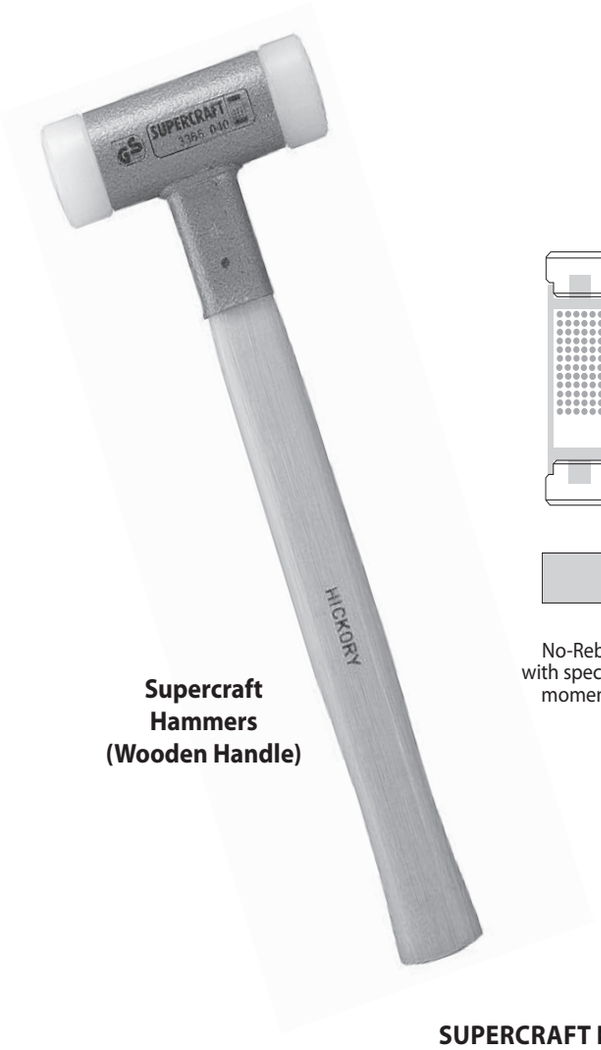


Insert **Insert** **Housing** **Handle** **Hammer Assembly**

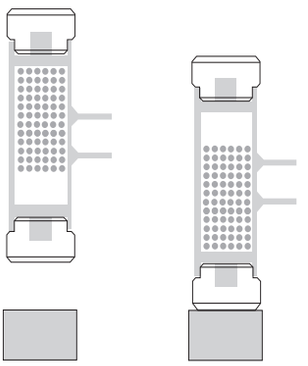
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NO-REBOUND HAMMERS

HOUSINGS: STEEL ASSEMBLY CONTAINING STEEL PELLETS. HANDLE: HICKORY WOOD.
INSERTS: NYLON, NATURAL WHITE COLOR, HARDNESS 68-78 SHORE D



Supercraft Hammers (Wooden Handle)



No-Rebound Hammers are filled with special steel pellets that transfer momentum to the impact point.

No-Rebound Hammers deliver full impact, about 50% greater than a standard hammer. The housing is filled with special steel pellets that transfer momentum to the impact point. Ideal for assembling machine parts without damage. Speeds up work while reducing fatigue. Allows better hammer control by absorbing the bounce. Hickory-wood handle. Available in five standard sizes, plus two sledgehammer sizes.

Supercraft No-Rebound Hammers have replaceable nylon inserts. These nylon inserts are hard, grease and oil resistant, highly elastic, and have superior strike effectiveness. Applications include assembly operations, metalworking, tooling, positioning of workpieces, automotive assembly and repair work, joining of workpieces, sheet metal working, dent removal, mold construction, assembly of sharp-edged workpieces, and scaffold construction.

Observe all appropriate safety precautions. Never allow the hammer's striking faces to wear down to the point where the hammer housing makes contact with the work surface, as irreparable damage could result. Always wear safety goggles when using a hammer or any striking tool. Bystanders must also wear safety goggles. Never strike the hammer with or against another striking tool, hardened nail, or any other hard object that could cause damage. Chipping could occur, resulting in possible eye or other injury. Discard any chipped or damaged hammer.

SUPERCRAFT HAMMERS — WOODEN HANDLE

PART NO.	FACE DIA	WEIGHT (LBS)	OVERALL LENGTH	HEAD LENGTH	REPLACEMENT INSERT (2 REQUIRED)
CL-3366-020-NRH	20mm (.78)	0.5	11.77	4.12	CL-3508-020-NRHI
CL-3366-030-NRH	30mm (1.18)	0.7	12.95	4.32	CL-3508-030-NRHI
CL-3366-040-NRH	40mm (1.57)	1.6	14.13	4.51	CL-3508-040-NRHI
CL-3366-050-NRH	50mm (1.96)	2.2	14.52	4.71	CL-3508-050-NRHI
CL-3366-060-NRH	60mm (2.36)	3.8	14.52	5.69	CL-3508-060-NRHI



Supercraft Sledgehammers (Wooden Handle)

SUPERCRAFT SLEDGEHAMMERS — WOODEN HANDLE

PART NO.	FACE DIA	WEIGHT (LBS)	OVERALL LENGTH	HEAD LENGTH	REPLACEMENT INSERT (2 REQUIRED)
CL-3366-081-NRH	80mm (3.14)	9	34.5	7.85	CL-3508-080-NRHI
CL-3366-107-NRH	100mm (3.93)	15	39.2	8.24	CL-3508-100-NRHI

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NO-REBOUND HAMMERS

HOUSING & HANDLE: STEEL ASSEMBLY CONTAINING STEEL PELLETS
SUPERCRAFT INSERTS: NYLON, NATURAL WHITE COLOR, HARDNESS 68-78 SHORE D
SECURAL INSERTS: POLYURETHANE, YELLOW



Supercraft Hammers (Steel Handle)



HI-VIS Supercraft Hammers (Steel Handle)



Secural Narrow Hammers (Steel Handle)

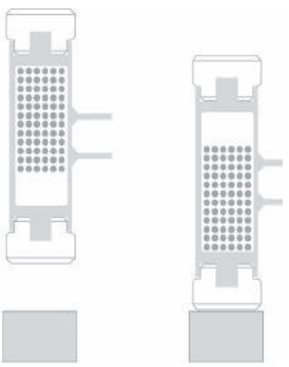
Also available in a high-visibility version!

No-Rebound Hammers deliver full impact, about 50% greater than a standard hammer. The housing is filled with special steel pellets that transfer momentum to the impact point. Ideal for assembling machine parts without damage. Speeds up work while reducing fatigue. Allows better hammer control by absorbing the bounce. Steel handle with ergonomic rubber grip.

Supercraft No-Rebound Hammers are available in four sizes, now optionally available with a high-visibility yellow fluorescent finish, ideal for locating your hammer in dim lighting conditions. Supercraft Hammers have replaceable nylon inserts. These nylon inserts are hard, grease and oil resistant, highly elastic, and have superior strike effectiveness.

Secural Narrow No-Rebound Hammers have a narrow, rectangular head that allows hammering in tight spots, and also makes storage easier in toolbox drawers. Available in one size, with a 30mm x 40mm face. Secural Narrow Hammers have replaceable polyurethane inserts. These inserts are medium soft.

Observe all appropriate safety precautions. Never allow the hammer's striking faces to wear down to the point where the hammer housing makes contact with the work surface, as irreparable damage could result. Always wear safety goggles when using a hammer or any striking tool. Bystanders must also wear safety goggles. Never strike the hammer with or against another striking tool, hardened nail, or any other hard object that could cause damage. Chipping could occur, resulting in possible eye or other injury. Discard any chipped or damaged hammer.



No-Rebound Hammers are filled with special steel pellets that transfer momentum to the impact point.

SUPERCRAFT HAMMERS — STEEL HANDLE

PART NO.	FACE DIA	WEIGHT (LBS)	OVERALL LENGTH	HEAD LENGTH	REPLACEMENT INSERT (2 REQUIRED)
CL-3377-030-NRH	30mm (1.18)	1.3	11.38	4.32	CL-3508-030-NRHI
CL-3377-040-NRH	40mm (1.57)	1.9	11.77	4.51	CL-3508-040-NRHI
CL-3377-050-NRH	50mm (1.96)	2.6	12.17	4.71	CL-3508-050-NRHI
CL-3377-060-NRH	60mm (2.36)	3.9	12.76	5.69	CL-3508-060-NRHI

HI-VIZ SUPERCRAFT HAMMERS — STEEL HANDLE

PART NO.	FACE DIA	WEIGHT (LBS)	OVERALL LENGTH	HEAD LENGTH	REPLACEMENT INSERT (2 REQUIRED)
CL-3377-130-NRH	30mm (1.18)	1.3	11.38	4.32	CL-3508-030-NRHI
CL-3377-140-NRH	40mm (1.57)	1.9	11.77	4.51	CL-3508-040-NRHI
CL-3377-150-NRH	50mm (1.96)	2.6	12.17	4.71	CL-3508-050-NRHI
CL-3377-160-NRH	60mm (2.36)	3.9	12.76	5.69	CL-3508-060-NRHI

SECURAL NARROW HAMMERS — STEEL HANDLE

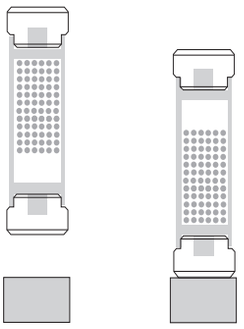
PART NO.	FACE DIA	WEIGHT (LBS)	OVERALL LENGTH	HEAD LENGTH	REPLACEMENT INSERT (2 REQUIRED)
CL-3380-040-NRH	30mm x 40mm (1.18 x 1.57)	1.6	11.77	4.59	CL-3511-040-NRHI

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NO-REBOUND DROP HAMMERS

HOUSING: STEEL ASSEMBLY CONTAINING STEEL PELLETS
INSERTS: NYLON, NATURAL WHITE COLOR, HARDNESS 68-78 SHORE D





No-Rebound Drop Hammers are filled with special steel pellets that transfer momentum to the impact point.

No-Rebound Drop Hammers provide the impact of a normal hammer even when access is restricted. No-Rebound Hammers deliver full impact, about 50% greater than a standard hammer. The housing is filled with special steel pellets that transfer momentum to the impact point. Ideal for assembling machine parts without damage. Speeds up work while reducing fatigue. Allows better hammer control by absorbing the bounce. Available in four sizes .

No-Rebound Drop Hammers have replaceable nylon inserts. These nylon inserts are hard, grease and oil resistant, highly elastic, and have superior strike effectiveness. Applications include assembly operations, metalworking, tooling, positioning of workpieces, automotive assembly and repair work, joining of workpieces, sheet metal working, dent removal, mold construction, and assembly of sharp-edged workpieces.

PART NO.	FACE DIA	WEIGHT (LBS)	LENGTH	REPLACEMENT INSERT (2 REQUIRED)
CL-3408-020-NRH	20mm (.78)	0.5	5.89	CL-3508-020-NRHI
CL-3408-030-NRH	30mm (1.18)	1.0	6.08	CL-3508-030-NRHI
CL-3408-040-NRH	40mm (1.57)	1.8	6.28	CL-3508-040-NRHI
CL-3408-050-NRH	50mm (1.96)	2.8	6.48	CL-3508-050-NRHI

SOFT-FACE PUNCHES

HOUSING: STEEL. INSERTS: NYLON, NATURAL WHITE COLOR, HARDNESS 68-78 SHORE D



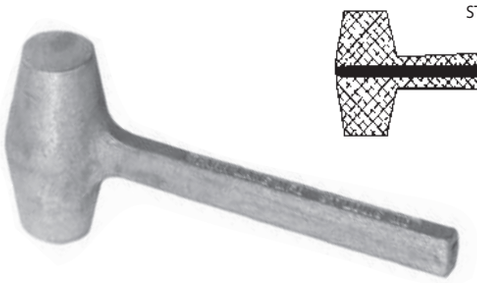
Soft-Face Punches safely extend the reach of a hammer when access is restricted. Transfers impact to difficult-to-reach places. Available in two sizes.

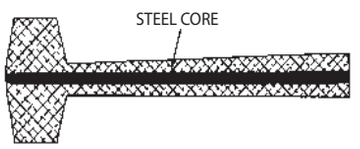
Soft-Face Punches have replaceable nylon inserts. These nylon inserts are hard, grease and oil resistant, highly elastic, and have superior strike effectiveness. Applications include assembly operations, metalworking, tooling, automotive assembly and repair work, joining of workpieces, sheet metal working, dent removal, and assembly of sharp-edged workpieces.

PART NO.	FACE DIA	WEIGHT (LBS)	LENGTH	REPLACEMENT INSERT (2 REQUIRED)
CL-3408-010-SFP	10mm (.39)	0.2	6.59	CL-3508-010-NRHI
CL-3408-015-SFP	15mm (.59)	0.4	6.87	CL-3508-015-NRHI

NO-MAR HAMMERS

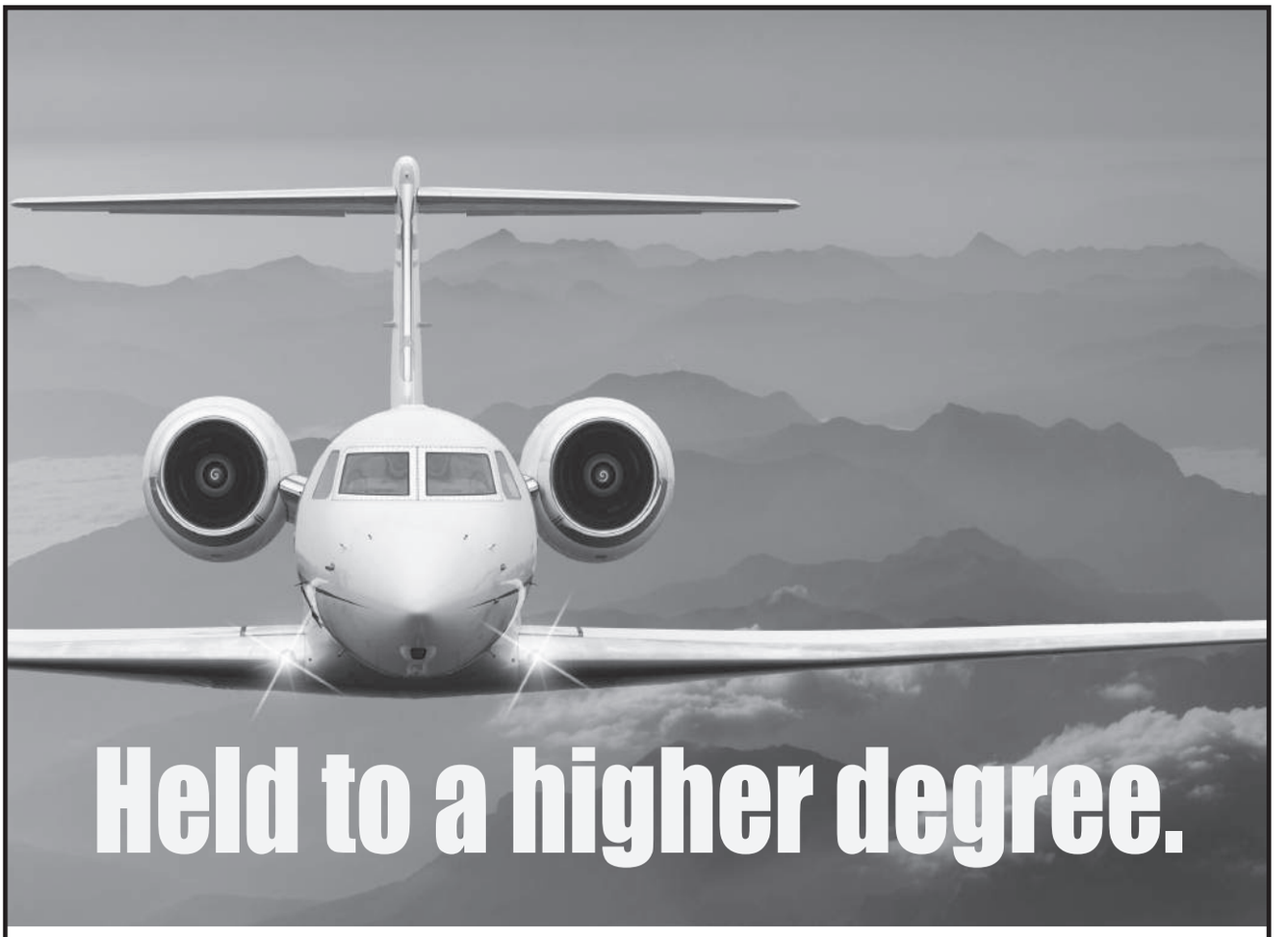
ALUMINUM ALLOY WITH STEEL CORE





Economical aluminum alloy hammer. Excellent alternative to old-fashioned lead hammers, to eliminate the risk of lead contamination. One-piece cast construction with a steel core for extra strength. Applications include metalworking, tooling, automotive assembly and repair work, straightening work, car body work, and mold construction. Available in two sizes.

PART NO.	WEIGHT	FACE DIA	HANDLE LENGTH TO CENTERLINE OF FACE
CL-1-NMH	2 lb	1-1/2	10-1/2
CL-2-NMH	3.5 lb	2	11



7

ON-SIZE® Bushings from Carr Lane Manufacturing



Made from a 36% nickel-iron alloy,
ON-SIZE® Bushings provide minimum thermal expansion.

Choose ON-SIZE® Bushings from Carr Lane,
when high dimensional stability is required,
even under sustained high temperatures
and multiple heat-cool cycles.

See Page 249

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THREADED INSERTS



Key Inserts – Heavy Duty



Key Inserts – Thinwall



Key Inserts – Solid



Key-Insert Installation Tools

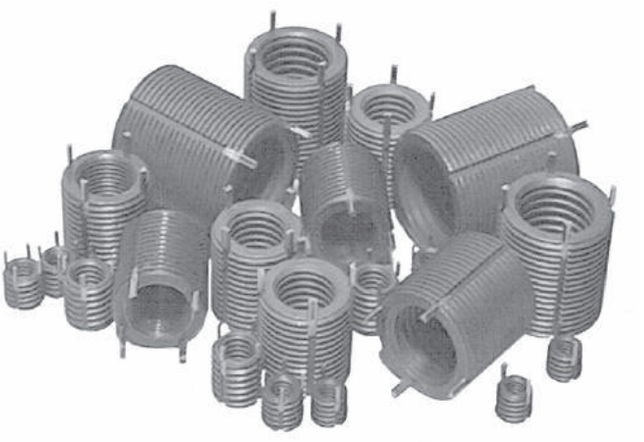


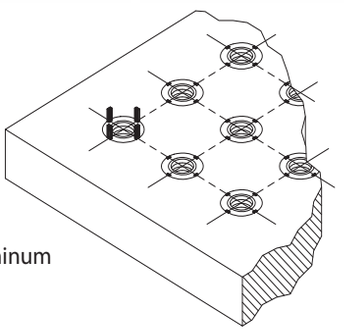
Key-Insert Assortments



Adhesive-Bonded Fasteners

KEY INSERTS



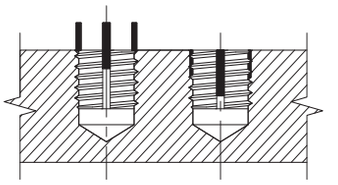


Key Inserts are often used to reinforce tapped holes in aluminum tooling plates.

These key-locking threaded inserts are ideal for thread reinforcement, especially when the mating stud or bolt will be removed frequently. They provide strong, permanent steel threads in any parent material — ferrous, non-ferrous, or non-metallic.

Key Inserts are also well suited for quick repair of stripped, damaged, or worn threads. A solid version is also available to use as a handy plug to relocate holes drilled or tapped on the wrong location.

Install with standard drills and taps. Important: Use tap drill specified in table (slightly larger than standard for that thread size). Tap-drill hole tolerance should be -.001/+.004 (-.001/+.005 above .500 dia).

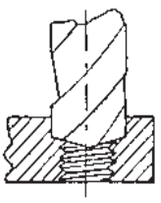


Locking keys are driven down into the parent material during installation, providing a positive mechanical lock against rotation. Inserts with an ID thread 5/16 and above have four locking keys, smaller sizes have two. Pull-out strength can be calculated approximately by the following formula:

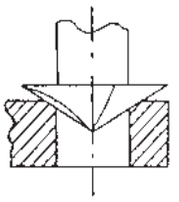
Approximate pull-out strength = Shear engagement area of insert (see table) X Minimum ultimate shear strength of parent material (psi)

8

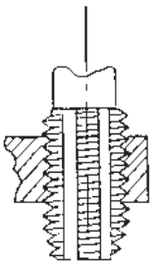
EASY INSTALLATION



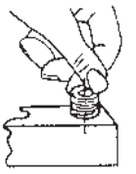
1. Drill out old threads using tap drill specified in table (Important: Correct tap drill is slightly larger than standard for that thread size).



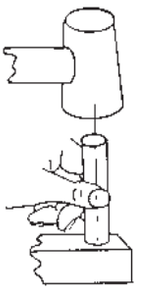
2. Countersink to diameter shown in table.



3. Tap new threads, using standard tap.

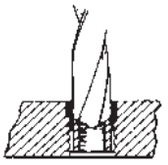


4. Screw in insert until body is slightly (.010 to .030 inches) below the surface, by hand or using installation tool. Keys act as a depth stop.

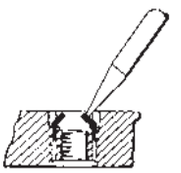


5. Drive keys down with several light hammer taps on installation tool (or directly on keys if no installation tool is available).

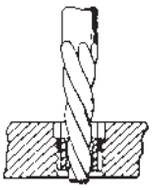
EASY REMOVAL



1. Drill out locking keys with specified drill diameter and depth (see table).



2. Deflect keys inward and break off.



3. Remove insert with an E-Z OUT type tool.



4. Screw replacement into original holes. Parent material is totally undamaged.

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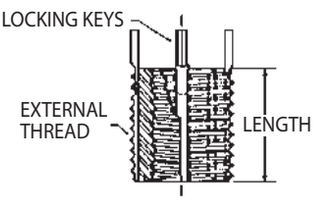
KEY INSERTS – HEAVY DUTY

BODY: 1215 STEEL, BLACK OXIDE FINISH. KEYS: 302 STAINLESS STEEL



Heavy Duty – Steel

General-purpose threaded inserts suitable for most applications. Available in USA ID-thread sizes from #10-24 to 1-1/2″-12, plus metric sizes from M5 to M24. Important: Use tap drill specified in table (slightly larger than standard for that thread size).





For installation tools, see tables below.



Repair Kits shown below contain an installation tool and several Key Inserts of a given size.

HEAVY DUTY – STEEL (INCH)

	INSERT DIMENSIONS				INSTALLATION DATA							REMOVAL DATA	
PART NO.	INTERNAL THREAD	EXTERNAL THREAD	LENGTH	SHEAR ENGAG. (SQ. IN.)	REQ'D TAP DRILL	C'SINK DIA	MIN. THREAD DEPTH	STANDARD TAP UN-2B	INSTALLATION TOOL PART NO.	REPAIR KIT PART NO.	INSERTS PER KIT	DRILL SIZE	DRILL DEPTH
CL-1024-KS	#10-24	3/8-16	.31	.190	Q	3/8	3/8	3/8-16	CL-10-KST	CL-1024-KSK	15	9/32	1/8
CL-1032-KS	#10-32									CL-1032-KSK			
CL-1420-KS	1/4-20	7/16-14	.37	.284	X	7/16	7/16	7/16-14	CL-14-KST	CL-1420-KSK	13	11/32	3/16
CL-1428-KS	1/4-28									CL-1428-KSK			
CL-51618-KS	5/16-18	1/2-13	.43	.359	29/64	1/2	1/2	1/2-13	CL-516-KST	CL-51618-KSK	8	13/32	3/16
CL-51624-KS	5/16-24									CL-51624-KSK			
CL-3816-KS	3/8-16	9/16-12	.50	.498	33/64	9/16	9/16	9/16-12	CL-38-KST	CL-3816-KSK	6	15/32	3/16
CL-3824-KS	3/8-24									CL-3824-KSK			
CL-71614-KS	7/16-14	5/8-11	.62	.717	37/64	5/8	11/16	5/8-11	CL-716-KST	CL-71614-KSK	6	17/32	3/16
CL-71620-KS	7/16-20									CL-71620-KSK			
CL-1213-KS	1/2-13	3/4-16	.62	1.057	45/64	3/4	11/16	3/4-16	CL-12-KST	CL-1213-KSK	5	21/32	3/16
CL-1220-KS	1/2-20									CL-1220-KSK			
CL-91612-KS	9/16-12	3/4-16	.81	1.057	45/64	3/4	7/8	3/4-16	CL-12-KST	CL-91612-KSK	3	21/32	3/16
CL-91618-KS	9/16-18									CL-91618-KSK			
CL-5811-KS	5/8-11	7/8-14	.87	1.487	53/64	7/8	1	7/8-14	CL-58-KST	CL-5811-KSK	2	25/32	3/16
CL-5818-KS	5/8-18									CL-5818-KSK			
CL-3410-KS	3/4-10	1-1/8″-12	1.12	2.490	1-1/16	1-1/8	1-5/16	1-1/8″-12	CL-34-KST	CL-3410-KSK	2	31/32	5/16
CL-3416-KS	3/4-16									CL-3416-KSK			
CL-789-KS	7/8-9	1-1/4″-12	1.25	3.137	1-3/16	1-1/4	1-7/16	1-1/4″-12	CL-34-KST	CL-789-KSK	2	1-3/32	5/16
CL-7814-KS	7/8-14									CL-7814-KSK			
CL-18-KS	1″-8	1-3/8″-12	1.37	3.838	1-5/16	1-3/8	1-9/16	1-3/8″-12	CL-1-KST	CL-18-KSK	2	1-7/32	5/16
CL-112-KS	1″-12									CL-112-KSK			
CL-1187-KS	1-1/8″-7	1-1/2″-12	1.62	4.752	1-7/16	1-1/2	1-11/16	1-1/2″-12	CL-118-KST	CL-1187-KSK	2	1-11/32	5/16
CL-11812-KS	1-1/8″-12									CL-11812-KSK			
CL-1147-KS	1-1/4″-7	1-5/8″-12	1.81	5.446	1-35/64	1-5/8	2	1-5/8″-12	CL-114-KST	CL-1147-KSK	2	1-15/32	5/16
CL-11412-KS	1-1/4″-12									CL-11412-KSK			
CL-1126-KS	1-1/2″-6	1-7/8″-12	2.00	7.103	1-51/64	1-7/8	2-3/16	1-7/8″-12	CL-112-KST	CL-1126-KSK	2	1-23/32	5/16
CL-11212-KS	1-1/2″-12									CL-11212-KSK			

HEAVY DUTY – STEEL (METRIC)

–	M5	M10x1.25											
–	M6	M12x1.25											
–	M8	M14x1.5											
–	M8x1												
–	M10	M16x1.5											
–	M10x1.25												
–	M12	M18x1.5											
–	M12x1.25												
CLM-162-KSM	M16	M22x1.5	.87	1.390	20.5 or 13/16	.88	.96	M22x1.5	CL-58-KST	CLM-162-KSK	2	17.5mm or 11/16	1/4
CLM-1615-KSM	M16x1.5									CLM-1615-KSK			
CLM-2025-KSM	M20	M30x2	1.18	2.750	28mm or 1-7/64	1.19	1.36	M30x2	CL-34-KST	CLM-2025-KSK	2	26mm or 1-1/32	1/4
CLM-2015-KSM	M20x1.5									CLM-2015-KSK			
CLM-243-KSM	M24	M33x2	1.30	3.328	31mm or 1-7/32	1.31	1.48	M33x2	CLM-243-KSMT	CLM-243-KSK	2	29mm or 1-9/64	1/4
CLM-242-KSM	M24x2									CLM-242-KSK			

INFO+: AVAILABLE IN STAINLESS STEEL ONLY (PAGE 348)

* Installation Tool included in Repair Kit.

CONTINUED ON NEXT PAGE

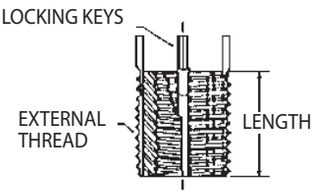
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KEY INSERTS – HEAVY DUTY

BODY: 303 STAINLESS STEEL. KEYS: 302 STAINLESS STEEL

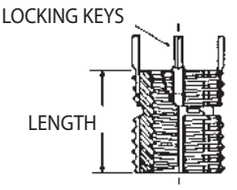


Heavy Duty – Stainless Steel





Heavy Duty – Stainless Steel Internal-Thread Locking



Stainless steel version of our general-purpose threaded inserts with a thick, heavy-duty thread wall. Key Inserts are ideal for thread reinforcement, especially when the mating stud or bolt will be removed frequently. These stainless inserts provide strong, permanent stainless steel threads in any parent material, ferrous, non-ferrous, or non-metallic. Key Inserts are also well suited for quick repair of stripped, damaged, or worn threads. Locking keys positively prevent the insert from rotating.

Stainless Key Inserts are optionally available with "Internal Thread Locking," which uses a modified internal thread to prevent the installed bolt or stud from rotating. This feature is useful for one-time, permanent installations.

See Technical Information at the beginning of this section for complete installation steps. Key Inserts are installed with standard drills and taps. Important: Use exactly the tap-drill size specified in the tables (slightly larger than the standard tap drill for that thread size). Locking keys are driven down into the parent material during installation, providing a positive mechanical lock against rotation. See tables for optional installation tools.

HEAVY DUTY — STAINLESS STEEL (INCH)

	INSERT DIMENSIONS				INSTALLATION DATA					REMOVAL DATA			
PART NO.	INTERNAL THREAD	EXTERNAL THREAD	LENGTH	SHEAR ENGAG. (SQ. IN.)	REQ'D TAP DRILL	C'SINK DIA	MIN. THREAD LENGTH	STANDARD TAP UN-2B	INSTALLATION TOOL PART NO.	DRILL SIZE	DRILL DEPTH	MS EQUIVALENT	NAS EQUIVALENT
CL-1024-SKS	#10-24	3/8-16	.31	.190	.332	.385	.37	3/8-16	CL-10-KST	9/32	1/8	MS 51831-101	—
CL-1032-SKS	#10-32											MS 51831-201	NAS 1395C3
CL-1420-SKS	1/4-20	7/16-14	.37	.284	.397	.447	.43	7/16-14	CL-14-KST	11/32	3/16	MS 51831-102	—
CL-1428-SKS	1/4-28											MS 51831-202	NAS 1395C4
CL-51618-SKS	5/16-18	1/2-13	.43	.359	.453	.510	.50	1/2-13	CL-516-KST	13/32	3/16	MS 51831-103	—
CL-51624-SKS	5/16-24											MS 51831-203	NAS 1395C5
CL-3816-SKS	3/8-16	9/16-12	.50	.498	.516	.572	.56	9/16-12	CL-38-KST	15/32	3/16	MS 51831-104	—
CL-3824-SKS	3/8-24											MS 51831-204	NAS 1395C6
CL-1213-SKS	1/2-13	3/4-16	.62	1.057	.703	.750	.69	3/4-16	CL-12-KST	21/32	3/16	—	—
CL-1220-SKS	1/2-20											—	—
CL-5811-SKS	5/8-11	7/8-14	.87	1.487	.828	.885	1.00	7/8-14	CL-58-KST	25/32	3/16	MS 51831-108	—
CL-3410-SKS	3/4-10	1-1/8"-12	1.12	2.490	1.062	1.145	1.31	1-1/8"-12	CL-34-KST	31/32	5/16	MS 51831-109	—

HEAVY DUTY — STAINLESS STEEL INTERNAL THREAD LOCKING (INCH)

CL-1420-SKSL	1/4-20	7/16-14	.37	.197	.397	.447	.43	7/16-14	CL-14-KST	11/32	3/16	MS 51831-102L	—
CL-51618-SKSL	5/16-18	1/2-13	.43	.261	.453	.510	.50	1/2-13	CL-516-KST	13/32	3/16	MS 51831-103L	—
CL-3816-SKSL	3/8-16	9/16-12	.50	.384	.516	.572	.56	9/16-12	CL-38-KST	15/32	3/16	MS 51831-104L	—
CL-1213-SKSL	1/2-13	11/16-11NS	.68	.737	.641	.700	.75	11/16-11NS	CL-111611-KSST	19/32	3/16	MS 51831-106L	—
CL-5811-SKSL	5/8-11	7/8-14	.87	1.242	.828	.885	1.00	7/8-14	CL-58-KST	25/32	3/16	MS 51831-108L	—

HEAVY DUTY — STAINLESS STEEL (METRIC)

CLM-58-SKSM	M5	M10x1.25	.39	.275	8.8mm or S	.40	.45	M10x1.25	CL-10-KST	7.5mm or 19/64	.19	—	—
CLM-61-SKSM	M6	M12x1.25	.47	.413	10.8mm or 27/64	.48	.53	M12x1.25	CL-14-KST	9.5mm or 3/8	.19	—	—
CLM-8125-SKSM	M8	M14x1.5	.55	.530	13mm or 1/2	.56	.61	M14x1.5	CL-516-KST	11.5mm or 29/64	.19	—	—
CLM-81-SKSM	M8x1										.19	—	—
CLM-1015-SKSM	M10	M16x1.5	.63	.729	15mm or 37/64	.64	.69	M16x1.5	CL-38-KST	13.5mm or 17/32,	.19	—	—
CLM-10125-SKSM	M10x1.25										.19	—	—
CLM-12175-SKSM	M12	M18x1.5	.71	.820	17mm or 21/32	.72	.77	M18x1.5	CL-12-KST	15.5mm or 39/64	.19	—	—
CLM-12125-SKSM	M12x1.25										.19	—	—
CLM-162-SKS	M16	M22x1.5	.87	1.390	20.5mm or 13/16	.88	.96	M22x1.5	CLM-58-KSMT	17.5mm or 11/16	1/4	—	—
CLM-2025-SKS	M20	M30x2	1.18	2.750	28mm or 1-7/64	1.19	1.36	M30x2	CL-34-KST	26mm or 1-1/64	1/4	—	—
CLM-243-SKS	M24	M33x2	1.30	3.328	31mm or 1-7/32	1.31	1.48	M33x2	CLM-243-KSMT	29mm or 1-9/64	1/4	—	—

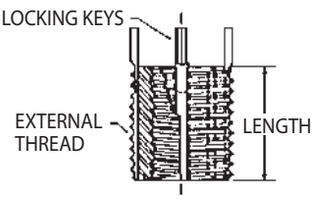
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KEY INSERTS – THINWALL

BODY: 12L15 STEEL, BLACK OXIDE FINISH, OR 303 STAINLESS STEEL.
KEYS: 302 STAINLESS STEEL

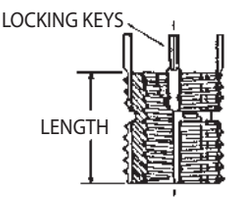


Thinwall — Steel and Stainless Steel





Thinwall — Stainless Steel Internal-Thread Locking



Thinwall Key Inserts have a smaller OD thread size than standard heavy-duty inserts, ideal for tight spaces where less pull-out strength is acceptable. Key Inserts are ideal for thread reinforcement, especially when the mating stud or bolt will be removed frequently. These stainless inserts provide strong, permanent stainless steel threads in any parent material, ferrous, non-ferrous, or non-metallic. Key Inserts are also well suited for quick repair of stripped, damaged, or worn threads. Locking keys positively prevent the insert from rotating.

Stainless Key Inserts are optionally available with "Internal Thread Locking," which uses a modified internal thread to prevent the installed bolt or stud from rotating. This feature is useful for one-time, permanent installations.

See Technical Information at the beginning of this section for complete installation steps. Key Inserts are installed with standard drills and taps. Important: Use exactly the tap-drill size specified in the tables (slightly larger than the standard tap drill for that thread size). Locking keys are driven down into the parent material during installation, providing a positive mechanical lock against rotation. See tables for optional installation tools.

THINWALL — STAINLESS STEEL (INCH)

	INSERT DIMENSIONS				INSTALLATION DATA					REMOVAL DATA			
PART NO.	INTERNAL THREAD	EXTERNAL THREAD	LENGTH	SHEAR ENGAG. (SQ. IN.)	REQ'D TAP DRILL	C'SINK DIA	MIN. THREAD LENGTH	STANDARD TAP UN-2B	INSTALLATION TOOL PART NO.	DRILL SIZE	DRILL DEPTH	MS EQUIVALENT	NAS EQUIVALENT
CL-1024-TSKS	#10-24	5/16-18	.31	.152	.272	.323	.37	5/16-18	CL-10-KST	7/32	5/32	MS 51830-105	—
CL-1032-TSKS	#10-32											MS 51830-201	NAS 1394C3
CL-1420-TSKS	1/4-20	3/8-16	.37	.237	.332	.385	.43	3/8-16	CL-14-KST	9/32	3/16	MS 51830-106	—
CL-1428-TSKS	1/4-28											MS 51830-202	NAS 1394C4
CL-51618-TSKS	5/16-18	7/16-14	.43	.305	.397	.447	.50	7/16-14	CL-516-KST	11/32		MS 51830-107	—
CL-3816-TSKS	3/8-16	1/2-13	.50	.430	.453	.510	.56	1/2-13	CL-38-KST	13/32		MS 51830-108	—
CL-1213-TSKS	1/2-13	5/8-11	.62	.718	.578	.635	.68	5/8-11	CL-12-KST	17/32		MS 51830-110	—

THINWALL — STAINLESS STEEL INTERNAL THREAD LOCKING (INCH)

CL-1032-TSKSL	#10-32	5/16-18	.31	.094	.272	.323	.37	5/16-18	CL-10-KST	7/32	5/32	MS 51830-201L	NAS 1394C3L
CL-1420-TSKSL	1/4-20	3/8-16	.37	.173	.332	.385	.43	3/8-16	CL-14-KST	9/32	3/16	MS 51830-106L	—
CL-51618-TSKSL	5/16-18	7/16-14	.43	.232	.397	.447	.50	7/16-14	CL-516-KST	11/32		MS 51830-107L	—
CL-3816-TSKSL	3/8-16	1/2-13	.50	.337	.453	.510	.56	1/2-13	CL-38-KST	13/32		MS 51830-108L	—
CL-1213-TSKSL	1/2-13	5/8-11	.68	.591	.578	.635	.68	5/8-11	CL-12-KST	17/32		MS 51830-110L	—

THINWALL — STEEL (METRIC)

CLM-58-KSM	M5	M8	.32	.163	6.9mm or I	.32	.36	M8	CL-10-KST	5.5mm or 7/32	5/32	—	—
CLM-61-KSM	M6	M10x1.25	.39	.275	8.8mm or S	.40	.45	M10x1.25	CL-14-KST	7.5mm or 19/64	3/16	—	—
CLM-8125-KSM	M8	M12x1.25	.47	.413	10.8mm or 27/64	.48	.54	M12x1.25	CL-516-KST	9.5mm or 3/8		—	—
CLM-81-KSM	M8x1											—	—
CLM-1015-KSM	M10	M14x1.5	.55	.530	13mm or 1/2	.56	.62	M14x1.5	CL-38-KST	11.5mm or 29/64		—	—
CLM-10125-KSM	M10x1.25											—	—
CLM-12175-KSM	M12	M16x1.5	.63	.729	15mm or 37/64	.63	.69	M16x1.5	CL-12-KST	13.5mm or 17/32		—	—
CLM-12125-KSM	M12x1.25											—	—

THINWALL — STAINLESS STEEL (METRIC)

CLM-58-SKS	M5	M8	.32	.163	6.9mm or I	.32	.36	M8	CL-10-KST	5.5mm or 7/32	5/32	—	—
CLM-61-SKS	M6	M10x1.25	.39	.275	8.8mm or S	.40	.45	M10x1.25	CL-14-KST	7.5mm or 19/64	3/16	—	—
CLM-8125-SKS	M8	M12x 1.25	.47	.413	10.8mm or 27/64	.48	.54	M12x1.25	CL-516-KST	9.5mm or 3/8		—	—
CLM-81-SKS	M8x1											—	—
CLM-1015-SKS	M10	M14x 1.5	.55	.530	13mm or 1/2	.56	.62	M14x1.5	CL-38-KST	11.5mm or 29/64		—	—
CLM-10125-SKS	M10x1.25											—	—
CLM-12175-SKS	M12	M16x 1.5	.63	.729	15mm or 37/64	.63	.69	M16x1.5	CL-12-KST	13.5mm or 17/32		—	—
CLM-12125-SKS	M12x1.25											—	—

8

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KEY INSERTS – SOLID

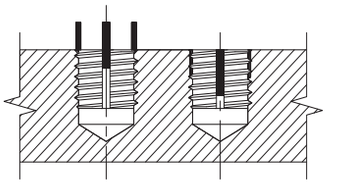
BODY: 12L15 STEEL, BLACK OXIDE FINISH, OR 303 STAINLESS STEEL.
KEYS: 302 STAINLESS STEEL



Solid – Steel and Stainless Steel

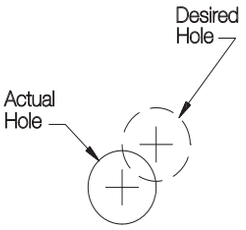
Solid Key Inserts are ideal for relocating a drilled or tapped hole. This threaded plug installs quickly, and the locking keys positively prevent the insert from rotating.

See Technical Information at the beginning of this section for complete installation steps. Key Inserts are installed with standard drills and taps. Important: Use exactly the tap-drill size specified in the tables (slightly larger than the standard tap drill for that thread size). Locking keys are driven down into the parent material during installation, providing a positive mechanical lock against rotation. See tables for optional installation tools.

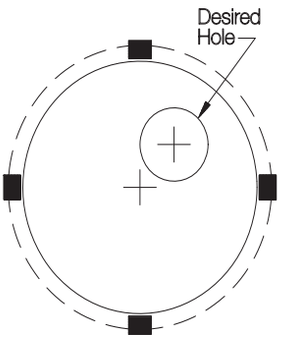




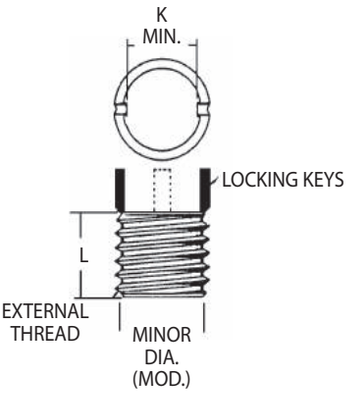
For installation tools, see table below.



Before Repair



After Repair



8

SOLID – STAINLESS STEEL (INCH)

	INSERT DIMENSIONS				INSTALLATION DATA					REMOVAL DATA	
PART NO.	EXTERNAL THREAD	L	K	SHEAR ENGAGEMENT (SQ. IN.)	REQ'D TAP DRILL	C'SINK DIA +.010/-.000	STANDARD TAP UN-2B	MIN. THREAD DEPTH	INSTALLATION TOOL PART NO.	DRILL SIZE	DRILL DEPTH
CL-51618-KSS	5/16-18	.31	.216	.152	I	.323	5/16-18	.37	CL-51618-KSST	7/32	1/8
CL-3816-KSS	3/8-16	.31	.285	.190	Q	.385	3/8-16	.37	CL-3816-KSST	9/32	1/8
CL-71614-KSS	7/16-14	.37	.341	.284	X	.447	7/16-14	.43	CL-71614-KSST	11/32	3/16
CL-1213-KSS	1/2-13	.43	.403	.359	29/64	.510	1/2-13	.50	CL-1213-KSST	13/32	3/16
CL-91612-KSS	9/16-12	.50	.465	.498	33/64	.572	9/16-12	.56	CL-91612-KSST	15/32	3/16
CL-5811-KSS	5/8-11	.62	.528	.717	37/64	.635	5/8-11	.68	CL-5811-KSST	17/32	3/16
CL-111611-KSS	11/16-11-NS	.68	.590	.888	41/64	.700	11/16-11-NS	.75	CL-111611-KSST	19/32	3/16
CL-131616-KSS	13/16-16	.81	.716	1.249	49/64	.822	13/16-16	.94	CL-131616-KSST	23/32	3/16
CL-7814-KSS	7/8-14	.87	.778	1.487	53/64	.885	7/8-14	1.00	CL-7814-KSST	25/32	3/16
CL-11812-KSS	1-1/8"-12	1.12	.970	2.490	1-1/16	1.145	1-1/8"-12	1.31	CL-11812-KSST	31/32	5/16
CL-11412-KSS	1-1/4"-12	1.25	1.095	3.137	1-3/16	1.270	1-1/4"-12	1.41	CL-11412-KSST	1-3/32	5/16
CL-13812-KSS	1-3/8"-12	1.37	1.220	3.838	1-5/16	1.395	1-3/8"-12	1.56	CL-13812-KSST	1-7/32	5/16

SOLID – STEEL (METRIC)

CLM-8125-KSSM	M8	.31	.218	.154	6.9mm or I	.325	M8	.37	CLM-8125-KSST	5.5mm or 7/32	.16
CLM-10125-KSSM	M10 x 1.25	.39	.299	.209	8.8mm or S	.404	M10 x 1.25	.49	CLM-10125-KSST	7.5mm or M	.19
CLM-12125-KSSM	M12 x 1.5	.47	.368	.331	10.8mm or 27/64	.482	M12 x 1.25	.57	CLM-12125-KSST	9.5mm or 3/8	.19
CLM-1615-KSSM	M16 x 1.5	.63	.532	.728	14.75mm or 37/64	.640	M16 x 1.5	.73	CLM-1615-KSST	13.5mm or 17/32	.19
CLM-2015-KSSM	M20 x 1.5	.79	.694	1.173	18.75mm or 47/64	.797	M20 x 1.5	.89	CLM-2015-KSST	17.5mm or 11/16	.19
CLM-2415-KSSM	M24 x 1.5	.94	.815	1.757	22.5mm or 57/64	.955	M24 x 1.5	1.04	CLM-2415-KSST	19.75mm or 25/32	.25
CLM-302-KSSM	M30 x 2	1.18	1.035	2.800	28mm or 1-7/64	1.191	M30 x 2	1.36	CLM-302-KSST	25.75mm or 1-1/64	.25

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KEY INSERT ASSORTMENTS



With Key Insert Assortments, you always have the right insert and installation tool on hand for thread repairs. Each of the four assortments contains many different insert sizes and an installation tool for each size. The durable case provides convenient storage and clear organization. **INFO+**: Order individual inserts on pages 347-350 as refills.



INFO+: To order repair kits for a single thread size, see page 347.

UNC COARSE

PART NO.	CONTAINS THESE INSERTS			CONTAINS THESE TOOLS
	QTY	ID THREAD	PART NO.	
CL-1-KS-C	5	#10-24	CL-1024-KS	CL-10-KST
	10	1/4-20	CL-1420-KS	CL-14-KST
	10	5/16-18	CL-51618-KS	CL-516-KST
	10	3/8-16	CL-3816-KS	CL-38-KST
	10	1/2-13	CL-1213-KS	CL-12-KST
	10	5/8-11	CL-5811-KS	CL-58-KST
	5	3/4-10	CL-3410-KS	CL-34-KST

UNC COARSE — STAINLESS STEEL

PART NO.	CONTAINS THESE INSERTS			CONTAINS THESE TOOLS
	QTY	ID THREAD	PART NO.	
CL-1-SKS-C	5	#10-24	CL-1024-KS	CL-10-KST
	10	1/4-20	CL-1420-KS	CL-14-KST
	10	5/16-18	CL-51618-KS	CL-516-KST
	10	3/8-16	CL-3816-KS	CL-38-KST
	10	1/2-13	CL-1213-KS	CL-12-KST
	10	5/8-11	CL-5811-KS	CL-58-KST
	5	3/4-10	CL-3410-KS	CL-34-KST

UNF FINE

PART NO.	CONTAINS THESE INSERTS			CONTAINS THESE TOOLS
	QTY	ID THREAD	PART NO.	
CL-1-KS-F	5	#10-24	CL-1032-KS	CL-10-KST
	10	1/4-20	CL-1428-KS	CL-14-KST
	10	5/16-18	CL-51624-KS	CL-516-KST
	10	3/8-16	CL-3824-KS	CL-38-KST
	10	1/2-13	CL-1220-KS	CL-12-KST
	10	5/8-11	CL-5818-KS	CL-58-KST
	5	3/4-10	CL-3416-KS	CL-34-KST

METRIC COARSE

PART NO.	CONTAINS THESE INSERTS			CONTAINS THESE TOOLS
	QTY	ID THREAD	PART NO.	
CLM-1-KSM-C	5	M5	CLM-58-KSM	CL-10-KST
	10	M6	CLM-61-KSM	CL-14-KST
	10	M8	CLM-8125-KSM	CL-516-KST
	10	M10	CLM-1015-KSM	CL-38-KST
	10	M12	CLM-12175-KSM	CL-12-KST
	10	M16	CLM-162-KSM	CL-58-KST
	5	M20	CLM-2025-KSM	CL-34-KST

SOLID — STAINLESS STEEL

PART NO.	CONTAINS THESE INSERTS			CONTAINS THESE TOOLS
	QTY	ID THREAD	PART NO.	
CL-1-KSS-S	5	5/16-18	CL-51618-KSS	CL-51618-KSST
	10	3/8-16	CL-3816-KSS	CL-3816-KSST
	10	1/2-13	CL-1213-KSS	CL-1213-KSST
	10	9/16-12	CL-91612-KSS	CL-91612-KSST
	10	5/8-11	CL-5811-KSS	CL-5811-KSST
	10	7/8-14	CL-7814-KSS	CL-7814-KSST
	5	1-1/8"-12	CL-11812-KSS	CL-11812-KSST

ADHESIVELY BONDED FASTENERS

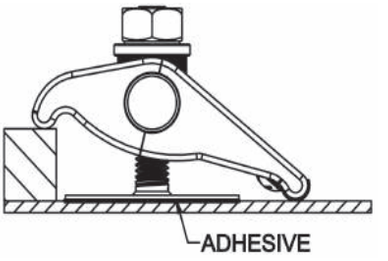
STUDS & FLOATING NUT PLATES: 304 STAINLESS STEEL
LANYARD MOUNT: PLASTIC

New Adhesively Bonded Fastener System!

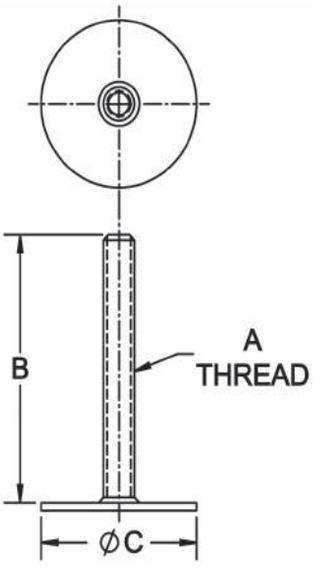
This unique system of fasteners is designed to be adhesively bonded to almost any substrate – metal, plastic, or composite. This wide range of fasteners includes studs, floating nut plates, and lanyard mounts. The heart of this fastener system is our WELD MOUNT® No-Slide Adhesive, which is specifically formulated to be used with our adhesively bonded fasteners. This unique structural adhesive is a high-strength, high-viscosity methacrylate with incredible strength in both tension and shear, designed to hold any of our adhesively bonded fasteners without sliding or sagging, even on a vertical or overhead surface, with no need for fixturing.



Adhesively Bonded Studs



Our Adhesively Bonded Studs are heavy-duty structural parts that provide considerable tensile and shear strength. These studs can be attached to virtually any metal, plastic, or composite surface using our acrylic adhesive. They can be bonded on either surface of the base plate, bottom or top. Made of 304 stainless steel for excellent corrosion resistance. The largest two sizes are inertial (friction) welded to a 2" base plate, creating a very strong part with 1200 lbs tensile strength and 1500 lbs shear strength.



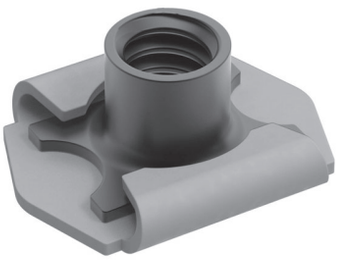
ADHESIVELY BONDED STUDS

PART NO.	A THREAD	B	C DIA	TENSILE STRENGTH (LBS)	SHEAR STRENGTH (LBS)
CL-1024-ABS-1.00-S	#10-24	1	1-1/4	500	650
CL-1420-ABS-1.50-S	1/4-20	1-1/2	1-1/4	500	650
CL-51618-ABS-1.50-S	5/16-18	1-1/2	2	1200	1500
CL-3816-ABS-2.00-S	3/8-16	2	2	1200	1500

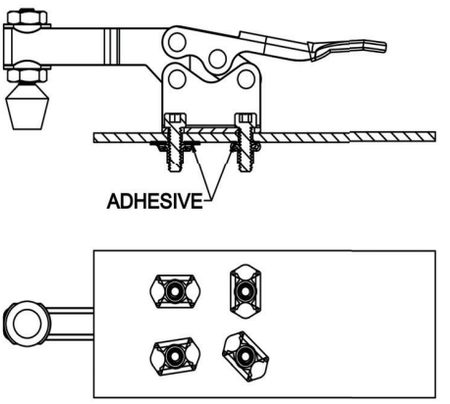
WELD MOUNT® is a registered trademark of Royal Adhesives and Sealants, LLC.

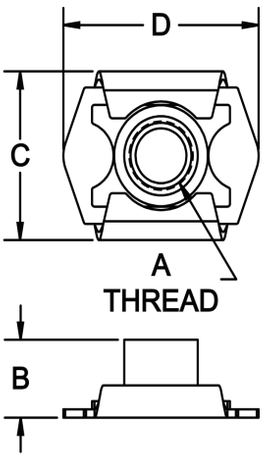
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ADHESIVELY BONDED FASTENERS



Adhesively Bonded Floating Nut Plates



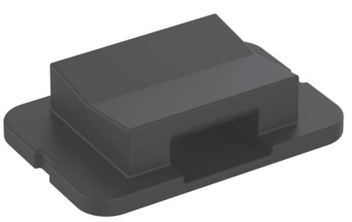


Floating Nut Plates have a captive threaded nut that floats to allow for accurate bolt alignment. Our adhesively bonded nut plates eliminate tapping. These nut plates can be used for either though-hole or blind-hole applications. Made of 304 stainless steel for excellent corrosion resistance. An included rubber fixture insert holds the nut plate stationary while it is bonded in place with acrylic adhesive, keeping the threads clean during installation. Remove the rubber fixture when you are ready to make up the assembly.

8

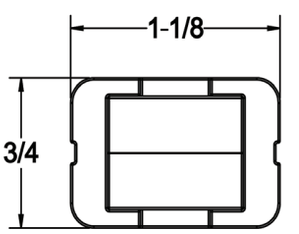
ADHESIVELY BONDED FLOATING NUT PLATES

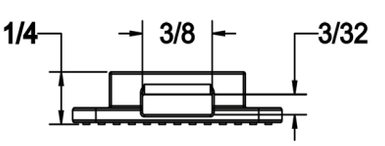
PART NO.	A THREAD	B	C	D
CL-1024-FNP-S	#10-24	.24	.43	.73
CL-1420-FNP-S	1/4-20	.30	.50	.79



Adhesively Bonded Lanyard Mounts

This heavy-duty lanyard mount is designed to be bonded with our acrylic adhesive, eliminating drilling, blocking, and tapping operations. Provides an excellent average pull strength of 150 lbs. These lanyard mounts fit wire-rope cable lanyards up to .094" diameter (#3) or wire ties up to .35" wide (#5).





ADHESIVELY BONDED LANYARD MOUNTS

PART NO. (PACK OF 10)	MAXIMUM LANYARD CABLE DIA	MAXIMUM WIRE-TIE WIDTH	AVERAGE PULL STRENGTH (LBS)
CL-5G-ABT-PACKOF10	.094 (#3)	.35	150

ADHESIVELY BONDED FASTENERS



WELD MOUNT® No-Slide Adhesive

WELD MOUNT® No-Slide Adhesive

This unique structural adhesive is specifically formulated to be used with our adhesively bonded fasteners. Adhesive CL-AT-8040 is a high-strength, high-viscosity methacrylate with incredible strength in both tension and shear, designed to hold any of our adhesively bonded fasteners without sliding or sagging, even on a vertical or overhead surface, with no need for fixturing.

CL-AT-8040 is a solvent-free, VOC-compliant, two-part methacrylate-based, structural adhesive formulated to bond metals, engineered thermoplastics and thermosetting plastics, and composites to most metal and composite substrates. It has excellent adhesion to metal surfaces including aluminum, stainless steel, galvanized steel, and plated steels. CL-AT-8040 forms a tough high-strength bond, with minimal surface preparation required, developing handling strength in 12 minutes and a functional cure within 45 minutes, making it ideal for production applications. Shear strength exceeds 3500 psi on aluminum, with remarkable impact and peel strengths. Comprehensive Care & Use Instructions are included with this product and can be found at www.carrlane.com. Note: this product ships to USA and Canada only, via air freight.

WELD MOUNT® NO-SLIDE ADHESIVE

PART NO.	CARTRIDGE SIZE	MIXING RATIO	REQUIRED DISPENSING GUN	REQUIRED MIXING TIP
CL-AT-8040	50ml	1:1	CL-AT-300	CL-AT-850



Adhesive Dispensing Gun

This dispensing gun is designed specifically for use with our WELD MOUNT® two-part adhesive CL-AT-8040, with dual plungers to mix at a 1:1 ratio.

ADHESIVE DISPENSING GUN

PART NO.	TYPE	MIXING RATIO
CL-AT-300	Dual plunger	1:1



Adhesive Mixing Tip

This 3.5"-long mixing tip is designed specifically for dispensing our CL-AT-8040 two-part adhesive using our CL-AT-300 Adhesive Dispensing Gun. Its unique design eliminates any possibility of the cartridge plugging up as the entry is separated. Sold in pack of 3.

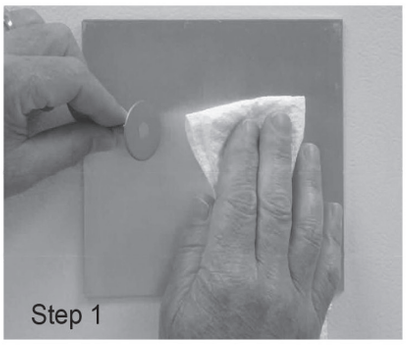
ADHESIVE MIXING TIP

PART NO.	LENGTH
CL-AT-850-PACKOF3	3.5

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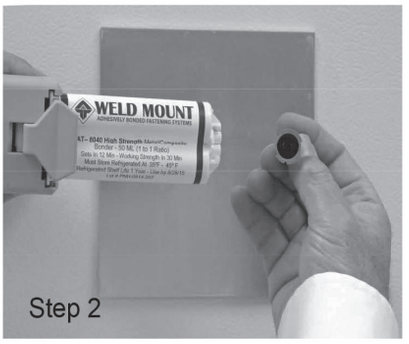
SIMPLE INSTALLATION

1



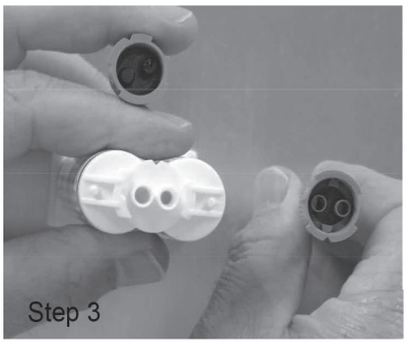
Clean fastener and substrate with Scotchbrite (light scuff) and solvent.

2



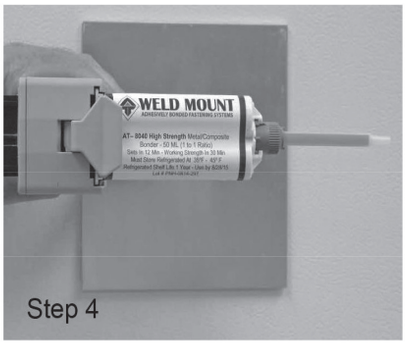
Cap can only be installed one way, preventing cross contamination.

3



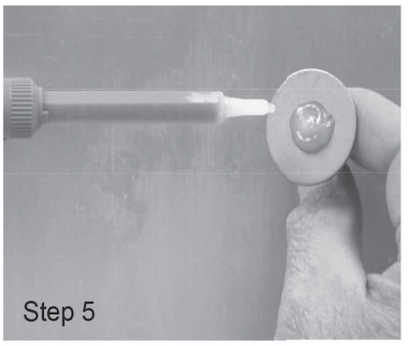
New cartridge design insures easy reuse of the adhesive.

4



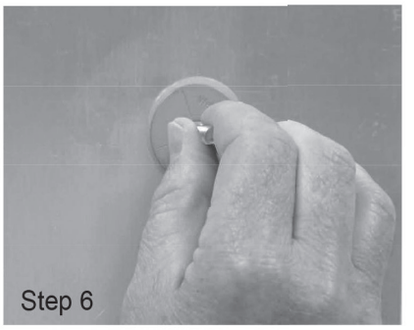
Fit tip onto CL-AT-8040 cartridge.

5



Put a large drop of adhesive in the center of the part base.

6



Push part into the substrate to squeeze adhesive out from base.

7



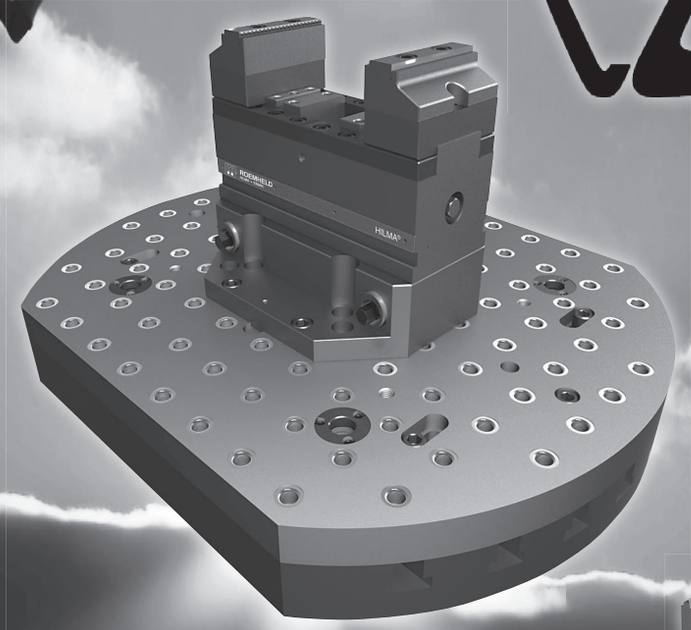
Slowly turn part clockwise while pushing until it won't turn.

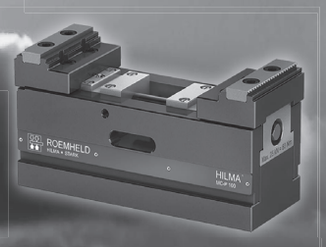


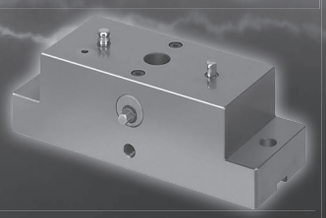
Get the Highest Clamping Force

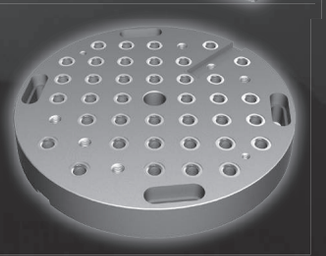
Quick-Change 5-Axis Workholding

CL5®









The CL5 Advantage:

- 50% greater clamping force
- Setup in seconds – no adaptor plates, blocks or pallets necessary
- Holds the tightest of tolerances
- Unrestricted tool access for multiple-side machining
- A stronger, more precise hold

See Pages 373-394

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JIG AND FIXTURE BASES



Carr Lock® System



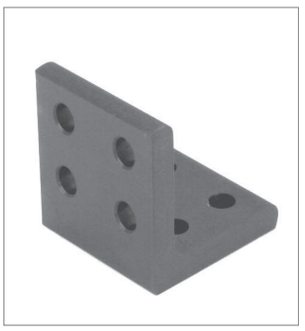
CL5® Quick-Change
5-Axis Workholding



Blank Tooling Plates



Blank Tooling Blocks



Angle Brackets



Cast Sections



Hinged Bushing Plates



Trunnions



Adjustable Locking Hubs

9

Also see:



Quintus Zero-Point
Quick-Change Risers
pp. 178-186



CARVESMART™
Dovetailed Quick-Change
Vise Jaw System
SEE WEBSITE



Modular Tooling
Plates & Blocks
pp. 415-450



DropZero™ Modular
Zero-Point System
pp. 672-675



Precision Vises
pp. 656-657



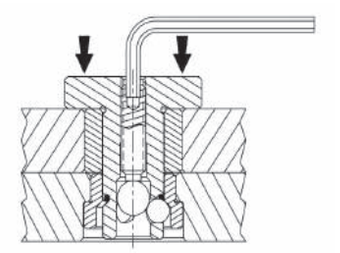
Assembly & Handling
Technology
pp. 734-735

CARR LOCK® SYSTEM

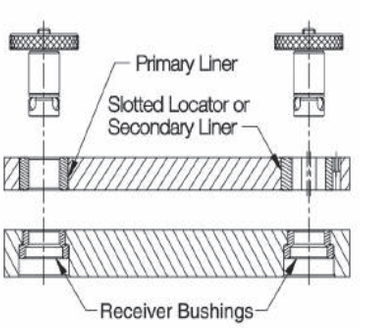
CLAMP BODY: 4340 STEEL, HEAT TREATED RC 40-45, BLACK OXIDE FINISH
RECEIVER BUSHINGS: 4340 STEEL, HEAT TREATED RC 50-54, BLACK OXIDE FINISH
LINERS: 1144 OR TOOL STEEL, HEAT TREATED RC 58-64, BLACK OXIDE FINISH



Carr Lock® Clamp



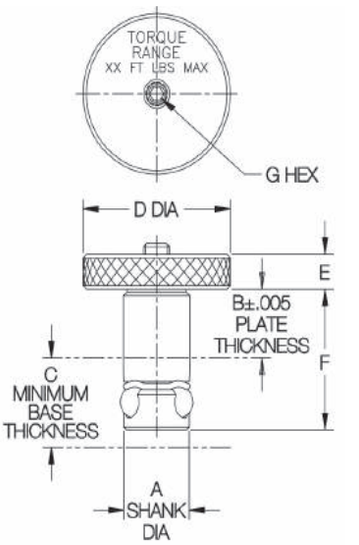
Turning the clamping screw with a hex wrench advances the large center ball, pushing the three clamping balls outward. These balls engage the angled ID of the Receiver Bushing, pulling the entire unit firmly downward.



The Carr Lock® System allows accurately locating and clamping at the same time, with just the turn of a hex wrench. Ideal for mounting quick-change tooling on a subplate. Each mount consists of three components: (1) a Carr Lock® Clamp with a precisely ground shank; (2) a Liner Bushing in the top plate; (3) a Receiver Bushing in the subplate. This compact assembly provides considerable holddown force, together with an incredible ±.0005 inches repeatability!

Each top plate should have one Carr Lock® Clamp designated as its primary reference point, and one as its secondary reference point. These two clamps should be as far apart as possible. The secondary reference point should have a relieved liner to avoid redundant location (binding). Additional Carr Lock® Clamps can be used for more clamping force, but these should be installed in clearance holes, not locating liners. Note that the same Carr Lock® Clamp fits any type of liner or a clearance hole.

Carr Lock® Clamps must be used with one of the Receiver Bushings (**INFO+**) on page 360. Plate thickness must be ±.005 inches to achieve proper clamping force. Special grip lengths for other plate thicknesses are available as specials. Do not exceed maximum screw torque shown.



CARR LOCK® CLAMPS (INCH)

PART NO.	A SHANK DIA NOMINAL	A SHANK DIA ACTUAL	B NOMINAL	B ACTUAL	C	D DIA	E	F	G	MAX SCREW TORQUE (FT-LBS)	MAX HOLD DOWN FORCE	SPARE PARTS KIT PART NO.*
CL-13-CLC-0.50	13mm	.5116	1/2	.500	.75	7/8	1/4	1.08	3/32	1	750	CL-13-CLPK-0.50
CL-13-CLC-0.75		.5111	3/4	.750				1.33				CL-13-CLPK-0.75
CL-16-CLC-0.50	16mm	.6297	1/2	.500	.75	1-1/2	5/16	1.15	1/8	2	1200	CL-16-CLPK-0.50
CL-16-CLC-0.75		.6292	3/4	.750				1.40				CL-16-CLPK-0.75
CL-20-CLC-0.75	20mm	.7872	3/4	.750	.83	1-3/4	3/8	1.53	1/8	3	3000	CL-20-CLPK-0.75
CL-20-CLC-1.00		.7867	1	1.000				1.78				CL-20-CLPK-1.00
CL-25-CLC-0.75	25mm	.9841	3/4	.750	1.00	2	3/8	1.70	5/32	7	7000	CL-25-CLPK-0.75
CL-25-CLC-1.00		.9836	1	1.000				1.95				CL-25-CLPK-1.00
CL-30-CLC-0.75	30mm	1.1809	3/4	.750	1.23	2-1/4	1/2	1.88	3/16	12	10000	CL-30-CLPK-0.75
CL-30-CLC-1.00		1.1804	1	1.000				2.13				CL-30-CLPK-1.00
CL-35-CLC-0.75	35mm	1.3778	3/4	.750	1.28	2-1/4	1/2	1.97	1/4	19	15500	CL-35-CLPK-0.75
CL-35-CLC-1.00			1	1.000				2.22				CL-35-CLPK-1.00
CL-35-CLC-1.50		1.3773	1-1/2	1.500				2.72				CL-35-CLPK-1.50
CL-35-CLC-2.00			2	2.000				3.22				CL-35-CLPK-2.00
CL-50-CLC-1.00	50mm	1.9683	1	1.000	1.80	3	3/4	2.70	3/8	38	20000	CL-50-CLPK-1.00
CL-50-CLC-1.50		1.9678	1-1/2	1.500				3.20				CL-50-CLPK-1.50
CL-50-CLC-2.00			2	2.000				3.70				CL-50-CLPK-2.00

CARR LOCK® CLAMPS (METRIC)

CLM-13-CLC-13	13mm	.5116	13mm	.512	.75	.87	.236	1.09	2.5mm	1	750	CLM-13-CLPK-13
CLM-13-CLC-20		.5111	20mm	.787				1.36				CLM-13-CLPK-20
CLM-16-CLC-20	16mm	.6297	20mm	.787	.75	1.50	.315	1.44	3mm	2	1200	CLM-16-CLPK-20
CLM-16-CLC-25		.6292	25mm	.984				1.63				CLM-16-CLPK-25
CLM-20-CLC-20	20mm	.7872	20mm	.787	.83	1.77	.394	1.56	3mm	3	3000	CLM-20-CLPK-20
CLM-20-CLC-25		.7867	25mm	.984				1.75				CLM-20-CLPK-25
CLM-25-CLC-20	25mm	.9841	20mm	.787	1.00	1.97	.394	1.73	4mm	7	7000	CLM-25-CLPK-20
CLM-25-CLC-25		.9836	25mm	.984				1.93				CLM-25-CLPK-25

* Spare Parts Kit includes screw, center ball, locking balls, and O-ring.

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Primary Liner Bushing



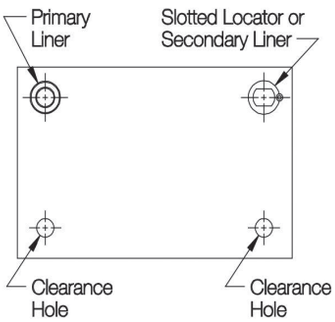
Secondary Liner Bushing



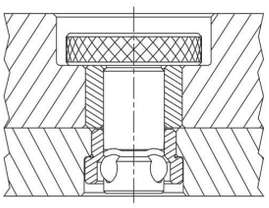
Slotted Locator Bushing

LINER BUSHINGS

Each top plate should have one Primary Liner, and one Secondary Liner or Slotted Locator Bushing. Primary Liners have a tight ID (+.0002/+.0007 tolerance) for precise reference in two axes. Secondary Liners have an extra .001" ID clearance (+.0012/+.0017 tolerance) to avoid binding. Slotted Locator Bushings provide better accuracy than Secondary Liners, but take a few extra steps to install (**INFO+**: see page 42 for instructions and additional dimensions). Slotted Locators have a tight ID tolerance in one direction and full relief in the perpendicular direction (available only in 16mm, 20mm, and 25mm diameters). Note: alternatively, two Primary Liners can be used for alignment if hole locations are held to ±.0002 inches.



To mount top plates with more than two Carr Lock® Clamps, use clearance holes .015-.030 inches over nominal size for the additional holes, instead of liner bushings, to avoid redundant location. (Still use four Receiver Bushings in the subplate.)



Extra-thick top plates can be counter-bored to achieve proper clamping thickness (hold thickness to ±.005). Special-length Carr Lock® Clamps are also available, as specials.

PRIMARY LINER BUSHINGS (INCH)

PART NO.	ID	LENGTH	OD	HOLE IN PLATE
CL-13-CLPL-0.50	13mm	.50	.7518	.7504
CL-13-CLPL-0.75		.75	.7514	.7509
CL-16-CLPL-0.50	16mm	.50	1.0018	1.0004
CL-16-CLPL-0.75		.75	1.0014	1.0009
CL-20-CLPL-0.75	20mm	.75	1.3772	1.3758
CL-20-CLPL-1.00		1.00	1.3768	1.3763
CL-25-CLPL-0.75	25mm	.75	1.3772	1.3758
CL-25-CLPL-1.00		1.00	1.3768	1.3763
CL-30-CLPL-0.75	30mm	.75	1.7523	1.7509
CL-30-CLPL-1.00		1.00	1.7519	1.7514
CL-35-CLPL-0.75	35mm	.75	1.7523 1.7519	1.7509 1.7514
CL-35-CLPL-1.00		1.00		
CL-35-CLPL-1.50		1.50		
CL-35-CLPL-2.00		2.00		
CL-50-CLPL-1.00	50mm	1.00	2.5025 2.5021	2.5007 2.5012
CL-50-CLPL-1.50		1.50		
CL-50-CLPL-2.00		2.00		

(METRIC)

CLM-13-CLPL-13	13mm	.512	19mm	.7487
CLM-13-CLPL-20		.787		.7491
CLM-16-CLPL-20	16mm	.787	25mm	.9849
CLM-16-CLPL-25		.984		.9853
CLM-20-CLPL-20	20mm	.787	35mm	1.3787
CLM-20-CLPL-25		.984		1.3791
CLM-25-CLPL-20	25mm	.787	35mm	1.3787
CLM-25-CLPL-25		.984		1.3791

SECONDARY LINER BUSHINGS (INCH)

PART NO.	ID	LENGTH	OD	HOLE IN PLATE
CL-13-CLSL-0.50	13mm	.50	.7518	.7504
CL-13-CLSL-0.75		.75	.7514	.7509
CL-16-CLSL-0.50	16mm	.50	1.0018	1.0004
CL-16-CLSL-0.75		.75	1.0014	1.0009
CL-20-CLSL-0.75	20mm	.75	1.3772	1.3758
CL-20-CLSL-1.00		1.00	1.3768	1.3763
CL-25-CLSL-0.75	25mm	.75	1.3772	1.3758
CL-25-CLSL-1.00		1.00	1.3768	1.3763
CL-30-CLSL-0.75	30mm	.75	1.7523	1.7509
CL-30-CLSL-1.00		1.00	1.7519	1.7514
CL-35-CLSL-0.75	35mm	.75	1.7523 1.7519	1.7509 1.7514
CL-35-CLSL-1.00		1.00		
CL-35-CLSL-1.50		1.50		
CL-35-CLSL-2.00		2.00		
CL-50-CLSL-1.00	50mm	1.00	2.5025 2.5021	2.5007 2.5012
CL-50-CLSL-1.50		1.50		
CL-50-CLSL-2.00		2.00		

(METRIC)

CLM-13-CLSL-13	13mm	.512	19mm	.7487
CLM-13-CLSL-20		.787		.7491
CLM-16-CLSL-20	16mm	.787	25mm	.9849
CLM-16-CLSL-25		.984		.9853
CLM-20-CLSL-20	20mm	.787	35mm	1.3787
CLM-20-CLSL-25		.984		1.3791
CLM-25-CLSL-20	25mm	.787	35mm	1.3787
CLM-25-CLSL-25		.984		1.3791

SLOTTED LOCATOR BUSHINGS (INCH)

PART NO.	ID	LENGTH	OD	HOLE IN PLATE
—	13mm	—	—	—
CLM-16-SLLB	16mm	.472	1.1815	1.1806
			1.1812	1.1809
CLM-20-SLLB	20mm	.748	1.4177	1.4168
			1.4174	1.4171
CLM-25-SLLB	25mm	.748	1.5752	1.5743
			1.5749	1.5746
—	30mm	—	—	—
—	35mm	—	—	—
—	50mm	—	—	—

(METRIC)

—	13mm	—	—	—
CLM-16-SLLB	16mm	.472	30mm	1.1806
				1.1809
CLM-20-SLLB	20mm	.748	36mm	1.4168
				1.4171
CLM-25-SLLB	25mm	.748	40mm	1.5743
				1.5746

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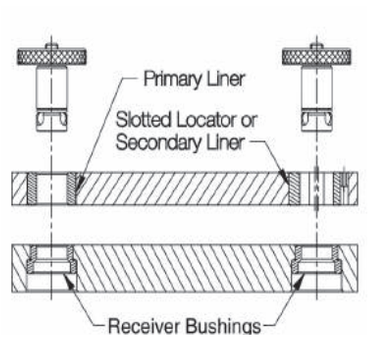
Face-Mount Receiver Bushing

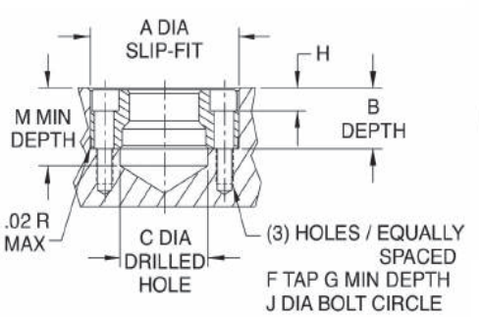


Back-Mount Receiver Bushing

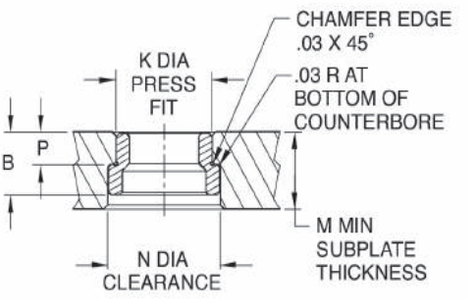
RECEIVER BUSHINGS

Carr Lock® Clamps must be used in conjunction with one of these Receiver Bushings. Face-Mount Receiver Bushings can be bolted into a slip-fit bored hole from above, with three Socket-Head Cap Screws (furnished). Back-Mount Receiver Bushings are more compact, but take more effort to install. Back-mount bushings are installed in the subplate from below, with a slight press fit (measure actual bushing before boring hole to provide .0005 maximum press fit, to avoid I.D. distortion). With either bushing type, the installation holes must be jig bored for accurate size and location. Installed bushings will be approximately .012" below the subplate surface.





Face Mount Hole Dimensions



Back Mount Hole Dimensions

9

FACE-MOUNT RECEIVER BUSHINGS (INCH)

PART NO.	ID	A DIA BUSHING	A DIA HOLE	B BUSHING	B HOLE	C	F	G	H	J DIA	M
CL-13-CLFR	13mm	1.3750 1.3746	1.3750 1.3755	.455	.469 .471	.688	#8-32	.31	.180	.984	.75
CL-16-CLFR	16mm	1.4370 1.4366	1.4370 1.4375	.455	.469 .471	.812	#8-32	.31	.193	1.125	.75
CL-20-CLFR	20mm	1.6873 1.6869	1.6873 1.6878	.623	.637 .639	.812	#10-32	.38	.273	1.362	.83
CL-25-CLFR	25mm	2.0623 2.0619	2.0623 2.0628	.785	.799 .801	1.000	1/4-28	.50	.316	1.644	1.00
CL-30-CLFR	30mm	2.2654 2.2650	2.2654 2.2659	.857	.871 .873	1.188	1/4-28	.75	.316	1.876	1.23
CL-35-CLFR	35mm	2.6873 2.6869	2.6873 2.6878	.890	.904 .906	1.562	5/16-24	.88	.375	2.178	1.28
CL-50-CLFR	50mm	3.4998 3.4994	3.4998 3.5003	1.225	1.239 1.241	2.156	3/8-24	1.00	.475	2.916	1.80

(METRIC)

CLM-13-CLFR	13mm	1.3776 1.3772	1.3780 1.3783	.455	.468 .470	.531	M4	.39	.177	.984	.78
CLM-16-CLFR	16mm	1.4563 1.4559	1.4567 1.4570	.455	.468 .470	.650	M4	.39	.177	1.142	.78
CLM-20-CLFR	20mm	1.7713 1.7709	1.7717 1.7720	.623	.637 .639	.807	M5	.47	.236	1.378	.78
CLM-25-CLFR	25mm	2.1650 2.1646	2.1654 2.1657	.785	.799 .801	1.004	M6	.59	.276	1.654	.98

BACK-MOUNT RECEIVER BUSHINGS (INCH)

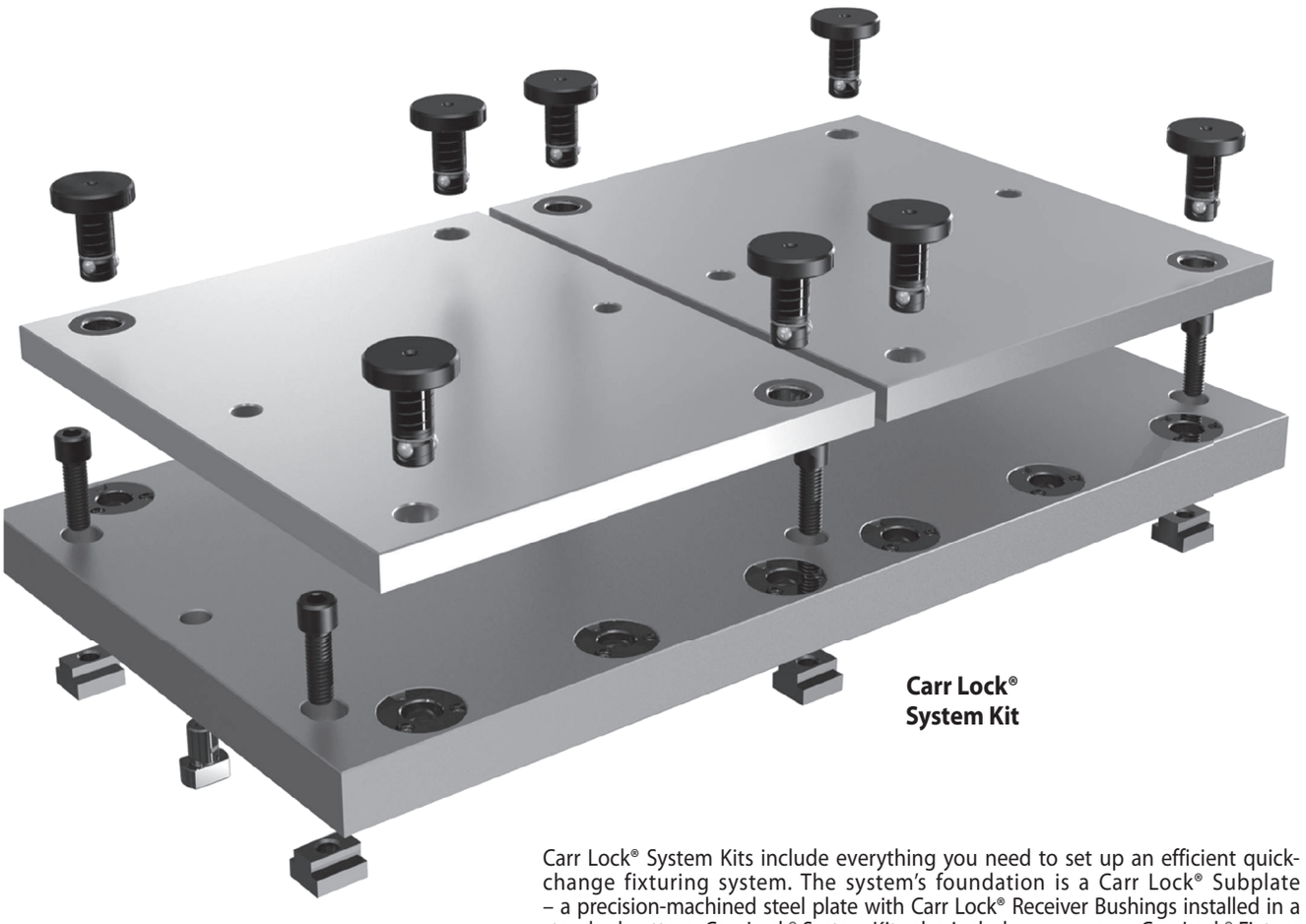
PART NO.	ID	B	K DIA BUSHING	K DIA HOLE	M	N DIA BUSHING	N DIA HOLE	P
CL-13-CLBR	13mm	.475	.7870 .7866	ACTUAL BUSHING K DIA -.0001 -.0005	.75	.984	.995 1.005	.277 .275
CL-16-CLBR	16mm	.475	.8760 .8756		.75	1.125	1.150 1.160	.285 .283
CL-20-CLBR	20mm	.673	1.0950 1.0946		.83	1.250	1.275 1.285	.345 .343
CL-25-CLBR	25mm	.826	1.3763 1.3759		1.00	1.562	1.588 1.598	.416 .414
CL-30-CLBR	30mm	.857	1.6264 1.6260		1.23	1.875	1.901 1.911	.432 .430
CL-35-CLBR	35mm	.990	1.8764 1.8760		1.28	2.125	2.150 2.160	.493 .491
CL-50-CLBR	50mm	1.225	2.6269 2.6265		1.80	2.937	2.963 2.973	.621 .619

(METRIC)

CLM-13-CLBR	13mm	.476	.7890 .7886	ACTUAL BUSHING K DIA -.0001 -.0005	.78	.984	1.019 1.029	.273 .271
CLM-16-CLBR	16mm	.476	.8677 .8673		.78	1.125	1.137 1.147	.286 .284
CLM-20-CLBR	20mm	.673	1.1039 1.1035		.78	1.268	1.294 1.304	.345 .343
CLM-25-CLBR	25mm	.826	1.3795 1.3791		.98	1.583	1.609 1.619	.416 .414

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CARR LOCK® SYSTEM



**Carr Lock®
System Kit**

Carr Lock® System Kits include everything you need to set up an efficient quick-change fixturing system. The system's foundation is a Carr Lock® Subplate – a precision-machined steel plate with Carr Lock® Receiver Bushings installed in a standard pattern. Carr Lock® System Kits also include one or more Carr Lock® Fixture Plates, plus all required Carr Lock® Clamps and subplate-mounting components.

The Carr Lock® System is extremely accurate. All Receiver-Bushing installation holes are located +/-.0002" from their primary reference hole. Clamping repeatability is +/-.0005", while bushing concentricity is .0002" TIR. The resulting x/y-axis repeatability of a mounted fixture plate is +/-.0028" considering all tolerance accumulation. Made in USA.

CARR LOCK® SYSTEM KITS

PART NO. CARR LOCK® SYSTEM KIT	FOR MACHINE	KIT INCLUDES CARR LOCK® SUBPLATE		KIT INCLUDES CARR LOCK® FIXTURE PLATES		KIT INCLUDES CARR LOCK® CLAMPS	KIT INCLUDES T NUTS AND SOCKET-HEAD CAP SCREWS	KIT INCLUDES FIXTURE KEYS
CL-1214-00-CLSK	HAAS® Mini Mill	12 x 14	CL-1214-00-CLSP	12 x 14	(1) CL-1214-00-CLFP	(4) CL-20-CLC-0.75	4	2
CL-1426-00-CLSK	HAAS® VF-1	14 x 26	CL-1426-00-CLSP	12 x 14	(2) CL-1214-00-CLFP	(8) CL-20-CLC-0.75	6	2
CL-1436-00-CLSK	HAAS® VF-2	14 x 36	CL-1436-01-CLSP	14 x 14	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75	8	2
CL-1436-01-CLSK				Jigsaw	(3) CL-1016-01-CLFP	(9) CL-20-CLC-0.75		
CL-400400-00-CLSK	Various	400 x 400mm	CL-400400-00-CLSP	400 x 400mm	(1) CL-400400-00-CLFP	(4) CL-20-CLC-0.75	6	2
CL-1626-00-CLSK	HAAS® VF-1YT	16 x 26	CL-1626-00-CLSP	12 x 14	(2) CL-1214-00-CLFP	(8) CL-20-CLC-0.75	6	2
CL-1626-01-CLSK			CL-1626-01-CLSP	Jigsaw	(2) CL-1016-01-CLFP	(6) CL-20-CLC-0.75		
CL-1636-00-CLSK	HAAS® VF-2YT	16 x 36	CL-1636-01-CLSP	14 x 14	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75	8	2
CL-1636-01-CLSK				Jigsaw	(3) CL-1016-01-CLFP	(9) CL-20-CLC-0.75		
CL-5001000-00-CLSK	Various	500 x 1000mm	CL-5001000-01-CLSP	14 x 14	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75	8	2
CL-5001000-01-CLSK				400 x 400mm	(2) CL-400400-00-CLFP	(8) CL-20-CLC-0.75		
CL-5001000-02-CLSK				500 x 500mm	(2) CL-500500-00-CLFP	(8) CL-25-CLC-1.00		
CL-5001000-03-CLSK				Jigsaw	(4) CL-1016-01-CLFP	(12) CL-20-CLC-0.75		

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CARR LOCK® SYSTEM

SUBPLATE: CARBON STEEL
RECEIVER BUSHINGS: 4340 STEEL, HEAT TREATED RC 50-54, BLACK OXIDE FINISH

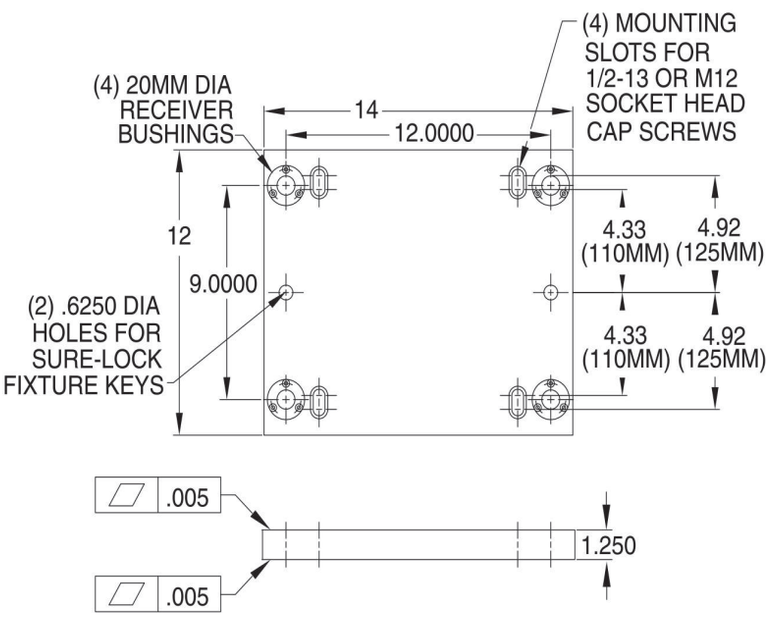


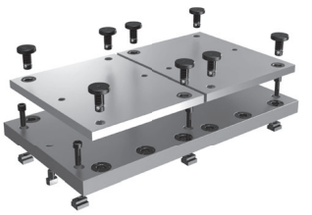
Carr Lock® Subplate
12 x 14
For HAAS® Mini Mill

Carr Lock® Subplates are precision-machined steel plates with Carr Lock® Receiver Bushings installed in a standard pattern. These subplates serve as the foundation of an efficient quick-change fixturing system. The 12 x 14 subplate shown here has (4) 20mm Face-Mount Receiver Bushings for mounting Fixture Plates.

Subplates should generally be large enough to cover most of the machine table, for maximum fixture flexibility, but should never extend beyond the machine table. For maximum quick-change benefits, subplates are usually left permanently on the machine table while only the mounted fixtures or vises are exchanged.

The Carr Lock® System is extremely accurate. All Receiver-Bushing installation holes are located +/-.0002" from their primary reference hole. Clamping repeatability is +/-.0005", while bushing concentricity is .0002" TIR. The resulting x/y-axis repeatability of a mounted fixture plate is +/-.0028" considering all tolerance accumulation. Made in USA.





Carr Lock® System Kits
System Kits include everything you need to set up an efficient quick-change fixturing system. Kits include a Carr Lock® subplate, one or more Carr Lock® Fixture Plates, plus all required Carr Lock® Clamps and subplate-mounting components (Sure-Lock™ Fixture Keys, T Nuts, and Socket-Head Cap Screws).

9

CARR LOCK® SUBPLATE

PART NO.	FOR MACHINE	SUBPLATE SIZE	SUBPLATE THICKNESS	ACCEPTS CARR LOCK® FIXTURE PLATES	REQUIRES CARR LOCK® CLAMPS
CL-1214-00-CLSP	HAAS® MINI MILL	12 X 14	(4) CL-20-CLC-0.75	(1) CL-1214-00-CLFP	(4) CL-20-CLC-0.75

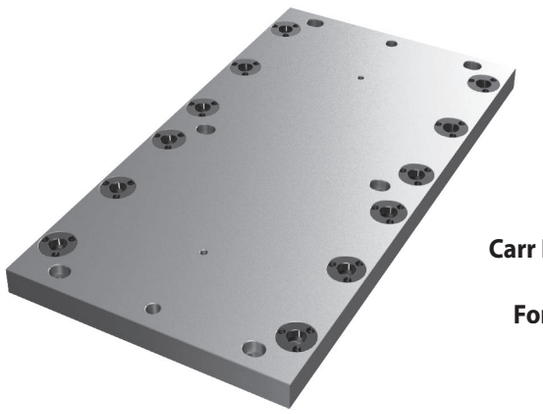
CARR LOCK® SYSTEM KIT

	SYSTEM KIT INCLUDES					
PART NO.	CARR LOCK® SUBPLATE 14 x 36	CARR LOCK® FIXTURE PLATE 14 x 14	CARR LOCK® CLAMPS 20mm	T NUTS 5/8	SOCKET-HEAD CAP SCREWS 1/2-13	SURE-LOCK™ FIXTURE KEYS 5/8
CL-1214-00-CLSK	(1) CL-1214-00-CLSP	(1) CL-1214-00-CLFP	(4) CL-20-CLC-0.75	(4) CL-2-TN	(4) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK

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CARR LOCK® SYSTEM

SUBPLATE: CARBON STEEL
RECEIVER BUSHINGS: 4340 STEEL, HEAT TREATED RC 50-54, BLACK OXIDE FINISH

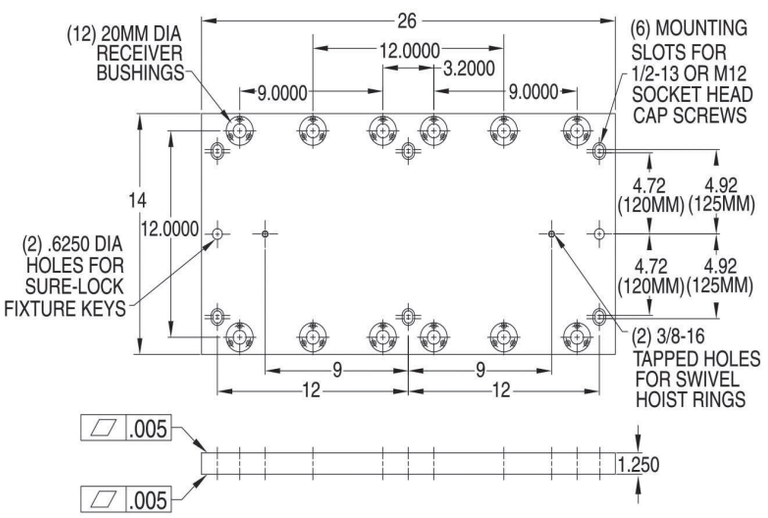


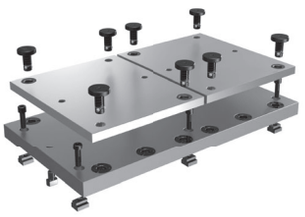
Carr Lock® Subplate
14 x 26
For HAAS® VF-1

Carr Lock® Subplates are precision-machined steel plates with Carr Lock® Receiver Bushings installed in a standard pattern. These subplates serve as the foundation of an efficient quick-change fixturing system. The 14 x 26 subplate shown here has (12) 20mm Face-Mount Receiver Bushings to allow mounting a variety of fixture plates.

Subplates should generally be large enough to cover most of the machine table, for maximum fixture flexibility, but should never extend beyond the machine table. For maximum quick-change benefits, subplates are usually left permanently on the machine table while only the mounted fixtures or vises are exchanged.

The Carr Lock® System is extremely accurate. All Receiver-Bushing installation holes are located +/-.0002" from their primary reference hole. Clamping repeatability is +/-.0005", while bushing concentricity is .0002" TIR. The resulting x/y-axis repeatability of a mounted fixture plate is +/-.0028" considering all tolerance accumulation. Made in USA.





Carr Lock® System Kits

System Kits include everything you need to set up an efficient quick-change fixturing system. Kits include a Carr Lock® Subplate, one or more Carr Lock® Fixture Plates, plus all required Carr Lock® Clamps and subplate-mounting components (Sure-Lock™ Fixture Keys, T Nuts, and Socket-Head Cap Screws).

CARR LOCK® SUBPLATE

PART NO.	FOR MACHINE	SUBPLATE SIZE	SUBPLATE THICKNESS	ACCEPTS CARR LOCK® FIXTURE PLATES		REQUIRES CARR LOCK® CLAMPS
CL-1426-00-CLSP	HAAS® VF-1	14 X 26	1.250	12 X 14	(2) CL-1214-00-CLFP	(8) CL-20-CLC-0.75
				12 X 14	(1) CL-1414-00-CLFP	(4) CL-20-CLC-0.75

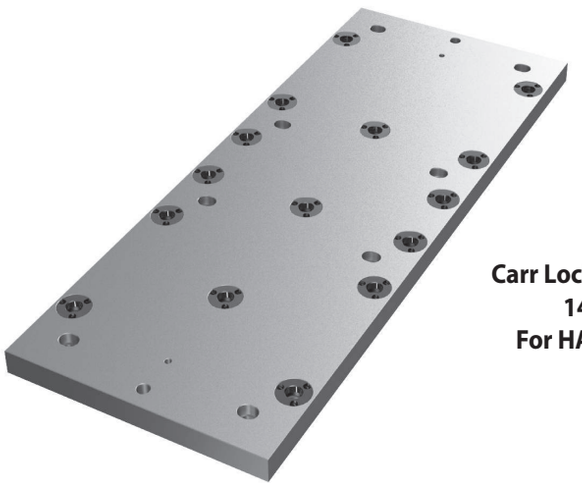
CARR LOCK® SYSTEM KIT

	SYSTEM KIT INCLUDES					
PART NO.	CARR LOCK® SUBPLATE 14 x 36	CARR LOCK® FIXTURE PLATE 14 x 14	CARR LOCK® CLAMPS 20mm	T NUTS 5/8	SOCKET-HEAD CAP SCREWS 1/2-13	SURE-LOCK™ FIXTURE KEYS 5/8
CL-1426-00-CLSK	(1) CL-1426-00-CLSP	(2) CL-1214-00-CLFP	(8) CL-20-CLC-0.75	(6) CL-2-TN	(6) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK

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CARR LOCK® SYSTEM

SUBPLATE: CARBON STEEL
RECEIVER BUSHINGS: 4340 STEEL, HEAT TREATED RC 50-54, BLACK OXIDE FINISH

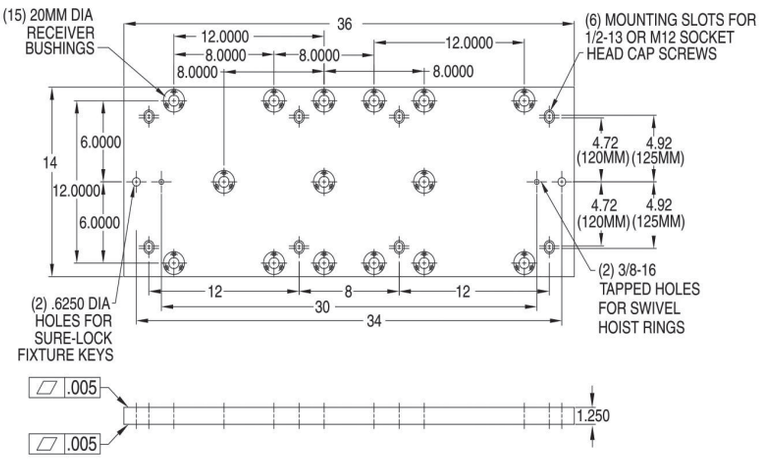


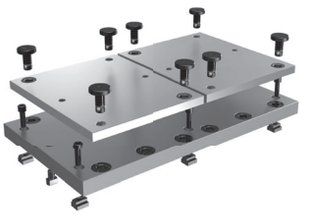
Carr Lock® Subplate
14 x 36
For HAAS® VF-2

Carr Lock® Subplates are precision-machined steel plates with Carr Lock® Receiver Bushings installed in a standard pattern. These subplates serve as the foundation of an efficient quick-change fixturing system. The 14 x 36 subplate shown here has (15) 20mm Face-Mount Receiver Bushings to allow mounting a variety of Fixture Plates and vise plates.

Subplates should generally be large enough to cover most of the machine table, for maximum fixture flexibility, but should never extend beyond the machine table. For maximum quick-change benefits, subplates are usually left permanently on the machine table while only the mounted fixtures or vises are exchanged.

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CARR LOCK® SUBPLATE

PART NO.	FOR MACHINE	SUBPLATE SIZE	SUBPLATE THICKNESS	ACCEPTS CARR LOCK® FIXTURE PLATES		REQUIRES CARR LOCK® CLAMPS
CL-1436-01-CLSP	HAAS® VF-2	14 X 36	1.250	14 X 14	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75
				Jigsaw	(3) C-1016-0L1-CLFP	(9) CL-20-CLC-0.75

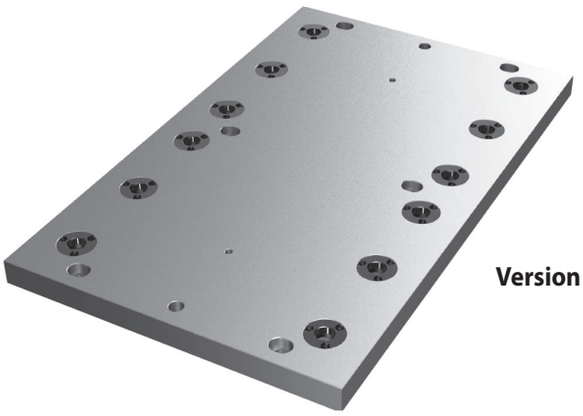
CARR LOCK® SYSTEM KITS

	SYSTEM KIT INCLUDES					
PART NO.	CARR LOCK® SUBPLATE 14 x 36	CARR LOCK® FIXTURE PLATE 14 x 14	CARR LOCK® CLAMPS 20mm	T NUTS 5/8	SOCKET-HEAD CAP SCREWS 1/2-13	SURE-LOCK™ FIXTURE KEYS 5/8
CL-1436-00-CLSK	(1) CL-1436-01-CLSP	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75	(8) CL-2-TN	(8) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK
CL-1436-01-CLSK	(1) CL-1436-01-CLSP	(3) CL-1016-01-CLFP	(9) CL-20-CLC-0.75	(8) CL-2-TN	(8) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK

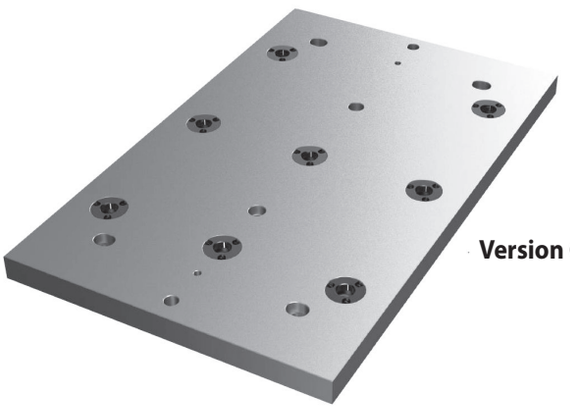
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CARR LOCK® SYSTEM

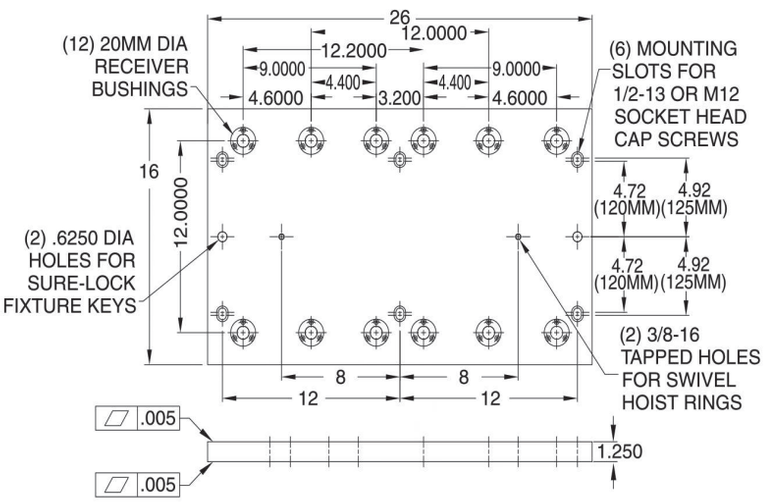
SUBPLATE: CARBON STEEL
RECEIVER BUSHINGS: 4340 STEEL, HEAT TREATED RC 50-54, BLACK OXIDE FINISH

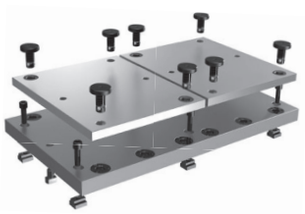


Version 00



Version 01





Carr Lock® System Kits

System Kits include everything you need to set up an efficient quick-change fixturing system. Kits include a Carr Lock® subplate, one or more Carr Lock® Fixture Plates, plus all required Carr Lock® Clamps and subplate-mounting components (Sure-Lock™ Fixture Keys, T Nuts, and Socket-Head Cap Screws).

Carr Lock® Subplates 16 x 26 For HAAS® VF-1YT

Carr Lock® Subplates are precision-machined steel plates with Carr Lock Receiver Bushings installed in a standard pattern. These subplates serve as the foundation of an efficient quick-change fixturing system. The 16 x 26 subplates shown here have either (12) or (8) 20mm Face-Mount Receiver Bushings, depending on the version, to allow mounting a variety of Fixture Plates and vise plates.

Subplates should generally be large enough to cover most of the machine table, for maximum fixture flexibility, but should never extend beyond the machine table. For maximum quick-change benefits, subplates are usually left permanently on the machine table while only the mounted fixtures or vises are exchanged.

The Carr Lock® System is extremely accurate. All Receiver-Bushing installation holes are located +/-.0002" from their primary reference hole. Clamping repeatability is +/-.0005", while bushing concentricity is .0002" TIR. The resulting x/y-axis repeatability of a mounted fixture plate is +/-.0028" considering all tolerance accumulation. Made in USA.

9

CARR LOCK® SUBPLATES

PART NO.	FOR MACHINE	SUBPLATE SIZE	SUBPLATE THICKNESS	ACCEPTS CARR LOCK® FIXTURE PLATES		REQUIRES CARR LOCK® CLAMPS
CL-1626-00-CLSP	HAAS® VF-2	16 X 26	1.250	12 X 14	(2) CL-1214-00-CLFP	(8) CL-20-CLC-0.75
				14 X 14	(1) CL-1414-00-CLFP	(4) CL-20-CLC-0.75
				400 x 400mm	(1) CL-400400-00-CLFP	(4) CL-20-CLC-0.75
CL-1626-01-CLSP				16 X 20	(1) CL-1620-00-CLFP	(4) CL-20-CLC-0.75
				Jigsaw	(2) CL-1016-01-CLFP	(6) CL-20-CLC-0.75

CARR LOCK® SYSTEM KITS

PART NO.	SYSTEM KIT INCLUDES					
	CARR LOCK® SUBPLATES 16 x 26	CARR LOCK® FIXTURE PLATES 12 x 14	CARR LOCK® CLAMPS 20mm	T NUTS 5/8	SOCKET-HEAD CAP SCREWS 1/2-13	SURE-LOCK™ FIXTURE KEYS 5/8
CL-1626-00-CLSK	(1) CL-1626-00-CLSP	(2) CL-1214-00-CLFP	(8) CL-20-CLC-0.75	(6) CL-2-TN	(6) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK
CL-1626-01-CLSK	(1) CL-1626-01-CLSP	(2) CL-1016-01-CLFP	(6) CL-20-CLC-0.75	(6) CL-2-TN	(6) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK

CARR LOCK® SYSTEM

SUBPLATE: CARBON STEEL
RECEIVER BUSHINGS: 4340 STEEL, HEAT TREATED RC 50-54, BLACK OXIDE FINISH

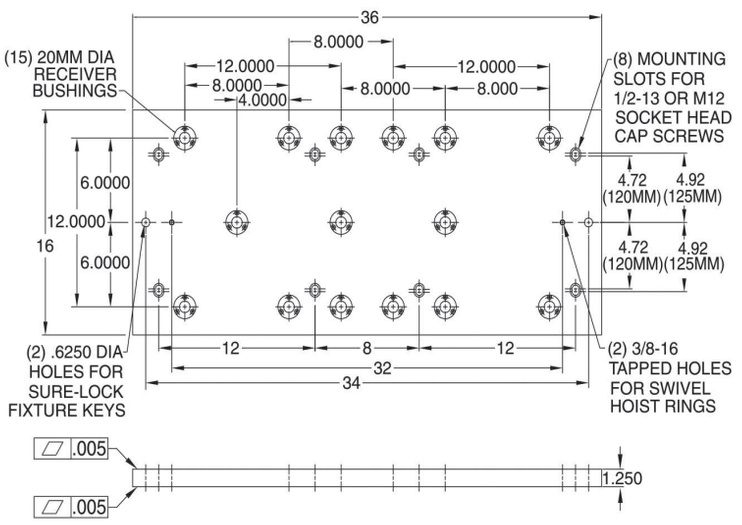


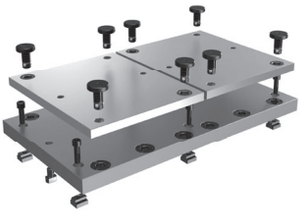
Carr Lock® Subplate
16 x 36
For HAAS® VF-2YT

Carr Lock® Subplates are precision-machined steel plates with Carr Lock® Receiver Bushings installed in a standard pattern. These subplates serve as the foundation of an efficient quick-change fixturing system. The 16 x 36 subplate shown here has (15) 20mm Face-Mount Receiver Bushings to allow mounting a variety of fixture plates and vise plates.

Subplates should generally be large enough to cover most of the machine table, for maximum fixture flexibility, but should never extend beyond the machine table. For maximum quick-change benefits, subplates are usually left permanently on the machine table while only the mounted fixtures or vises are exchanged.

The Carr Lock® System is extremely accurate. All Receiver-Bushing installation holes are located +/-.0002" from their primary reference hole. Clamping repeatability is +/-.0005", while bushing concentricity is .0002" TIR. The resulting x/y-axis repeatability of a mounted fixture plate is +/-.0028" considering all tolerance accumulation. Made in USA.





Carr Lock® System Kits

System Kits include everything you need to set up an efficient quick-change fixturing system. Kits include a Carr Lock® subplate, one or more Carr Lock® Fixture Plates, plus all required Carr Lock® Clamps and subplate-mounting components (Sure-Lock™ Fixture Keys, T Nuts, and Socket-Head Cap Screws).

CARR LOCK® SUBPLATES

PART NO.	FOR MACHINE	SUBPLATE SIZE	SUBPLATE THICKNESS	ACCEPTS CARR LOCK® FIXTURE PLATES		REQUIRES CARR LOCK® CLAMPS
CL-1636-01-CLSP	HAAS® VF-2YT	16 X 36	1.250	14 X 14	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75
				400 x 400mm	(2) CL-400400-00-CLFP	(8) CL-20-CLC-0.75
				16 x 20	(1) CL-1620-00-CLFP	(4) CL-20-CLC-0.75
				Jigsaw	(3) CL-1016-01-CLFP	(9) CL-20-CLC-0.75

CARR LOCK® SYSTEM KITS

PART NO.	SYSTEM KIT INCLUDES					
	CARR LOCK® SUBPLATE 16 x 36	CARR LOCK® FIXTURE PLATE 14 x 14	CARR LOCK® CLAMPS 20mm	T NUTS 5/8	SOCKET-HEAD CAP SCREWS 1/2-13	SURE-LOCK™ FIXTURE KEYS 5/8
CL-1636-00-CLSK	(1) CL-1636-01-CLSP	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75	(8) CL-2-TN	(8) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK
CL-1636-01-CLSK	(1) CL-1636-01-CLSP	(3) CL-1016-01-CLFP	(9) CL-20-CLC-0.75	(8) CL-2-TN	(8) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK

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SUBPLATE: CARBON STEEL
RECEIVER BUSHINGS: 4340 STEEL, HEAT TREATED RC 50-54, BLACK OXIDE FINISH

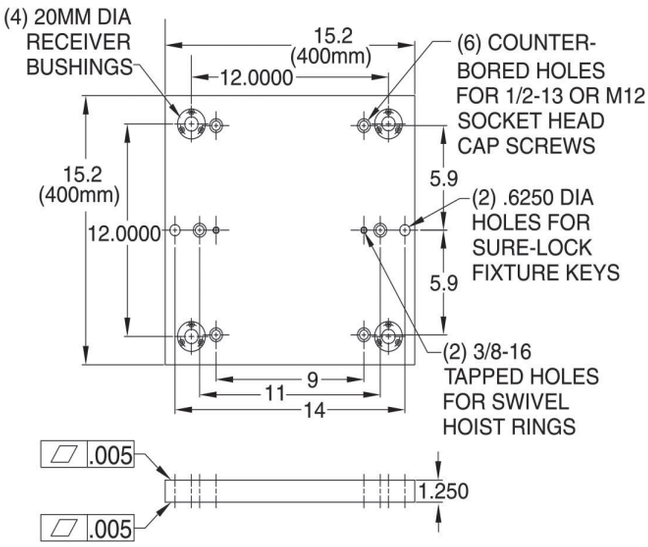


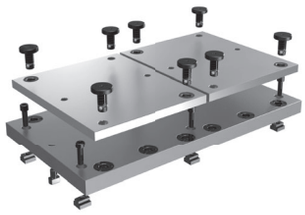
Carr Lock® Subplate 400 x 400mm

Carr Lock® Subplates are precision-machined steel plates with Carr Lock® Receiver Bushings installed in a standard pattern. These subplates serve as the foundation of an efficient quick-change fixturing system. The 400 x 400mm subplate shown here has (4) 20mm Face-Mount Receiver Bushings for mounting fixture plates.

Subplates should generally be large enough to cover most of the machine table, for maximum fixture flexibility, but should never extend beyond the machine table. For maximum quick-change benefits, subplates are usually left permanently on the machine table while only the mounted fixtures or vises are exchanged.

The Carr Lock® System is extremely accurate. All Receiver-Bushing installation holes are located +/-.0002" from their primary reference hole. Clamping repeatability is +/-.0005", while bushing concentricity is .0002" TIR. The resulting x/y-axis repeatability of a mounted fixture plate is +/-.0028" considering all tolerance accumulation. Made in USA.





Carr Lock® System Kits

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CARR LOCK® SUBPLATE

PART NO.	FOR MACHINE	SUBPLATE SIZE	SUBPLATE THICKNESS	ACCEPTS CARR LOCK® FIXTURE PLATES		REQUIRES CARR LOCK® CLAMPS
CL-400400-00-CLSP	Various	400 x 400mm	1.250	400 x 400mm	(1) CL-1214-00-CLFP	(4) CL-20-CLC-0.75
				14 X 14	(1) CL-1414-00-CLFP	(4) CL-20-CLC-0.75

CARR LOCK® SYSTEM KIT

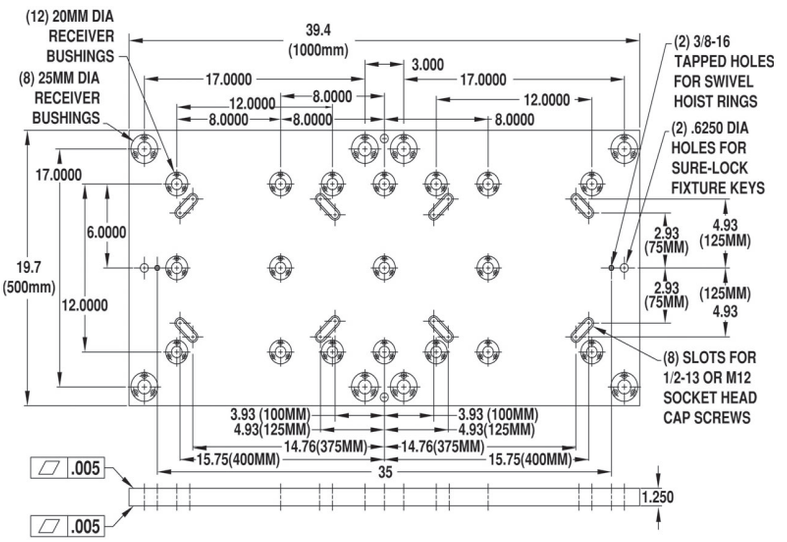
	SYSTEM KIT INCLUDES					
PART NO.	CARR LOCK® SUBPLATE 400 x 400mm	CARR LOCK® FIXTURE PLATE 400 x 400mm	CARR LOCK® CLAMPS 20mm	T NUTS 5/8	SOCKET-HEAD CAP SCREWS 1/2-13	SURE-LOCK™ FIXTURE KEYS 5/8
CL-400400-00-CLSK	(1) CL-400400-00-CLSP	(1) CL-400400-00-CLFP	(4) CL-20-CLC-0.75	(6) CL-2-TN	(6) CL-1/2-13X1.50-SHCS	(2) CL-6250-SLFK

CARR LOCK® SYSTEM

SUBPLATE: CARBON STEEL
RECEIVER BUSHINGS: 4340 STEEL, HEAT TREATED RC 50-54, BLACK OXIDE FINISH



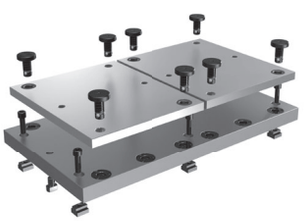
Carr Lock® Subplate 500 x 1000mm



Carr Lock® Subplates are precision-machined steel plates with Carr Lock® Receiver Bushings installed in a standard pattern. These subplates serve as the foundation of an efficient quick-change fixturing system. The 500 x 1000mm subplate shown here has (18) 20mm and (8) 25mm Face-Mount Receiver Bushings to allow mounting a variety of fixture plates and vise plates.

Subplates should generally be large enough to cover most of the machine table, for maximum fixture flexibility, but should never extend beyond the machine table. For maximum quick-change benefits, subplates are usually left permanently on the machine table while only the mounted fixtures or vises are exchanged.

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Carr Lock® System Kits

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CARR LOCK® SUBPLATE

PART NO.	FOR MACHINE	SUBPLATE SIZE	SUBPLATE THICKNESS	ACCEPTS CARR LOCK® FIXTURE PLATES		REQUIRES CARR LOCK® CLAMPS
CL-5001000-02-CLSP	Various	500 x 1000mm	1.250	14 X 14	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75
				400 x 400mm	(2) CL-400400-00-CLFP	(8) CL-20-CLC-0.75
				16 x 20	(1) CL-1620-00-CLFP	(4) CL-20-CLC-0.75
				500 x 500mm	(2) CL-500500-00-CLFP	(8) CL-25-CLC-1.00
				Jigsaw	(4) CL-1016-01-CLFP	(12) CL-20-CLC-0.75

CARR LOCK® SYSTEM KITS

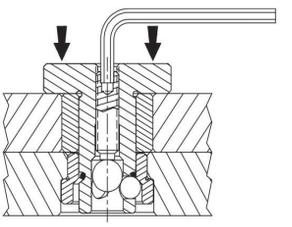
PART NO.	SYSTEM KIT INCLUDES					
	CARR LOCK® SUBPLATES 14 x 26	CARR LOCK® FIXTURE PLATES 12 x 14	CARR LOCK® CLAMPS 20mm	T NUTS 5/8	SOCKET-HEAD CAP SCREWS 1/2-13	SURE-LOCK™ FIXTURE KEYS 5/8
CL-5001000-00-CLSK	(1) CL-5001000-02-CLSP	(2) CL-1414-00-CLFP	(8) CL-20-CLC-0.75	(8) CL-3-TN	(8) CL-1/2-13X1.50-SHCS	(2) CL-18-SLFK
CL-5001000-01-CLSK	(1) CL-5001000-02-CLSP	(2) CL-400400-00-CLFP	(8) CL-20-CLC-0.75	(8) CL-3-TN	(8) CL-1/2-13X1.50-SHCS	(2) CL-18-SLFK
CL-5001000-02-CLSK	(1) CL-5001000-02-CLSP	(2) CL-500500-00-CLFP	(8) CL-25-CLC-1.00	(8) CL-3-TN	(8) CL-1/2-13X1.50-SHCS	(2) CL-18-SLFK
CL-5001000-03-CLSK	(1) CL-5001000-02-CLSP	(4) CL-1016-01-CLFP	(12) CL-20-CLC-0.75	(8) CL-3-TN	(8) CL-1/2-13X1.50-SHCS	(2) CL-18-SLFK

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FIXTURE PLATE: MIC-6 PRECISION-MACHINED CAST ALUMINUM
LINER BUSHINGS: 1144 STEEL, HEAT TREATED RC 58-64, BLACK OXIDE FINISH

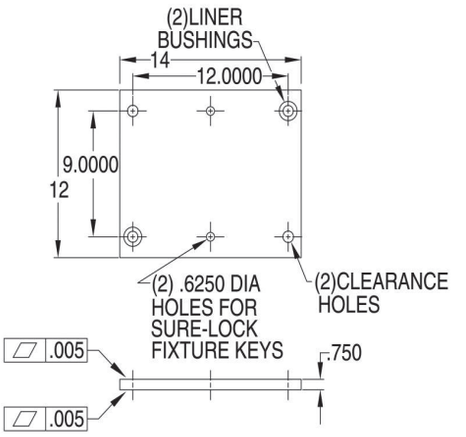
Carr Lock® Fixture Plates

Carr Lock® Fixture Plates are precision-machined MIC-6 cast aluminum plates available in a wide range of standard sizes to use as a base for building quick-change fixtures. To fasten the Carr Lock® Fixture Plate to a subplate, begin by inserting a Carr Lock® Clamp into each of the four corner holes. Next, fully tighten the clamps one at a time – first the clamp in the primary liner bushing, then the clamp in the secondary liner bushing, then the clamps in the clearance holes. Made in USA.





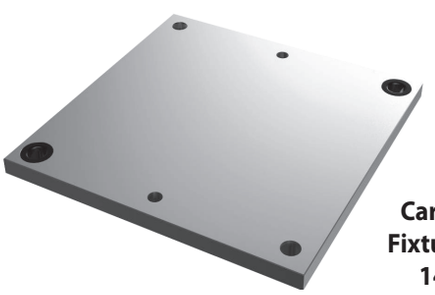
Carr Lock® Fixture Plate 12 x 14



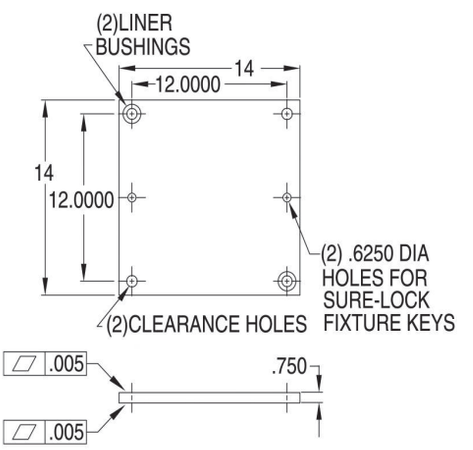
These 12 x 14 fixture plates have four 20mm mounting holes – a primary liner, a secondary liner, and two clearance holes. They also have two fixture-key holes for conventional mounting directly on a slotted machine table using Sure-Lock™ Fixture Keys.

CARR LOCK® FIXTURE PLATE — 12 X 14

PART NO.	PLATE SIZE	PLATE THICKNESS	REQUIRES CARR LOCK® CLAMPS	CARR LOCK® CLAMP SPACING
CL-1214-00-CLFP	12 X 14	.750	(4) CL-25-CLC-0.75	9 X 12



Carr Lock® Fixture Plate 14 x 14



These 14 x 14 fixture plates have four 20mm mounting holes – a primary liner, a secondary liner, and two clearance holes. They also have two fixture-key holes for conventional mounting directly on a slotted machine table using Sure-Lock™ Fixture Keys.

CARR LOCK® FIXTURE PLATE — 14 X 14

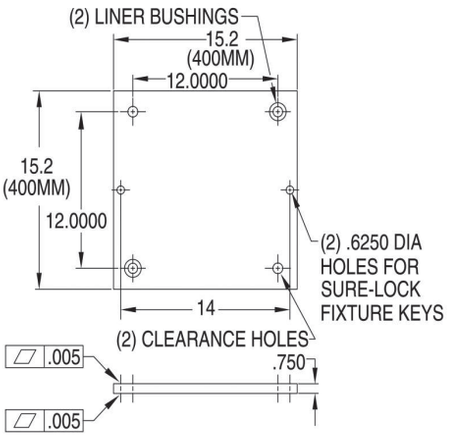
PART NO.	PLATE SIZE	PLATE THICKNESS	REQUIRES CARR LOCK® CLAMPS	CARR LOCK® CLAMP SPACING
CL-1414-00-CLFP	14 X 14	.750	(3) CL-20-CLC-0.75	12 X 12

CARR LOCK® SYSTEM

FIXTURE PLATE: MIC-6 PRECISION-MACHINED CAST ALUMINUM
LINER BUSHINGS: 1144 STEEL, HEAT TREATED RC 58-64, BLACK OXIDE FINISH



**Carr Lock®
Fixture Plate
400 x 400mm**

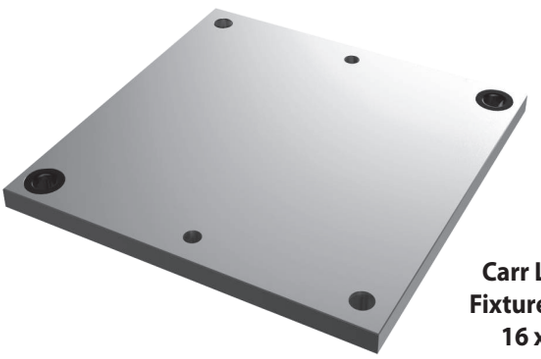


These 400 x 400mm fixture plates have four 20mm mounting holes – a primary liner, a secondary liner, and two clearance holes. They also have two fixture-key holes for conventional mounting directly on a slotted machine table using Sure-Lock™ Fixture Keys.

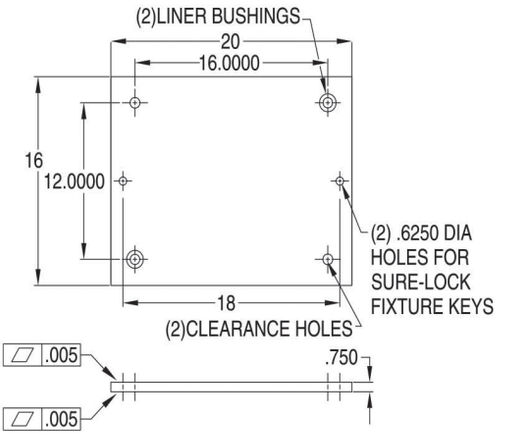
CARR LOCK® FIXTURE PLATE — 400 x 400mm

PART NO.	PLATE SIZE	PLATE THICKNESS	REQUIRES CARR LOCK® CLAMPS	CARR LOCK® CLAMP SPACING
CL-400400-00-CLFP	400 x 400	.750	(4) CL-20-CLC-0.75	12 X 12

9



**Carr Lock®
Fixture Plate
16 x 20**



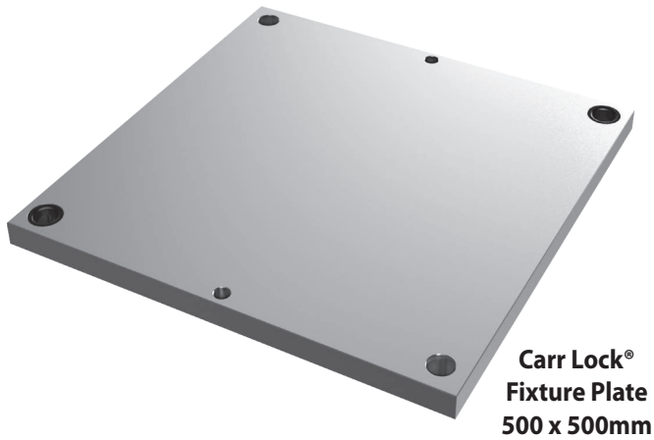
These 16 x 20 fixture plates have four 20mm mounting holes – a primary liner, a secondary liner, and two clearance holes. They also have two fixture-key holes for conventional mounting directly on a slotted machine table using Sure-Lock™ Fixture Keys.

CARR LOCK® FIXTURE PLATE — 16 x 20

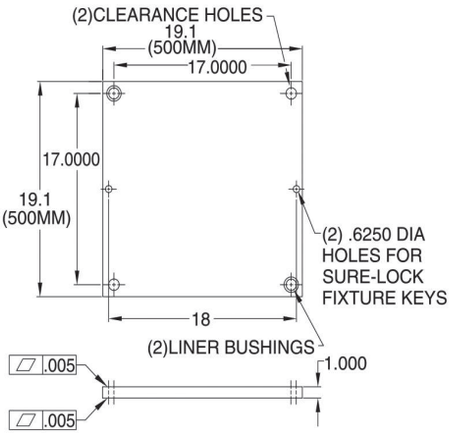
PART NO.	PLATE SIZE	PLATE THICKNESS	REQUIRES CARR LOCK® CLAMPS	CARR LOCK® CLAMP SPACING
CL-1620-00-CLFP	16 x 20	.750	(4) CL-20-CLC-0.75	12 X 16

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FIXTURE PLATE: MIC-6 PRECISION-MACHINED CAST ALUMINUM
LINER BUSHINGS: 1144 STEEL, HEAT TREATED RC 58-64, BLACK OXIDE FINISH



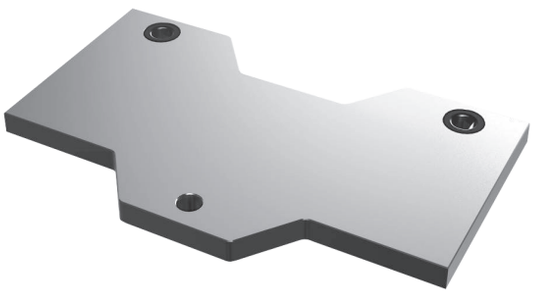
Carr Lock®
Fixture Plate
500 x 500mm



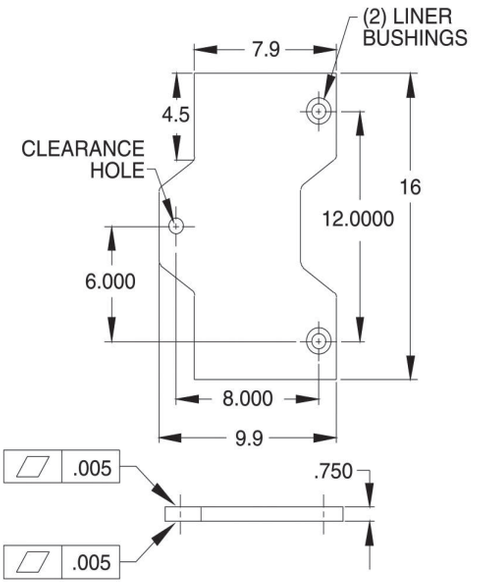
These 500 x 500mm fixture plates have four 25mm mounting holes – a primary liner, a secondary liner, and two clearance holes. They also have two fixture-key holes for conventional mounting directly on a slotted machine table using Sure-Lock™ Fixture Keys.

CARR LOCK® FIXTURE PLATE — 500 x 500mm

PART NO.	PLATE SIZE	PLATE THICKNESS	REQUIRES CARR LOCK® CLAMPS	CARR LOCK® CLAMP SPACING
CL-500500-00-CLFP	500x500	1.000"	(4) CL-25-CLC-1.000	17x17



Carr Lock®
Jigsaw Vise Plate
10 x 16



Jigsaw Vise Plates have an interlocking design to allow mounting vises and other narrow fixtures close together. These 10 x 16 plates have three 20mm mounting holes – a primary liner, a secondary liner, and a clearance hole.

CARR LOCK® JIGSAW VISE PLATE — 10 x 16

PART NO.	PLATE SIZE	PLATE THICKNESS	REQUIRES CARR LOCK® CLAMPS	CARR LOCK® CLAMP SPACING
CL-1016-01-CLFP	10 x 16	.750	(3) CL-20-CLC-0.75	8 x 12

CARR LOCK® SYSTEM

FIXTURE MACHINING KITS





Carr Lock® Fixture Machining Kits are extremely useful for machining a fixture using its Carr Lock® mounting holes as an absolute reference. The kit consists of four extra-long Carr Lock® Clamps, used together with four precision-height spacers, providing ample clearance underneath the fixture plate to allow through-hole machining without damaging the subplate. The kit also includes an extra four spacers to use as additional supports under large plates, all in a handy carrying case. Made in USA.

FIXTURE MACHINING KITS

PART NO.	CARR LOCK® CLAMP DIAMETER	FOR FIXTURE-PLATE THICKNESS	SPACER HEIGHT	SPACER OD
CL-20-CLMK-0.75	20mm	.750	.500	1-3/4
CL-25-CLMK-0.75	25mm	.750	.750	2
CL-25-CLMK-1.00		1.000	.500	2



These handy Preset Torque Wrenches are designed to tighten Carr Lock® Clamps exactly to their maximum recommended torque, ensuring that maximum hold-down force is achieved without over-tightening. The wrench body shown here is used for the first three Carr Lock® Clamp sizes – 13mm, 16mm, and 20mm – each preset to the torque recommended for that size, and with the appropriate hex key. A slightly larger wrench body is used for the 25mm size. Torque accuracy is +/-10%.

PRESET TORQUE WRENCHES

PART NO.	FOR CARR LOCK® CLAMP DIA	PRESET TORQUE (FT-LBS)	HEX KEY SIZE	HANDLE LENGTH	HANDLE WIDTH
CL-13-CLTW	13mm	1.0	3/32	3.54	1.40
CL-16-CLTW	16mm	2.0	1/8		
CL-20-CLTW	20mm	3.0	1/8		
CL-25-CLTW	25mm	7.0	5/32	7.50	1.67



Protection plugs are extremely useful to keep chips and debris from entering unused receiver bushings in a subplate. These durable plastic plugs fit snugly in the receiver hole, yet can be easily removed.

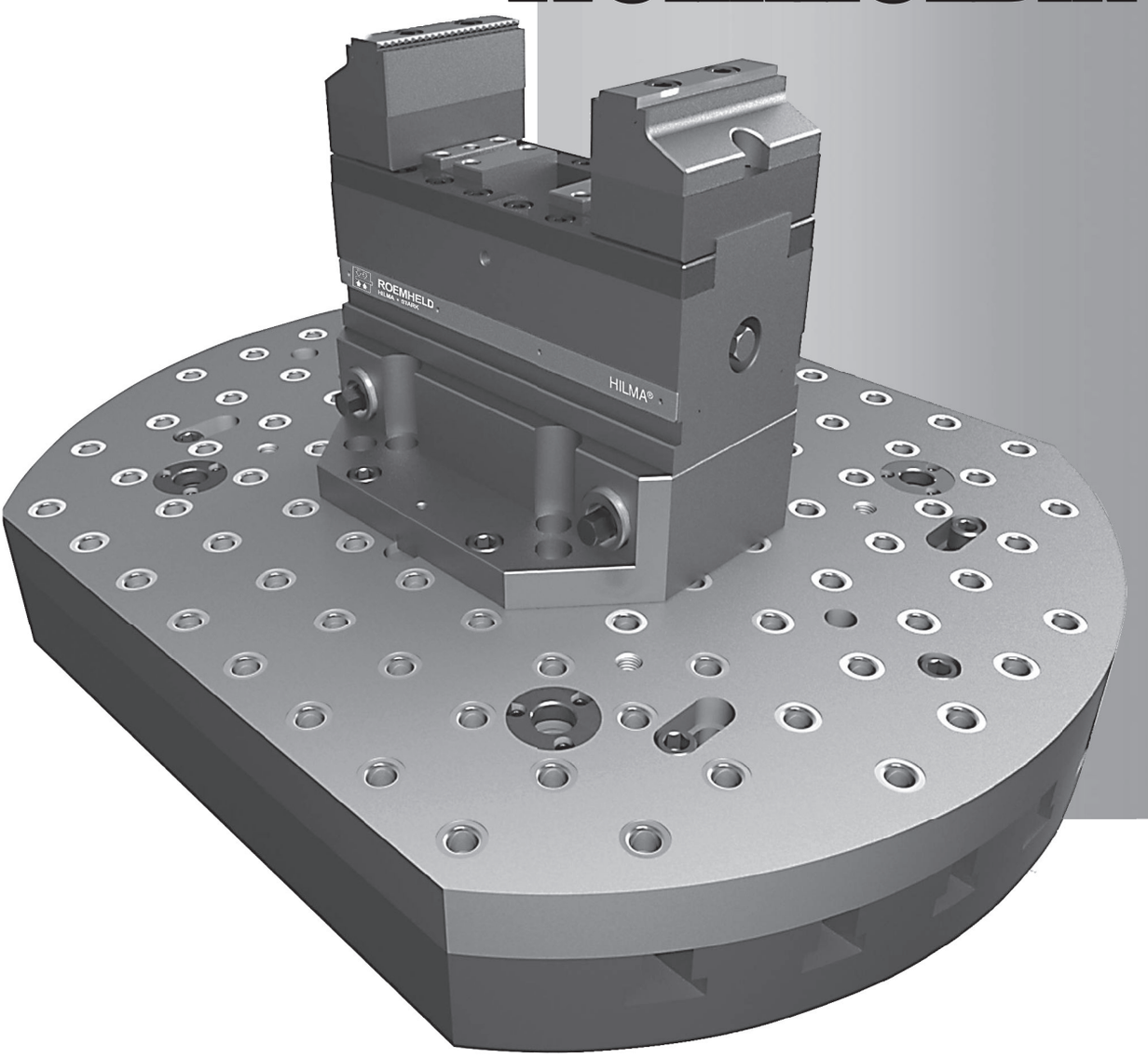
PROTECTION PLUGS

PART NO.	FOR CARR LOCK® RECEIVER DIA.
CL-13-CLPP	13mm
CL-16-CLPP	16mm
CL-20-CLPP	20mm
CL-25-CLPP	25mm
CL-30-CLPP	30mm

Get quote

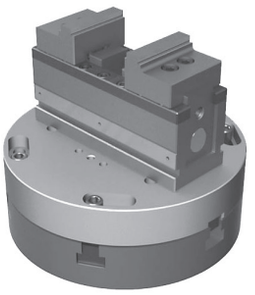
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QUICK-CHANGE 5-AXIS WORKHOLDING



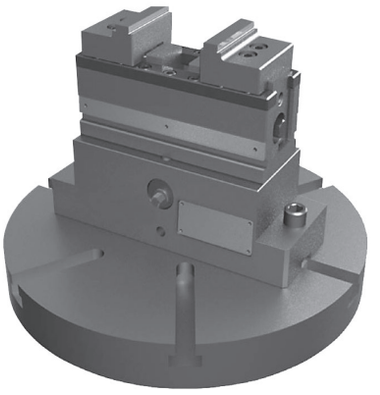
CL5® QUICK-CHANGE 5-AXIS WORKHOLDING

SOLUTIONS FOR ALL SIZES OF ROTARY TABLES



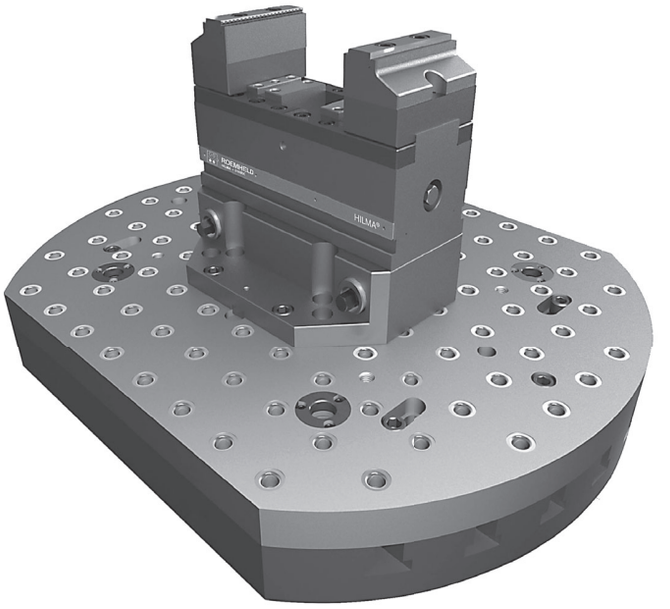
METHOD 1
Fixture Plate Mounted on Rotary Table

Method 1 is ideal for small rotary tables up to 210mm diameter, but can also be used for larger tables up to 400mm diameter. These fixture plates are accurately located and fastened directly on the rotary table. This simple, economical method allows using 5-Axis Vises, modular fixturing, or dedicated permanent fixturing.



METHOD 2
Quintus Quick-Change Riser Mounted on Rotary Table

Method 2 utilizes our Quintus Quick-Change Risers to achieve full quick-change fixturing benefits on rotary tables 250mm diameter and larger. A Quintus Quick-Change Riser provides additional height for spindle clearance, and can be quickly and accurately mounted directly on the rotary table at its center.

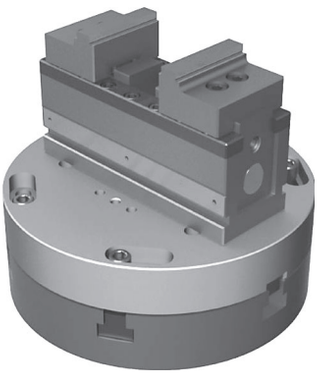


METHOD 3
Subplate Mounted on Rotary Table

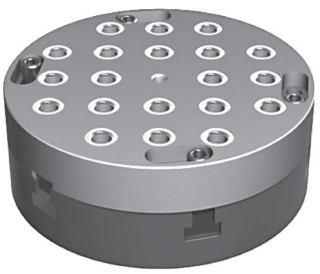
Method 3 is appropriate for medium and large machine tables, achieving further quick-change benefits for the entire riser assembly. Using this method, the Quintus riser is mounted on a subplate to allow quick exchange of the riser with other fixturing.

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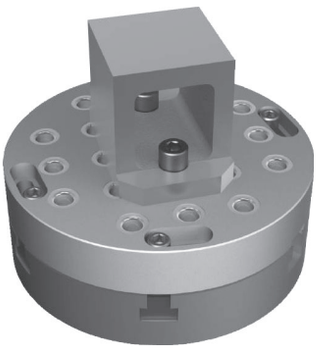
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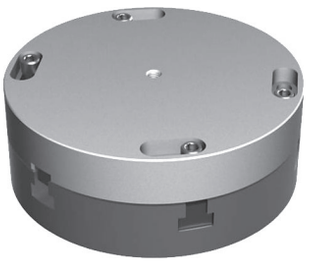
Vise-Adaptor Fixture Plate with 5-Axis Vise



Modular Fixture Plate



Modular Fixture Plate with Riser Block



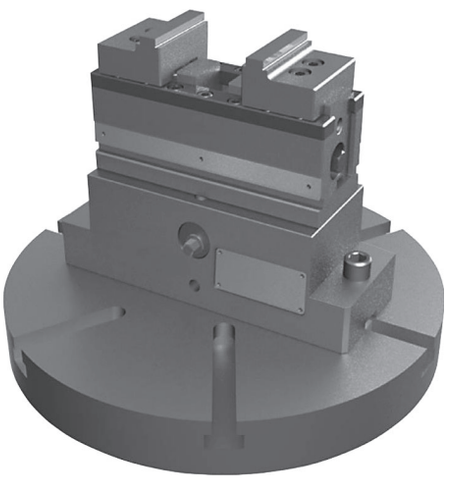
Blank Fixture Plate

Method 1 is ideal for small rotary tables up to 210mm diameter, but can also be used for larger tables up to 400mm diameter. These fixture plates are accurately located and fastened directly on the rotary table. This simple, economical method allows using 5-Axis Vises, modular fixturing, or dedicated permanent fixturing. **INFO+**: See pages 386-391 for fixture plates.

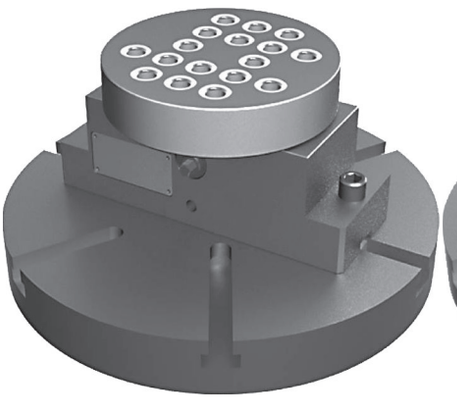
METHOD 1
FIXTURE PLATE MOUNTED ON ROTARY TABLE

BASE OPTIONS	BASE SIZE	WORKHOLDER OPTIONS	FITS TABLE DIAMETER														
			110mm	130mm	160mm	200mm	210mm	250mm	260mm	300mm	310mm	320mm	400mm	450mm	500mm	500mm	600mm	630mm
Vise Adaptor Plate with 5-Axis Vise	130mm	MC40 , MC40Z Vises	✓	✓														
	160mm	MC40, MC40Z, MC60, MC60Z, SCS80 Vises			✓													
	210mm	MC40, MC40Z, MC60, MC60Z, SCS80 Vises				✓	✓	✓	✓									
	310mm	MC60, MC60Z, SCS80, MC100, MC100Z, SCS120 Vises								✓	✓	✓	✓					
Modular Fixture Plate	130mm	Custom	✓	✓														
	160mm				✓													
	210mm					✓	✓											
	250mm							✓	✓									
	310mm									✓	✓	✓	✓					
Modular Fixture Plate with Riser Block	130mm	Custom	✓	✓														
	160mm	Custom			✓													
	210mm	Custom				✓	✓											
	250mm	MC60, MC60Z, SCS80 Vises or Custom						✓	✓									
	310mm	MC60, MC60Z, SCS80, MC100, MC100Z, SCS120 Vises or Custom								✓	✓	✓	✓					
Blank Fixture Plate	130mm	Custom	✓	✓														
	160mm				✓													
	210mm					✓	✓											
	250mm							✓	✓									
	310mm									✓	✓	✓	✓					

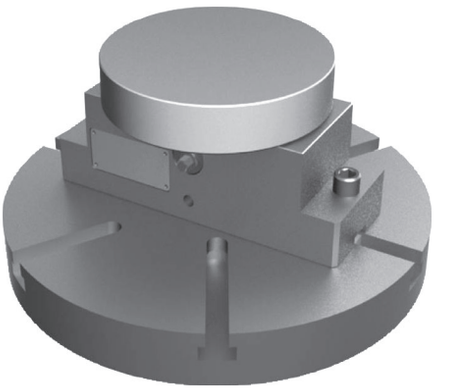
CL5® QUICK-CHANGE 5-AXIS WORKHOLDING



Quintus Riser with 5-Axis Vise



Quintus Riser with Modular Fixture Plate



Quintus Riser with Blank Fixture Plate

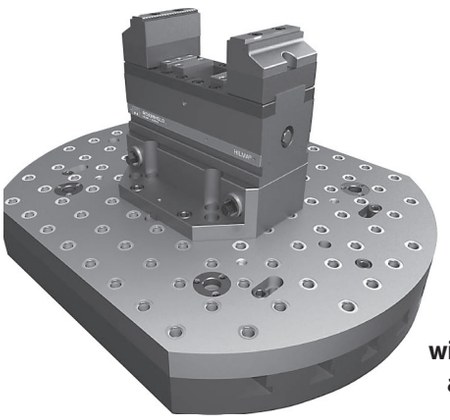
Method 2 utilizes our Quintus Quick-Change Risers to achieve full quick-change fixturing benefits on rotary tables 250mm diameter and larger. A Quintus Quick-Change Riser provides additional height for spindle clearance, and can be quickly and accurately mounted directly on the rotary table at its center. **INFO+**: See pages 378-380 for Quintus fixture plates.

METHOD 2
QUINTUS MOUNTED ON ROTARY TABLE

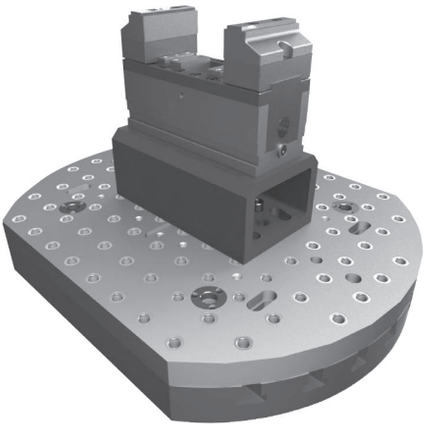
			FITS TABLE DIAMETER															
BASE OPTIONS	**BASE SIZE**	**WORKHOLDER OPTIONS**	**110mm**	**130mm**	**160mm**	**200mm**	**210mm**	**250mm**	**260mm**	**300mm**	**310mm**	**320mm**	**400mm**	**450mm**	**500mm**	**500mm**	**600mm**	**630mm**
Quintus Riser with 5-Axis Vise	Quintus 1	MC40, MC40Z, MC60, MC60Z, SCS80 Vises						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 2	MC100, MC100Z, SCS120 Vises								✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 3	MC125Z Vise												✓	✓	✓	✓	✓
Quintus Riser with Modular Fixture Plate	Quintus 1 + 130mm	Custom						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 1 + 160mm							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 1 + 100x250mm							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 1 + 150x250mm							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 2 + 250mm									✓	✓	✓	✓	✓	✓	✓	✓	✓
Quintus Riser with Blank Fixture Plate	Quintus 1 + 130mm	Custom						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 1 + 160mm							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 1 + 100x250mm							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 1 + 150x250mm							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Quintus 2 + 250mm									✓	✓	✓	✓	✓	✓	✓	✓	✓

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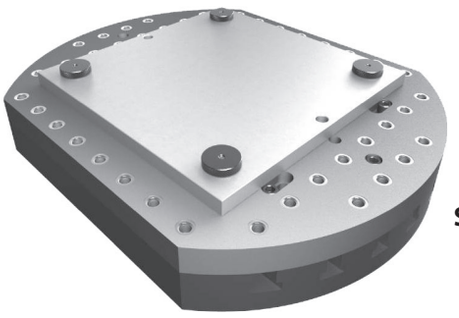
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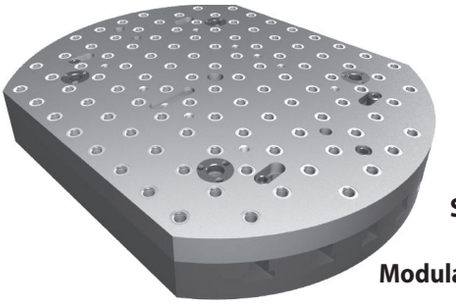
Subplate with Quintus Riser and 5-Axis Vise



Subplate with Riser Block



Subplate with Carr Lock Fixture Plate



Subplate used as Modular Fixture Plate

Method 3 is appropriate for medium and large machine tables, achieving further quick-change benefits for the entire riser assembly. Using this method, the Quintus riser is mounted on a subplate to allow quick exchange of the riser with other fixturing. **INFO+**: See pages 392-393 for subplates.

9

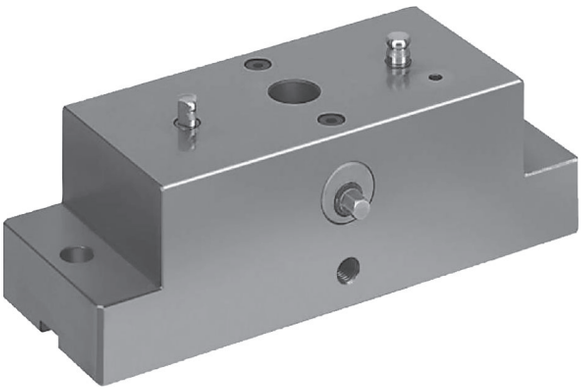
METHOD 3
SUBPLATE MOUNTED ON ROTARY TABLE

			FITS TABLE DIAMETER															
BASE OPTIONS	**BASE SIZE**	**WORKHOLDER OPTIONS**	**110mm**	**130mm**	**160mm**	**200mm**	**210mm**	**250mm**	**260mm**	**300mm**	**310mm**	**320mm**	**400mm**	**450mm**	**500mm**	**500mm**	**600mm**	**630mm**
Subplate with Quintus Riser and 5-Axis Vise	250mm + Quintus 1	MC40, MC40Z, MC60, MC60Z, SCS80 Vises or Custom						✓	✓									
	310mm + Quintus 1	MC40, MC40Z, MC60, MC60Z, SCS80 Vises or Custom								✓	✓	✓	✓					
	310mm + Quintus 2	MC100, MC100Z, SCS120 Vises or Custom								✓	✓	✓	✓					
	630x500mm + Quintus 1	MC40, MC40Z, MC60, MC60Z, SCS80 Vises or Custom															✓	✓
	630x500mm+Quintus 2	MC100, MC100Z, SCS120 Vises or Custom															✓	✓
	630x500mm + Quintus 3	MC125Z Vise or Custom															✓	✓
Subplate with Riser Block	250mm	MC60, MC60Z, SCS80,Vises or Custom						✓	✓									
	310mm	MC60, MC60Z, SCS80, MC100, MC 100Z, SCS120 Vises or Custom								✓	✓	✓	✓					
	630x500mm	MC60, MC60Z, SCS80, MC100, MC 100Z, SCS120 Vises or Custom															✓	✓
Subplate with Carr Lock Plate	630x500mm	14x14, 400x400mm Carr Lock Fixture Plates															✓	✓
Subplate used as Modular Fixture Plate	250mm	Custom						✓	✓									
	310mm									✓	✓	✓	✓					
	630x500mm																✓	✓

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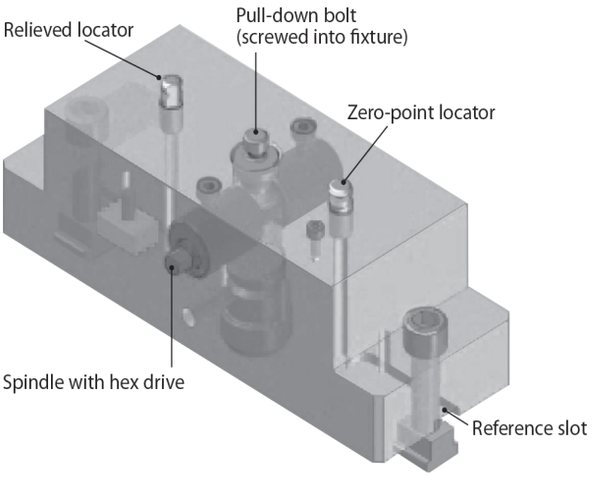
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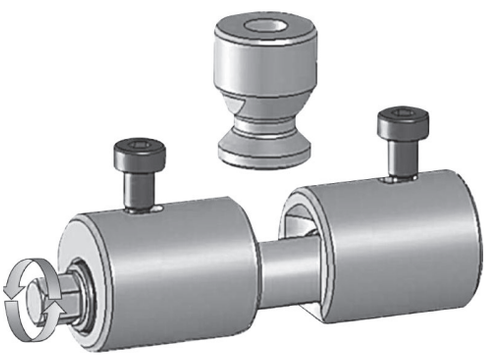
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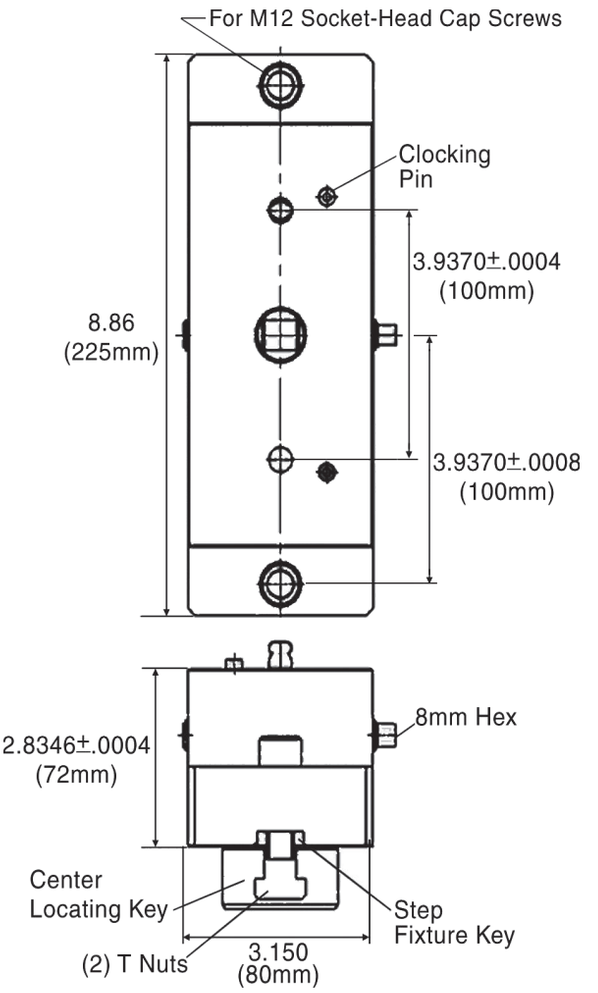
Quintus 1
Quick-Change Riser
Pull-Down Force 2700 Lbs
CLRH-9-6153-0101-VSA

Quintus Quick-Change Risers provide accurate location and secure clamping while also providing quick-change capability and elevating the workpiece for improved spindle access – all in one compact unit. The Quintus 1 riser shown here utilizes two locating pins, a round pin for zero-point centering and a diamond pin for single-axis centering, and a single pull-down bolt that provides 2700 lbs of pull-down force.



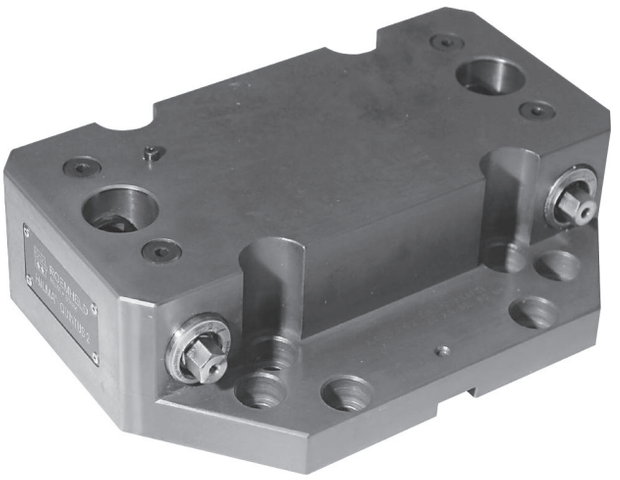


Quintus
Clamping
Mechanism



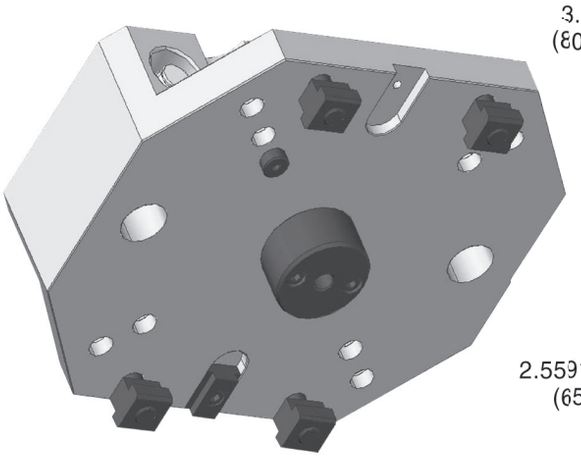
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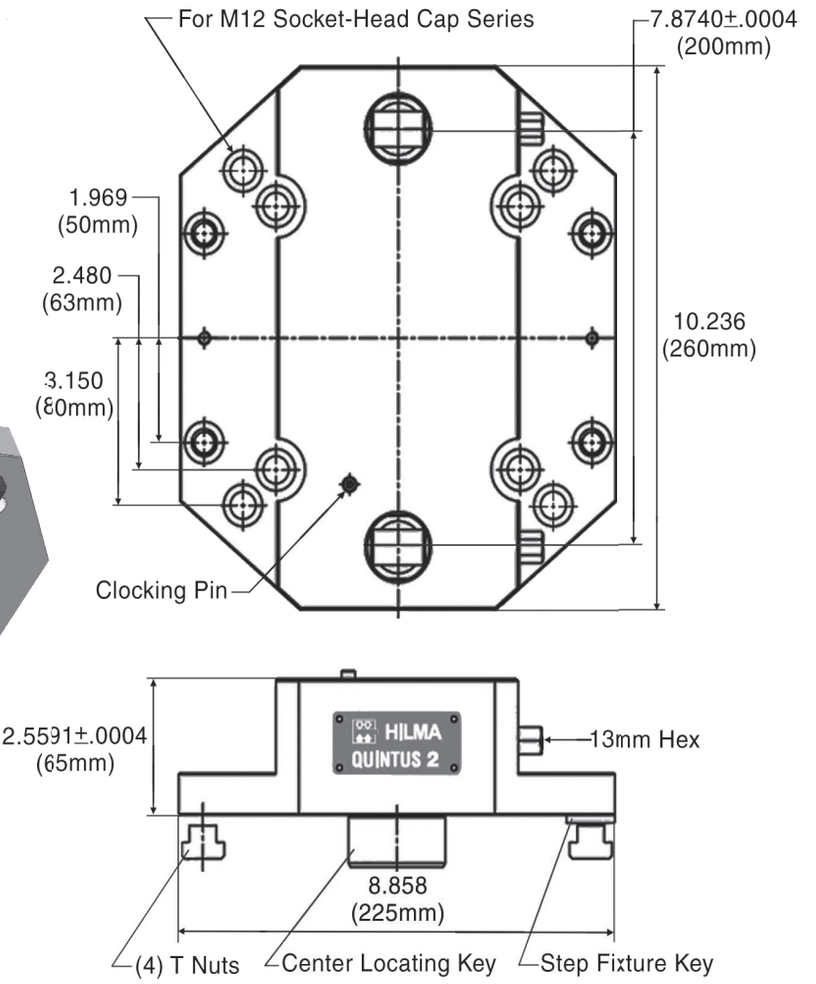
CL5® QUICK-CHANGE 5-AXIS WORKHOLDING



Quintus 2
Quick-Change Riser
Pull-Down Force 4500 Lbs x 2
CLRH-9-6155-0102-VSA

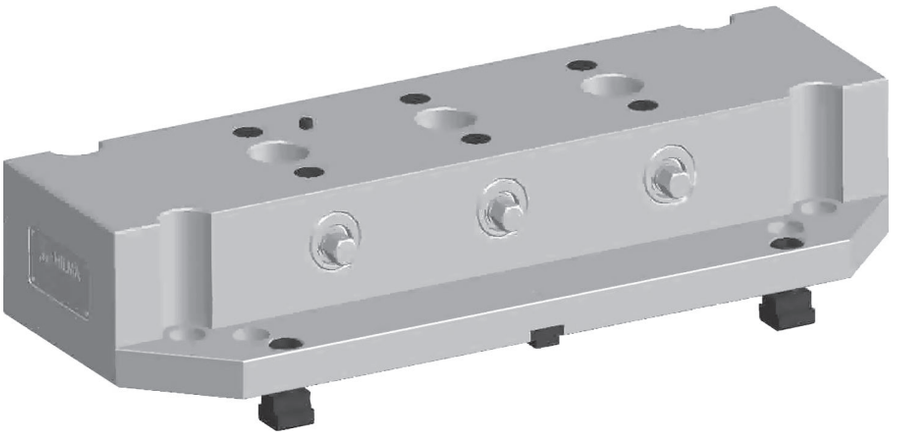
Quintus Quick-Change Risers provide accurate location and secure clamping while also providing quick-change capability and elevating the workpiece for improved spindle access – all in one compact unit. The Quintus 2 riser shown here utilizes two pull-down bolts – one with zero-point centering, the other with single-axis centering – providing 2 x 4500 lbs of pull-down force.





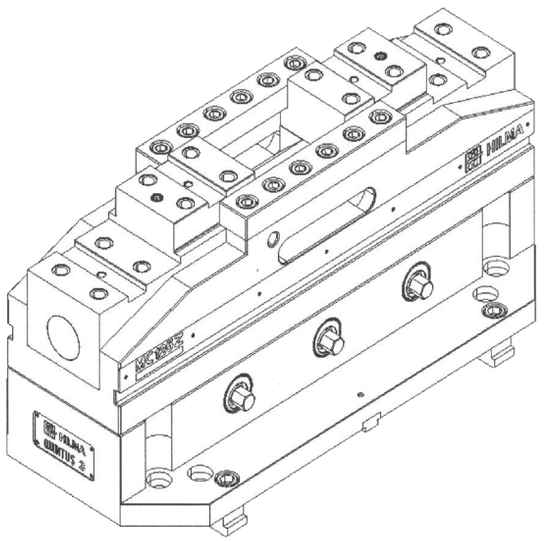
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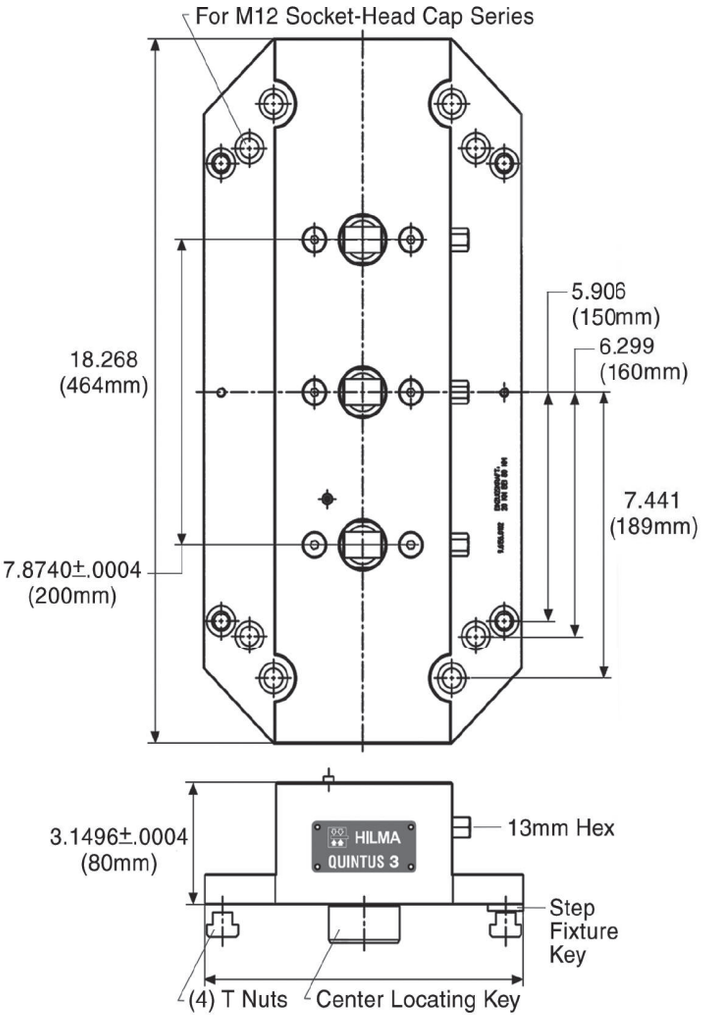


Quintus 3
Quick-Change Riser
Pull-Down Force 4500 Lbs x 3
CLRH-9-6156-0102-VSA

Quintus Quick-Change Risers provide accurate location and secure clamping while also providing quick-change capability and elevating the workpiece for improved spindle access – all in one compact unit. The Quintus 3 riser shown here utilizes three pull-down bolts – one with zero-point centering, one with single-axis centering, and one without centering – providing 3 x 4500 lbs of pull-down force.

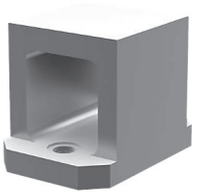


MC125Z-series 5-axis concentric vise mounted on Quintus 3 Quick-Change Riser

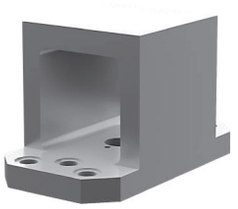


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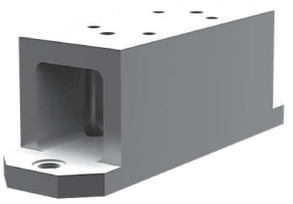
RISER BLOCKS



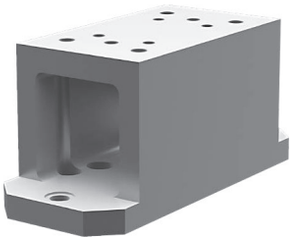
3 x 3 x 3
Blank



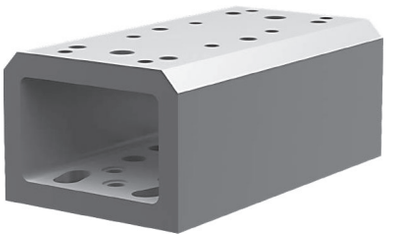
4 x 4 x 4
Blank



3 x 3 x 7
Vise Adaptor
(MC60, MC60Z)

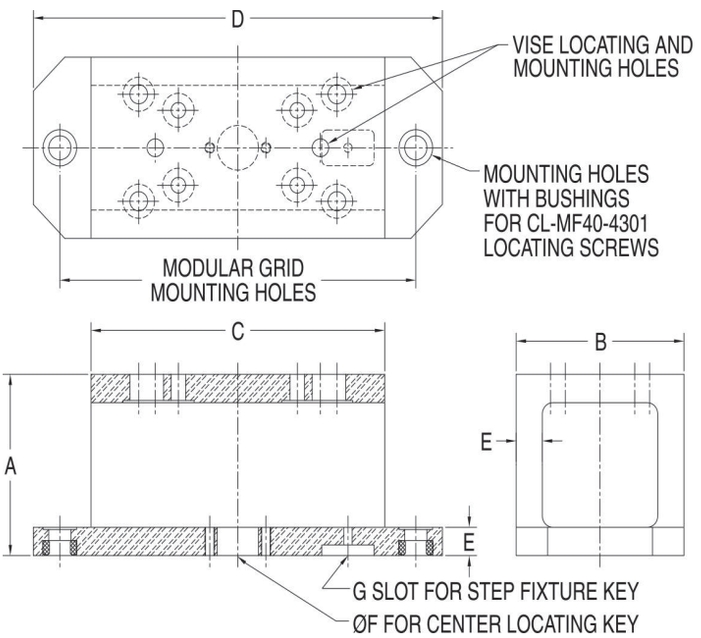


4 x 4 x 7
Vise Adaptor
(MC60, MC60Z, SCS80)



4 x 6 x 11
Vise Adaptor
(MC100, MC100Z, SCS120)

Riser Blocks provide an economical way to raise a workpiece for 5-Axis machining. These precision blocks are available blank for customization, or with locating and mounting holes for 5-Axis vises. Riser Blocks are usually mounted on a modular fixture plate, but sizes from 4x4x4 up can also be mounted directly on a rotary table.



9

RISER BLOCKS – BLANK

PART NO.	A	B	C	D	E	F DIA	G	MODULAR GRID MOUNTING HOLES	WORKHOLDER OPTIONS
CL-333-00-RBF	3	3	3	4.50	.50	—	—	2.8284 (2x2 diagonal)	Custom
CL-444-00-RBF	4	4	4	7.25	.62	25mm	—	2.0000 x 6.0000	

RISER BLOCKS – VISE ADAPTOR

CL-337-02-RBF	3	3	7	9.75	.50	25mm	20mm	8.4853 (6x6 diagonal)	MC60, MC60Z Vises
CL-447-02-RBF	4	4	7	9.75	.62			8.4853 (6x6 diagonal)	MC60, MC60Z, SCS80 Vises
CL-4611-03-RBF		6	11	11	.62			2.0000 x 6.0000	MC100, MC100Z, SCS120 Vises

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5-AXIS VISES
FOR MOUNTING ON QUINTUS 1



MCP40
Fixed-Jaw Vise
40mm wide x 110mm long
1800 lbs clamping force

The MCP40 vise is extremely compact yet quite powerful. Like all of our 5-Axis vises, this vise has optimal features to allow unrestricted tool access for multiple-side machining. The standard fixed-jaw version has one fixed jaw and one sliding jaw that clamps against it. Due to its small size, the MCP40 vise uses an adaptor plate to mount on a Quintus 1 riser. **INFO+**: See page 665 for more information.



MCP40 Z
Concentric Vise
40mm wide x 110mm long
1800 lbs clamping force

The Z-series version of our MCP40 vise is dimensionally similar, but incorporates our precision self-centering mechanism. This concentric vise has two sliding jaws that provide clamping at the exact center of the rotary table. **INFO+**: See page 666 for more information.



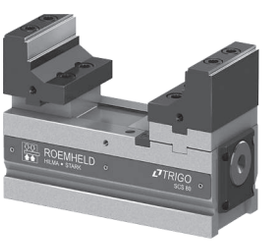
MCP60
Fixed-Jaw Vise
60mm wide x 170mm long
3400 lbs clamping force

The MCP60 vise is our most popular 5-Axis-vise size. Like all of our 5-Axis vises, this vise has optimal features to allow unrestricted tool access for multiple-side machining. The standard fixed-jaw version has one fixed jaw and one sliding jaw that clamps against it.
INFO+: See page 665 for more information.



MCP60 Z
Concentric Vise
60mm wide x 170mm long
3400 lbs clamping force

The Z-series version of our MCP60 vise is dimensionally similar, but incorporates our precision self-centering mechanism. This concentric vise has two sliding jaws that provide clamping at the exact center of the rotary table. **INFO+**: See page 666 for more information.



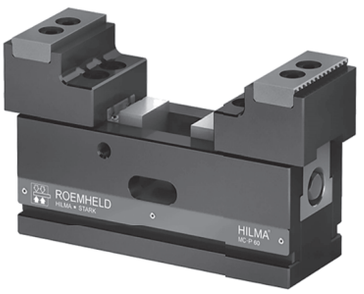
SCS80
Fixed-Jaw Vise
80mm wide x 200mm long
5600 lbs clamping force

SCS-series vises are slightly wider, and allow clamping higher up in the jaws with greater holding force. Like all of our 5-Axis vises, the SCS80 vise has optimal features to allow unrestricted tool access for multiple-side machining. The standard fixed-jaw design has one fixed jaw and one sliding jaw that clamps against it. **INFO+**: See our online catalog for more information.

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5-AXIS VISES
FOR MOUNTING ON QUINTUS 2



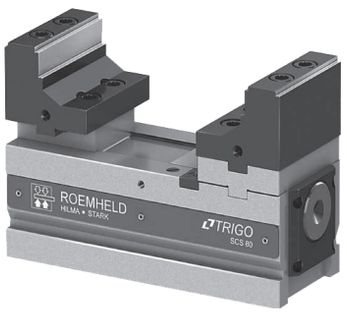
MCP100
Fixed-Jaw Vise
100mm wide x 260mm long
5600 lbs clamping force

The MCP100 vise handles a wide range of workpiece sizes. Like all of our 5-Axis vises, this vise has optimal features to allow unrestricted tool access for multiple-side machining. The standard fixed-jaw version has one fixed jaw and one sliding jaw that clamps against it. **INFO+**: See page 665 for more information.



MCP100 Z
Concentric Vise
100mm wide x 266mm long
5600 lbs clamping force

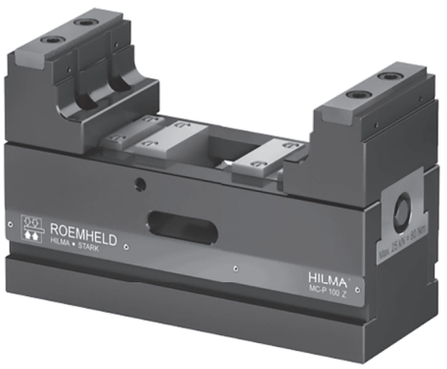
The Z-series version of our MCP100 vise is dimensionally similar, but incorporates our precision self-centering mechanism. This concentric vise has two sliding jaws that provide clamping at the exact center of the rotary table. **INFO+**: See pages 666-667 for more information.



SCS120
Fixed-Jaw Vise
120mm wide x 227mm long
9000 lbs clamping force

SCS-series vises are slightly wider, and allow clamping higher up in the jaws with greater holding force. Like all of our 5-Axis vises, the SCS120 vise has optimal features to allow unrestricted tool access for multiple-side machining. The standard fixed-jaw design has one fixed jaw and one sliding jaw that clamps against it. **INFO+**: See our online catalog for more information.

5-AXIS VISES
FOR MOUNTING ON QUINTUS 3

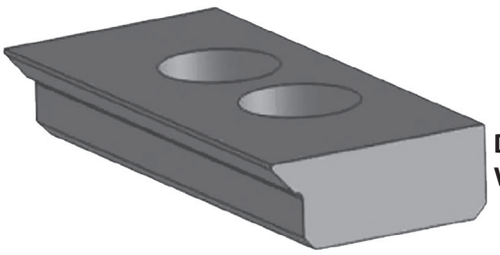


MCP125 Z
Concentric Vise
125mm wide x 465mm long
7900 lbs clamping force

The MCP125Z vise is ideal for large workpieces. Like all of our 5-Axis vises, this vise has optimal features to allow unrestricted tool access for multiple-side machining. This Z-series concentric vise incorporates our precision self-centering mechanism, with two sliding jaws that provide clamping at the exact center of the rotary table. Shown with optional tapered slides. **INFO+**: See our online catalog for more information.

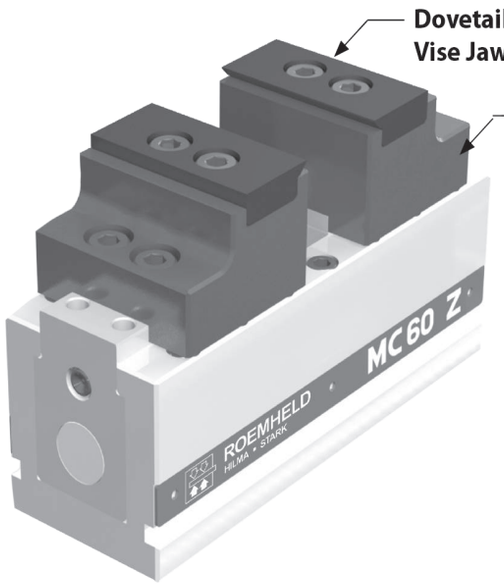
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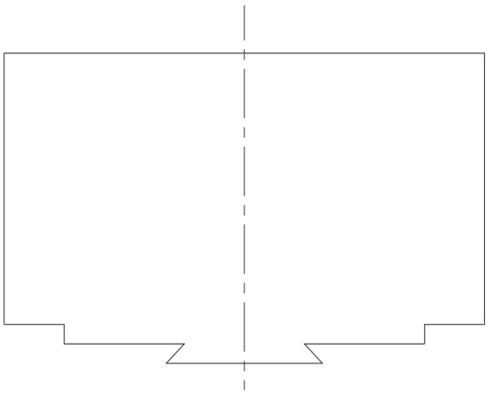
DOVETAIL VISE JAWS



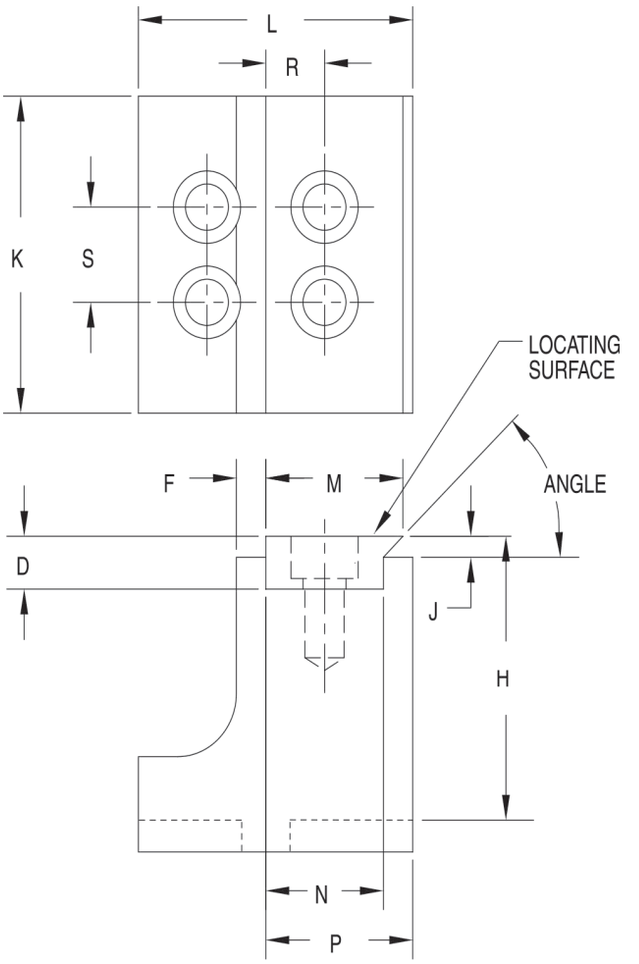
Dovetail Vise Jaw Insert

Dovetail clamping requires leaving excess material at the bottom of each workpiece for machining a male dovetail. This machined dovetail extension is used to clamp on during 5-Axis work, by a mating dovetail clamp or vise jaw, then is removed in a secondary machining operation. The dovetail inserts shown here fit 60mm-wide insertable jaws on MCP60 and MCP60Z 5-Axis vises, with other sizes available upon request. Inserts are available for either 45-degree or 60-degree dovetails. 1018 steel, carburized-hardened, black oxide finish.





Example dovetail extension at bottom of workpiece.

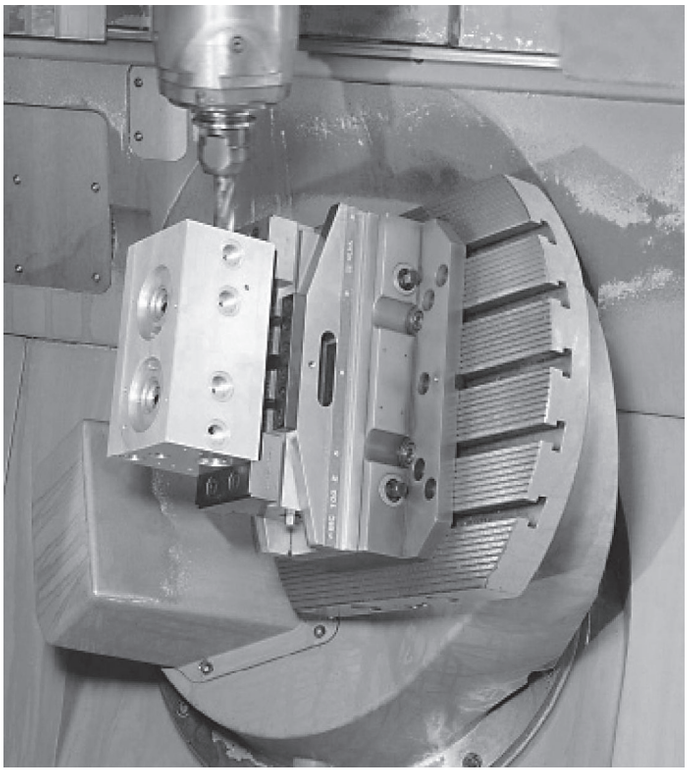


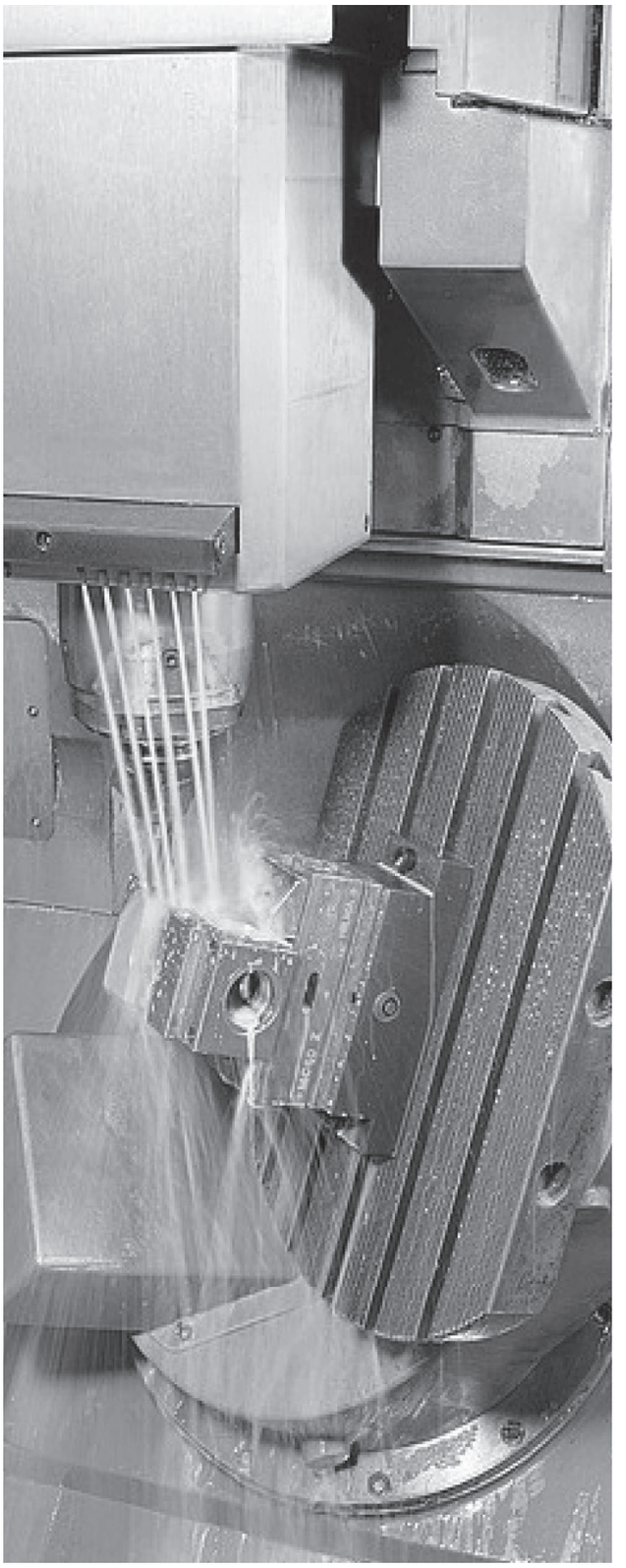
VISE JAWS AND DOVETAIL INSERTS

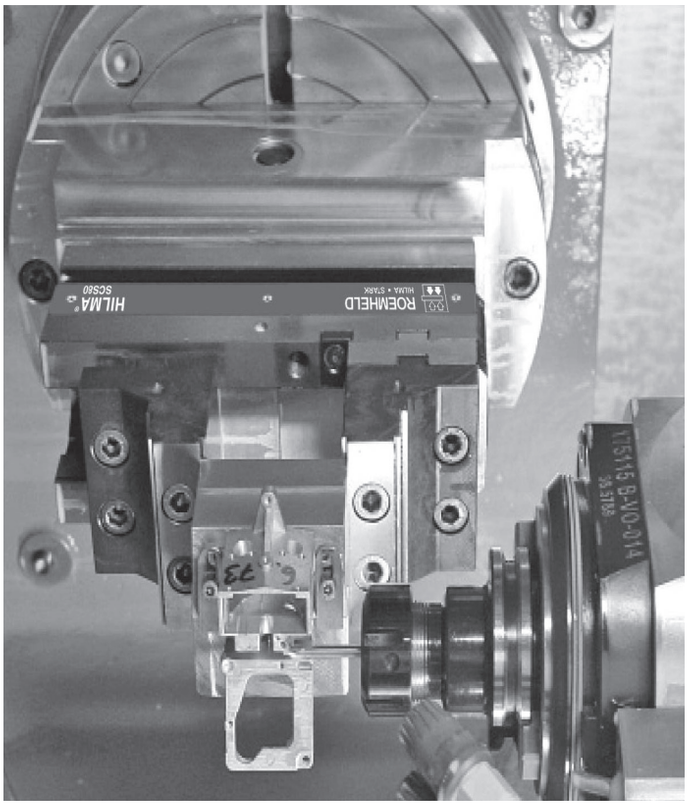
VISE JAW PART NO. (2 REQD)	INSERT PART NO. (2 REQD)	ANGLE	D	F	H	D	K	L	M	N	P	R	M
CLRH-9-3583-6906-VSA	CL-36-DVJI-45	45°	.394	.236	1.339	.157	2.362	2.205	1.102	.945	1.181	.472	.709
	CL-36-DVJI-60	60°							1.063				

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CL5® QUICK-CHANGE 5-AXIS WORKHOLDING







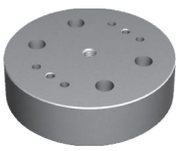
FIXTURE PLATES
FOR MOUNTING ON ROTARY TABLE



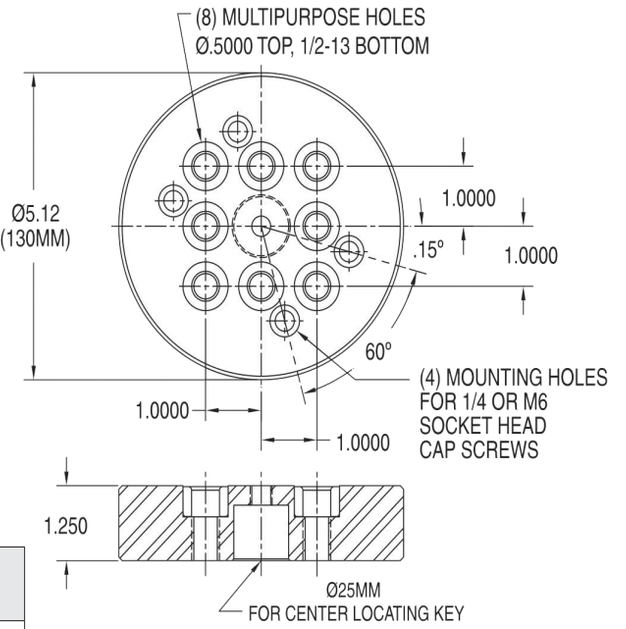
130mm Blank



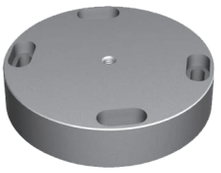
130mm Modular Fixturing



130mm Vise Adaptor



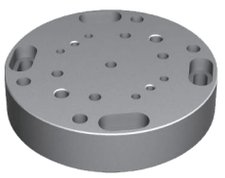
PART NO.	TYPE	PLATE DIA	FITS TABLE DIA	WORKHOLDER OPTIONS
CL-130-00-RFP	Blank	130mm	110mm 130mm	Custom
CL-130-40-RFP	Modular			Riser Block, Custom
CL-130-01-RFP	Vise Adaptor			MC40, MC40Z Vises



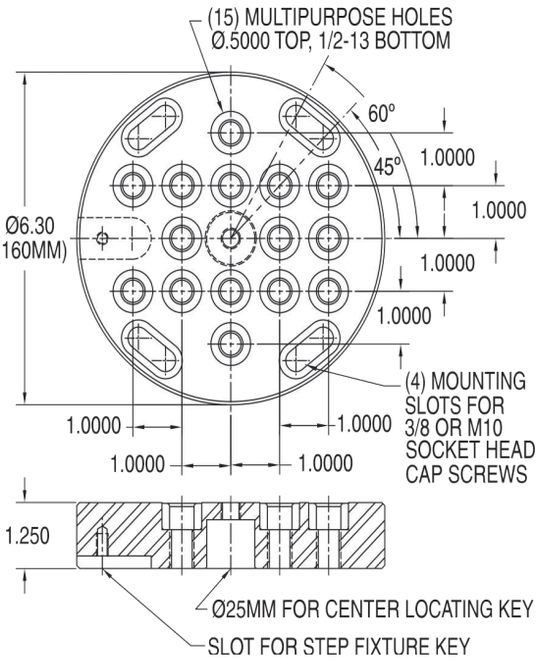
160mm Blank



160mm Modular Fixturing



160mm Vise Adaptor



PART NO.	TYPE	PLATE DIA	FITS TABLE DIA	WORKHOLDER OPTIONS
CL-160-00-RFP	Blank	160mm	160mm	Custom
CL-160-40-RFP	Modular			Riser Block, Custom
CL-160-02-RFP	Vise Adaptor			MC40, MC40Z, MC60, MC60Z, SCS80 Vises

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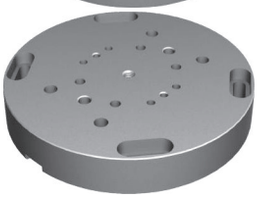
FIXTURE PLATES
FOR MOUNTING ON ROTARY TABLE



210mm
Blank

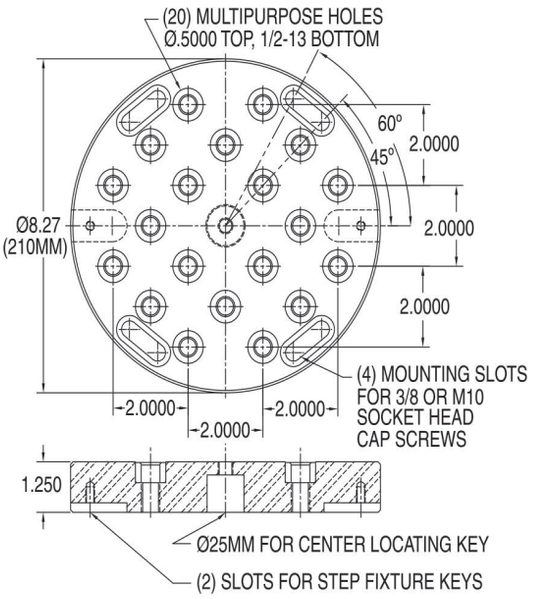


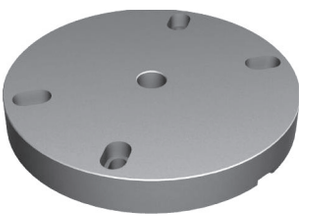
210mm
Modular Fixturing



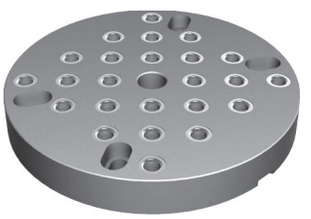
210mm
Vise Adaptor

PART NO.	TYPE	PLATE DIA	FITS TABLE DIA	WORKHOLDER OPTIONS
CL-210-00-RFP	Blank	210mm	200mm 210mm	Custom
CL-210-40-RFP	Modular			Riser Block, Custom
CL-210-02-RFP	Vise Adaptor			MC40, MC40Z, MC60, MC60Z, SCS80 Vises





250mm
Blank

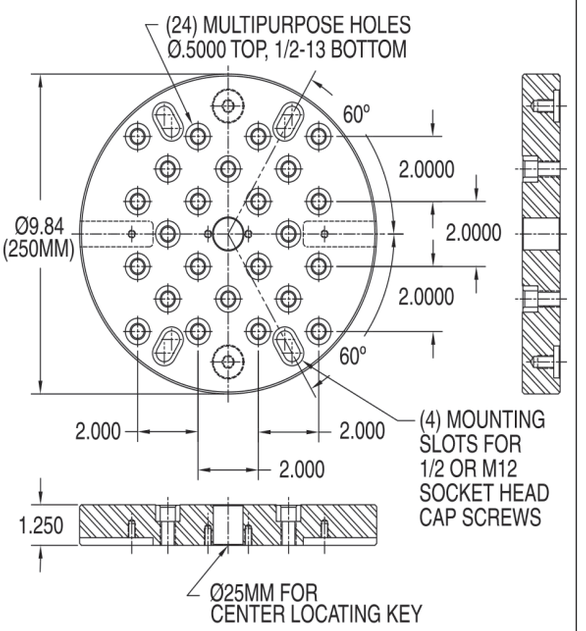


250mm
Modular Fixturing

Use 210mm Vise Adaptor
for 250mm tables.

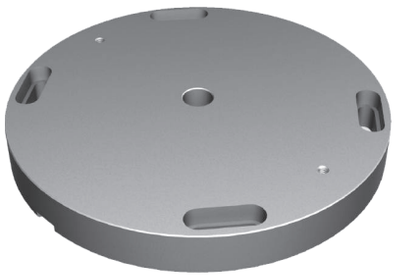
250mm
Vise Adaptor

PART NO.	TYPE	PLATE DIA	MOUNTS ON	WORKHOLDER OPTIONS
CL-250-00-QRFP	Blank	250mm	250mm 260mm	Custom
CL-250-40-QRFP	Modular			Riser Block with MC60, MC60Z, SCS80 Vise or Custom
CL-210-02-RFP	Vise Adaptor	210mm		MC40, MC40Z, MC60, MC60Z, SCS80 Vises

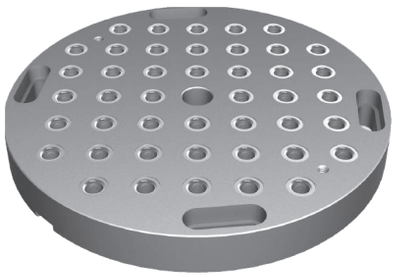


9

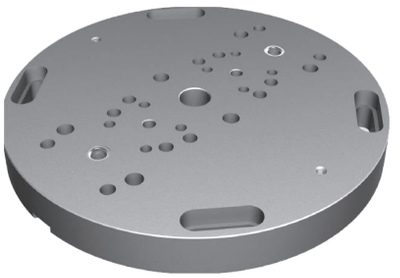
FIXTURE PLATES
FOR MOUNTING ON ROTARY TABLE



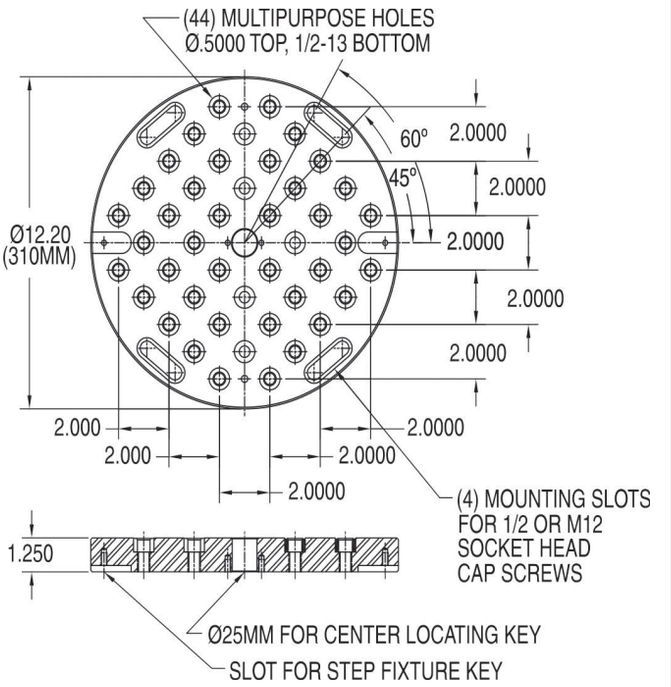
310mm
Blank



310mm
Modular Fixturing



310mm
Vise Adaptor

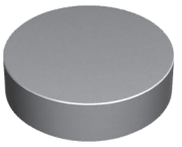


PART NO.	TYPE	PLATE DIA	FITS TABLE DIA	WORKHOLDER OPTIONS
CL-310-00-RFP	Blank	310mm	300mm	Custom
CL-310-40-RFP	Modular		310mm 320mm	Riser Block with MC60, MC60Z, SCS80, MC100, MC100Z, SCS120 Vise or Custom
CL-310-03-RFP	Vise Adaptor		400mm	MC60, MC60Z, SCS80, MC100, MC100Z, SCS120 Vises

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FIXTURE PLATES
FOR MOUNTING ON QUINTUS 1



130mm
Blank
(Mounts on Quintus 1)

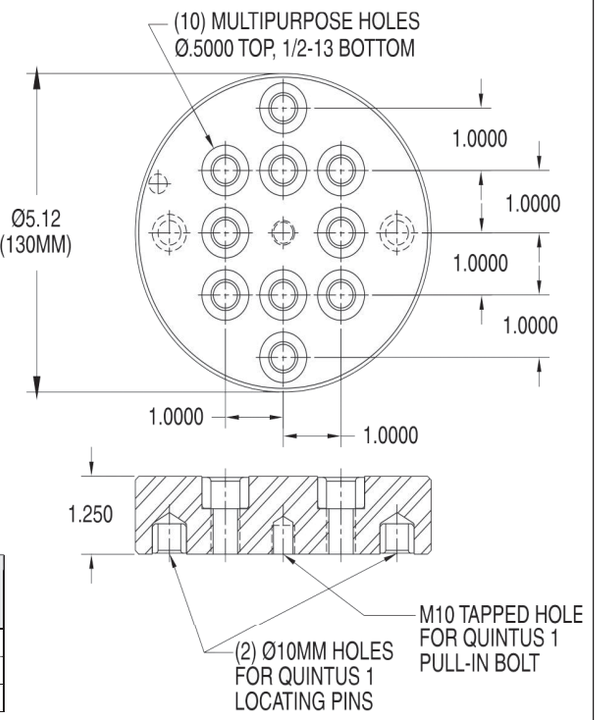


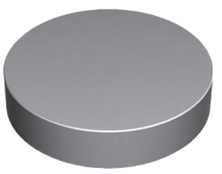
130mm
Modular Fixturing
(Mounts on Quintus 1)



130mm
Vise Adaptor
(Mounts on Quintus 1)

PART NO.	TYPE	PLATE DIA	MOUNTS ON	WORKHOLDER OPTIONS
CL-130-00-QRFP	Blank	120mm	Quintus 1	Custom
CL-130-40-QRFP	Modular			Riser Block or Custom
CL-130-01-QRFP	Vise Adaptor			MC40, MC40Z Vises





160mm
Blank
(Mounts on Quintus 1)

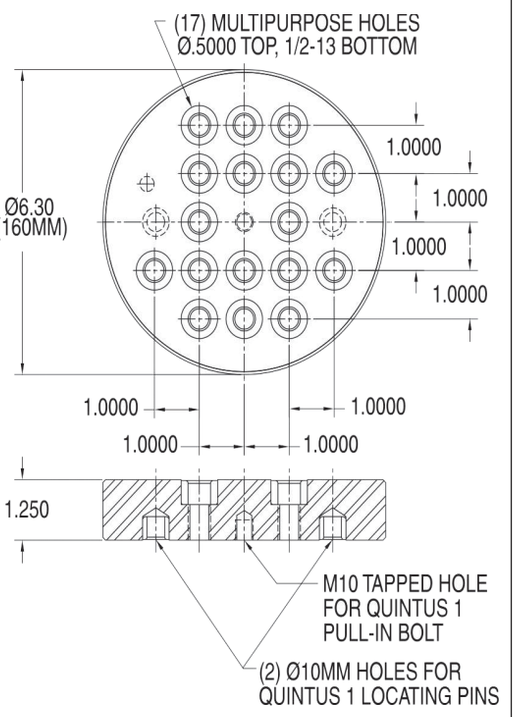


160mm
Modular Fixturing
(Mounts on Quintus 1)

Use 130mm
Vise Adaptor.

160mm
Vise Adaptor
(Mounts on Quintus 1)

PART NO.	TYPE	PLATE DIA	MOUNTS ON	WORKHOLDER OPTIONS
CL-160-00-QRFP	Blank	160mm	Quintus 1	Custom
CL-160-40-QRFP	Modular			Riser Block or Custom
CL-130-01-QRFP	Vise Adaptor	130mm		MC40, MC40Z Vises



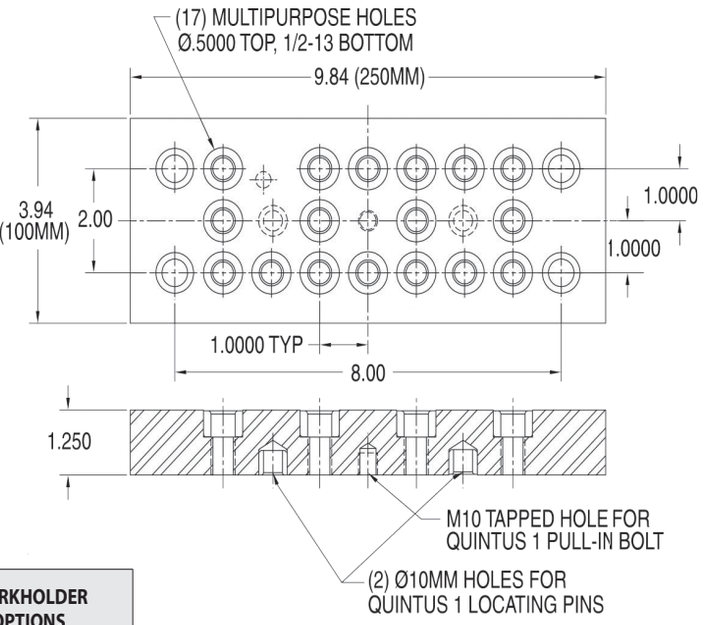
FIXTURE PLATES
FOR MOUNTING ON QUINTUS 1



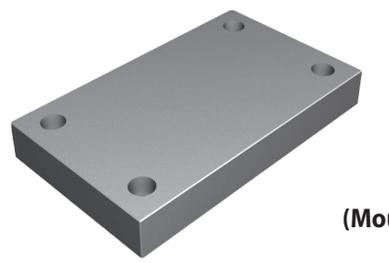
100 x 250mm
Blank
(Mounts on Quintus 1)



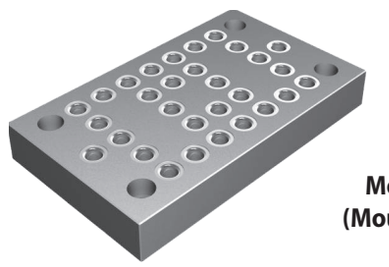
100 x 250mm
Modular Fixturing
(Mounts on Quintus 1)



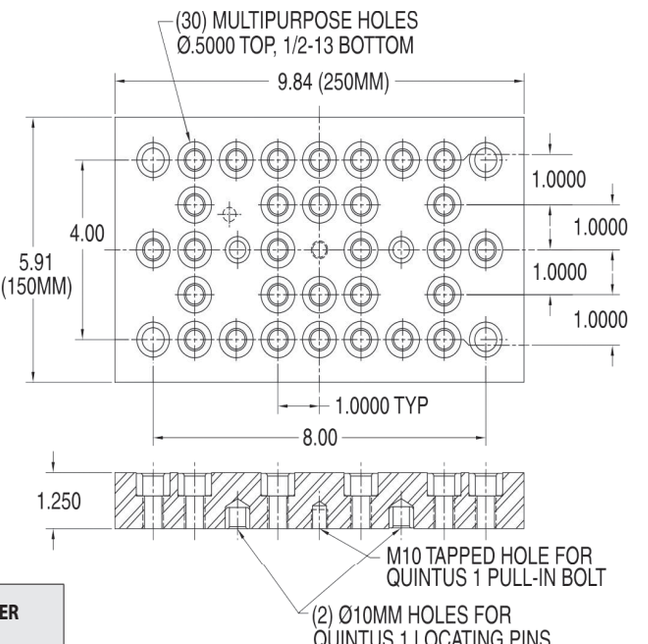
PART NO.	TYPE	PLATE SIZE	MOUNTS ON	WORKHOLDER OPTIONS
CL-100250-00-QFP	Blank	100 x 250mm	Quintus 1	Custom
CL-100250-40-QFP	Modular			Riser Block or Custom



150 x 250mm
Blank
(Mounts on Quintus 1)



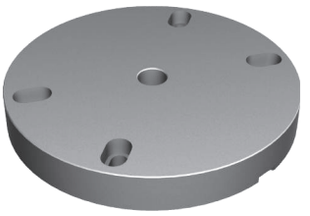
150 x 250mm
Modular Fixturing
(Mounts on Quintus 1)



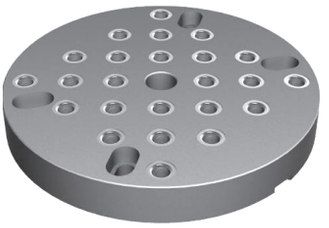
PART NO.	TYPE	PLATE SIZE	MOUNTS ON	WORKHOLDER OPTIONS
CL-150250-00-QFP	Blank	150 x 250mm	Quintus 1	Custom
CL-150250-40-QFP	Modular			Riser Block or Custom

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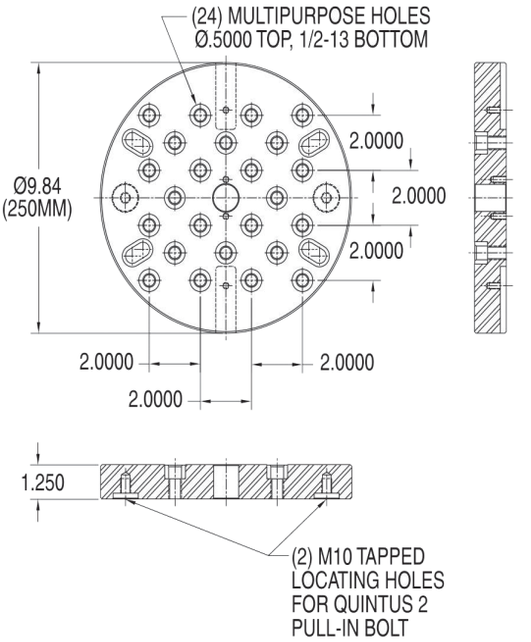
FIXTURE PLATES
FOR MOUNTING ON QUINTUS 2



250mm
Blank
(Mounts on Quintus 2)

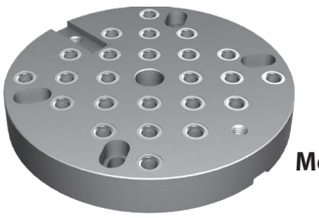


250mm
Modular Fixturing
(Mounts on Quintus 2)

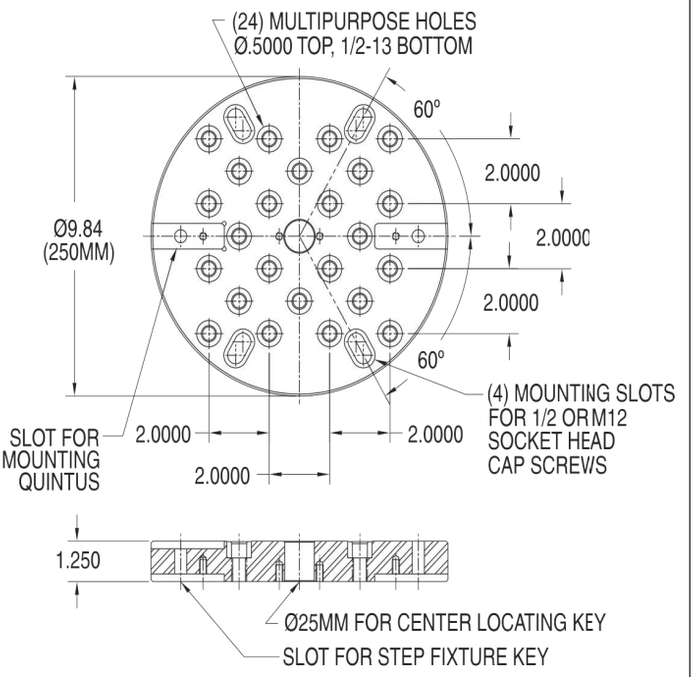


PART NO.	TYPE	PLATE DIA	MOUNTS ON	WORKHOLDER OPTIONS
CL-250-00-QRFP	Blank	250mm	Quintus 2	Custom
CL-250-40-QRFP	Modular			Riser Block or Custom

SUBPLATES



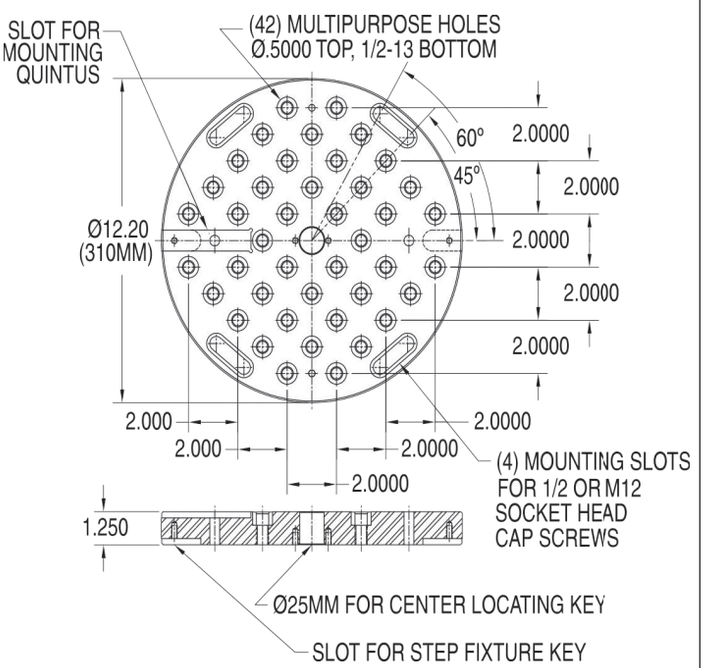
250mm Quintus 1 and Modular Fixturing



PART NO.	PLATE DIA	FITS TABLE DIA	WORKHOLDER OPTIONS
CL-250-41-QRFP	250mm	250mm 260mm	Quintus 1 with MC40, MC40Z, MC60, MC60Z, SCS80 Vise or Custom
			Riser Block with MC60, MC60Z, SCS80 Vise or Custom
			Modular Fixture or Custom



310mm Quintus 1, 2 and Modular Fixturing



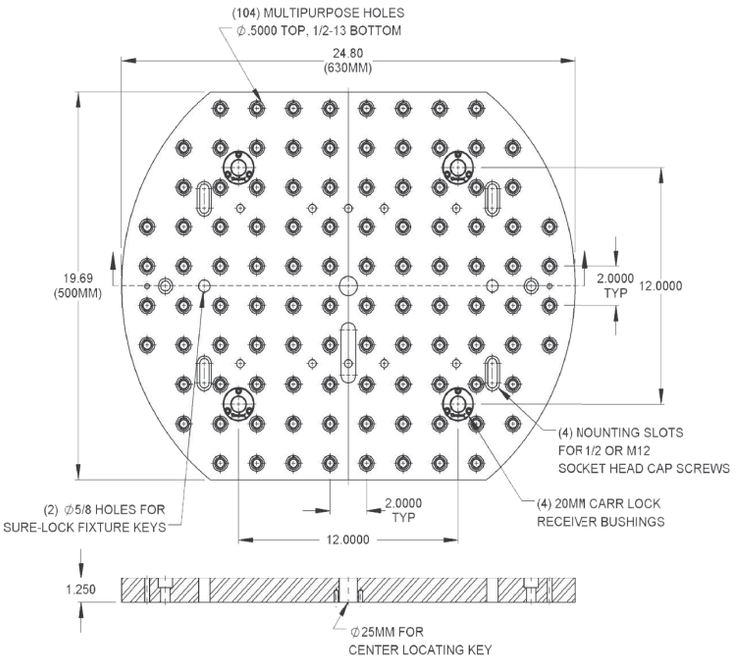
PART NO.	PLATE DIA	FITS TABLE DIA	WORKHOLDER OPTIONS
CL-310-42-RFP	310mm	300mm 310mm 320mm 400mm	Quintus 1 with MC40, MC40Z, MC60, MC60Z, SCS80 Vise or Custom
			Quintus 2 with MC100, MC100Z, SCS120 Vise or Custom
			Riser Block with MC60, MC60Z, SCS80, MC100, MC100Z, SCS120 Vise or Custom
			Modular Fixture or Custom

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SUBPLATES

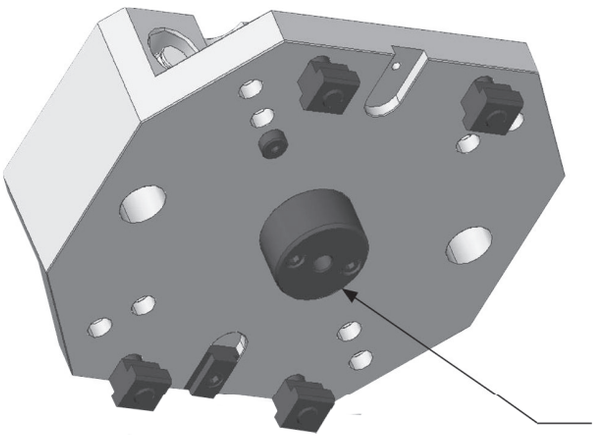


630 x 500mm Quintus 1, 2, 3, Modular Fixturing® and Carr Lock

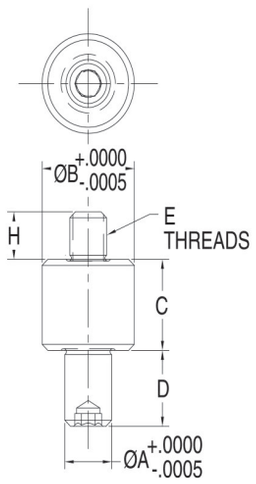


PART NO.	PLATE SIZE	FITS TABLE DIA	WORKHOLDER OPTIONS
CL-630500-44-CLRS	630 x 500mm	600mm 630 x 500mm	Quintus 1 with MC40, MC40Z, MC60, MC60Z, SCS80 Vise or Custom
			Quintus 2 with MC100, MC100Z, SCS120 Vise or Custom
			Quintus 3 with MC125Z Vise or Custom
			Riser Block with MC60, MC60Z, SCS80, MC100, MC100Z, SCS120 Vise or Custom
			Modular Fixture or Custom
			Carr Lock Fixture Plate

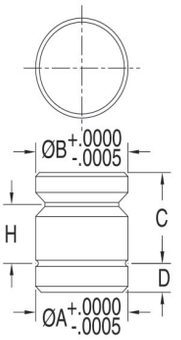
CENTER LOCATING KEYS



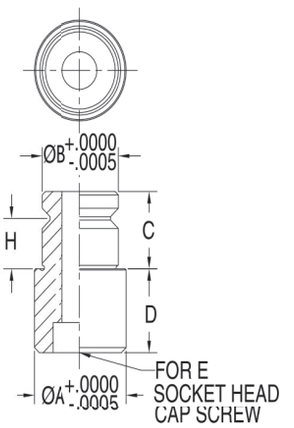
Center Locating Keys are used to precisely center a fixture on a rotary table. They can be used for mounting Quintus Quick-Change Risers, Riser Blocks, and Round Tooling Plates, which all have a standard 25mm center hole. All Center Locating Keys have a 25mm upper diameter and are available with a wide range of bottom diameters to fit the rotary table's center hole. 1144 steel, heat treated Rc 50-55, black oxide finish.



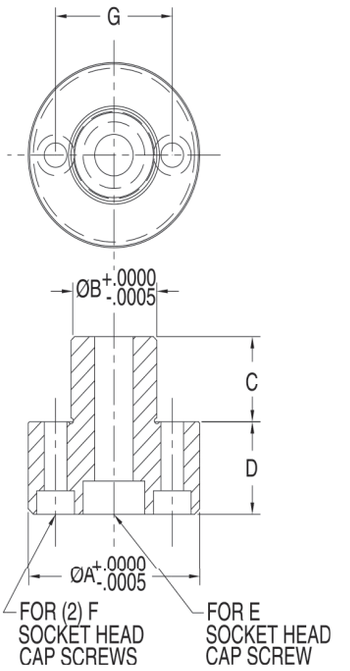
Type 1



Type 2



Type 3



Type 4

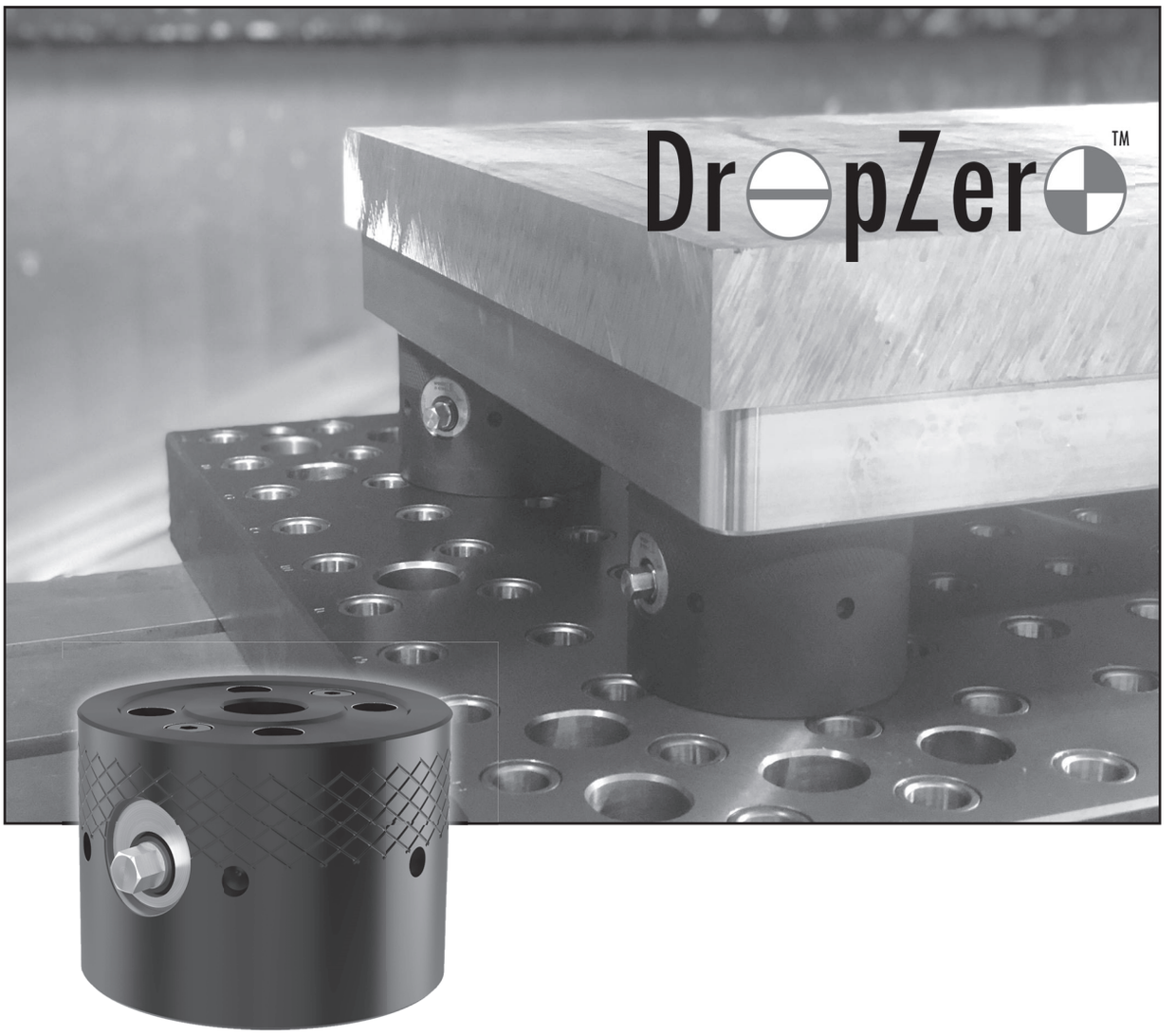
CENTER LOCATING KEYS

PART NO.	TYPE	A DIA	B DIA	C	D	E	F	G	H
CLM-25-CLK-.5000	Type 1	.5000	9.843 (25mm)	.90	.75	M10	—	—	.47
CLM-25-CLK-25	Type 2	.9843 (25mm)		.90	.29	—	—	—	.58
CLM-25-CLK-30	Type 3	1.1811 (30mm)		.91	.98	M10	—	—	.59
CLM-25-CLK-32		1.2598 (32mm)							
CLM-25-CLK-1.5000		1.5000							
CLM-25-CLK-50	Type 4	1.9685 (50mm)		.91	.98	M10	M6	1.339	—
CLM-25-CLK-70		2.000							
CLM-25-CLK-60		2.3622 (60mm)							
CLM-25-CLK-65		2.5591 (65mm)							
CLM-25-CLK-70		2.7559 (70mm)							
CLM-25-CLK-80		3.1496 (80mm)							
CLM-25-CLK-3.2500		3.2500							

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DROPZERO™ MODULAR ZERO-POINT SYSTEM

Completely Machine Your Workpiece in One Setup



NEW Roemheld DropZero Modular Zero-Point System allows you to completely machine a workpiece in one setup. With a few turns of a wrench, DropZero locates, supports, and securely clamps the workpiece, providing full machining access to 5 sides.

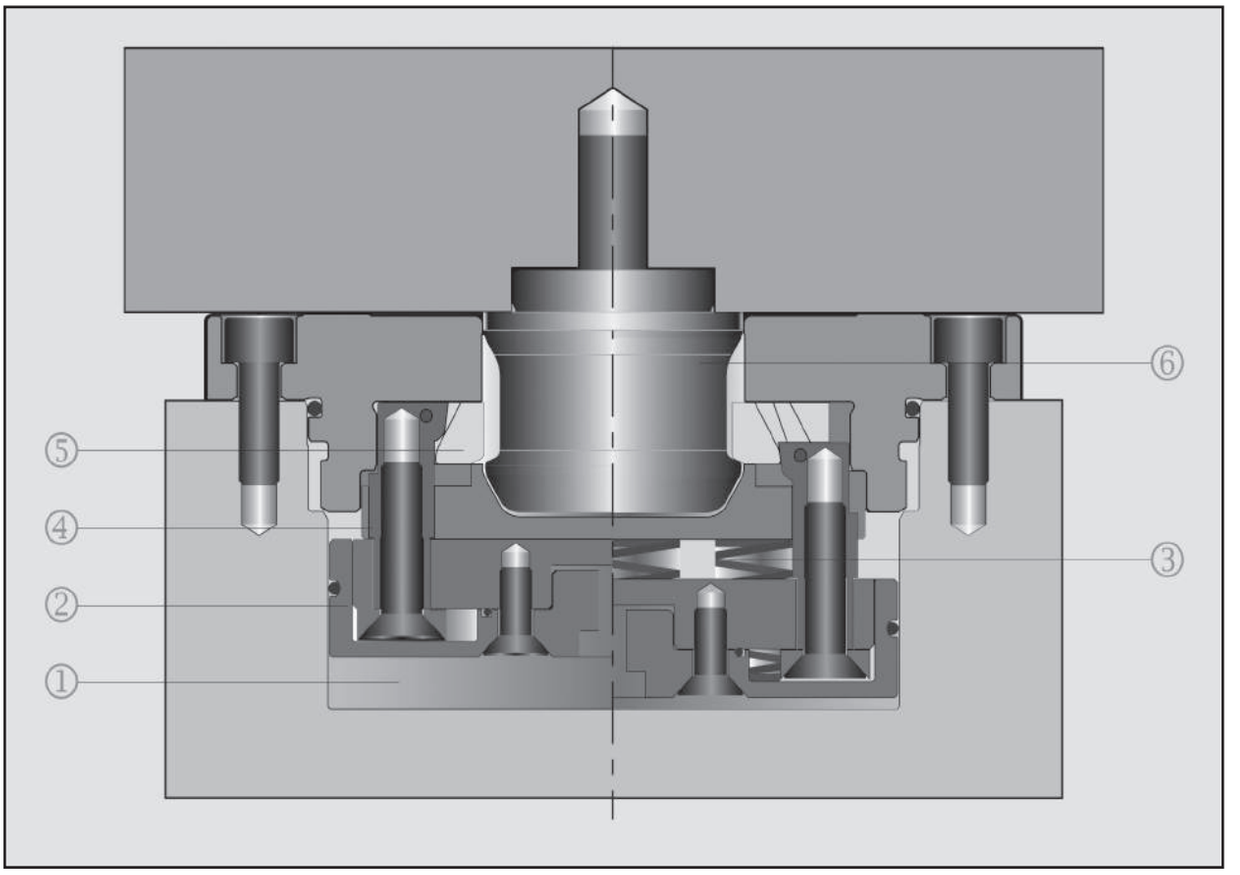
Pull studs (round, diamond, and floating) are mounted directly to a part, and clamping modules can be mounted to anywhere on the fixturing plate, elevating the workpiece for machine-spindle clearance. Clamp modules are stackable for added clearance, and can fit on all of Carr Lane Mfg. Co.'s 1/2" and 5/8" modular tooling plates and blocks. They can also be used with non-modular tooling.

See Pages 672-675

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STARK ZERO-POINT MOUNTING SYSTEM

PRINCIPLES OF OPERATION



9

Releasing pneumatically:

- Pneumatic pressure (1) is applied to the piston (2) and the piston moves upward. The spiral springs (3) are pressed together.
- The clamping fingers (4) move upward through the piston (2) and pull the segments (5) to the outside.
- The retractable nipple (6) is released.

Clamping mechanically:

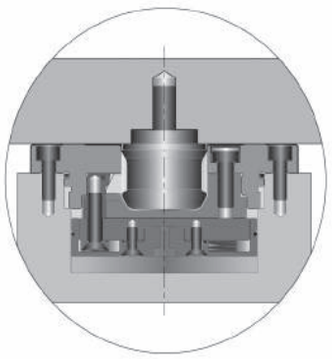
- The pneumatic pressure is relieved. The pneumatic pressure drops to zero.
- The spring pre-load is applied via the piston (2) and push the segments (5) toward the inside.
- The retractable nipple (6) is pulled down by the clamping face on the segments (5) and clamped against the bearing surface.

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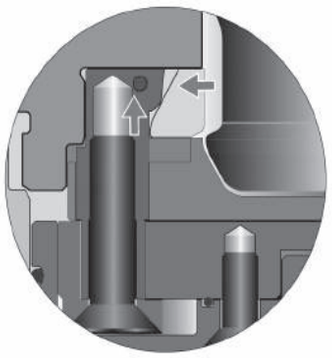
STARK ZERO-POINT MOUNTING SYSTEM

FEATURES AND ADVANTAGES



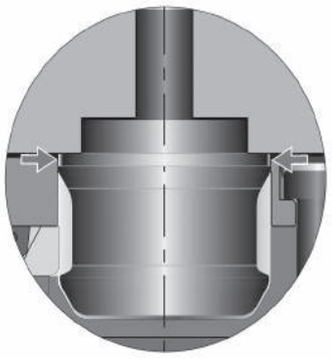
Design

- Compact design (Flush Mount, screw-fit or module)
- High retention force, enormous power density
- Maintenance-free, designed for large number of load changes (> 2 million in continuous test)
- Made of high quality tool steel and chromium steel
- Actuation with clean air, from 75psi to release
- Can be operated without additional service unit
- Environmentally friendly and clean operation (no oil)
- Particularly suitable for oil-free environment, e.g. in the foodstuffs, aerospace industry or medical sector.



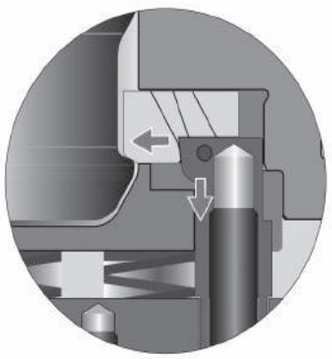
Positive action operation

- The segments are actuated mechanically
- Powerful and secure clamping is ensured at all times
- In an endurance test over 3 million clamping cycles tested full functionality even under extreme conditions.
- Functions reliably in an y installation position
- Very short clamping and release time – o.2sec



Cylindrical fit

- Due to the cylindrical fit, high lateral forces can be absorbed by the fast closing clamp during the machining
- Ideal pre-centring for Römheld coupling elements without coupling travel, data sheet F9.461



Segments

- Due to the optimal all-round positive clamping action of the clamping segments, the retractable nipple is retained stably and securely in the fast closing clamp.

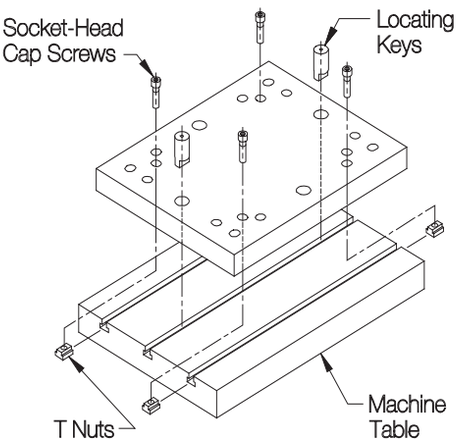
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RECTANGULAR TOOLING PLATES

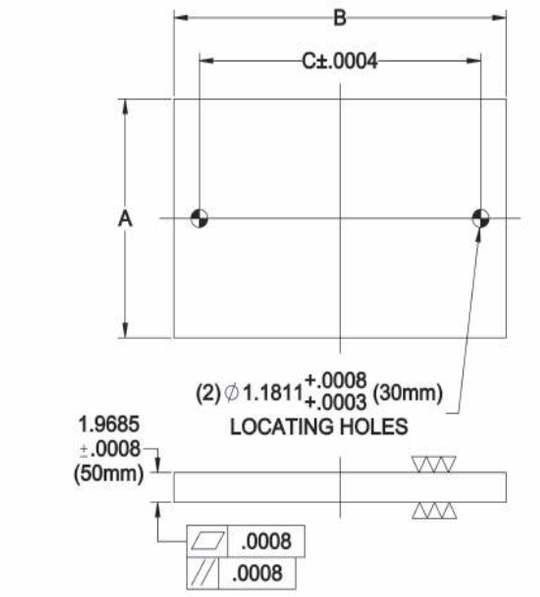
GRAY CAST IRON, ASTM CLASS 45





T-Slotted Table

Precision blank tooling plates that are ready to mount on virtually any vertical machining center, reducing tooling cost and leadtime considerably. Finish machined to tight tolerances. Precision Locating-Key holes allow accurate mounting directly on a machine table. Available in two standard fixture sizes. **INFO+**: See page 257 for Locating Keys and page 320 for T Nuts, to fit specific table-slot sizes.

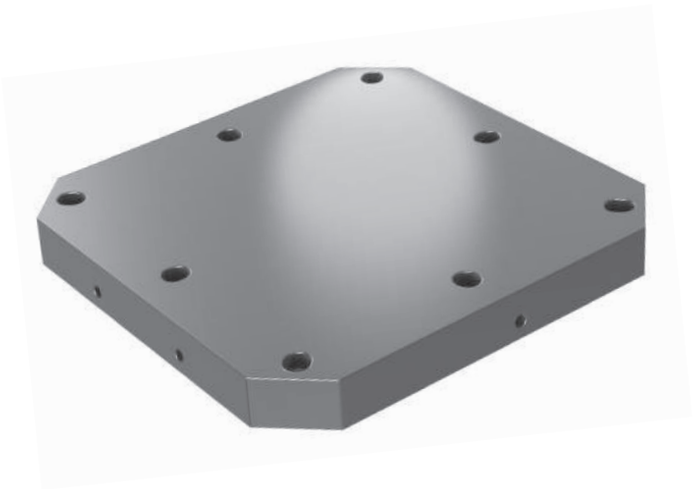


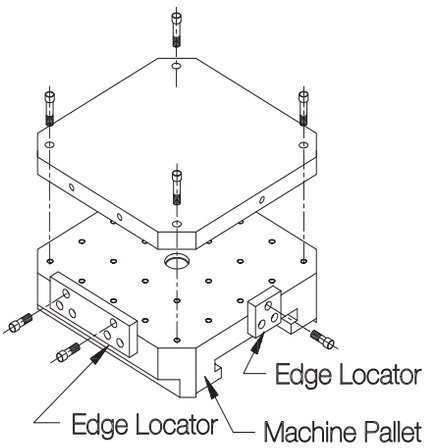
PART NO.	A		B		C	WEIGHT (lbs)
	NOMINAL	ACTUAL	NOMINAL	ACTUAL		
CL-1624-RTPB	16	15.75	24	23.62	20	188
CL-2024-RTPB	20	19.69	24	23.62	20	235

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SQUARE PALLET TOOLING PLATES

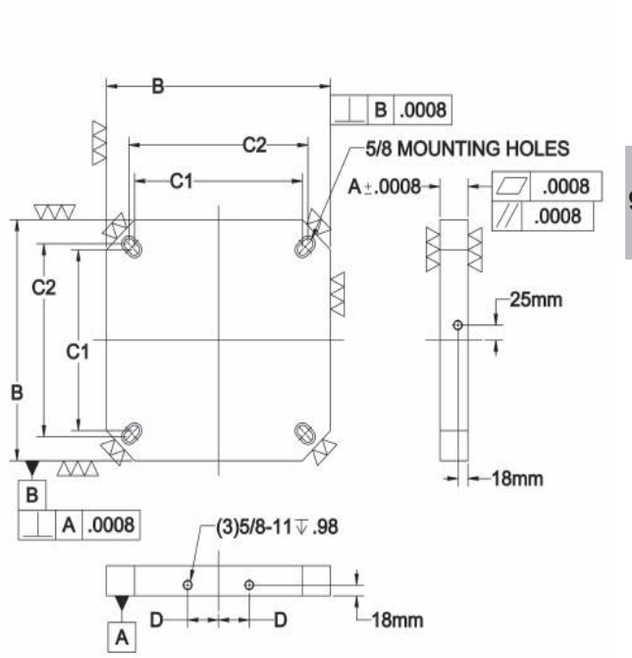
GRAY CAST IRON, ASTM CLASS 45





JIS Mounting

Precision blank tooling plates that are ready to mount on standard horizontal-machining-center pallets, reducing tooling cost and leadtime considerably. Finish machined to tight tolerances. JIS mounting from two reference edges provides accurate location.



PART NO.	B PALLET SIZE NOMINAL	B PALLET SIZE ACTUAL	A HEIGHT NOMINAL	A HEIGHT ACTUAL	C1	C2	D	NO. OF MOUNTING HOLES	WEIGHT (lbs)
CL-400-PTPB	400mm	15.7480	50mm	1.9685	320mm	11.81	55mm	4	126
CL-500-PTPB	500mm	19.6850	50mm	1.9685	400mm	16	75mm	8	194

TWO-SIDED TOOLING BLOCKS

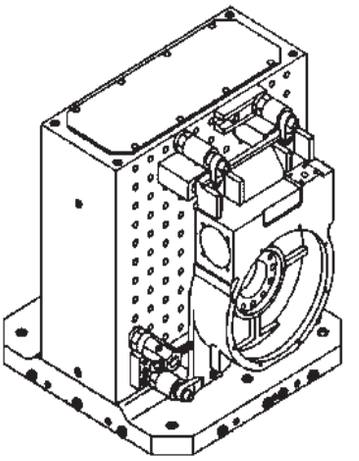
GRAY CAST IRON, ASTM CLASS 45



Extra Tall

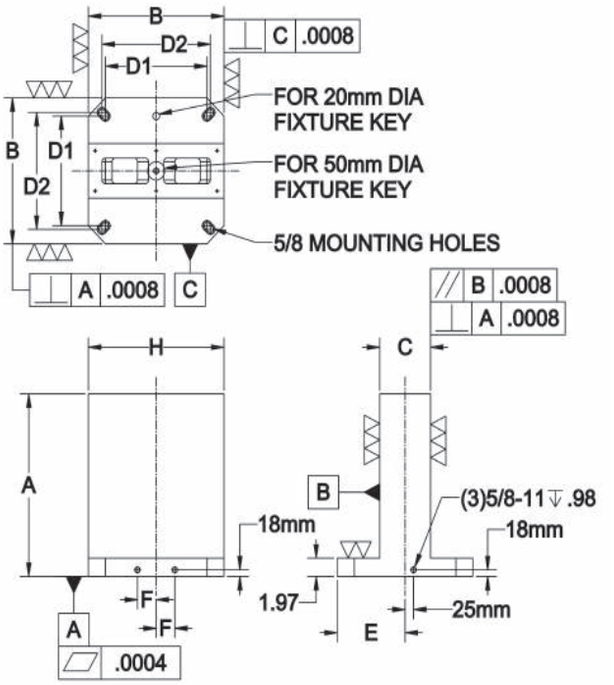


Regular Height



These tooling blocks have two identical wide faces to allow fixturing large parts.

Precision blank tooling blocks for horizontal-machining-center pallets. One-piece cast iron construction provides superior accuracy, dimensional stability, and vibration dampening. Both tooling faces are finish machined to tight tolerances and qualified to the base. Dual mounting capability allows both JIS mounting (locating from two reference edges) and DIN mounting (locating from center and radial holes) with excellent accuracy. Universal mounting holes fit almost any inch or metric slot spacing. Available in 400 and 500mm pallet sizes, each in a choice of heights.



PART NO.	B PALLET SIZE NOMINAL	B PALLET SIZE ACTUAL	A HEIGHT NOMINAL	A HEIGHT ACTUAL	C NOMINAL	C ACTUAL	D1	D2	E	F	G	H	NO. OF MOUNTING HOLES	WEIGHT (lbs)
CL-400400500-TTBB	400mm	15.7480	500mm	19.69	150mm	5.9055	320mm	11.81	7.8740	55mm	1.97	15.75	4	375
CL-400400650-TTBB			650mm	25.59										520
CL-500500600-TTBB	500mm	19.6850	600mm	23.62	200mm	7.8740	400mm	16	9.8425	75mm	1.97	19.69	6	584
CL-500500750-TTBB			750mm	29.53										820

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FOUR-SIDED TOOLING BLOCKS

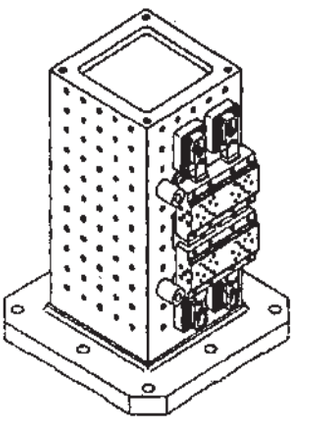
GRAY CAST IRON, ASTM CLASS 45



Extra Tall

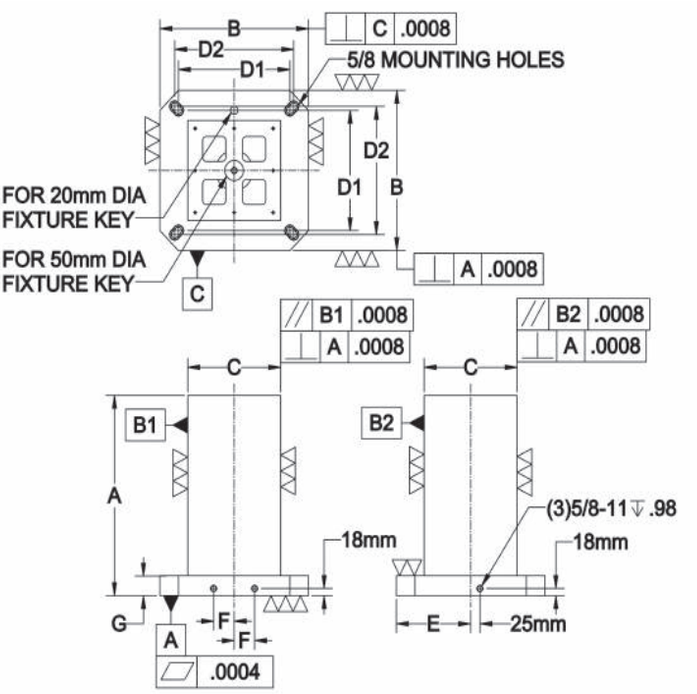


Regular Height



With four identical faces, these tooling blocks are ideal for loading a large number of medium-size parts on a pallet.

Precision blank tooling blocks for horizontal-machining-center pallets. One-piece cast iron construction provides superior accuracy, dimensional stability, and vibration dampening. All four faces are finish machined to tight tolerances and qualified to the base. Dual mounting capability allows both JIS mounting (locating from two reference edges) and DIN mounting (locating from center and radial holes) with excellent accuracy. Universal mounting holes fit almost any inch or metric slot spacing. Available in 400 and 500mm pallet sizes, each in a choice of heights.



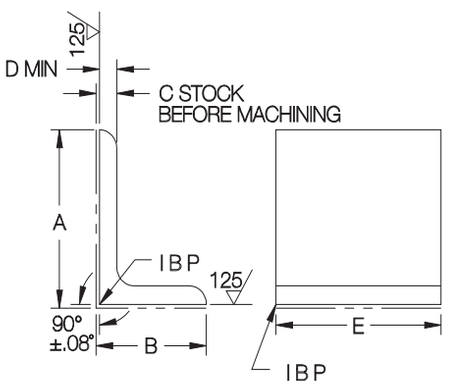
PART NO.	B PALLET SIZE		A HEIGHT		C		D1	D2	E	F	G	NO. OF MOUNTING HOLES	WEIGHT (lbs)
	NOMINAL	ACTUAL	NOMINAL	ACTUAL	NOMINAL	ACTUAL							
CL-400250500-FTBB	400mm	15.7480	500mm	19.69	250mm	9.8425	320mm	11.81	7.8740	55mm	1.97	4	337
CL-400250650-FTBB			650mm	25.59									481
CL-500300600-FTBB	500mm	19.6850	600mm	23.62	300mm	11.8110	400mm	16	9.8425	75mm	1.97	8	551
CL-500300750-FTBB			750mm	29.53									739

ANGLE BRACKETS

STEEL: ASTM A36, BLACK OXIDE FINISH
ALUMINUM: 6061-T6



Precision setup angles machined flat and perpendicular to close tolerances. Available in steel or high-strength aluminum.

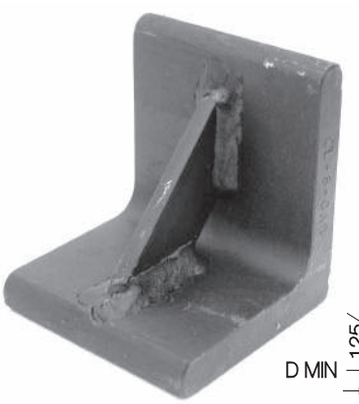


PART NO. STEEL	PART NO. ALUMINUM	A	B	C	D	E
CL-1-AB	—	2-1/2	2	1/4	7/32	1-1/2
CL-2-AB	CL-2-AB-A	2	2	3/8	5/16	2
CL-21-AB	—					3
CL-3-AB	CL-3-AB-A					4
CL-4-AB	—					6
CL-3A-AB	CL-3A-AB-A	3	2			2
CL-3B-AB	—					3
CL-22-AB	—					4
CL-5-AB	—	3	3			2
CL-6-AB	—					3
CL-7-AB	—					4
CL-23-AB	—					6
CL-8-AB	—	4	4			4
CL-9-AB	—	3	3	1/2	7/16	2
CL-10-AB	CL-10-AB-A					3
CL-11-AB	—					4
CL-7A-AB	—	4	3			2
CL-7B-AB	—					3
CL-12-AB	CL-12-AB-A	4	4			3
CL-13-AB	CL-13-AB-A					4
CL-14-AB	—					5
CL-24-AB	—					6
CL-15-AB	CL-15-AB-A	6	4			4
CL-16-AB	—					5
CL-17-AB	CL-17-AB-A					6
CL-18-AB	—	6	6			4
CL-19-AB	—					5
CL-20-AB	CL-20-AB-A					6

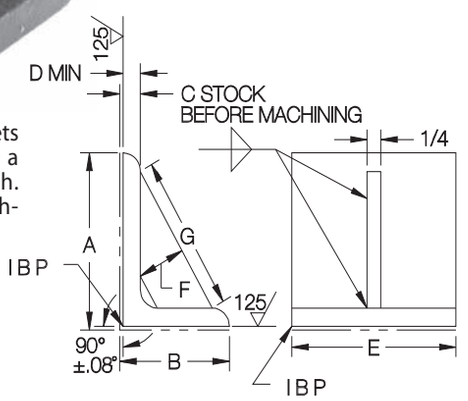
GUSSETED ANGLE BRACKETS

9

STEEL: ASTM A36, BLACK OXIDE FINISH
ALUMINUM: 6061-T6



Similar to the Angle Brackets shown above, except with a gusset for added strength. Available in steel or high-strength aluminum.

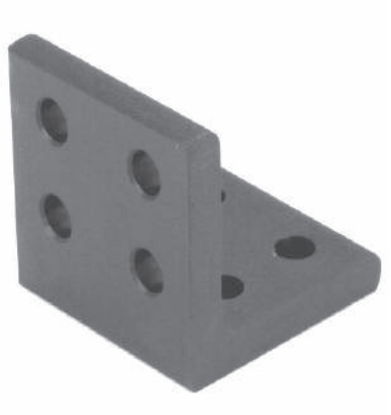


PART NO. STEEL	PART NO. ALUMINUM	A	B	C	D	E	F	G
CL-3A-GAB	—	3	2	3/8	5/16	2	7/8	2-3/4
CL-3B-GAB	—					3		
CL-1-GAB	—	3	3			2	1	3-7/16
CL-2-GAB	—					3		
CL-3-GAB	—					4		
CL-4-GAB	—	4	4			3	1	4-13/16
CL-5-GAB	—					4		
CL-6-GAB	—					5		
CL-7-GAB	—	3	3	1/2	7/16	2	1	3-1/4
CL-8-GAB	CL-8-GAB-A					3		
CL-9-GAB	—					4		
CL-7A-GAB	—	4	3			2	1-1/4	3-7/8
CL-7B-GAB	—					3		
CL-10-GAB	CL-10-GAB-A	4	4			3	1	4-5/8
CL-11-GAB	CL-11-GAB-A					4		
CL-12-GAB	—					5		
CL-13-GAB	CL-13-GAB-A	6	4			4	1-1/2	6-1/4
CL-14-GAB	—					5		
CL-15-GAB	CL-15-GAB-A					6		
CL-16-GAB	—	6	6			4	1-1/2	7-7/16
CL-17-GAB	—				—	5		
CL-18-GAB	CL-18-GAB-A				—	6		

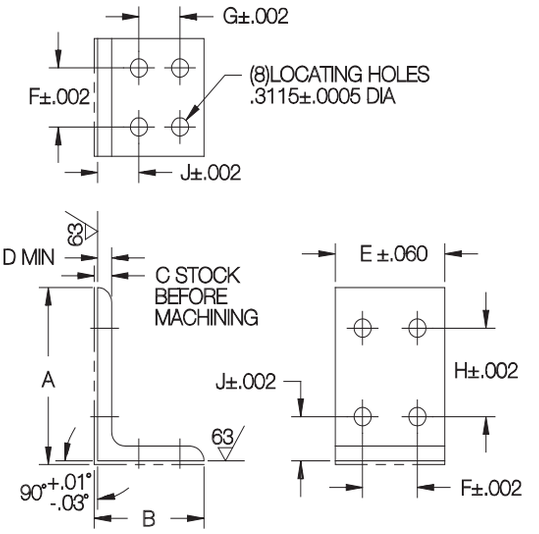
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ANGLE BRACKETS WITH LOCATING HOLES

ASTM A36 STEEL, BLACK OXIDE FINISH



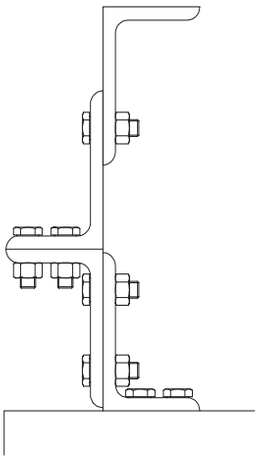
Angle Bracket



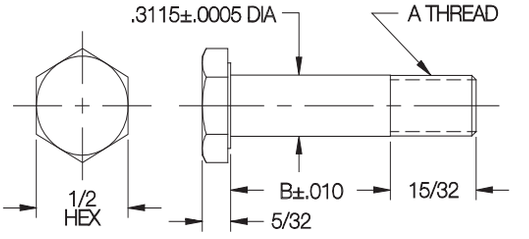
Extremely accurate angle brackets with precision locating holes. These angles are ideal for bolting together like an erector set to create large-scale tooling. The 90° angle and (8) locating holes are machined to close tolerances to maintain good accuracy in built-up tooling. Use with the precision locating bolts shown below.

ANGLE BRACKETS

PART NO. STEEL	A	B	C	D	E	F	G	H	J
CL-1531-ABK	2	2	3/8	1/4	2	1.000	.750	.750	.750
CL-1532-ABK	3	2						1.500	
CL-1535-ABK	2	2			4	3.000		.750	
CL-1539-ABK	3	3	1/2	3/8	3	2.000	1.250	1.250	1.125
CL-1533-ABK	4	4					2.000	2.000	1.000
CL-15310-ABK	4	4			4	3.000	2.000	2.000	1.125
CL-1534-ABK	6	4					1.500	3.500	1.500
CL-1536-ABK	6	6					3.500		
CL-1538-ABK	6	4	5/8	1/2	6	5.000	1.500	3.500	1.500
CL-1537-ABK	6	6					3.500		



These high-precision angles can be bolted together to build economical large-scale tooling. Ideal for assembly and welding fixtures.





Angle Bracket Locating Bolt



Hex Nut

Precision bolts for fastening angle brackets to each other, and to other tooling. Ground locating diameter provides a slight press fit when angles are bolted together. Steel.

ANGLE BRACKET LOCATING BOLTS AND HEX NUTS

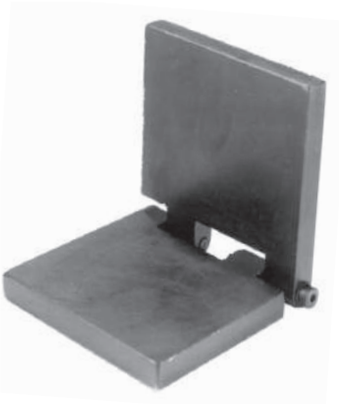
PART NO. LOCATING BOLT	PART NO. HEX NUT	A	B
CL-506-ABLB	CL-5-FHN	5/16-24	.375
CL-508-ABLB			.500
CL-510-ABLB			.625
CL-512-ABLB			.750
CL-516-ABLB			1.000
CL-520-ABLB			1.250
CL-524-ABLB			1.500

9

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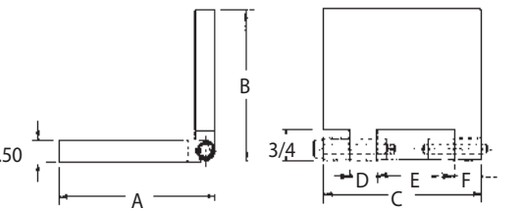
ADJUSTABLE ANGLES

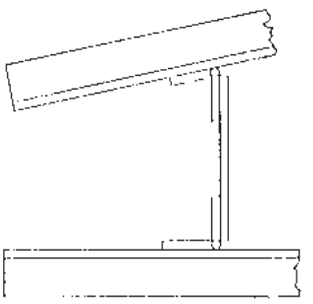
1018 STEEL, BLACK OXIDE FINISH



Plain

Precision angle with accurately machined sides and a close-tolerance hinge. Available either plain, with tabs for welding on a gusset, or with a removable pivot pin. **Patent no. 3,039,570.**



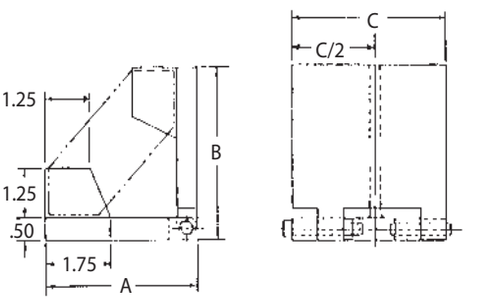


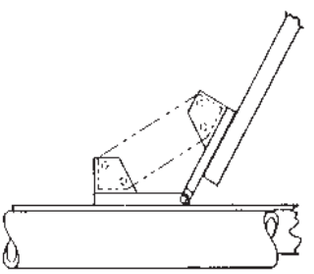
PLAIN

PART NO.	A	B	C	D	E	F
CL-AA-4P	3	3	3	5/8	1-1/8	5/8
CL-AA-3P			4	3/4	1-3/4	3/4
CL-AA-2P	4	3	4	3/4	1-3/4	3/4
CL-AA-1P		4				



Gusseted





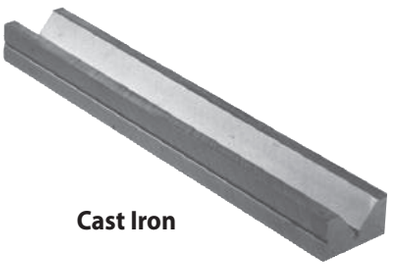
GUSSETED

PART NO.	A	B	C	D	E	F
CL-AA-4G	3	3	3	5/8	1-1/8	5/8
CL-AA-1G	4	4	4	3/4	1-3/4	3/4

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CAST SECTIONS

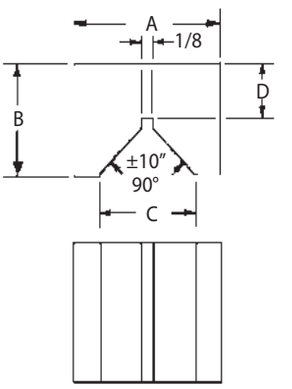
CAST IRON: ASTM CLASS 40, TENSILE STRENGTH 40,000 TO 45,000 PSI
ALUMINUM: 352, TENSILE STRENGTH 30,000 PSI

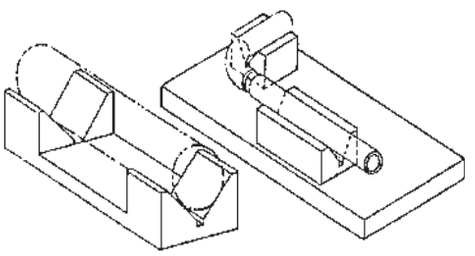


Cast Iron

Fast, economical way to make special fixture components. All surfaces are machined square and parallel within ±.005 inches per foot, except ends. Internal faces on square and rectangular sections are unfinished. All dimensions ±1/32 (except length, which is -1/16 to +1/8).

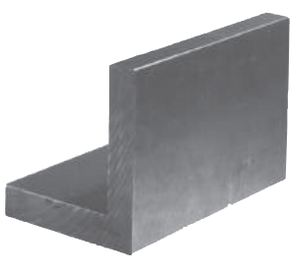
Cast sections are available in full lengths (usually 25″) or 6″ lengths. Custom lengths are available as specials.





V SECTIONS — CAST IRON

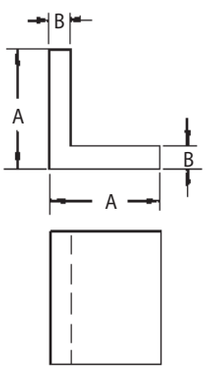
PART NO. FULL LENGTH	PART NO. 6″ LENGTH	A	B	C	D	FULL LENGTH
CL-1-CSV-18.00	CL-1-CSV-6.00	2	1	1-1/4	5/16	18
CL-2-CSV-18.00	CL-2-CSV-6.00	3	1-3/4	2	11/16	
CL-3-CSV-18.00	CL-3-CSV-6.00	4	2-1/2	3	7/8	



Cast Iron and Aluminum

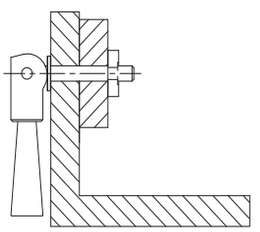
L SECTIONS — CAST IRON

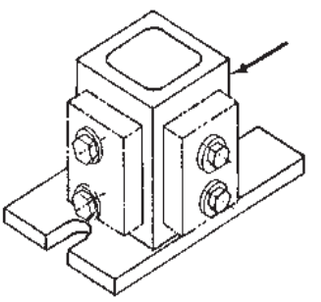
PART NO. FULL LENGTH	PART NO. 6″ LENGTH	A	B	FULL LENGTH
CL-1-CSA-25.00	CL-1-CSA-6.00	3	5/8	25
CL-2-CSA-25.00	CL-2-CSA-6.00	4	3/4	
CL-3-CSA-25.00	CL-3-CSA-6.00	5		
CL-4-CSA-25.00	CL-4-CSA-6.00	6	1	
CL-5-CSA-25.00	CL-5-CSA-6.00	8	1-1/4	

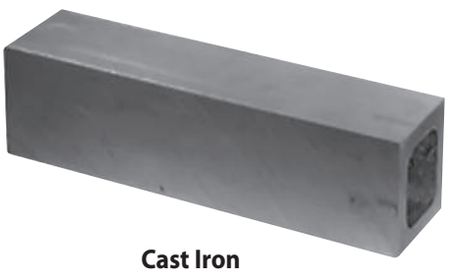


L SECTIONS — ALUMINUM

CL-1-CAA-25.00	CL-1-CAA-6.00	3	5/8	25
CL-2-CAA-25.00	CL-2-CAA-6.00	4	3/4	
CL-3-CAA-25.00	CL-3-CAA-6.00	5		



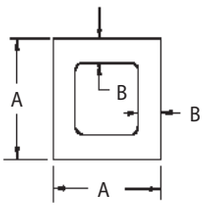




Cast Iron

SQUARE SECTIONS — CAST IRON

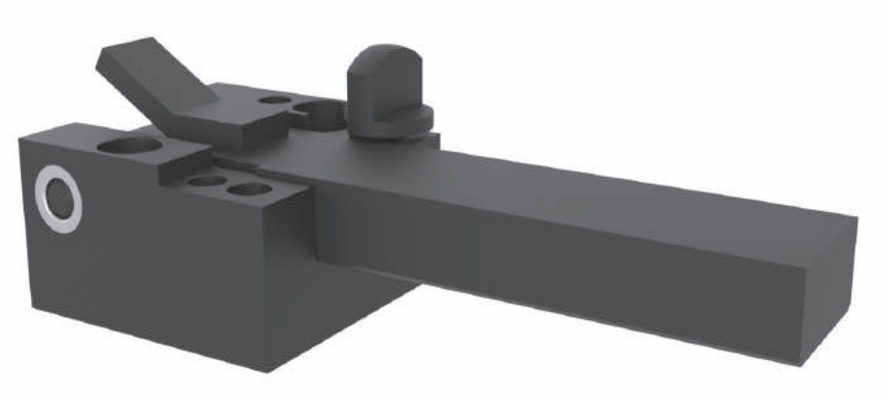
PART NO. FULL LENGTH	PART NO. 6″ LENGTH	A	B	FULL LENGTH
CL-1-CSS-25.00	CL-1-CSS-6.00	3	1/2	25
CL-2-CSS-25.00	CL-2-CSS-6.00	4	5/8	
CL-3-CSS-25.00	CL-3-CSS-6.00	6	3/4	
CL-4-CSS-25.00	CL-4-CSS-6.00	8	1	



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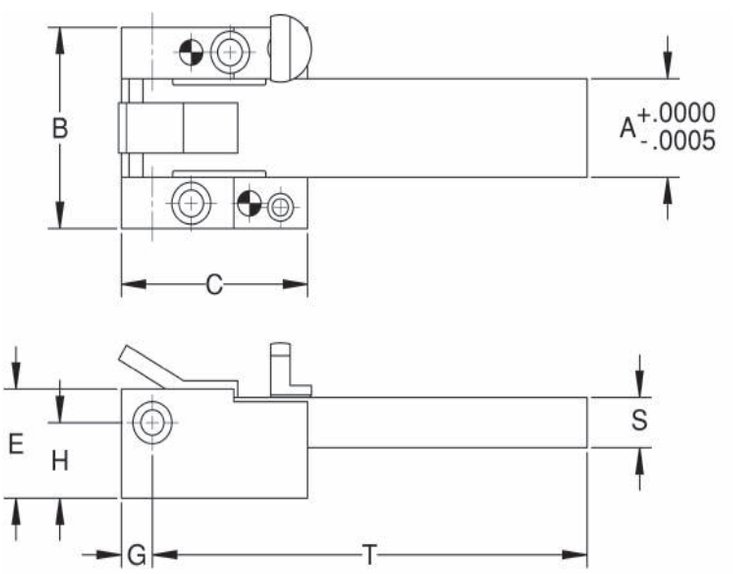
HINGED BUSHING PLATES

BASE: A36 STEEL, CARBURIZE-HARDENED, BLACK OXIDE FINISH
ARM: A36 STEEL, WEAR SURFACES HARD WELDED & GROUND, BLACK OXIDE FINISH
PIVOT PIN: 4130 STEEL, HEAT TREATED, BLACK OXIDE FINISH



Complete Assembly

Hinged Bushing Plates are precise, heavy-duty bushing-plate assemblies for large-scale production jigs. The swing-away arm is precision ground but left unhardened for installing drill bushings (wear surfaces are hard welded and ground). The arm swings open a full 120° for loading clearance. The mounting base is hardened and precisely ground to provide accurate location. The base includes liner bushings as bearings for the hardened pivot pin, and a half-turn latch screw. Available in three sizes.



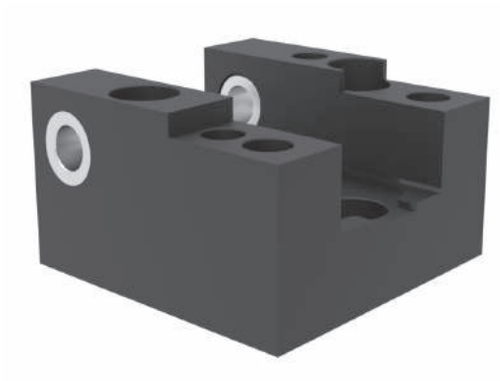
COMPLETE ASSEMBLY

PART NO.	A	B	C	E	G	H	S	T
CL-1-HBP	1.4675	3	3	1-5/8	.500	1.125	3/4	6.995
CL-2-HBP	1.9675	3-1/2	4	1-3/4	.500	1.250	1	9.500
CL-3-HBP	2.4675	4	5	2	.625	1.375	1-1/4	11.875

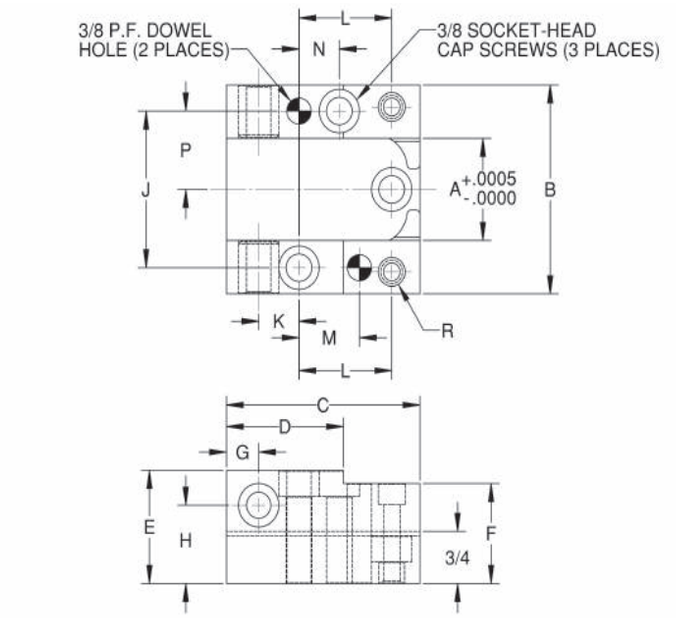
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HINGED BUSHING PLATES

BASE: A36 STEEL, CARBURIZE-HARDENED, BLACK OXIDE FINISH
ARM: A36 STEEL, WEAR SURFACES HARD WELDED & GROUND, BLACK OXIDE FINISH
PIVOT PIN: 4130 STEEL, HEAT TREATED, BLACK OXIDE FINISH



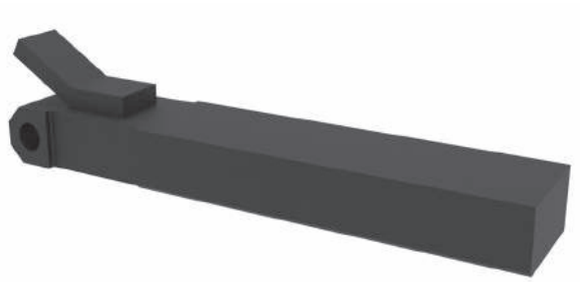
Base Only



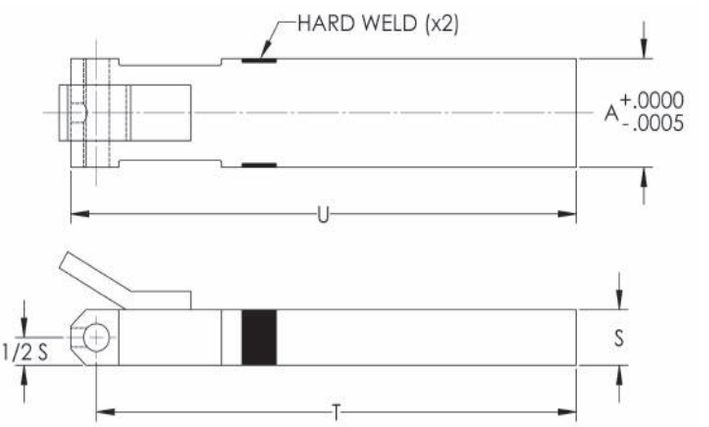
The base can be ordered separately if customer-made arms will be used. The base kit shown here includes all hardware including the liner bushings, pivot pin, setscrew, and half-turn latch screw.

BASE KIT ONLY

PART NO.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
CL-1-HBP-BK	1.468	3	3	1.81	1-5/8	1.43	.500	1.125	2.25	.625	1.438	.938	.625	1.125	5/16-18
CL-2-HBP-BK	1.968	3-1/2	4	2.50	1-3/4	1.68	.500	1.250	2.75	.750	2.250	1.500	.625	1.375	3/8-16
CL-3-HBP-BK	2.468	4	5	3.25	2	1.87	.625	1.375	3.25	.875	3.000	2.188	.750	1.625	1/2-13



Arm Only



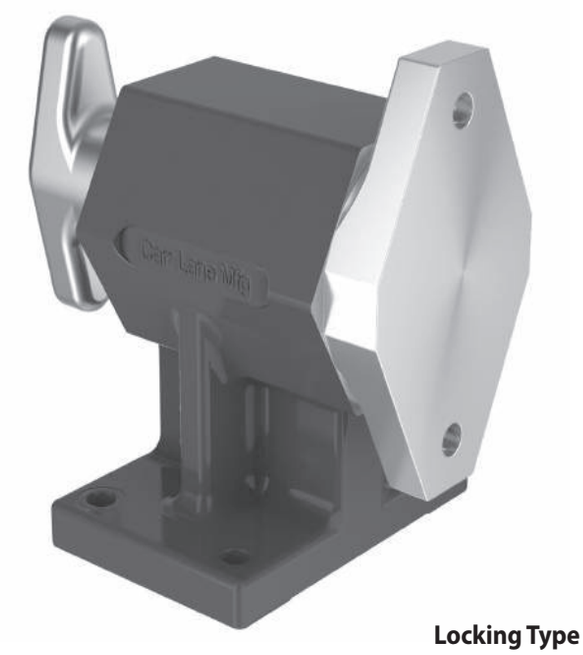
Arms can be ordered separately, to use as replacements or to switch tooling. The pivot pin can be easily removed by loosening the setscrew, allowing quick arm changeover.

ARM ONLY

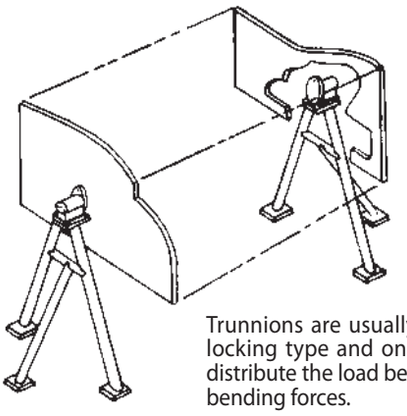
PART NO.	A	S	T	U
CL-1-HBP-A	1.4675	3/4	7.00	7-3/8
CL-2-HBP-A	1.9675	1	9.50	10
CL-3-HBP-A	2.4675	1-1/4	11.88	12-1/2

TRUNNIONS

ARM: TENZALOY ALUMINUM ALLOY
BODY: ALUMINUM WITH BRONZE BEARINGS, POWDER-COATED EXTERIOR

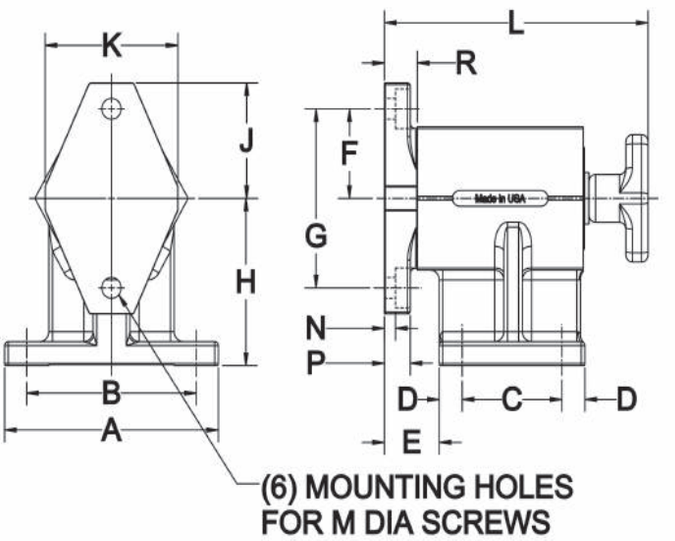


Locking Type



Trunnions are usually used in pairs, one locking type and one revolving type, to distribute the load between them without bending forces.

Trunnions are rugged, precision bearing mounts for revolving fixtures. Ideal for assembly and welding fixtures, and any other applications where the part must be accessible from all sides. Usually used in pairs, one locking Trunnion and one revolving Trunnion, to distribute the load between them without bending forces. The locking version, shown here, has a friction-cone mechanism that stops the rotor at any angle by tightening the knob handle (loosen knob again to unlock). The revolving version has a free-rotating bearing at both ends of the rotor shaft, with no locking mechanism. Choice of two sizes. **Patent no. 3,129,937.** Made in USA.



LOCKING TYPE

PART NO.	LOAD CAPACITY (18" from face)	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
CL-100-TL	1800 lbs	5	4	2-3/8	1/2	1-3/8	2	4	4	2-5/8	3-1/4	7	3/8 or M10	.33	5/8	13/16
CL-200-TL	2500 lbs	7-1/4	5-3/4	3-3/8	3/4	1-7/8	2-13/16	5-5/8	5-1/4	3-3/4	4-1/4	9	5/8 or M16	.38	7/8	1-1/8

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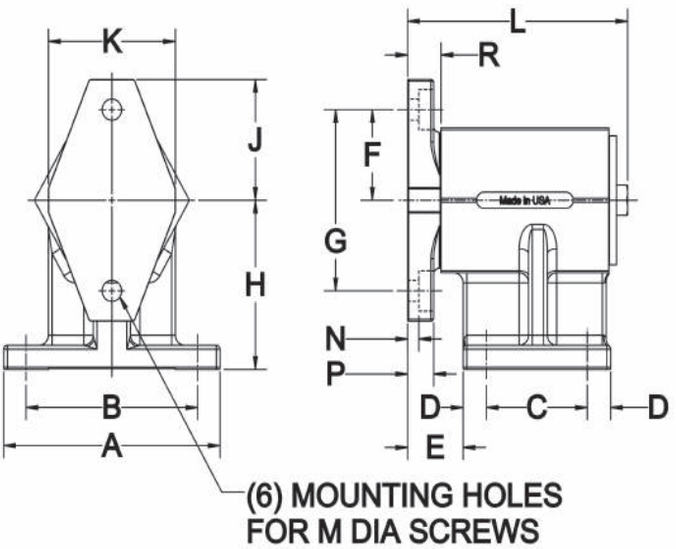
TRUNNIONS

ARM: TENZALOY ALUMINUM ALLOY
BODY: ALUMINUM WITH BRONZE BEARINGS, POWDER-COATED EXTERIOR



Revolving Type

Trunnions are rugged, precision bearing mounts for revolving fixtures. Ideal for assembly and welding fixtures, and any other applications where the part must be accessible from all sides. Usually used in pairs, one locking Trunnion and one revolving Trunnion, to distribute the load between them without bending forces. The locking version has a friction-cone mechanism that stops the rotor at any angle by tightening the knob handle (loosen knob again to unlock). The revolving version, shown here, has a free-rotating bearing at both ends of the rotor shaft, with no locking mechanism. Choice of two sizes. **Patent no. 3,129,937.** Made in USA.



REVOLVING TYPE

PART NO.	LOAD CAPACITY (18" from face)	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
CL-100-TR	1800 lbs	5	4	2-3/8	1/2	1-3/8	2	4	4	2-5/8	3-1/4	5-7/16	3/8 or M10	.33	5/8	13/16
CL-200-TR	2500 lbs	7-1/4	5-3/4	3-3/8	3/4	1-7/8	2-13/16	5-5/8	5-1/4	3-3/4	4-1/4	7-5/8	5/8 or M16	.38	7/8	1-1/8

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TECHNICAL INFORMATION
ADJUSTABLE LOCKING HUBS

TYPES AVAILABLE



Heavy-Duty—Stainless Steel
Two Round Ends
INFO+: Page 411



Heavy-Duty—Stainless Steel
Two Mounting Flanges
INFO+: Page 412

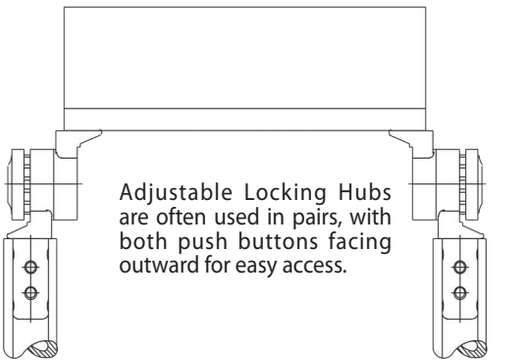


Heavy-Duty—Stainless Steel
Mounting Flange & Round End
INFO+: Page 413



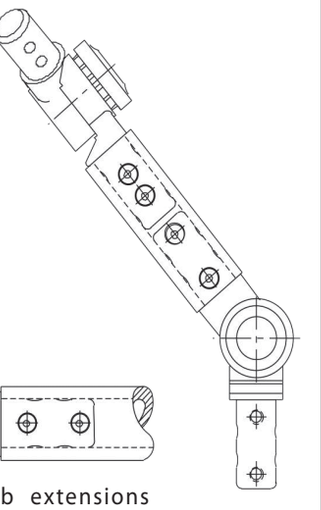
Medium-Duty—Thermoplastic
Two Square Ends
INFO+: Page 414

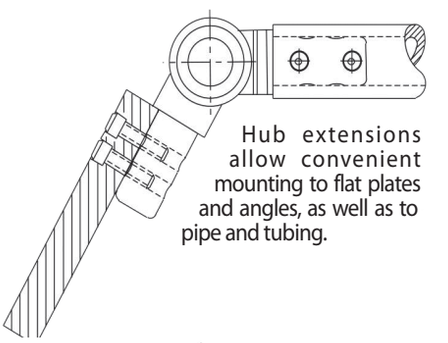
APPLICATION EXAMPLES



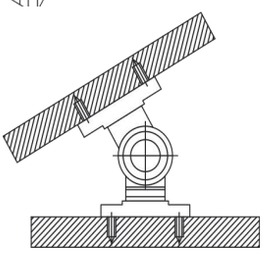
Adjustable Locking Hubs are often used in pairs, with both push buttons facing outward for easy access.

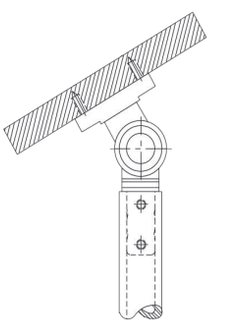
Connect two Adjustable Locking Hubs at 90° (with pipe or tubing) for full 5-Axis positioning.



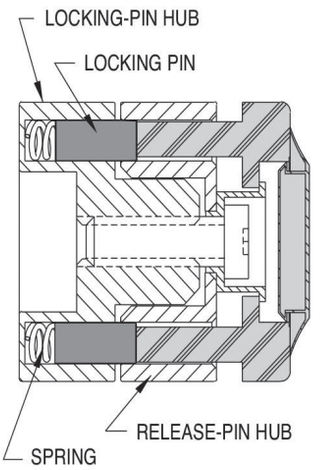


Hub extensions allow convenient mounting to flat plates and angles, as well as to pipe and tubing.



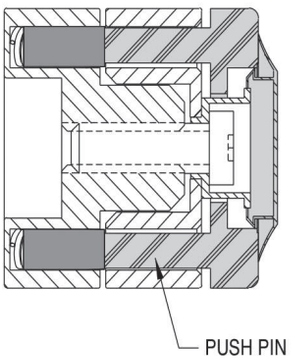


Mounting flanges are ideal for attaching Adjustable Locking Hubs to flat surfaces. Heavy-duty hubs are available with either two mounting flanges, or one mounting flange and one round end.



Locked

In locked position, the locking-pin hub and release-pin hub are positively engaged by high-strength locking pins.



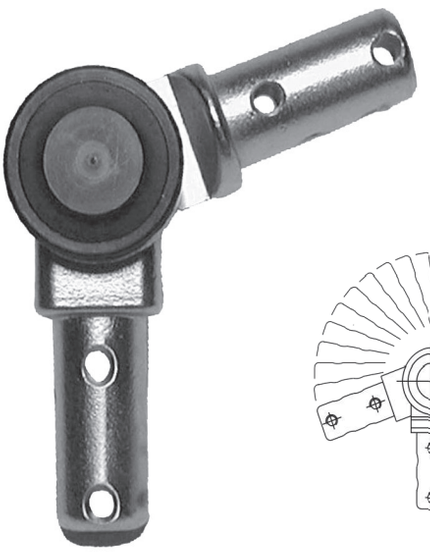
Unlocked

When the release button is pressed, against spring force, push pins force the locking pins to disengage. The hub is now free to rotate. After reaching the desired angle, releasing the button again allows the locking pins to extend back into locked position.

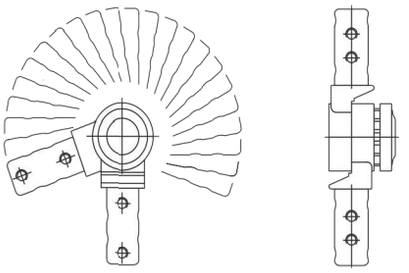
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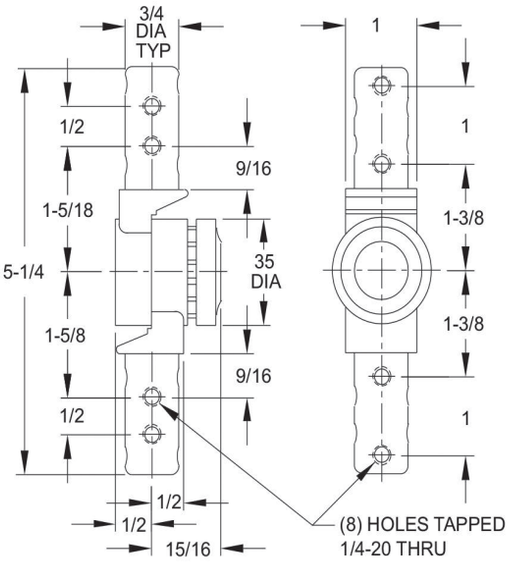
ADJUSTABLE LOCKING HUBS

BODY: 300-SERIES STAINLESS STEEL, ELECTRO POLISHED. PINS: 416 STAINLESS STEEL, HEAT TREATED
RELEASE BUTTON: BLACK THERMOPLASTIC.
US PATENT NO. 5,586, 363 AND 5,689,999. OTHER PATENTS PENDING.



**Heavy Duty—
Stainless Steel
Two Round Ends
Inline
(220° Adjustment)**

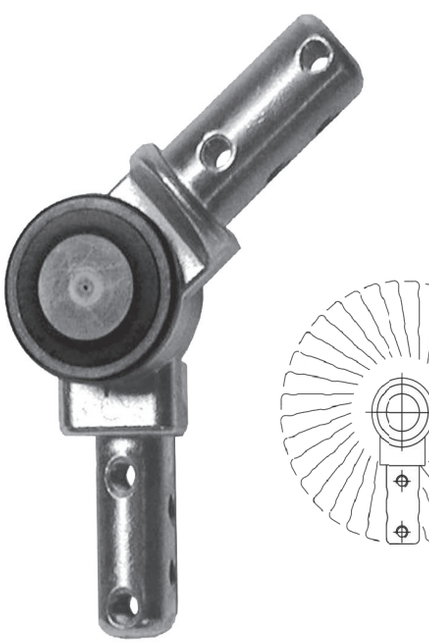




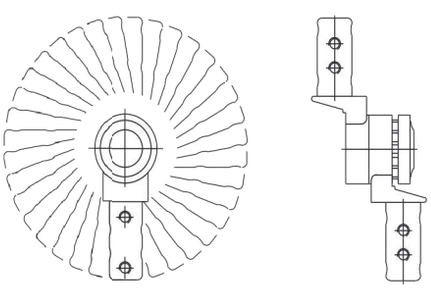
Adjustable Locking Hubs are rotary bearings that provide positive locking at any 10° increment. Once locked, the hub becomes an absolutely rigid joint, able to withstand 80 ft.-lbs. of torque (5:1 safety factor). Round Hub extensions fit 3/4" ID pipe or tubing. The tapped mounting holes can also be used to attach a plate or angle. Applications include adjustable fixtures, rotating fixtures, welding fixtures, trunnion mounting, adjustable and/or foldable handles, adjustable part trays and shelves, adjustable and/or flip-up work surfaces, positive positioning of spotlights or nozzles, and collapsable structures. Also available in alloy steel with a black finish (CL-100-ALH).

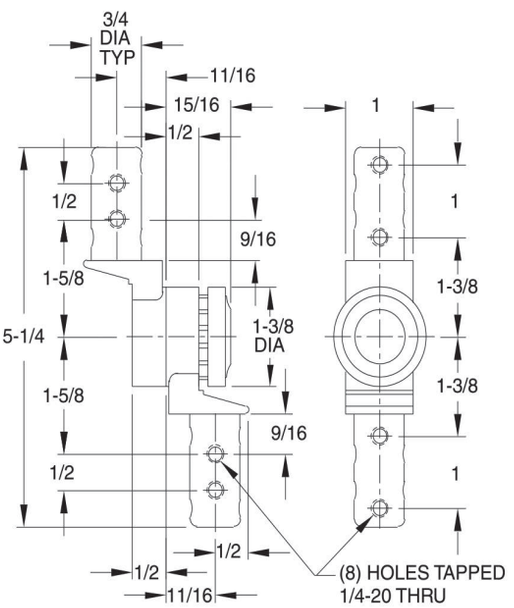
INLINE (220° ADJUSTMENT)

PART NO.	TOTAL ADJUSTMENT RANGE	ADJUSTMENT INCREMENTS	ALLOWABLE TORQUE (FT-LB)
CL-100-ALH-S	220°	10°	80



**Heavy Duty—
Stainless Steel
Two Round Ends
Offset
(360° Rotation)**





Similar to the Locking Hub above, except hub extensions are offset to allow full 360° rotation. Offset Locking Hubs should usually be used in pairs, to avoid off-center loading on a single hub. Make sure that rotating loads are balanced and avoid any possible pinch points, in case hubs are suddenly unlocked and the load is allowed to rotate freely.

OFFSET (360° ROTATION)

PART NO.	TOTAL ADJUSTMENT RANGE	ADJUSTMENT INCREMENTS	ALLOWABLE TORQUE (FT-LB)
CL-101-ALH-S	360°	10°	80

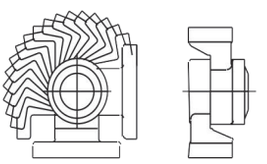
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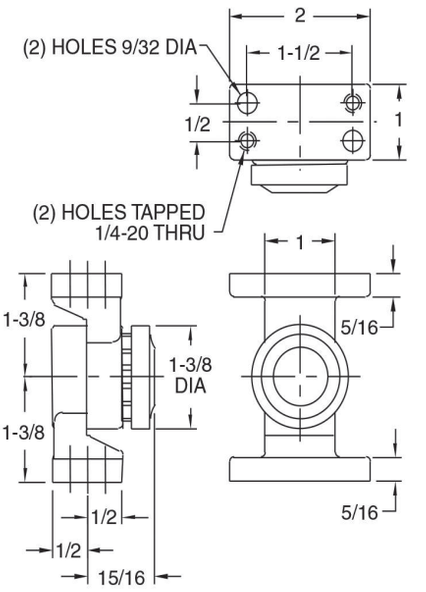
ADJUSTABLE LOCKING HUBS

BODY: 300-SERIES STAINLESS STEEL, ELECTRO POLISHED. PINS: 416 STAINLESS STEEL, HEAT TREATED
RELEASE BUTTON: BLACK THERMOPLASTIC.
US PATENT NO. 5,586, 363 AND 5,689,999. OTHER PATENTS PENDING.



**Heavy Duty—
Stainless Steel
Two Mounting Flanges
Inline
(180° Adjustment)**





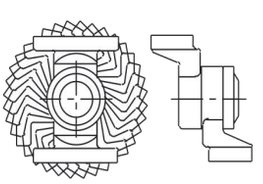
Adjustable Locking Hubs are rotary bearings that provide positive locking at any 10° increment. Once locked, the hub becomes an absolutely rigid joint, able to withstand 80 ft.-lbs. of torque (5:1 safety factor). Mounting flanges provide two mounting options: (1) two 1/4-20 tapped holes allow fastening an object to the mounting flange; (2) two 9/32 dia clearance holes for 1/4" screws allow fastening the mounting flange to a surface. Applications include adjustable fixtures, rotating fixtures, welding fixtures, trunnion mounting, adjustable and/or foldable handles, adjustable part trays and shelves, adjustable and/or flip-up work surfaces, positive positioning of spotlights or nozzles, and collapsible structures.

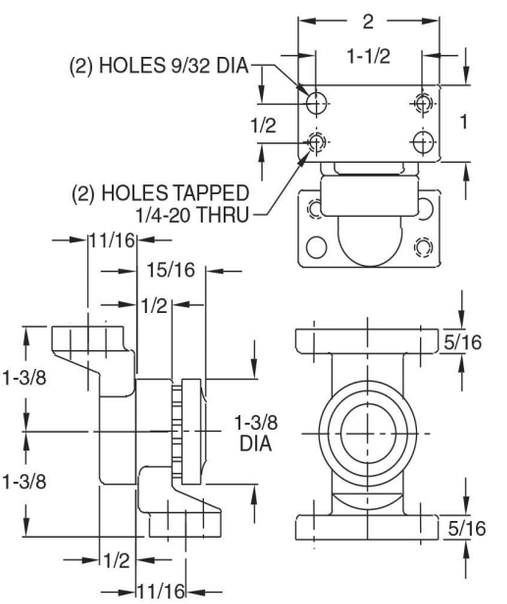
INLINE (180° ADJUSTMENT)

PART NO.	TOTAL ADJUSTMENT RANGE	ADJUSTMENT INCREMENTS	ALLOWABLE TORQUE (FT-LB)
CL-120-ALH-S	180°	10°	80



**Heavy Duty—
Stainless Steel
Two Mounting Flanges
Offset
(360° Rotation)**





Similar to the Locking Hub above, except hub extensions are offset to allow full 360° rotation. Offset Locking Hubs should usually be used in pairs, to avoid off-center loading on a single hub. Make sure that rotating loads are balanced and avoid any possible pinch points, in case hubs are suddenly unlocked and the load is allowed to rotate freely.

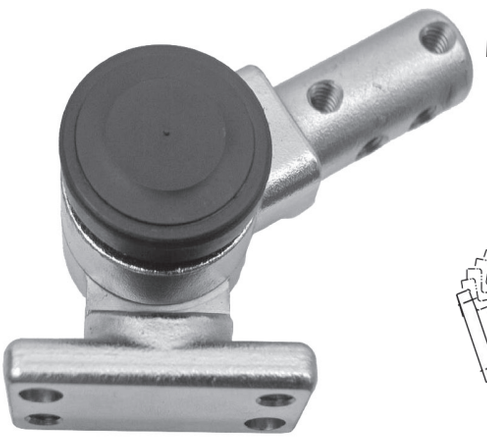
OFFSET (360° ROTATION)

PART NO.	TOTAL ADJUSTMENT RANGE	ADJUSTMENT INCREMENTS	ALLOWABLE TORQUE (FT-LB)
CL-121-ALH-S	360°	10°	80

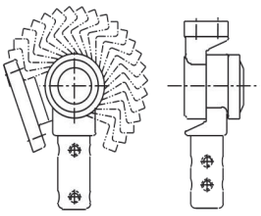
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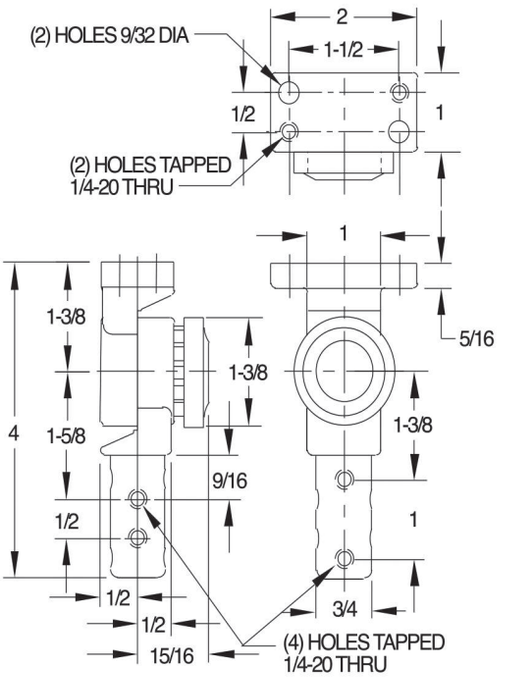
ADJUSTABLE LOCKING HUBS

BODY: 300-SERIES STAINLESS STEEL, ELECTRO POLISHED. PINS: 416 STAINLESS STEEL, HEAT TREATED
RELEASE BUTTON: BLACK THERMOPLASTIC.
US PATENT NO. 5,586,363 AND 5,689,999. OTHER PATENTS PENDING.



**Heavy Duty—
Stainless Steel
Mounting Flange &
Round End Inline
(220° Adjustment)**

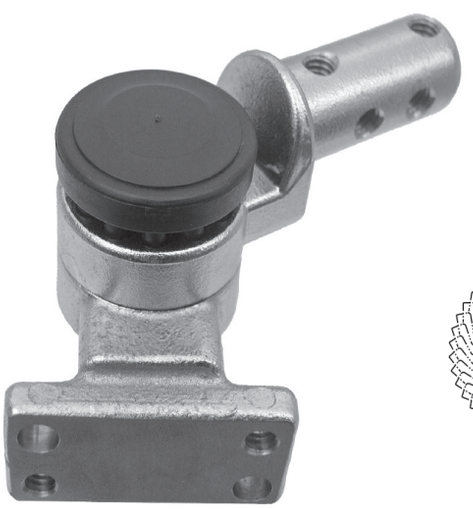




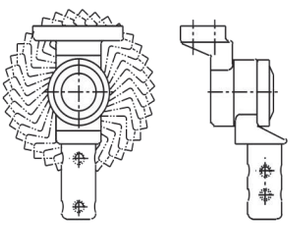
Adjustable Locking Hubs are rotary bearings that provide positive locking at any 10° increment. Once locked, the hub becomes an absolutely rigid joint, able to withstand 80 ft.-lbs. of torque (5:1 safety factor). The round hub extension fits 3/4" ID pipe or tubing. The tapped mounting holes can also be used to attach a plate or angle. The mounting flange provides two mounting options: (1) two 1/4-20 tapped holes allow fastening an object to the mounting flange; (2) two 9/32 dia clearance holes for 1/4" screws allow fastening the mounting flange to a surface. Applications include adjustable fixtures, rotating fixtures, welding fixtures, trunnion mounting, adjustable and/or foldable handles, adjustable part trays and shelves, adjustable and/or flip-up work surfaces, positive positioning of spotlights or nozzles, and collapsible structures.

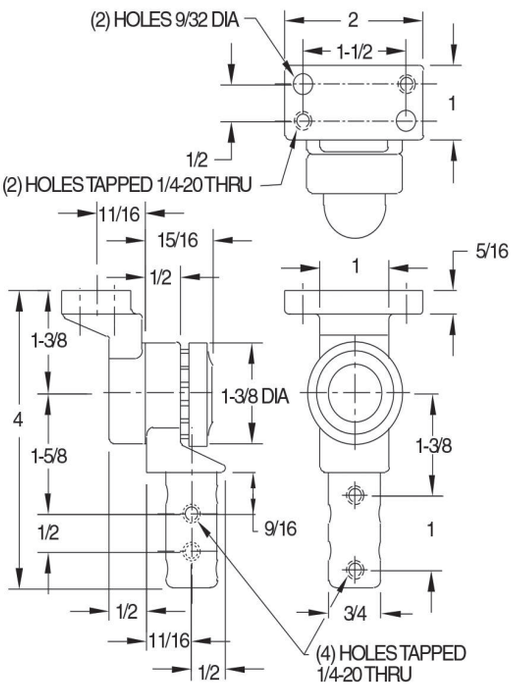
INLINE (220° ADJUSTMENT)

PART NO.	TOTAL ADJUSTMENT RANGE	ADJUSTMENT INCREMENTS	ALLOWABLE TORQUE (FT-LB)
CL-110-ALH-S	220°	10°	80



**Heavy Duty—
Stainless Steel
Mounting Flange &
Round End Offset
(360° Rotation)**





Similar to the Locking Hub above, except hub extensions are offset to allow full 360° rotation. Offset Locking Hubs should usually be used in pairs, to avoid off-center loading on a single hub. Make sure that rotating loads are balanced and avoid any possible pinch points, in case hubs are suddenly unlocked and the load is allowed to rotate freely.

OFFSET (360° ROTATION)

PART NO.	TOTAL ADJUSTMENT RANGE	ADJUSTMENT INCREMENTS	ALLOWABLE TORQUE (FT-LB)
CL-111-ALH-S	360°	10°	80

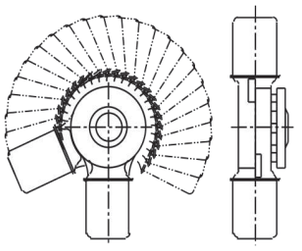
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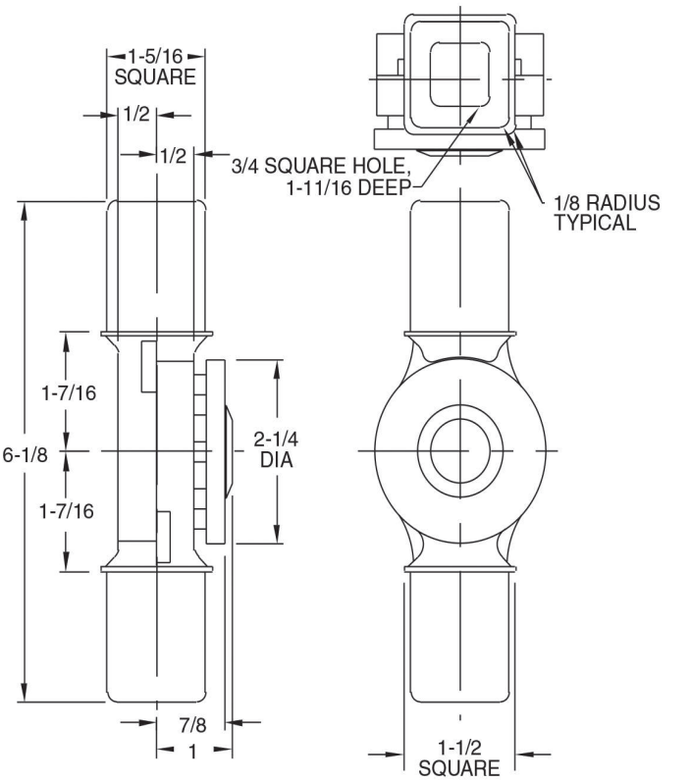
ADJUSTABLE LOCKING HUBS

BLACK THERMOPLASTIC (DUPONT ZYTEL™).
US PATENT NO. 5,586, 363 AND 5,689,999. OTHER PATENTS PENDING.



Medium Duty—
Thermoplastic
Two Square Ends
Inline
(220° Adjustment)





Economical-yet-rugged Locking Hub made of tough black thermoplastic. These Adjustable Locking Hubs are rotary bearings that provide positive locking at any 10° increment. Once locked, the hub becomes an absolutely rigid joint, able to withstand 33 ft.-lbs. of torque (5:1 safety factor). The square hub extensions fit 1-1/2" O.D. square tubing externally, or 3/4" O.D. square tubing or barstock internally. Hub extensions are sturdy, and can be easily modified to attach to flat surfaces. Applications include adjustable fixtures, rotating fixtures, trunnion mounting, adjustable and/or foldable handles, adjustable part trays and shelves, adjustable and/or flip-up work surfaces, positive positioning of spotlights or nozzles, and collapsible structures.

INLINE (220° ADJUSTMENT)

PART NO.	TOTAL ADJUSTMENT RANGE	ADJUSTMENT INCREMENTS	ALLOWABLE TORQUE (FT-LB)
CL-40-ALH-B	220°	10°	33

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MODULAR FIXTURING



Modular Tooling Plates & Blocks



Mounting Accessories



Modular Supports & Locators



Modular Clamps

Also see:

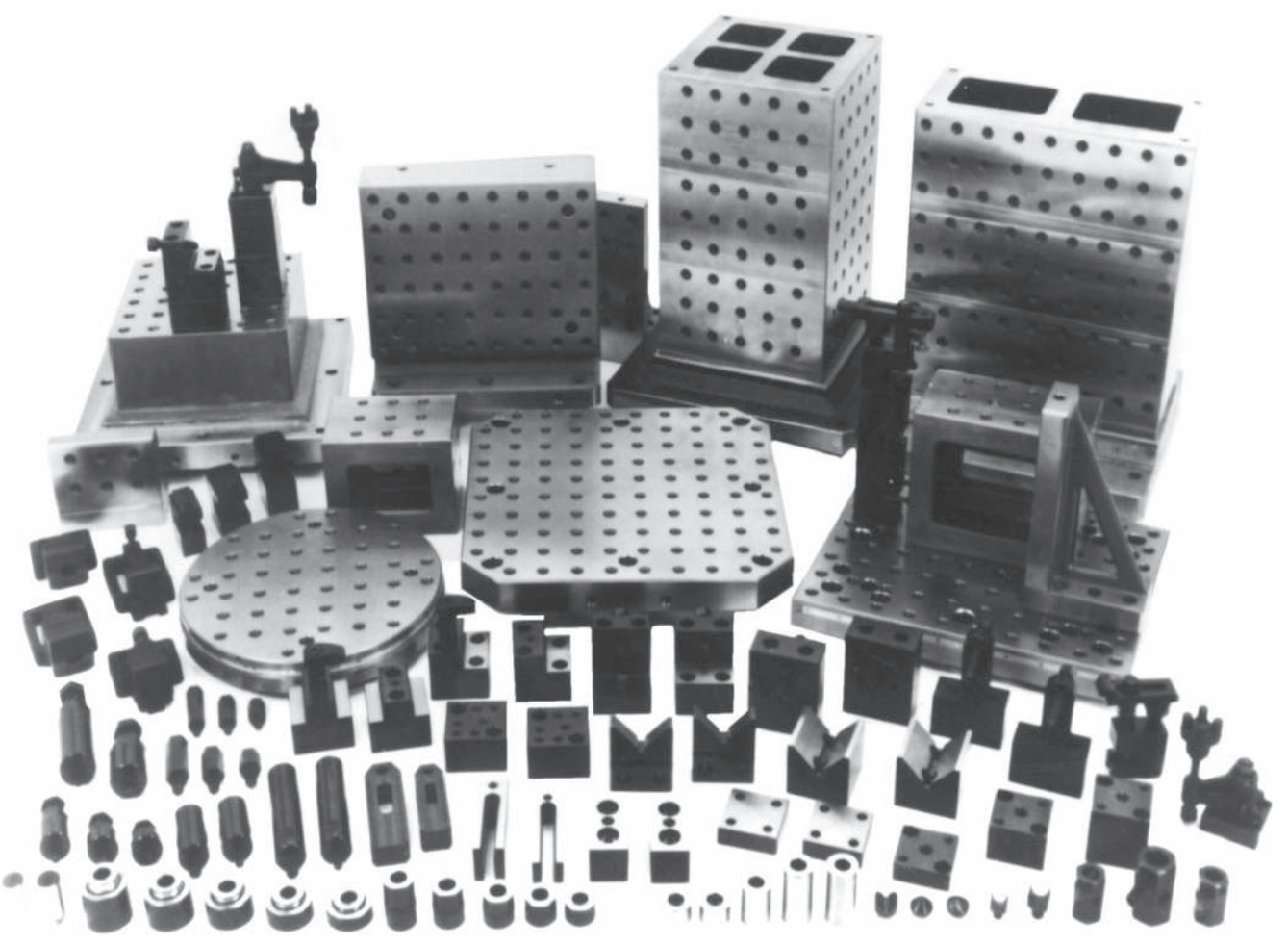


Drop Zero Modular Zero-Point System pp. 672-675

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INTRODUCTION



WHAT EXACTLY IS MODULAR FIXTURING?

In many ways modular fixturing is just like permanent fixturing, except for a few key differences. First, modular fixtures can be assembled entirely from reusable off-the-shelf components, without machining. Next, many modular components are adjustable and universal. Finally, specially designed tooling plates and blocks, with a standard grid pattern, are the foundation of a good modular system.

A VALUABLE TOOL FOR EVERY MACHINE SHOP:

Most metal-machining manufacturers have good applications for temporary fixturing every day! The leadtime and expense required to build a permanent fixture are often difficult to justify. This is especially true when production runs are small and do not repeat on a regular basis. General-purpose workholders — such as vises, chucks, and table mounted clamps — can be ready for production on short notice, but they are primarily suited for short runs of basic parts. Fortunately, there is now another alternative: modular fixturing. When a company adds modular fixturing to its options, even job-shop-type production can benefit from quality fixturing.

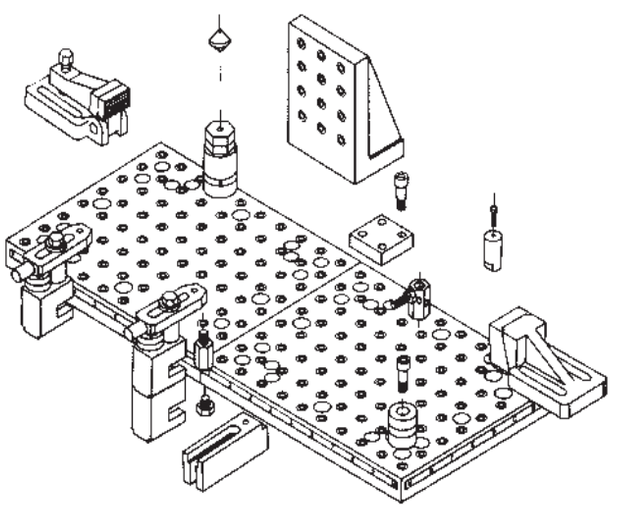
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GOOD APPLICATIONS FOR MODULAR FIXTURING:

Modular fixturing is an ideal answer to many workholding problems. One-time jobs, found especially in job shops, are ideal for modular fixturing; with modular fixturing, a workholder can be economically built even for a one-part run. Jobs that do not repeat on a regular basis are well suited to modular fixturing; modular fixturing permits rapid setup of short-notice production runs. Modular fixturing is also ideal for prototype parts; since prototypes are often changed or redesigned, the cost of building a permanent fixture for each new variation would be prohibitive. Replacement parts are another perfect application; modular fixturing allows a company to respond to orders as they are received, instead of shipping parts from an inventory. Trial fixturing is also an excellent application; modular workholders allow a designer to fine tune tooling ideas before a final production workholder is built. Finally, modular fixturing is valuable while permanent fixtures are built or repaired.

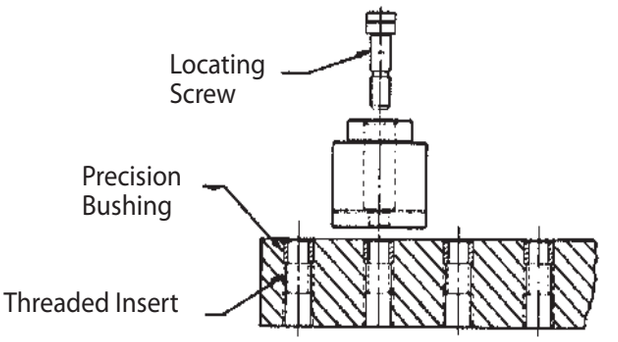
WIDE SELECTION OF TOOLING PLATES & BLOCKS:

Tooling plates and blocks are the main structural elements of any modular-fixturing system. The type, style, and number of plates and blocks available determine the variety of fixtures that can be built, and also the number of machine tools that can be used.



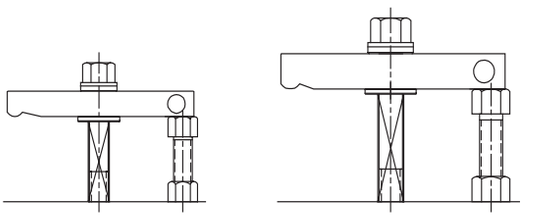
GRID HOLES VS. EARLIER T-SLOT SYSTEMS:

The two primary forms of modular systems available today are those with grid-pattern holes and earlier types with T slots to mount components. Grid holes offer many advantages over T slots. Modular systems with grid holes have greater positional accuracy and strength than those with T slots. T-slot systems permit movement along the slot, so nothing but friction holds components in place. Wherever T slots cross each other, a weak point exists.



MULTIPURPOSE GRID HOLES OFFER MAXIMUM FLEXIBILITY:

Grid-pattern modular-fixturing systems come in two styles: those with alternating dowel holes and tapped holes and those with multipurpose holes. The alternating-hole style does not offer as many advantages as the Carr Lane Manufacturing multipurpose-hole style. Multipurpose holes have both an alignment bushing and threaded insert in the same hole. This arrangement permits each hole to serve as an alignment hole, mounting hole, or both. Multipurpose holes are laid out in a standard 1″ or 2″ grid pattern (depending on the size) to allow the maximum number of mounting locations.



CHOICE OF TWO SYSTEM SIZES:

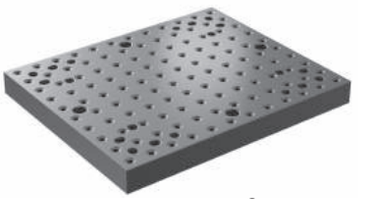
A good modular-fixturing system needs to accommodate a wide range of workpiece sizes. Only Carr Lane Manufacturing offers a full line of modular components in three system sizes. As a comparison to choose the proper system size, the table below shows typical clamping force exerted by clamp straps in each size (2-to-1 lever ratio).

SIZE	STUD SIZE	RECOMMENDED TORQUE (FT-LBS)	CLAMPING FORCE (LBS)
STANDARD	1/2-13	38	2300
HEAVY	5/8-11	77	3700

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Square Pallet
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Four-Sided
Blocks
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MODULAR MOUNTING ACCESSORIES



Locating Screws
and Bushings
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Hex-Head Cap
Screws
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Gages
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Pins
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Protection
Plugs
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MODULAR CLAMPS


Forged Adjustable Clamps p. 439


Slotted-Heel Clamp Straps p. 440


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Serrated Adjustable Clamps pp. 448-449

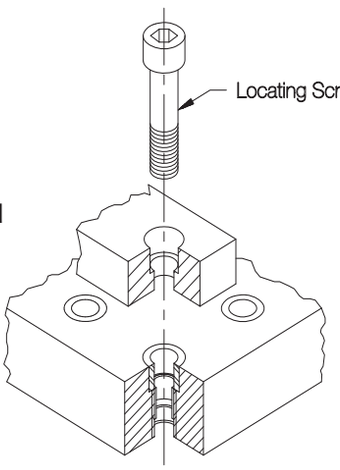

Pivoting Edge Clamps p. 450

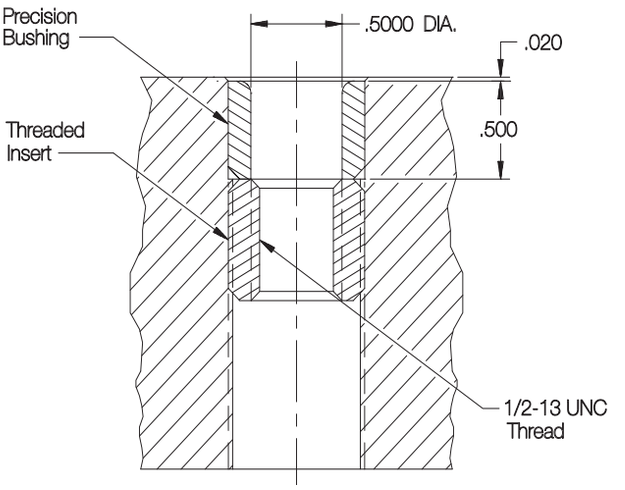
10

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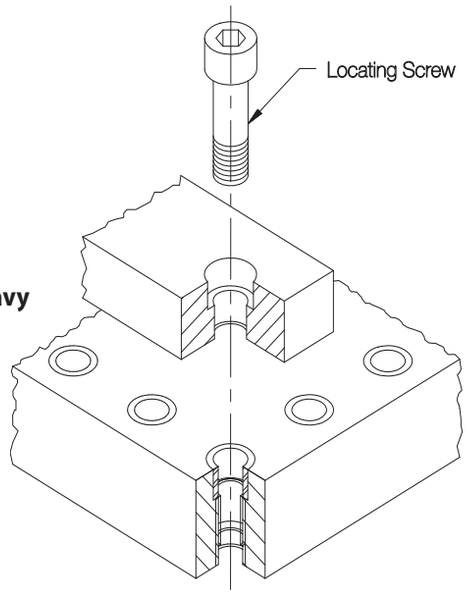
MULTIPURPOSE HOLES

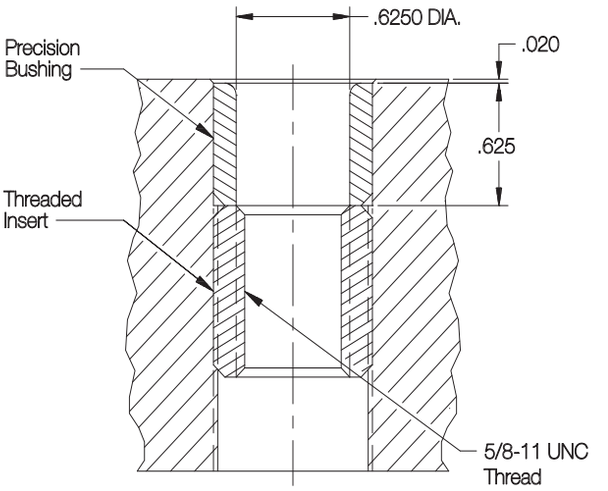
Standard





Heavy

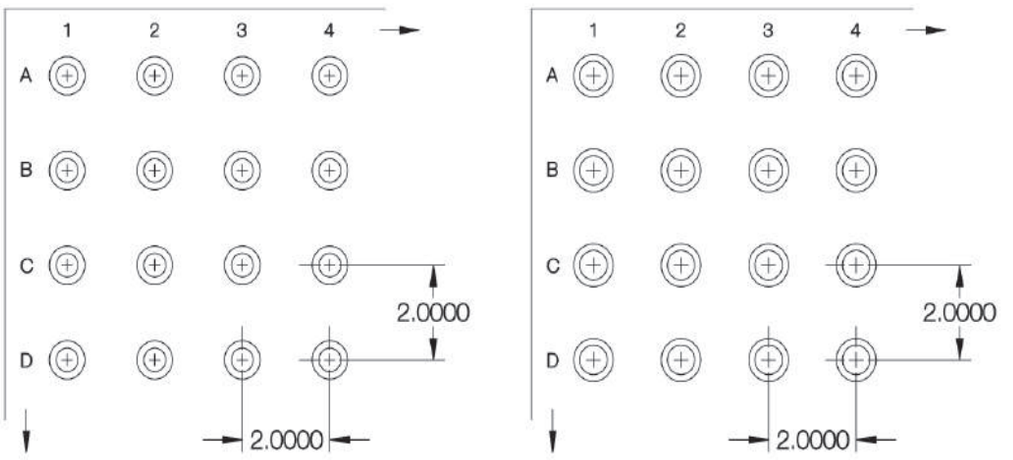




Every multipurpose hole on a tooling plate or block has a precision alignment bushing on top, with a threaded insert below it. Multipurpose holes will accept Locating Screws, Socket-Head Cap Screws, studs, and many other threaded components. The proper mounting screw for each component is listed in its table of dimensions. Locating Screws are used to locate and fasten at the same time.

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GRID ADDRESS SYSTEM



Standard **Heavy**

The grid pattern of multipurpose holes on every tooling plate and tooling block face is labelled with letters in one direction and numbers in the perpendicular direction. Tooling-block faces are numbered (counterclockwise) with Roman numerals. This allows recording the mounting-hole location of each component (e.g., A2, B3, D7, etc.) as part of permanent documentation. Multipurpose holes are spaced within ±.0008 inches of true position on all tooling plates and blocks.

CUSTOM TOOLING PLATES

To build your own custom tooling plates with multipurpose mounting holes, we offer precision bushings and threaded inserts separately. See hole locations and tolerances above (holes must be jig bored), and (**INFO+**) page 420 for proper counterbore depth to install bushings. The threaded insert's locking keys can be driven down by the bushing as it is pressed into the tooling plate.



Precision Bushing



Key Insert

PRECISION BUSHINGS

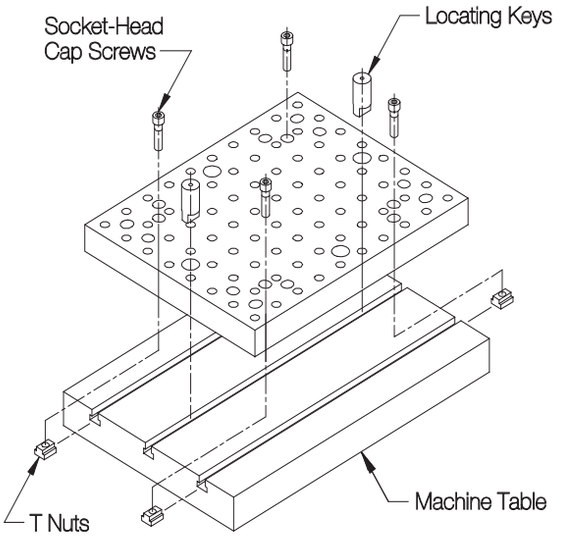
SIZE	PART NO.	ID	OD	LENGTH
STANDARD	CL-MF40-0101-02	.5006/.5013	.8122/.8119	.500
HEAVY	CL-MF50-0101-02	.6256/.6263	.9060/.9056	.625

KEY INSERTS

SIZE	PART NO.	ID	OD	LENGTH
STANDARD	CL-1213-KS	1/2-13	3/4-16	5/8
HEAVY	CL-5811-KS	5/8-11	7/8-14	7/8

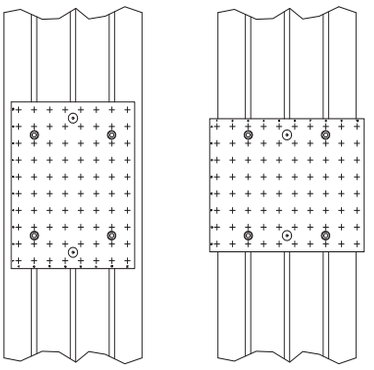
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MOUNTING TOOLING PLATES ON T-SLOTTED TABLES

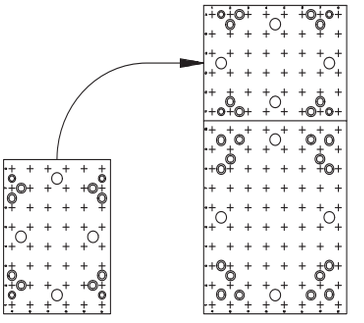


Standard and Heavy

Standard and heavy Rectangular Tooling Plates are accurately located on T-slotted tables using two Locating Keys **(INFO+** page 257) in the center table slot. These plates are fastened to the machine table using four or six Socket-Head Cap Screws (**INFO+** page 428) and T Nuts **(INFO+** page 320). Swivel Hoist Rings are recommended for lifting large tooling plates (**INFO+** page 75).



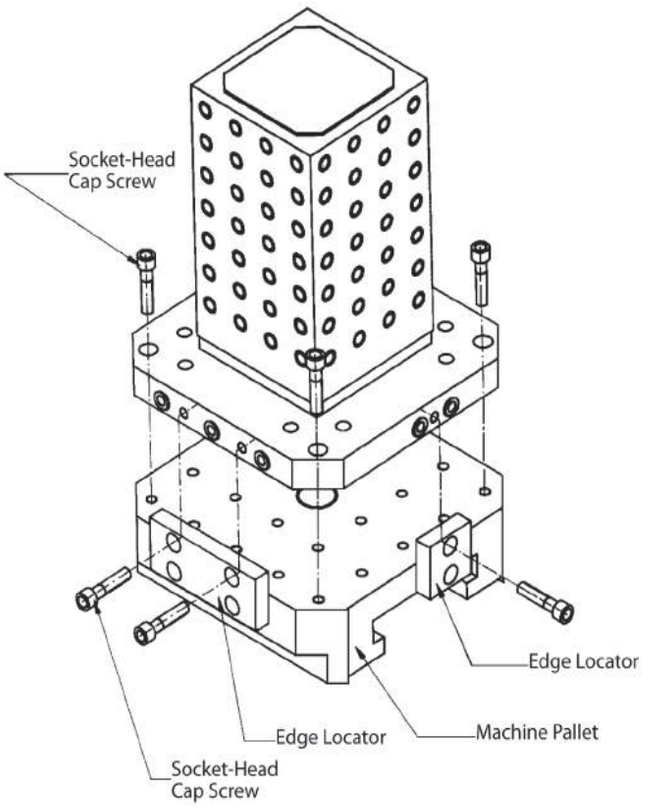
Two sets of Locating-Key holes allow mounting plates either lengthwise or widthwise on a machine table.



The length of each Rectangular Tooling Plate is the same as the width of the next-larger size, allowing many possible combinations by turning plates 90°.

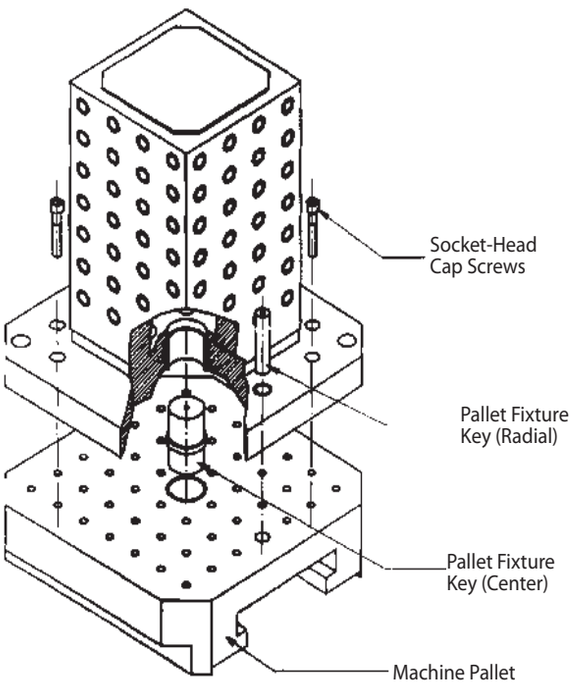
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MOUNTING TOOLING PLATES & BLOCKS ON PALLETS



JIS Mounting

JIS-type mounting is the most common way to mount tooling plates and blocks on a machining-center pallet. Here the plate or block is located from two precisely ground reference edges at 90° to each other. The plate or block is pulled against the pallet's edge locators using three Socket-Head Cap Screws (**INFO+** page 428) and also fastened down with four to eight Socket-Head Cap Screws, depending on the size. Swivel Hoist Rings are recommended for lifting tooling blocks and large tooling plates (**INFO+** page 76-83).



DIN Mounting

Most of our modular tooling plates and blocks also incorporate DIN-mounting capability. Here the plate or block is located using a center hole, and oriented using a radial hole. Two Pallet Fixture Keys, a center pin and a radial pin, are required (**INFO+** page 258). The plate or block is fastened down with four to eight Socket-Head Cap Screws, depending on the size.

PALLET SIZE	PALLET CENTER-HOLE DIA	PALLET RADIAL-HOLE DIA	DISTANCE BETWEEN CENTER AND RADIAL HOLES
320mm	50mm	20mm	100mm
400mm			150mm
500mm			200mm
630mm		25mm	200mm
800mm			300mm

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RECTANGULAR TOOLING PLATES

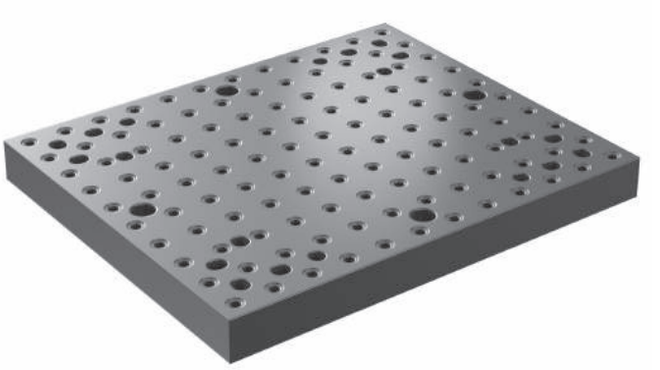
GRAY CAST IRON, ASTM CLASS 45

16x20



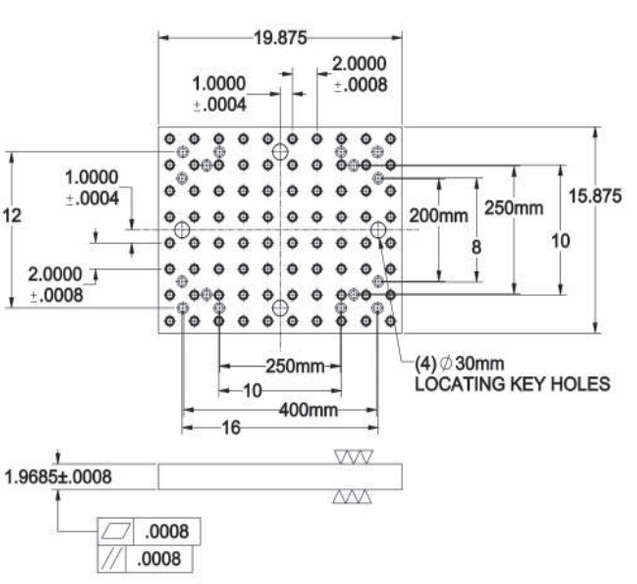
Standard 1/2"

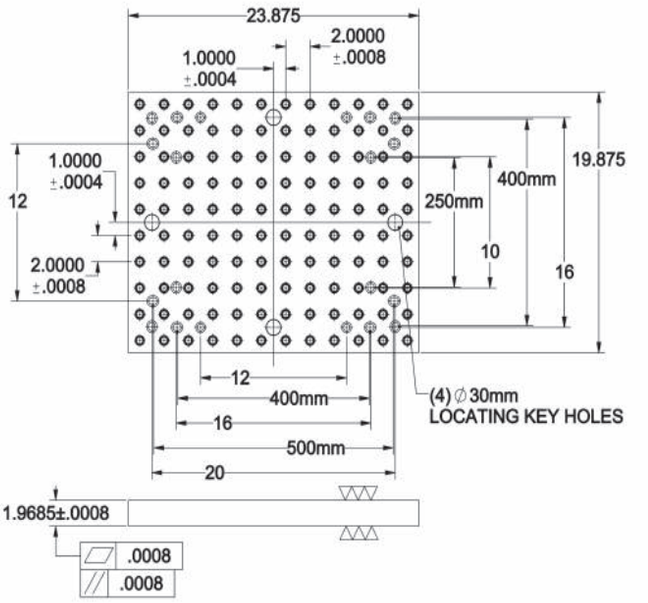
20x24



Standard 1/2"

Ideal tooling plate for most milling machines. Finish ground to tight tolerances, with all multipurpose holes located within .0008 inches of true position. Available in a full range of standard fixture sizes, with mounting holes to fit almost any inch or metric slot spacing. **INFO+** See page 422 for mounting information. Plates can be accurately connected to create many length and width combinations. **INFO+** Also available as blanks, without multipurpose holes (page 398).





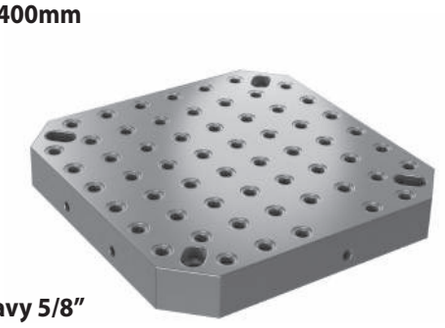
SIZE	PART NO.	MULTIPURPOSE HOLES				PLATE WIDTH		PLATE LENGTH		MOUNTING SCREWS	NO. OF MOUNTING SCREWS REQUIRED	APPROX WEIGHT (LBS)
		THREAD	ID	SPACING	PATTERN	NOMINAL	ACTUAL	NOMINAL	ACTUAL			
STANDARD	CL-1620-RTPM-40	1/2-13	.5000	2.0000	8x10	16	15.875	20	19.875	1/2-13 or M12	4	160
	CL-2024-RTPM-40				10x12	20	19.875	24	23.875			238

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SQUARE PALLET TOOLING PLATES

GRAY CAST IRON, ASTM CLASS 45

400mm



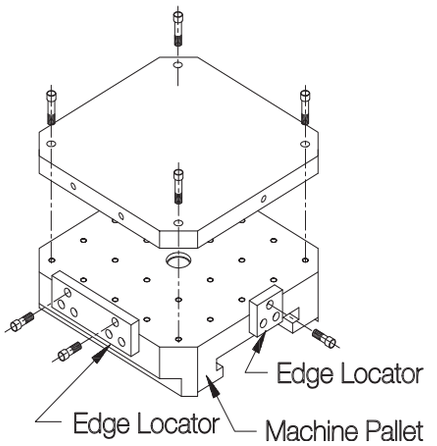
Heavy 5/8"

500mm

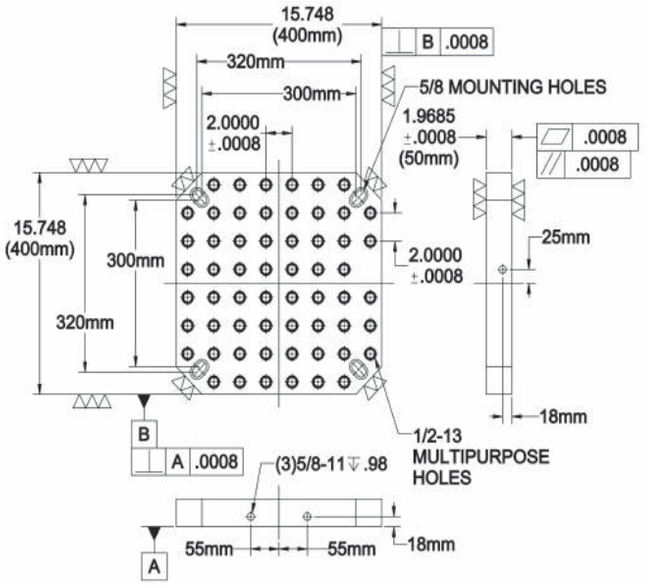


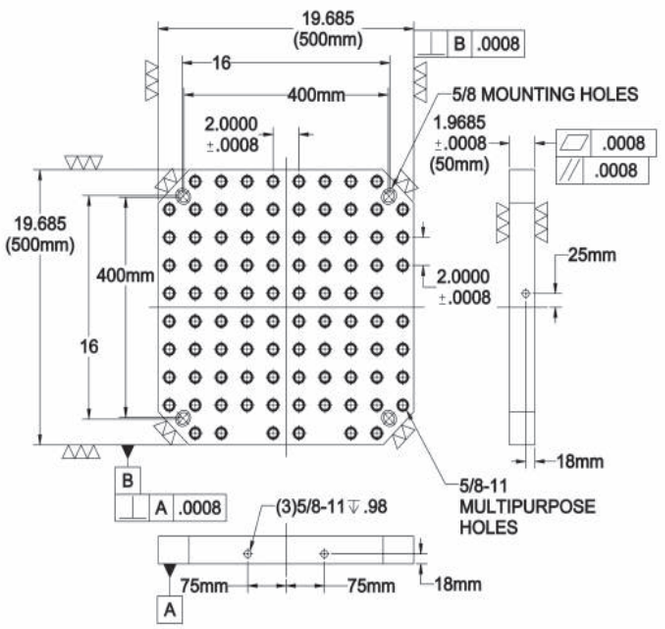
Heavy 5/8"

Ideal tooling plate for horizontal-machining-center pallets. Finish machined to tight tolerances. Available in a full range of standard pallet sizes, with mounting holes to fit almost any inch or metric slot spacing. JIS mounting from two reference edges provides accurate location. **INFO+**: See page 422 for mounting information. **INFO+**: Also available as blanks, without multipurpose holes (page 399).



JIS Mounting





SIZE	PART NO.	MULTIPURPOSE HOLES				PALLET SIZE	PLATE THICKNESS	APPROX. WEIGHT (LBS)
		THREAD	ID	SPACING	PATTERN			
HEAVY	CL-400-PTPM-50	5/8-11	.6250	2.0000	10x10	400mm	50mm	175
	CL-500-PTPM-50				12x12	500mm		280

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TWO-SIDED TOOLING BLOCKS

GRAY CAST IRON, ASTM CLASS 45

400mm

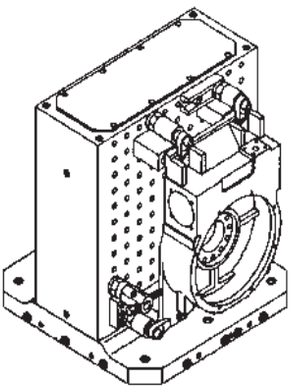


Standard 1/2"

500mm

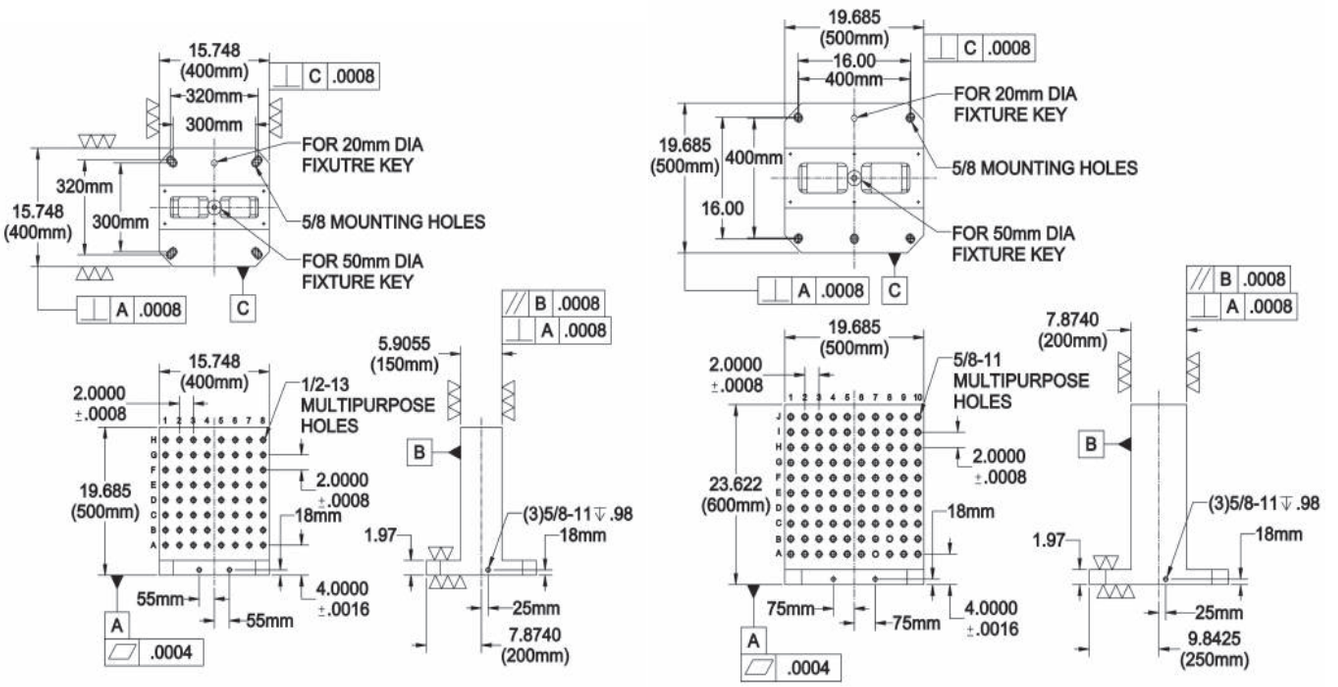


Heavy 5/8"



These tooling blocks have two identical wide faces to allow fixturing large parts.

Precision tooling block for horizontal-machining-center pallets. Both faces are accurately finish machined to tight tolerances, and qualified to the base. All multipurpose holes are spaced within .0008 inches of true position (.0004 for mini). One-piece cast construction provides superior accuracy, dimensional stability, and vibration dampening. Available in a full range of standard pallet sizes, with mounting holes to fit almost any inch or metric slot spacing. Dual mounting capability allows both JIS mounting (locating from two reference edges) and DIN mounting (locating from center and radial holes) with excellent accuracy. **INFO+**: See page 422 for mounting information. Also available as blanks, without multipurpose holes.



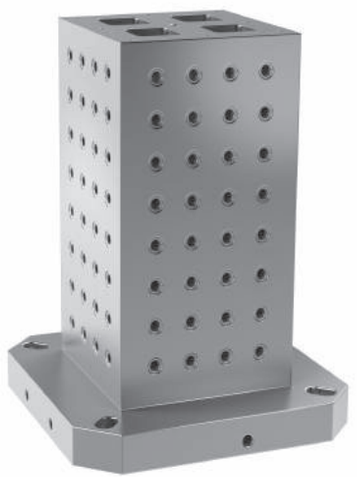
SIZE	PART NO.	MULTIPURPOSE HOLES				PALLET SIZE	APPROX. WEIGHT (LBS)
		THREAD	ID	SPACING	PATTERN		
STANDARD	CL-400400500-TTBM-40	1/2-13	.5000	2.0000	8x8	400mm	340
HEAVY	CL-500500600-TTBM-50	5/8-11	.6250	2.0000	10x10	500mm	516

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FOUR-SIDED TOOLING BLOCKS

GRAY CAST IRON, ASTM CLASS 45

400mm

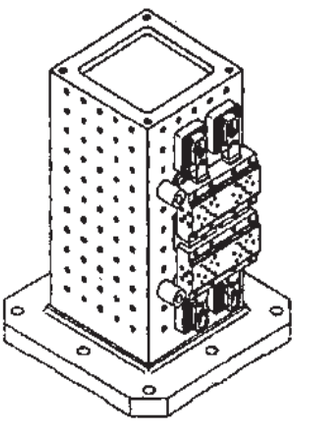


Standard 1/2"

500mm

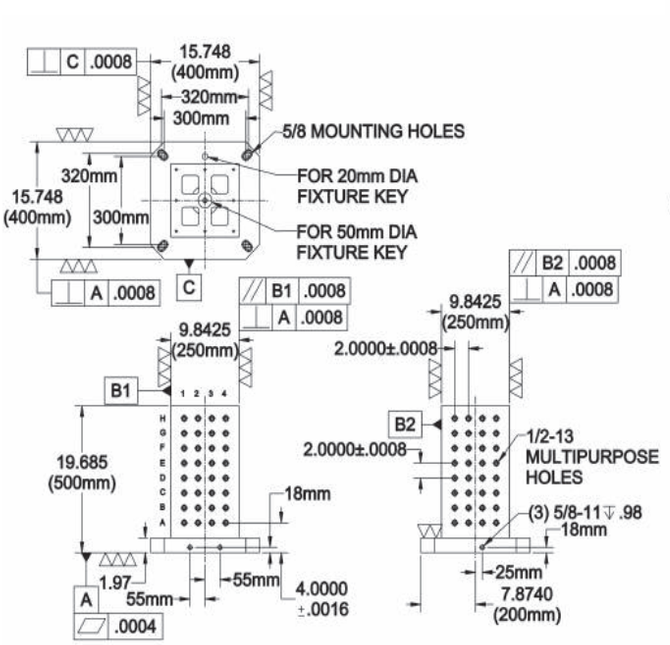


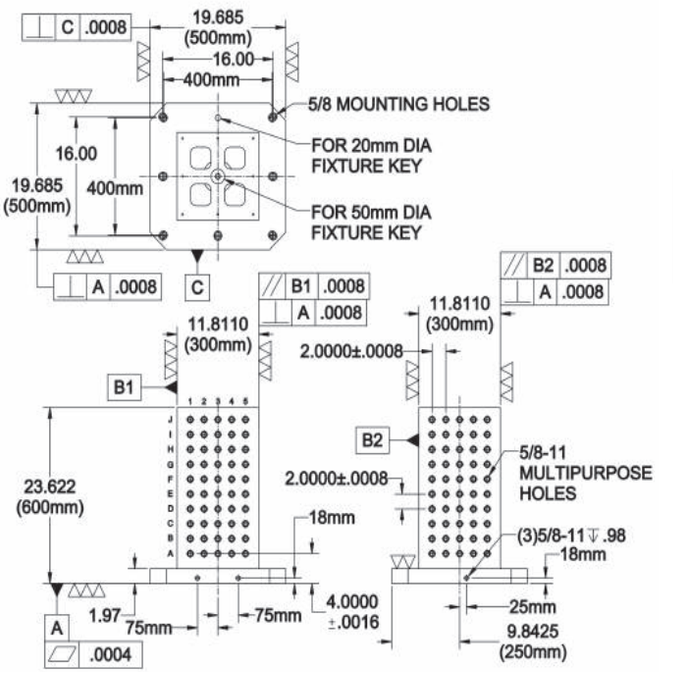
Heavy 5/8"



With four identical faces, these tooling blocks are ideal for loading a large number of medium-size parts on a pallet.

Precision four-sided tooling block for horizontal-machining-center pallets. All four faces are accurately finish machined to tight tolerances, and qualified to the base. All multipurpose holes are spaced within .0008 inches of true position (.0004 for mini). One-piece cast construction provides superior accuracy, dimensional stability, and vibration dampening. Available in a full range of standard pallet sizes, with mounting holes to fit almost any inch or metric slot spacing. Dual mounting capability allows both JIS mounting (locating from two reference edges) and DIN mounting (locating from center and radial holes) with excellent accuracy. **INFO+**: See page 422 for mounting information. Also available as blanks, without multipurpose holes.





SIZE	PART NO.	MULTIPURPOSE HOLES				PALLET SIZE	APPROX. WEIGHT (LBS)
		THREAD	ID	SPACING	PATTERN		
STANDARD	CL-400250500-FTBM-40	1/2-13	.5000	2.0000	4x8	400mm	375
HEAVY	CL-500300600-FTBM-50	5/8-11	.6250	2.0000	5x10	500mm	584

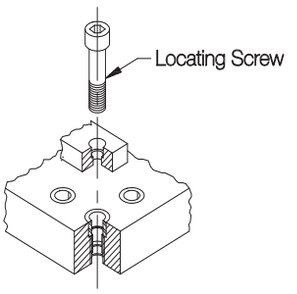
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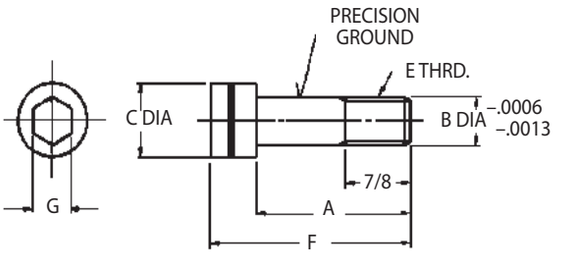
LOCATING SCREWS

4130 STEEL, HEAT TREATED RC 33-39, BLACK OXIDE FINISH



Standard
Heavy





Locating Screws are used to mount all locators in multipurpose grid holes. These specially designed, precision shoulder screws accurately locate and fasten at the same time.

SIZE	PART NO.	A	B DIA	C DIA	E	F	G
STANDARD	CL-MF40-4301	1-3/4	.5000	3/4	1/2-13	2-1/4	3/8
	CL-MF40-4302	2-1/4				2-3/4	
	CL-MF40-4303	2-3/4				3-1/4	
HEAVY	CL-MF50-4301	2	.6250	15/16	5/8-11	2-5/8	1/2
	CL-MF50-4302	2-1/2				3-1/8	
	CL-MF50-4303	3				3-5/8	

SOCKET-HEAD CAP SCREWS

GRADE 8, BLACK OXIDE FINISH



Standard
Heavy

Socket-Head Cap Screws (grade 8) are used for fastening components whenever precise location is not needed. Metric sizes are used to fasten plates and blocks to machine pallets.

INCH

PART NO.	THREAD SIZE	LENGTH UNDER HEAD
CL-6-32x.50-SHCS	#6-32	.50
CL-10-32x.50-SHCS	#10-32	.50
CL-1/4-20x.75-SHCS	1/4-20	.75
CL-1/2-13x1.00-SHCS	1/2-13	1.00
CL-1/2-13x1.25-SHCS		1.25
CL-1/2-13x1.50-SHCS		1.50
CL-1/2-13x1.75-SHCS		1.75
CL-1/2-13x2.00-SHCS		2.00
CL-1/2-13x2.25-SHCS		2.25
CL-1/2-13x2.75-SHCS		2.75
CL-1/2-13x4.50-SHCS		4.50
CL-5/8-11x1.00-SHCS	5/8-11	1.00
CL-5/8-11x1.25-SHCS		1.25
CL-5/8-11x1.50-SHCS		1.50
CL-5/8-11x2.00-SHCS		2.00
CL-5/8-11x2.25-SHCS		2.25
CL-5/8-11x2.50-SHCS		2.50
CL-5/8-11x3.00-SHCS		3.00
CL-5/8-11x5.00-SHCS		5.00

METRIC

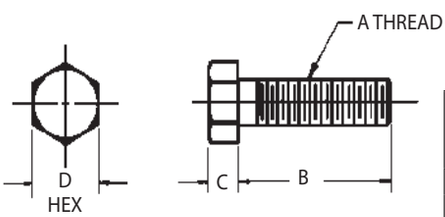
PART NO.	THREAD SIZE	LENGTH UNDER HEAD
CLM-16x40-SHCS	M16	1.57
CLM-16x50-SHCS		1.97
CLM-16x65-SHCS		2.56

HEX-HEAD CAP SCREWS

GRADE 8, BLACK OXIDE FINISH



Standard
Heavy



Mounting screws for high-rise clamps, where access to a socket-head screw is difficult.

SIZE	PART NO.	A	B	C	D
STANDARD	CL-MF40-4311	1/2-13	1.75	5/16	3/4
	CL-MF40-4312		2.75		
	CL-MF0-4313		3.00		
HEAVY	CL-MF50-4311	5/8-11	1.75	25/64	15/16
	CL-MF50-4312		2.75		
	CL-MF50-4313		3.00		

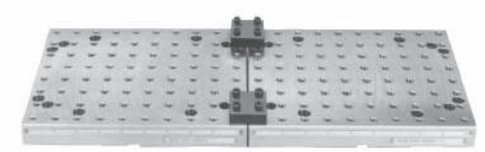
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LOCATING GAGES

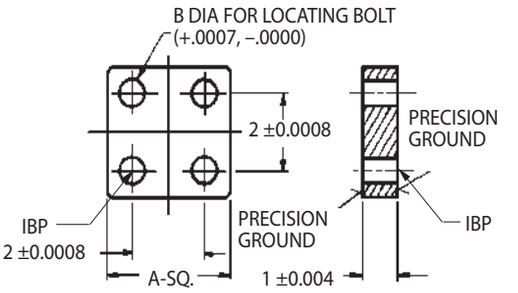
1045 STEEL, BLACK OXIDE FINISH



Standard
Heavy



Use when connecting two tooling plates, to hold tolerances. Remove after fastening plates to machine.



SIZE	PART NO.	A	B DIA	LOCATING SCREW (4 REQD)
STANDARD	CL-MF40-4001	3-1/8	.5000	CL-MF40-4302
HEAVY	CL-MF50-4001	3-3/8	.6250	CL-MF50-4302

LOCATING PINS

1144 STEEL, HEAT TREATED RC 50-55, BLACK OXIDE FINISH



Round **Diamond**

Standard
Heavy

Round and Diamond Locating Pins are used together to align Quick-Change Tooling Plates or vises on a modular plate or block.

ROUND

SIZE	PART NO.	HEAD DIA	SHANK DIA
STANDARD	CL-MF40-4501	.6250	.5000
HEAVY	CL-MF50-4501		.6250

DIAMOND

STANDARD	CL-MF40-4601	.6250	.5000
HEAVY	CL-MF50-4601		.6250

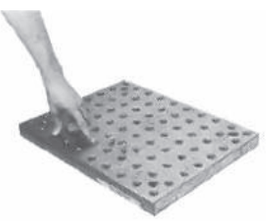
PROTECTION PLUGS

PLASTIC



Standard
Heavy

Durable screw-in plugs to keep dirt and chips out of holes that are not used for a particular setup.



SIZE	PART NO.
STANDARD	CL-MF40-0001
HEAVY	CL-MF50-0001

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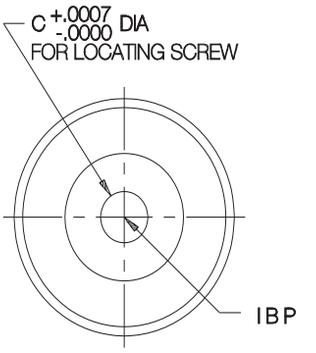
SUPPORT CYLINDERS

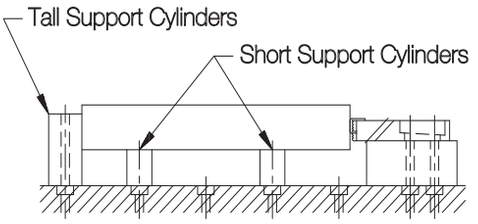
1045 OR 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH



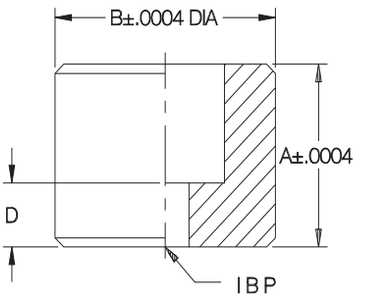
Standard
Heavy

Extremely versatile precision locator that can be used either as a support or for side location. Ground on top, bottom, and outside diameter. Available in many support heights to match other types of height locators.



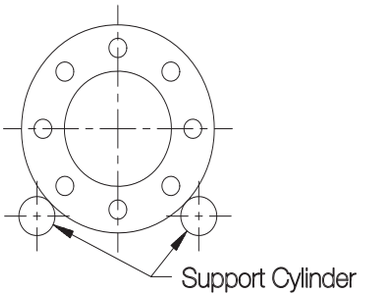


With the wide range of available heights, Support Cylinders can be used as both side locators and supports.



Standard
Heavy

10



Two Support Cylinders can accurately locate a large diameter, similar to using a V Block.

SIZE	PART NO.	A	B DIA	C DIA	D	LOCATING SCREW (1 REQD)
STANDARD	CL-MF40-3101	1.0000	1.6250	.5000	7/16	CL-MF40-4301
	CL-MF40-3113	1.5000				
	CL-MF40-3102	2.0000				
	CL-MF40-3103	3.0000				
HEAVY	CL-MF50-3113	1.5000	2.0000	.6250	9/16	CL-MF50-4301
	CL-MF50-3101	2.0000				
	CL-MF50-3102	3.0000			1-1/16	CL-MF50-4302
	CL-MF50-3103	4.0000				

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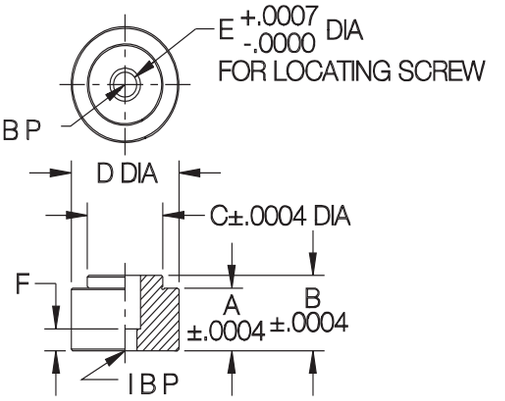
SHOULDER SUPPORT CYLINDERS

1045 OR 1144 STEEL, HEAT TREATED, BLACK OXIDE FINISH

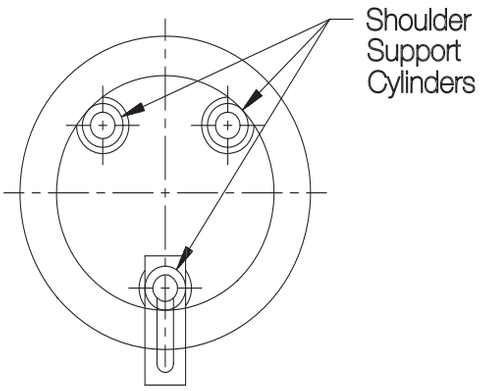


Standard
Heavy

Precision edge locator with a ground shoulder for simultaneous horizontal and vertical location. Available in many support heights to match other types of height locators. The standard (1/2″) and heavy (5/8″) versions are fastened with a Locating Screw (order separately).



Standard and Heavy



Shoulder Support Cylinders can be used to locate from internal edges, as well as external edges. Shown here, three of them locate a large bored diameter, one mounted on an Extension Support.

SIZE	PART NO.	A	B	C DIA	D DIA	E DIA	F	LOCATING SCREW (1 REQD)
STANDARD	CL-MF40-3201	.7500	1.0000	1.6250	2-5/16	.5000	7/16	CL-MF40-4301
	CL-MF40-3202	1.0000	1.2500					
HEAVY	CL-MF50-3201	1.0000	1.2500	2.0000	2-7/8	.6250	9/16	CL-MF50-4301
	CL-MF50-3203	1.5000	2.0000					
	CL-MF50-3204	2.0000	2.5000					

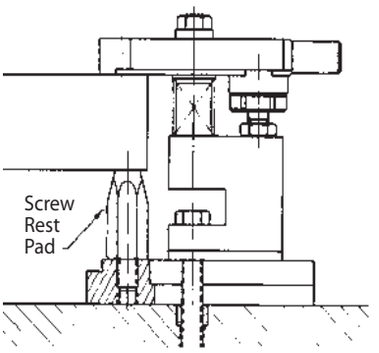
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SCREW REST PADS

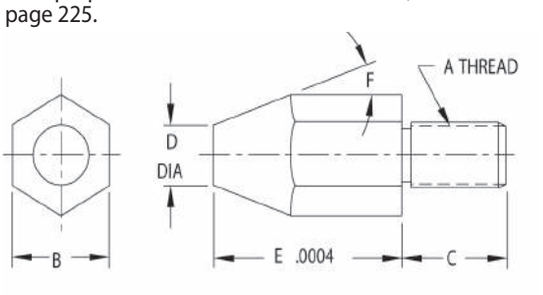
12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Mini
Standard
Heavy



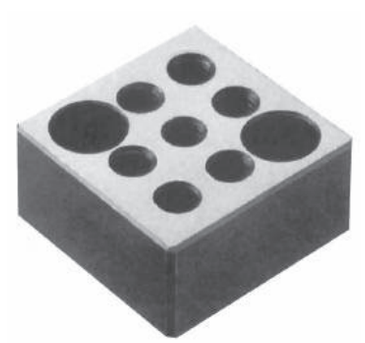
Precision height locator with a small contact area. Available in a wide range of heights, including very short sizes. This support can be installed in either a plain tapped hole or a multipurpose hole. **INFO+**: For metric sizes, see page 225.



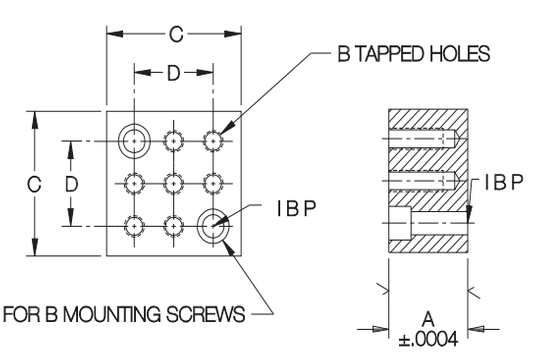
SIZE	PART NO.	A	B	C	D DIA	E	F
MINI	CL-MF25-4801	5/16-18	3/4	5/8	5/16	.2500	75°
	CL-MF25-4802					.3750	60°
	CL-MF25-4803					.5000	35°
	CL-MF25-4804					.7500	25°
	CL-MF25-4805					1.0000	20°
	CL-MF25-4806					1.2500	15°
	CL-MF25-4807					1.5000	
STANDARD	CL-MF40-4801	1/2-13	7/8	15/16	1/2	.2500	75°
	CL-MF40-4802					.3750	60°
	CL-MF40-4803					.5000	35°
	CL-MF40-4804					.7500	25°
	CL-MF40-4805					1.0000	20°
	CL-MF40-4806					1.2500	15°
	CL-MF40-4807					1.5000	
	CL-MF40-4808					2.0000	
HEAVY	CL-MF50-4801	5/8-11	1	1-1/4	5/8	.2500	75°
	CL-MF50-4802					.3750	60°
	CL-MF50-4803					.5000	35°
	CL-MF50-4804					.7500	25°
	CL-MF50-4805					1.0000	20°
	CL-MF50-4806					1.2500	15°
	CL-MF50-4807					1.5000	
	CL-MF50-4808					2.0000	

SUPPORT RISER BLOCKS

1045 STEEL, BLACK OXIDE FINISH



Standard
Heavy



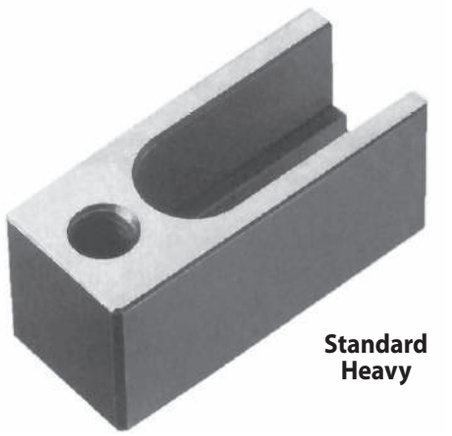
Stackable block with precision ground top and bottom surfaces for accurate height location. Ideal for raising supports up to a workpiece. A choice of seven tapped holes allows mounting the support at any position between grid points.

SIZE	PART NO.	A	B	C	D	SOCKET-HEAD CAP SCREWS (2 REQD)
STANDARD	CL-MF40-1411	1.0000	1/2-13	3-3/8	2	CL-1/2-13x1.75-SHCS
HEAVY	CL-MF50-1413	1.5000	5/8-11	3-3/8	2	CL-5/8-11x2.25-SHCS

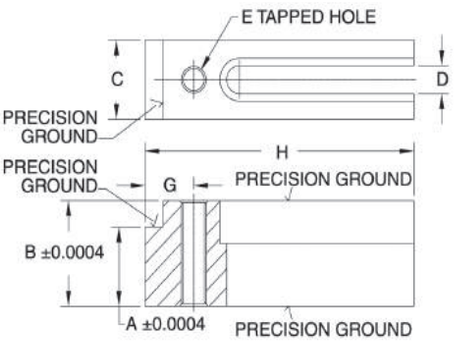
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EXTENSION SUPPORTS

1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH

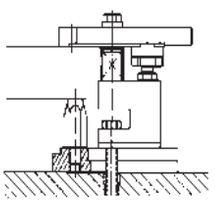


Standard
Heavy

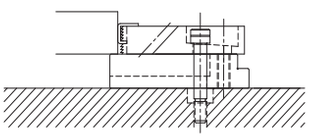


Extension Supports have a precision ground top and bottom surface for accurate height location. Available in a support height to match other types of height locators. The tapped hole is ideal for positioning components between grid points.

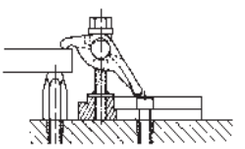
SIZE	PART NO.	A	B	C	D	E	F	G	H	SOCKET-HEAD CAP SCREW (1 REQD)
STANDARD	CL-MF40-3311	No step	1.0000	1-1/2	17/32	1/2-13	3/8	1	5-1/2	CL-1/2-13x1.50-SHCS
HEAVY	CL-MF50-3311	No step	1.5000	2	21/32	5/8-11	1/2	1-1/8	5-1/2	CL-5/8-11x2.00-SHCS



Screw Rest Pads (**INFO+** page 432) can be positioned anywhere between grid points when mounted on an Extension Support.



Extension Supports are a perfect height locator to mount underneath Serrated Edge Clamps (**INFO+** page 448.



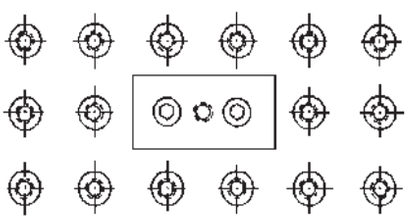
Forged Adjustable Clamps (**INFO+** page 438) can be placed anywhere between grid points when mounted in an Extension Support's tapped hole.

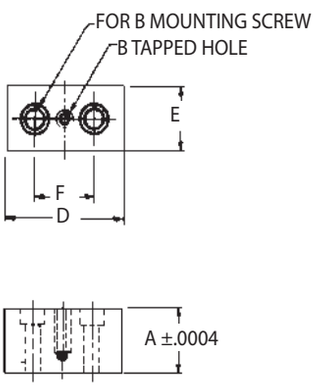
HALFWAY EXTENSION SUPPORTS

1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH



Standard
Heavy





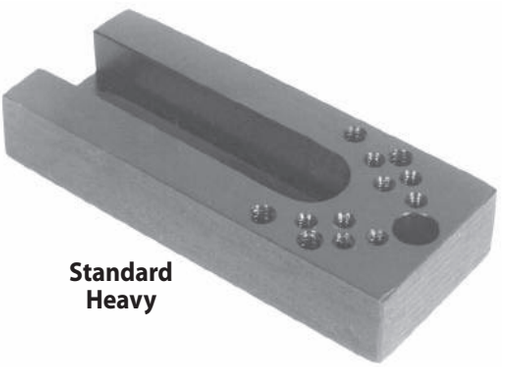
Precision ground top and bottom surface for accurate height location. Ideal for positioning components exactly halfway between two multipurpose holes. Also useful as a large rest pad.

SIZE	PART NO.	A	B	D	E	F	SOCKET-HEAD CAP SCREWS (2 REQD)
STANDARD	CL-MF40-3601	1.0000	1/2-13	4	2	2	CL-1/2-13x1.50-SHCS
HEAVY	CL-MF50-3603	1.5000	5/8-11	4	2	2	CL-5/8-11x2.00-SHCS

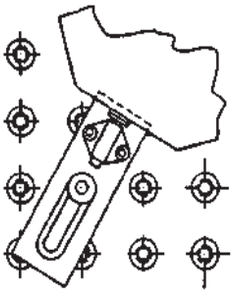
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SPRING-STOP-BUTTON ADAPTORS

CARBON STEEL, HEAT TREATED, BLACK OXIDE FINISH

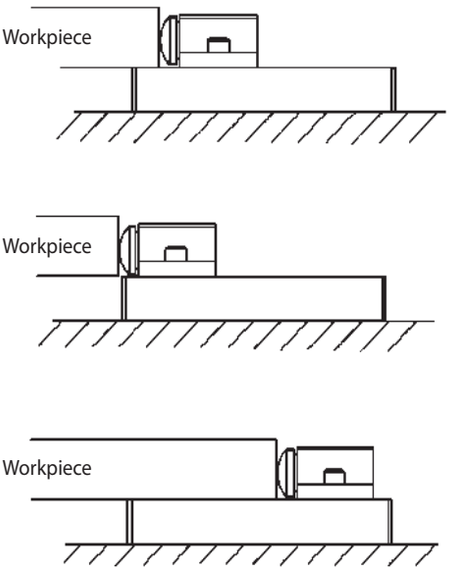


Standard Heavy



Versatile adaptor for standard Spring Stop Buttons and Spring Locating Pins. Applies spring pressure to the workpiece to hold it against its locators. Fits three sizes of Spring Stop Buttons, both round and flat face, and two sizes of Spring Locating Pins. **Patent no. 4,832,325.**

MOUNTING OPTIONS



The adaptor can be used three ways:
1. As a height-locating point. Use rear mounting holes.
2. Without height locating. Use front mounting holes.
3. Reverse mounting. Use as a height-locating point with most of adaptor under workpiece.



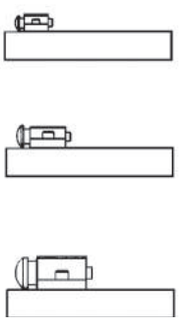
Round-Face Spring Stop Buttons

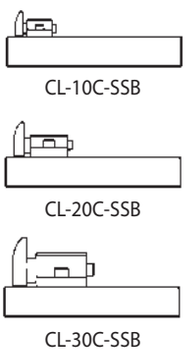


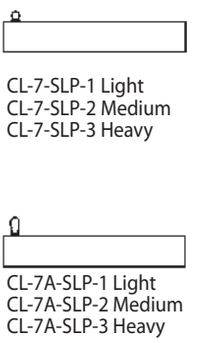
Flat-Face Spring Stop Buttons

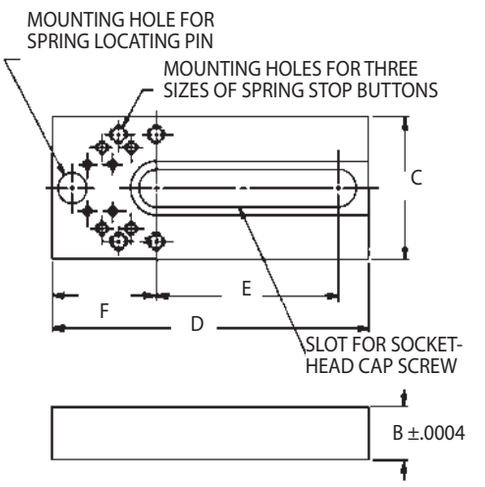


Spring Locating Pins







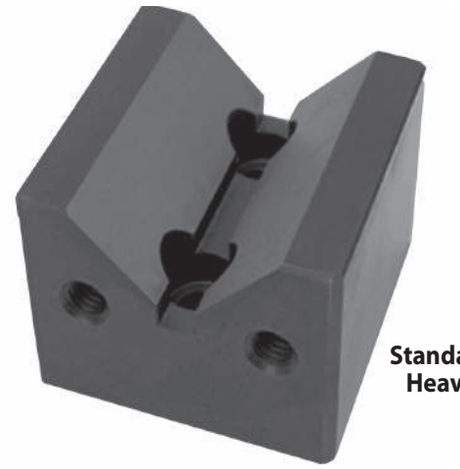


SIZE	PART NO.	FITS ROUND FACE STOP BUTTONS	FITS FLAT FACE STOP BUTTONS	FITS SPRING LOCATING PINS	B	C	D	E	F	SOCKET-HEAD CAP SCREW (1 REQD)	SOCKET-HEAD CAP SCREWS FOR SPRING STOP BUTTONS (2 REQD)		
											SMALL	MEDIUM	LARGE
STANDARD	CL-MF40-3902	CL-10A-SSB CL-20A-SSB CL-30A-SSB	CL-10C-SSB CL-20C-SSB CL-30C-SSB	CL-7-SLP-1 CL-7-SLP-2 CL-7-SLP-3	1.0000	2	4-3/4	2-3/4	1-9/16	CL-1/2-13x1.50-SHCS	CL-6-32x.50-SHCS	CL-10-32x.50-SHCS	CL-1/4-20x.75-SHCS
HEAVY	CL-MF50-3904	CL-10A-SSB CL-20A-SSB CL-30A-SSB	CL-10C-SSB CL-20C-SSB CL-30C-SSB	CL-7A-SLP-1 CL-7A-SLP-2 CL-7A-SLP-3	1.5000	2	4-3/4	2-3/4	1-9/16	CL-5/8-11x2.25-SHCS	CL-6-32x.50-SHCS	CL-10-32x.50-SHCS	CL-1/4-20x.75-SHCS

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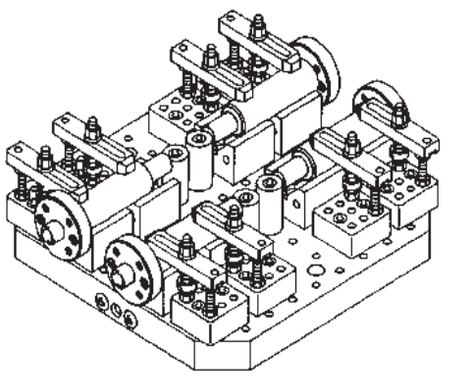
HORIZONTAL V BLOCKS

1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH

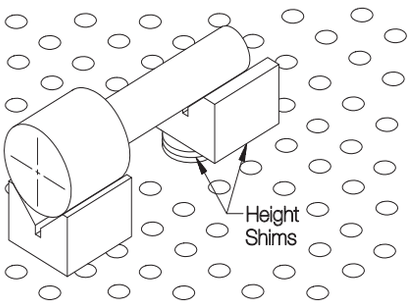


Standard
Heavy

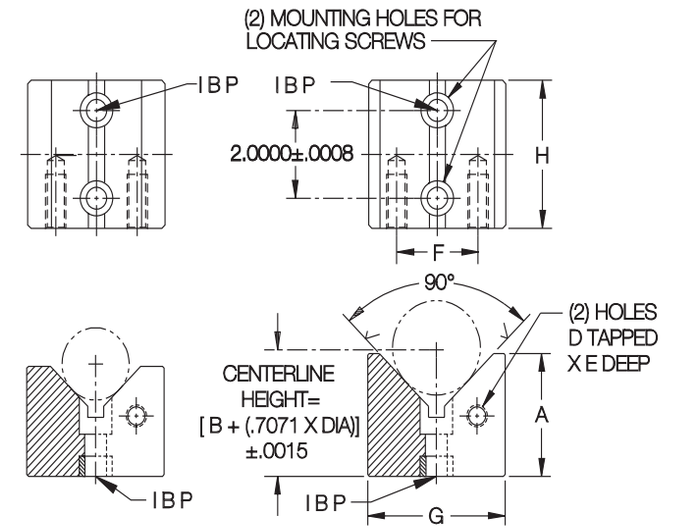
Extremely versatile locator for cylindrical workpieces. Locating surface is precision ground and accurately qualified with respect to the mounting holes. Two tapped holes in the side can be used to mount end stops or clamps. Available in two types: one for small diameters, and one for larger diameters.



In the above example, Support Cylinders are used as end stops for shafts located in Horizontal V Blocks.



To locate a workpiece from two different diameters simultaneously, use Height Shims (**INFO+** page 436) to raise one V block to the proper level.



Standard—Small V

Standard—Large V
Heavy—Large V

10

SMALL V

SIZE	PART NO.	WORKPIECE DIAMETER RANGE	A	B	D	E	F	G	H	LOCATING SCREWS (2 REQD)	SOCKET-HEAD CAP SCREWS (0 OR 2 REQD)
STANDARD	CL-MF40-6001	9/16 to 3-1/8	2-1/2	1.3951	1/2-13	1-1/8	2	3-3/8	3-3/8	CL-MF40-4302	—

LARGE V

STANDARD	CL-MF40-6002	9/16 to 4	3	1.5858	1/2-13	1-1/8	2	3-3/8	3-3/8	CL-MF40-4302	—
HEAVY	CL-MF50-6002	9/16 to 4	3	1.5858	5/8-11	1-3/8	2	3-3/8	3-3/8	CL-MF50-4302	—

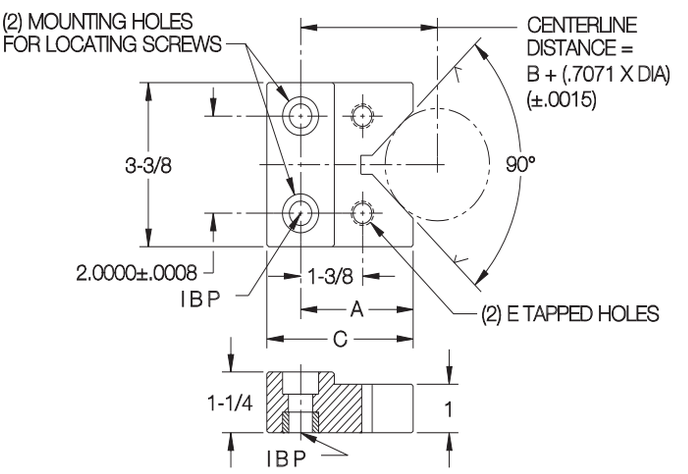
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VERTICAL V BLOCKS

1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH



Standard
Heavy



Ideal for mounting a cylindrical workpiece with its axis perpendicular to the tooling surface. Locating surfaces are precision ground and accurately qualified with respect to the mounting holes.

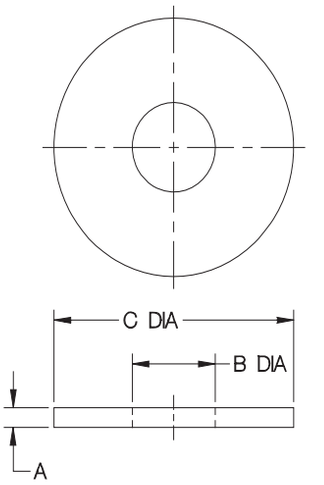
SIZE	PART NO.	WORKPIECE DIAMETER RANGE	A	B	C	E	LOCATING SCREWS (2 REQD)
STANDARD	CL-MF40-6101	9/16 to 3-1/8	2-1/2	1.3951	3-1/4	1/2-13	CL-MF40-4302
HEAVY	CL-MF50-6101	9/16 to 3-1/8	2-1/2	1.3951	3-1/4	5/8-11	CL-MF50-4302

HEIGHT SHIMS

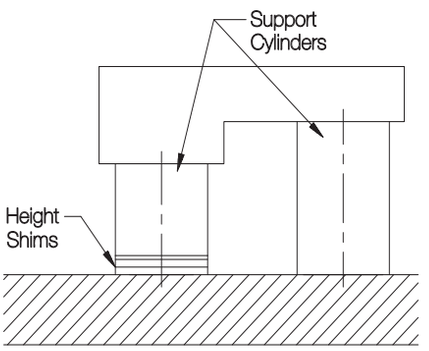
1010 STEEL



Standard
Heavy



Precision shims that allow raising a height locator by a small, exact amount. Ideal when supporting at different levels underneath a workpiece, as in the example shown using Support Cylinders. Thickness tolerance is ±.0003 on .125 size, ± 10% on smaller sizes.



SIZE	PART NO.	A	B DIA	C DIA
STANDARD	CL-MF40-7005	.005	9/16	1-5/8
	CL-MF40-7010	.010		
	CL-MF40-7020	.020		
	CL-MF40-7125	1.25		
HEAVY	CL-MF50-7005	.005	11/16	1-7/8
	CL-MF50-7010	.010		
	CL-MF50-7020	.020		
	CL-MF50-7125	1.25		

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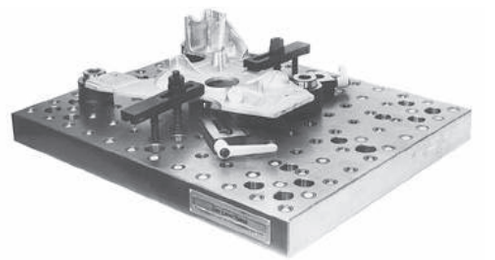
MANUAL WORK SUPPORTS

BODY & PLUNGER: CARBON STEEL, CASE HARDENED, BLACK OXIDE FINISH
HANDLE: ZINC DIE CASTING, ENAMEL PAINT

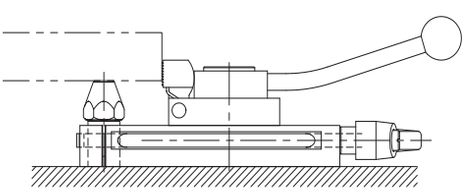


Standard
Heavy

Spring-extended manual work support with an extremely low profile. Plunger is locked at proper height by tightening handle. If desired, lock plunger in retracted position for easier loading of light parts, then release and retighten to extend and support. Adjustable handle can be reset to any convenient angle. **INFO+**: See page 229 for complete dimensions.



Ideal for supporting in hard-to-reach places, such as underneath this casting. Work supports can be positioned to allow convenient handle access.



A Screw Rest Pad (**INFO+** page 432), available from 1/4" to 2" tall, is an ideal contact bolt to use in the support plunger. For an adjustable contact screw, use a Knurled Screw Jack (**INFO+** page 437). The mounting slot allows stacking other components, such as this Cam Edge Clamp, on top of the support.

SIZE	PART NO.	TAPPED HOLE IN PLUNGER	HEIGHT WITH PLUNGER FULLY RETRACTED	MAX PLUNGER STROKE	DISTANCE FROM PLUNGER TO SLOT	SLOT LENGTH	SOCKET-HEAD CAP SCREW (1 REQD.)
STANDARD	CL-MF40-5701	1/2-13	.945	.236	1-9/16	3-9/16	CL-1/2-13x1.50-SHCS
HEAVY	CL-MF50-5702	5/8-11	1.339	.433	1-3/4	3-15/16	CL-5/8-11x2.00-SHCS

KNURLED SCREW JACKS

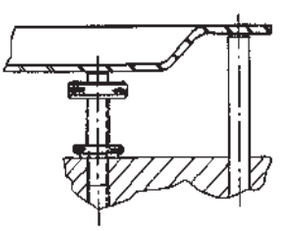
10

12L14 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH



Standard
Heavy

Knurled head allows quick, easy finger adjustment. Order Check Nut separately. **INFO+**: See page 311 for additional dimensions and sizes.



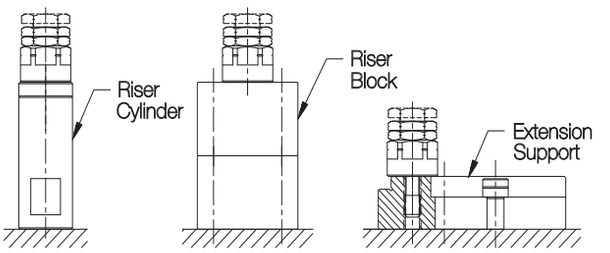
SIZE	KNURLED SCREW JACK PART NO.	CHECK NUT PART NO.	THREAD SIZE	LENGTH UNDER HEAD
STANDARD	CL-7-KSJ	CL-1213-TSJN	1/2-13	2-1/2
HEAVY	CL-10-KSJ	CL-5811-TSJN	5/8-11	2-1/2

HEAVY-DUTY SCREW JACKS

JACK SCREW: 4135 STEEL, HEAT TREATED, BLACK OXIDE FINISH
TIP: 1144 OR 1045 STEEL, HEAT TREATED, BLACK OXIDE FINISH
BODY: 1045 STEEL, BLACK OXIDE FINISH



Standard
Heavy

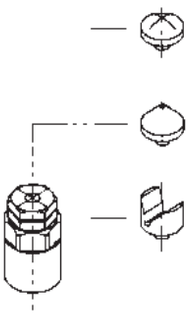


For additional height and/or mounting between grid points, use Riser Cylinders (**INFO+** page 445), Support Riser Blocks (**INFO+** page 432), or Extension Supports (**INFO+** page 433).

Heavy-duty adjustable support that accepts any of the three tips shown below. Choice of three heights in each size cover the full range of height possibilities. **INFO+**: See page 231 for additional dimensions and additional sizes.

SCREW JACKS

SIZE	PART NO.	MOUNTING SCREW SIZE	OUTSIDE DIAMETER	RETRACTED HEIGHT	MAX SCREW TRAVEL
STANDARD	CL-MF40-3401	1/2-13	1-9/16	1-5/8	3/8
	CL-MF40-3402			2	3/4
	CL-MF40-3403			2-3/4	1-1/2
HEAVY	CL-MF50-3401	5/8-11	1-9/16	1-5/8	3/8
	CL-MF50-3402			2	3/4
	CL-MF50-3403			2-3/4	1-1/2





Radius Tip **Conical Tip** **V-Shaped Tip**

SCREW-JACK TIPS

SIZE	PART NO.	TYPE	OUTSIDE DIAMETER	OVERALL TIP HEIGHT
ALL	CL-MF10-3501	RADIUS	1-3/16	3/8
	CL-MF10-3502	CONICAL		11/16
	CL-MF10-3503	V-SHAPED		11/16

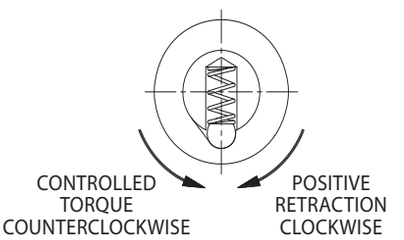
10

TORQUE SCREW JACKS

12L14 STEEL, BLACK OXIDE FINISH



Standard
Heavy



A knurled-head screw jack that declutches at a preset torque. When the indicated end force is reached, the head disengages and turns freely. This eliminates the possibility of exerting excess force on thinwall parts. Knurled Check Nut is furnished. **INFO+**: See page 311 for complete dimensions and additional sizes.

SIZE	PART NO.	THREAD SIZE	END FORCE (LBS)	LENGTH UNDER HEAD
STANDARD	CL-6-TSJ	1/2-13	18-20	1-3/4
HEAVY	CL-8-TSJ	5/8-11	20-22	1-3/4

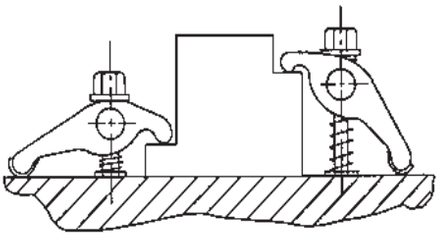
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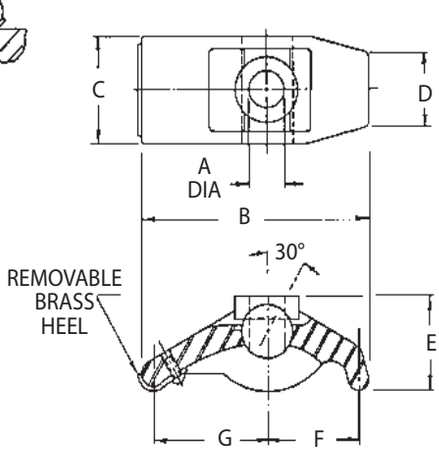
FORGED ADJUSTABLE CLAMPS

FORGED 1045 STEEL, BLACK OXIDE FINISH



Standard
Heavy





Rugged forged steel pivot clamp. Instant height adjustment without blocks or shims. One-piece assembly allows quick setups and eliminates lost clamp pieces. Removable brass heel protects machine table. Clamp can swing 90° in either direction for loading clearance.

CLAMP STRAPS

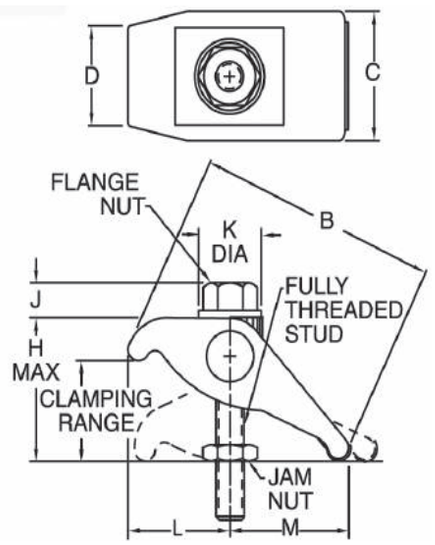
SIZE	PART NO.	STUD SIZE	CLAMPING RANGE	A DIA	B	C	D	E	F	G
STANDARD	CL-8-FAC	1/2 or M12	0 to 2-1/16	9/16	4	1-5/8	1-1/8	1-7/16	1-7/16	2-5/16
HEAVY	CL-10-FAC	5/8 or M16	0 to 3	11/16	5-1/2	1-7/8	1-3/8	1-7/8	2	3-1/4



Assembly with Flange Nut
CL-x-FACA-FN



Assembly with Hand Knob
CL-x-FACA-HK



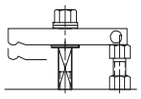
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ASSEMBLIES (INCH)

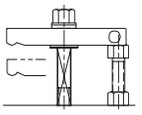
SIZE	PART NO.	STUD SIZE	CLAMPING RANGE	H	J	K DIA	L MIN	L MAX	M MIN	M MAX	FORGED ADJUSTABLE CLAMP	FULLY THREADED STUD	JAM NUT	FLANGE NUT
STANDARD	CL-8-FACA-FN	1/2-13	0 to 2-1/16	2-5/8	11/16	1-1/8	1-3/8	1-9/16	2-1/8	2-7/16	CL-8-FAC	CL-1/2-13x4.00-FTS	CL-8-JN	CL-3-FN
HEAVY	CL-10-FACA-FN	5/8-11	0 to 3	3-3/4	13/16	1-3/8	1-13/16	2-1/8	2-15/16	3-3/8	CL-10-FAC	CL-5/8-11x5.00-FTS	CL-10-JN	CL-4-FN

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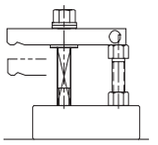
SLOTTED-HEEL CLAMP STRAPS



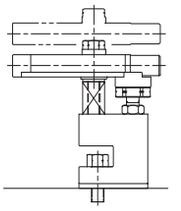
Short Clamp-Strap Assembly (see below)



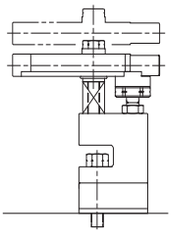
Tall Clamp-Strap Assembly (see below)



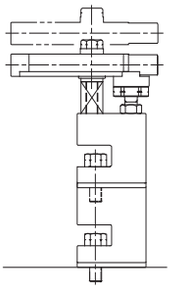
Tall Clamp-Strap Assembly - **INFO+:** on Riser Block (p. 432) or Riser Cylinders (p. 445)



High-Rise Clamp (**INFO+:** p. 442)



High-Rise Clamp on Spacer Block (**INFO+:** p. 443)



High-Rise Clamp on Narrow Riser Block (**INFO+:** p. 443)

Our most-popular clamp strap, with a slot underneath to allow sliding it straight back for clear loading. Choose from three different fastening devices, each available in a short or tall version, and two clamp-strap lengths. Order components individually (page numbers listed are in the tooling-component catalog section).



SPHERICAL NUT & WASHER (SHORT)

SIZE	CLAMPING HEIGHT RANGE	CLAMP STRAP (INFO++: p. 263) PART NO.	LENGTH	A	CLAMP REST (p. 329)	CLAMP SPRINGS (p. 330)	FLAT WASHER (p. 316)	JAM NUT (p. 312)	STUD (p. 318)	SPHER. NUT & WASHER (p. 314)
STANDARD	0 to 1-3/8	CL-8-CS	5	2-1/4	CL-4-CR	CL-9-SPG	CL-2-FW	CL-8-JN	CL-1/2-13x4.00	CL-3-SNW
		CL-10-CS	6	2-3/4						
HEAVY	0 to 1-3/8	CL-16-CS	5	2-3/16	CL-6-CR	CL-11-SPG	CL-3-FW	CL-10-JN	CL-5/8-11x4.50	CL-4-SNW
		CL-18-CS	6	2-11/16						

SPHERICAL NUT & WASHER (TALL)

STANDARD	1-3/8 to 2-3/4	CL-8-CS	5	2-1/4	CL-5-CR	(2) CL-9-SPG	CL-2-FW	CL-8-JN	CL-1/2-13x5.50	CL-3-SNW
		CL-10-CS	6	2-3/4						
HEAVY	1-3/8 to 2-1/2	CL-16-CS	5	2-3/16	CL-7-CR	(2)CL-11-SPG	CL-3-FW	CL-10-JN	CL-5/8-11x5.50	CL-4-SNW
		CL-18-CS	6	2-11/16						

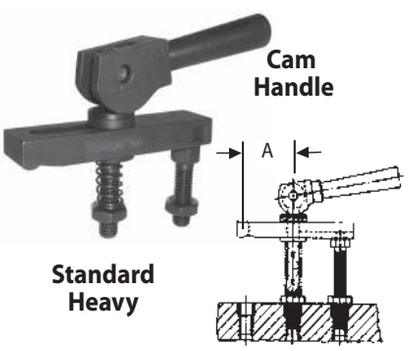


HAND KNOB (SHORT)

SIZE	CLAMPING HEIGHT RANGE	CLAMP STRAP (INFO++: p. 263) PART NO.	LENGTH	A	CLAMP REST (p. 329)	CLAMP SPRINGS (p. 330)	FLAT WASHER (p. 316)	JAM NUT (p. 312)	STUD (p. 318)	HAND KNOB (p. 100)	SPHERICAL WASHER (p. 314)
STANDARD	0 to 1-3/8	CL-8-CS	5	2-1/4	CL-4-CR	CL-9-SPG	CL-2-FW	CL-8-JN	CL-1/2-13x4.00	CL-4-HK-4	CL-3-SW
		CL-10-CS	6	2-3/4							
HEAVY	0 to 1-3/8	CL-16-CS	5	2-3/16	CL-6-CR	CL-11-SPG	CL-3-FW	CL-10-JN	CL-5/8-11x4.50	CL-10-HK-10	CL-4-SW
		CL-18-CS	6	2-11/16							

HAND KNOB (TALL)

STANDARD	1-3/8 to 2-3/4	CL-8-CS	5	2-1/4	CL-5-CR	(2) CL-9-SPG	CL-2-FW	CL-8-JN	CL-1/2-13x5.50	CL-4-HK-4	CL-3-SW
		CL-10-CS	6	2-3/4							
HEAVY	1-3/8 to 2-1/2	CL-16-CS	5	2-3/16	CL-7-CR	(2)CL-11-SPG	CL-3-FW	CL-10-JN	CL-5/8-11x5.50	CL-10-HK-10	CL-4-SW
		CL-18-CS	6	2-11/16							



CAM HANDLE (SHORT)

SIZE	CLAMPING HEIGHT RANGE	CLAMP STRAP (INFO++: p. 263) PART NO.	LENGTH	A	CLAMP REST (p. 329)	CLAMP SPRINGS (p. 330)	FLAT WASHER (p. 316)	JAM NUT (p. 312)	SPHERICAL WASHER (p. 314)	CAM HANDLE (p. 327)	EYE BOLT (p. 326)	CLEVIS PIN (p. 327)
STANDARD	0 to 1-3/8	CL-8-CS	5	2-1/4	CL-4-CR	CL-9-SPG	CL-2-FW	CL-8-JN	CL-3-SW	CL-13-CH	CL-50-EB	CL-1218-CLVP
		CL-10-CS	6	2-3/4								
HEAVY	0 to 1-3/8	CL-16-CS	5	2-3/16	CL-6-CR	CL-11-SPG	CL-3-FW	CL-10-JN	CL-4-SW	CL-14-CH	CL-62-EB	CL-2020-CLVP
		CL-18-CS	6	2-11/16								

CAM HANDLE (TALL)

STANDARD	1-3/8 to 2-3/4	CL-8-CS	5	2-1/4	CL-5-CR	(2) CL-9-SPG	CL-2-FW	CL-8-JN	CL-3-SW	CL-13-CH	CL-51-EB	CL-1218-CLVP
		CL-10-CS	6	2-3/4								
HEAVY	1-3/8 to 2-1/2	CL-16-CS	5	2-3/16	CL-7-CR	(2)CL-11-SPG	CL-3-FW	CL-10-JN	CL-4-SW	CL-14-CH	CL-63-EB	CL-2020-CLVP
		CL-18-CS	6	2-11/16								

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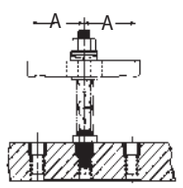
DOUBLE-END CLAMP STRAPS

A clamp-strap assembly with two clamping ends, for holding two workpieces simultaneously. Choose from three different fastening devices, each available in a short or tall version, and two clamp-strap lengths. Order components individually.



Spherical Nut & Washer

Standard
Heavy

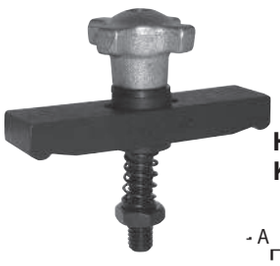


SPHERICAL NUT & WASHER (SHORT)

SIZE	CLAMPING-HEIGHT RANGE	CLAMP STRAP (INFO++: p. 276)			CLAMP SPRINGS (p. 330)	FLAT WASHER (p. 316)	JAM NUT (p. 312)	STUD (p. 318)	SPHERICAL NUT & WASHER (p. 314)
		PART NO.	LENGTH	A					
STANDARD	0 to 1-3/8	CL-28-CS	5	2-19/64	CL-9-SPG	CL-2-FW	CL-8-JN	CL-1/2-13x4.00	CL-3-SNW
		CL-30-CS	6	2-51/64					
HEAVY	0 to 1-3/8	CL-32A-CS	5	2-1/4	CL-11-SPG	CL-3-FW	CL-10-JN	CL-5/8-11x4.50	CL-4-SNW
		CL-33-CS	6	2-3/4					

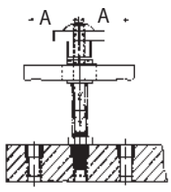
SPHERICAL NUT & WASHER (TALL)

STANDARD	1-3/8 to 2-3/4	CL-28-CS	5	2-19/64	(2) CL-9-SPG	CL-2-FW	CL-8-JN	CL-1/2-13x5.50	CL-3-SNW
		CL-30-CS	6	2-51/64					
HEAVY	1-3/8 to 2-1/2	CL-32A-CS	5	2-1/4	(2)CL-11-SPG	CL-3-FW	CL-10-JN	CL-5/8-11x5.50	CL-4-SNW
		CL-33-CS	6	2-3/4					



Hand Knob

Standard
Heavy



HAND KNOB (SHORT)

SIZE	CLAMPING-HEIGHT RANGE	CLAMP STRAP (INFO++: p. 276)			CLAMP SPRINGS (p. 330)	FLAT WASHER (p. 316)	JAM NUT (p. 312)	STUD (p. 318)	HAND KNOB (p. 100)	SPHERICAL NUT & WASHER (p. 314)
		PART NO.	LENGTH	A						
STANDARD	0 to 1-3/8	CL-28-CS	5	2-19/64	CL-9-SPG	CL-2-FW	CL-8-JN	CL-1/2-13x4.00	CL-4-HK-4	CL-3-SW
		CL-30-CS	6	2-51/64						
HEAVY	0 to 1-3/8	CL-32A-CS	5	2-1/4	CL-11-SPG	CL-3-FW	CL-10-JN	CL-5/8-11x4.50	CL-10-HK-10	CL-4-SW
		CL-33-CS	6	2-3/4						

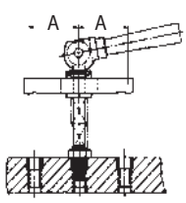
HAND KNOB (TALL)

STANDARD	1-3/8 to 2-3/4	CL-28-CS	5	2-19/64	(2) CL-9-SPG	CL-2-FW	CL-8-JN	CL-1/2-13x5.50	CL-4-HK-4	CL-3-SW
		CL-30-CS	6	2-51/64						
HEAVY	1-3/8 to 2-1/2	CL-32A-CS	5	2-1/4	(2)CL-11-SPG	CL-3-FW	CL-10-JN	CL-5/8-11x5.50	CL-10-HK-10	CL-4-SW
		CL-33-CS	6	2-3/4						



Cam Handle

Standard
Heavy



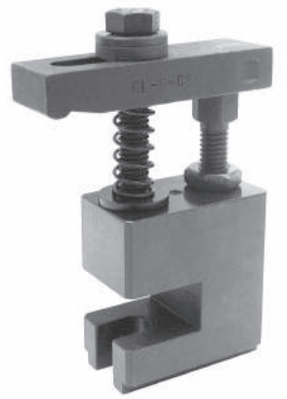
CAM HANDLE (SHORT)

SIZE	CLAMPING-HEIGHT RANGE	CLAMP STRAP (INFO++: p. 276)			CLAMP SPRINGS (p. 330)	FLAT WASHER (p. 316)	JAM NUT (p. 312)	SPHERICAL NUT & WASHER (p. 314)	CAM HANDLE (p. 327)	EYE BOLT (p. 326)	DOWEL PIN (p. 248)
		PART NO.	LENGTH	A							
STANDARD	0 to 1-3/8	CL-28-CS	5	2-19/64	CL-9-SPG	CL-2-FW	CL-8-JN	CL-3-SW	CL-13-CH	CL-50-EB	CL-3/8x1.00-CADP
		CL-30-CS	6	2-51/64							
HEAVY	0 to 1-3/8	CL-32A-CS	5	2-1/4	CL-11-SPG	CL-3-FW	CL-10-JN	CL-4-SW	CL-14-CH	CL-62-EB	CL-5/8x1.25-CADP
		CL-33-CS	6	2-3/4							

SPHERICAL NUT & WASHER (TALL)

STANDARD	1-3/8 to 2-3/4	CL-28-CS	5	2-19/64	(2) CL-9-SPG	CL-2-FW	CL-8-JN	CL-3-SW	CL-13-CH	CL-51-EB	CL-3/8x1.00-CADP
		CL-30-CS	6	2-51/64							
HEAVY	1-3/8 to 2-1/2	CL-32A-CS	5	2-1/4	(2)CL-11-SPG	CL-3-FW	CL-10-JN	CL-4-SW	CL-14-CH	CL-63-EB	CL-5/8x1.25-CADP
		CL-33-CS	6	2-3/4							

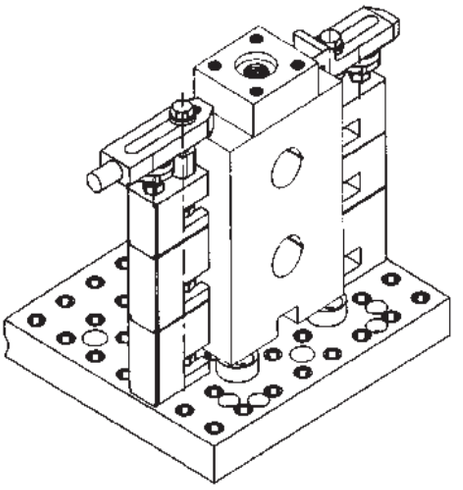
HIGH-RISE CLAMPS

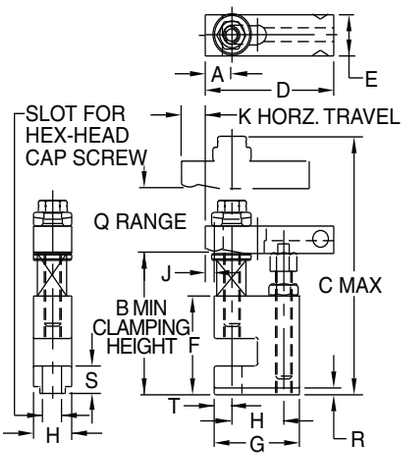


Slotted Heel

For clamping taller workpieces. All-in-one clamp construction for quick, safe setups. Modular design allows stacking for height flexibility. Clamp Straps slide back for loading clearance.

Standard Heavy





High-Rise Clamps can be stacked on Narrow Riser Blocks and Spacer Blocks (**INFO+**: page 443) to reach tall workpieces.

SLOTTED HEEL HIGH-RISE CLAMPS

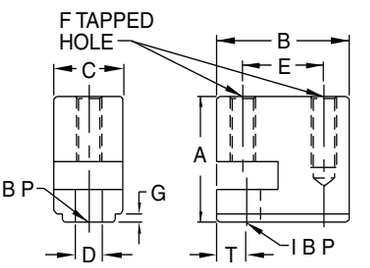
SIZE	PART NO.	A	B	C	D	E	F	G	H	J	K	Q	R	S	T	HEX-HEAD CAP SCREW (1 REQD)
STANDARD	CL-MF40-2051	23/32	3-5/8	5-3/4	4	1-1/4	2-3/4	2-3/4	1-9/16	13/64	1-9/32	1	3/16	13/16	9/16	CL-MF40-4311
HEAVY	CL-MF50-2051	29/32		7-1/4	5	1-1/2	2-15/16	3-9/16	2	1/4	1-19/32				13/16	CL-MF50-4311

* Use CL-MF25-4311 when mounted on a Narrow Riser Block.



Adaptor Base

Adaptor used in the assembly above. Also allows using other types of clamp straps as high-rise clamps.



Standard Heavy

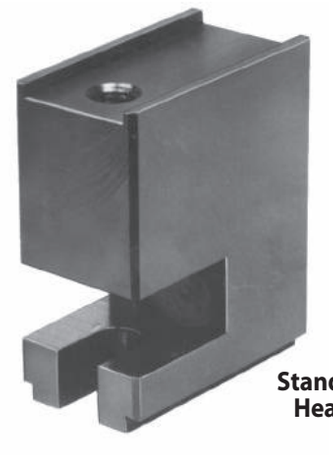
ADAPTOR BASES

SIZE	PART NO.	A	B	C	D	E	F	G	HEX-HEAD CAP SCREW (1 REQD)
STANDARD	CL-MF40-1901	2-3/4	2-3/4	1-9/16	9/16	1-9/16	1/2-13	3/16	CL-MF40-4311
HEAVY	CL-MF50-1901	2-15/16	3-9/16	2	11/16	2	5/8-11	3/16	CL-MF50-4311

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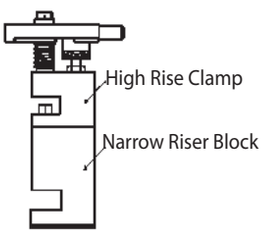
HIGH-RISE-CLAMP ACCESSORIES

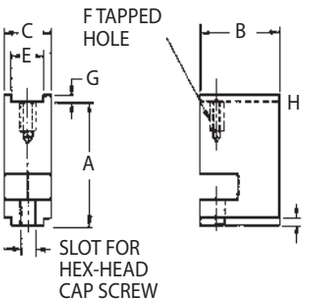
CARBON STEEL, BLACK OXIDE FINISH



Narrow Riser Block

Standard Heavy

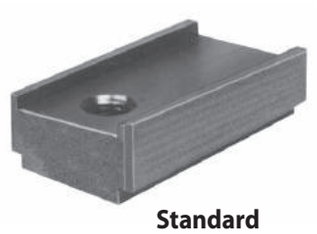




These Narrow Riser Blocks are used to raise up High-Rise Clamps to reach tall workpieces. Interlocking channels ensure that clamps and risers remain properly aligned when stacked up. Clamps and risers are fastened to the tapped hole on top of the riser block.

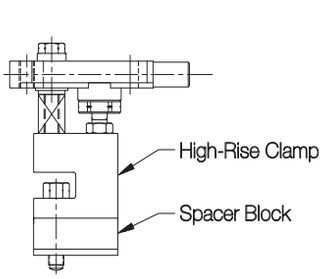
NARROW RISER BLOCKS

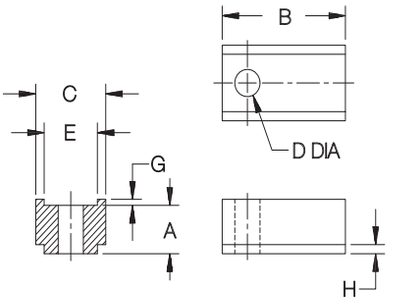
SIZE	PART NO.	A	B	C	E	F	G	H	HEX-HEAD CAP SCREW (1 REQD)
STANDARD	CL-MF40-2301	3	2-3/4	1-9/16	1-3/16	1/2-13	1/8	3/16	CL-MF40-4311
HEAVY	CL-MF50-2301	3	3-9/16	2	1-9/16	5/8-11	1/8	3/16	CL-MF50-4311



Spacer Block

Standard Heavy





A shorter version of the Narrow Riser Block for raising height only slightly. These blocks also have interlocking channels and can be stacked. Note: A longer hex-head cap screw is required to mount the High-Rise Clamp when using a Spacer Block.

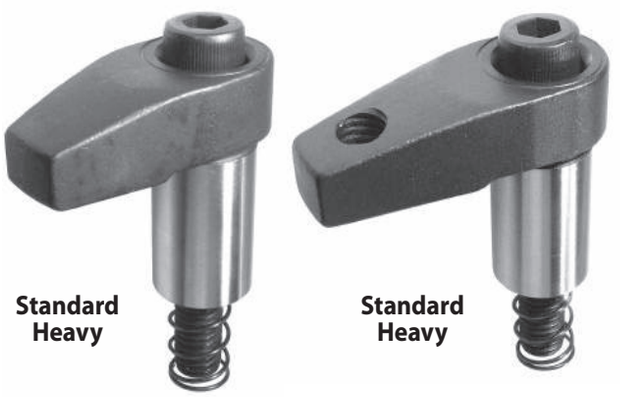
SPACER BLOCKS

SIZE	PART NO.	A	B	C	D DIA	E	G	H
STANDARD	CL-MF40-2351	1	2-3/4	1-9/16	17/32	1-3/16	1/8	3/16
HEAVY	CL-MF50-2351	1	3-9/16	2	11/16	1-9/16	1/8	3/16

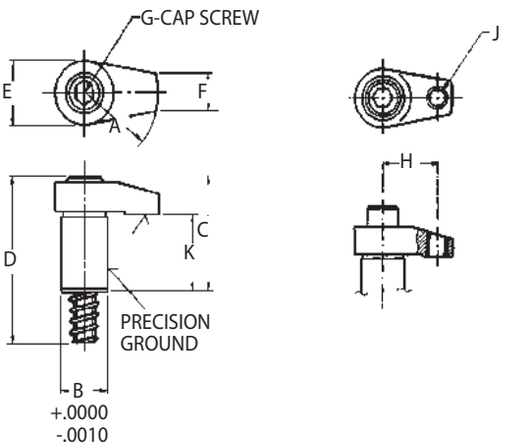
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HOOK CLAMPS

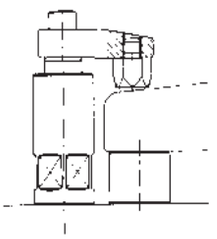
CLAMP BODY: 4135 STEEL, HEAT TREATED, BLACK OXIDE FINISH
HOLDER: 1045 STEEL, BLACK OXIDE FINISH



Long Arm **Tapped Long Arm**



Versatile Hook Clamps available with either a plain or tapped arm. The tapped-arm version accepts a wide variety of contact bolts ar adjustment spindles to increase clamping range (the tapped arm is also slightly longer). **INFO+**: For additional sizes and more complete dimensions, see pages 297-300 of tooling component catalog section.



LONG-ARM HOOK CLAMPS

SIZE	PART NO.	A	B DIA	C	D	E	F	G	H	J	K
STANDARD	CL-MF40-5002	2	1.0000	2-1/2	3-1/2	1-1/4	11/16	1/2-13x3.00	—	—	1-17/32
HEAVY	CL-MF50-5002	2	1.2500	2-7/8	3-7/8	1-7/16	7/8	5/8-11x3.25	—	—	1-17/32

TAPPED LONG-ARM HOOK CLAMPS

STANDARD	CL-MF40-5013	2-3/8	1.0000	2-1/2	3-1/2	1-1/4	11/16	1/2-13x3.00	1-13/16	1/2-13	1-17/32
HEAVY	CL-MF50-5014	2-3/8	1.2500	2-7/8	3-7/8	1-7/16	7/8	5/8-11x3.25	1-13/16	5/8-11	1-17/32

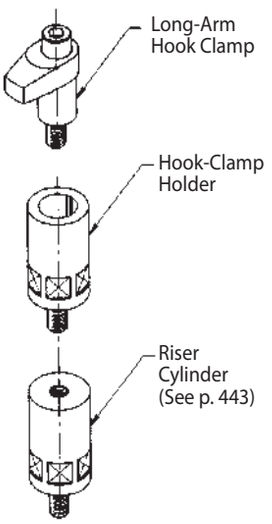
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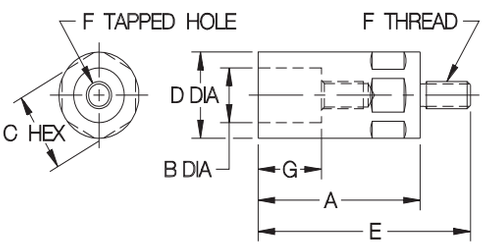
Hook Clamps work well in conjunction with Support Cylinders (**INFO+** page 430) or Screw Rest Pads (**INFO+** page 432) to allow clamping directly over a supported point. **INFO+**: Also see page 445 for Hook-Clamp Mounting Blocks.



Standard Heavy

Hook-Clamp Holder





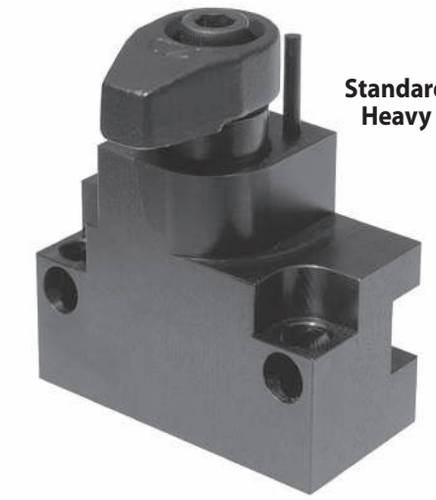
HOOK-CLAMP HOLDERS

SIZE	PART NO.	F THREAD SIZE	A	B DIA	C	D DIA	E	G
STANDARD	CL-MF40-5101	1/2-13	3-1/8	1.0000	1-7/16	1-9/16	4-3/8	1-9/16
	CL-MF40-5102		4				5-1/4	
HEAVY	CL-MF50-5101	5/8-11	3-1/8	1.2500	1-3/4	2	4-3/8	1-9/16
	CL-MF50-5102		4				5-1/4	

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HOOK CLAMPS

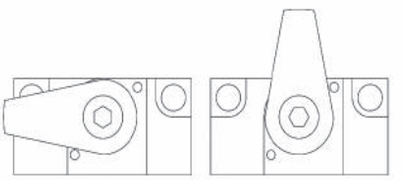
MOUNTING BLOCKS: 1045 STEEL, BLACK OXIDE FINISH

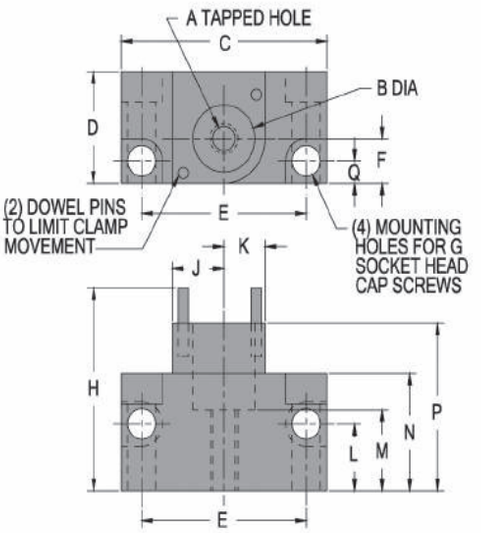


Standard
Heavy

Hook-Clamp Mounting Block
(order Hook-Clamp separately)

These mounting blocks for long-arm Hook Clamps have built-in 90˚ stops that provide consistent arm positioning in both clamped and unclamped position. Two sets of mounting holes allow either base mounting or side mounting. Precision bored hole for smooth swing action. Available for all three sizes of long-arm Hook Clamps.





HOOK-CLAMP MOUNTING BLOCKS

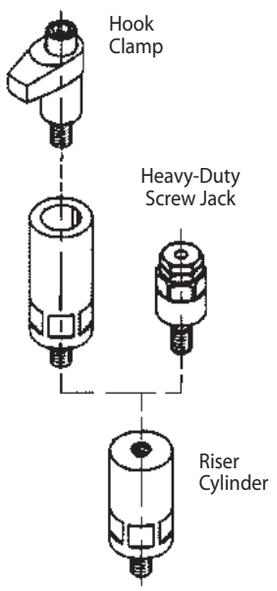
SIZE	PART NO.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
STANDARD	CL-MF40-5801	1/2-13	1.0000	2-3/4	2	2	1	1/2-13	3-3/4	1	3/4	1	1-5/32	1-7/8	2-3/4	3/8
HEAVY	CL-MF50-5801	5/8-11	1.2500	5	2	4	1	5/8-11	3-3/4	1	1	1-1/4	1-5/32	2-1/4	2-3/4	1/2

RISER CYLINDERS

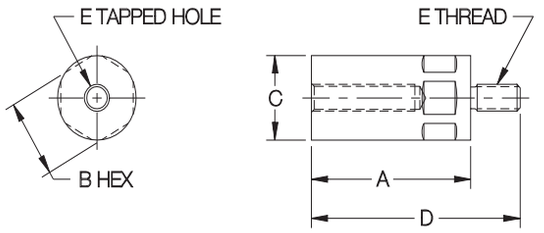
1045 STEEL, BLACK OXIDE FINISH



Standard
Heavy



Provides additional height without taking up much space. Useful with Hook Clamps (**INFO+** page 444), and Heavy-Duty Screw Jacks (**INFO+** page 438).



SIZE	PART NO.	A	B	C DIA	D	E
STANDARD	CL-MF40-5201	2	1-7/16	1-9/16	3-1/4	1/2-13
	CL-MF40-5203	3-1/8			4-3/8	
	CL-MF40-5204	4			5-1/4	
HEAVY	CL-MF50-5201	2	1-13/16	2	3-1/4	5/8-11
	CL-MF50-5203	3-1/8			4-3/8	
	CL-MF50-5204	4			5-1/4	

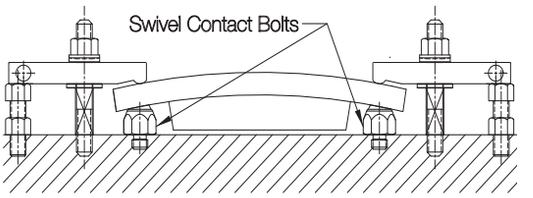
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SWIVEL CONTACT BOLTS

BALL: CHROME STEEL, HEAT TREATED RC 60-67
BODY: 1144 STEEL, HEAT TREATED RC 35-40, BLACK OXIDE FINISH

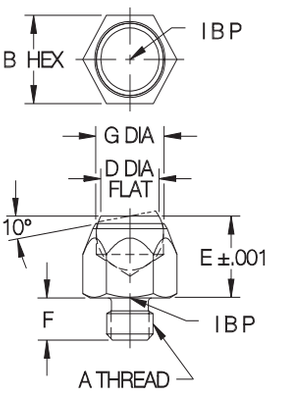


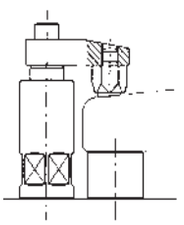
Standard
Heavy



Swivel Contact Bolts are precision ground for accurate height location, even on sloped surfaces. **INFO+**: See page 436 for Height Shims if additional heights are required.

Precision swivel ball that can be used as either a contact bolt or rest pad. Ideal for evenly distributing clamping pressure on sloped surfaces. **INFO+**: For additional thread sizes, see tooling-component catalog section (page 226).





SIZE	PART NO.	A	B	D DIA	E	F	G DIA
STANDARD	CL-MF40-2501	1/2-13	7/8	5/8	.8125	.41	23/32
HEAVY	CL-MF50-2501	5/8-11	1-1/16	13/16	1.0000	.61	29/32

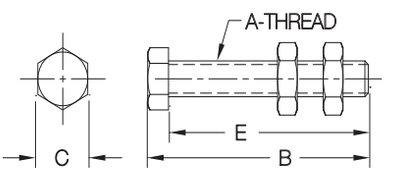
10

STANDARD-ADJUSTABLE SPINDLES

CARBON STEEL, ZINC PLATED CLEAR CHROMATE



Standard
Heavy



Long hex-head contact bolt. Fully threaded for maximum adjustment range.

SIZE	PART NO.	A	B	C	E
STANDARD	CL-12314-SA	1/2-13	3-5/16	3/4	3
HEAVY	CL-58438-SA	5/8-11	4-3/8	15/16	4

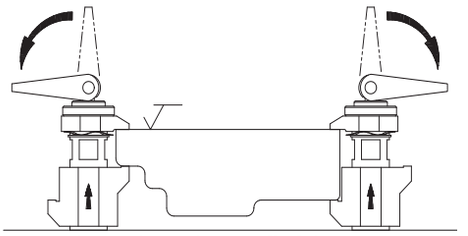
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UP-THRUST CLAMPS

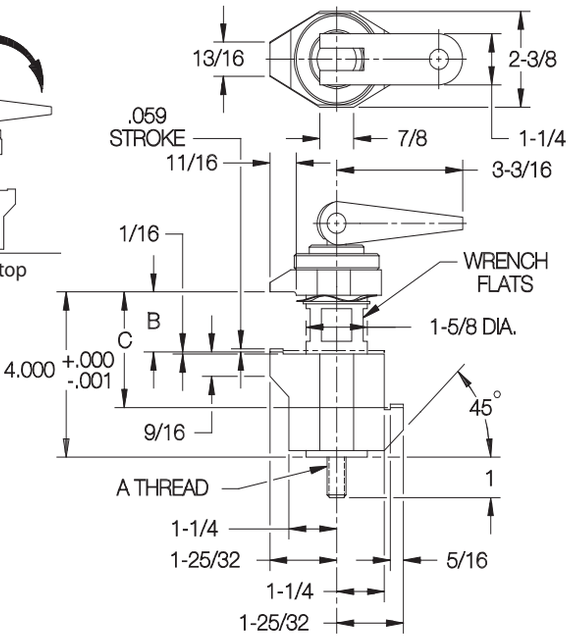
STEEL, WEAR SURFACES HARDENED, BLACK OXIDE FINISH



Standard



Up-Thrust Clamps locate off of the part's top surface and clamp up from below.



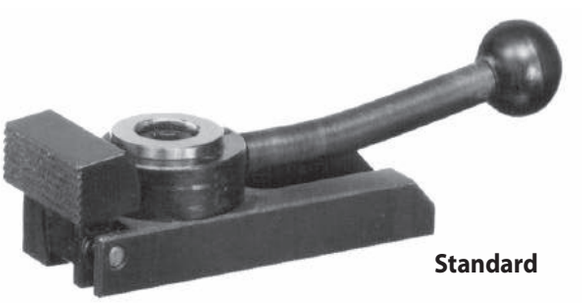
Combination clamp and locator with unique upward clamping action. Pushing down the cam handle pulls the lower jaw upward. This clamps the workpiece against the stationary upper jaw, whose bottom surface is a precision-ground locator.

The lower jaw has two clamping surfaces 180° apart, one for thinner parts, the other for thicker parts. The cam handle rotates to screw the lower jaw up or down for fine adjustment.

SIZE	PART NO.	A	B RANGE		C RANGE		MAX CLAMPING FORCE (LBS)
			MIN	MAX	MIN	MAX	
STANDARD	CL-MF40-5301	1/2-13	0	1-3/8	1-3/8	2-3/4	2200

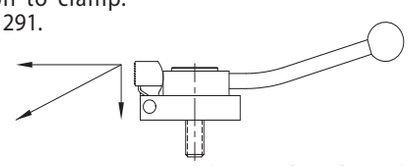
CAM EDGE CLAMPS

BODY: STEEL, WEAR SURFACES HARDENED, BLACK OXIDE FINISH
BALL HANDLE: BLACK PHENOLIC PLASTIC

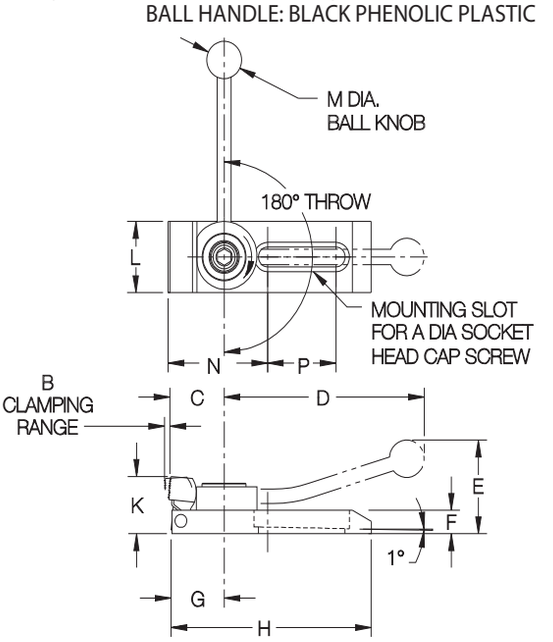


Standard

Pivoting-nose edge clamp operated by a cam handle for fast action. Smooth spiral cam locks positively anywhere within its 180° throw. Choice of clockwise or counterclockwise handle rotation to clamp. **INFO+**: For additional models, see page 291.



Nose pivots to exert clamping force forward and downward at the same time.

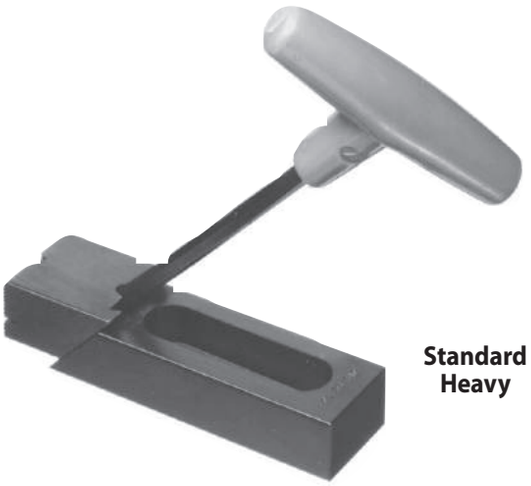


SIZE	PART NO.	CLAMPING DIRECTION	A	B	C	D	E	F	G	H	K		L	M	N	P	MAX CLAMPING FORCE (LBS)		SOCKET-HEAD CAP SCREW (1 REQD)
											MIN	MAX					HORIZ	VERT	
STANDARD	CL-MF40-5611	CLOCKWISE	1/2-13	7/32	1-9/16	5-3/4	2-1/2	5/8	1-1/2	6	1-5/16	1-1/2	1-7/8	1	2-15/16	2	1500	100	CL-1/2-13x1.25-SHCS
	CL-MF40-5612	CCW																	

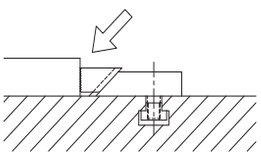
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SERRATED EDGE CLAMPS

BODY AND NOSE: 1018 STEEL, CARBURIZED-HARDENED, BLACK OXIDE FINISH
CLAMPING SCREW: 4140 STEEL, HEAT TREATED RC 43-45, BLACK OXIDE FINISH
NOSE COVER: ALUMINUM

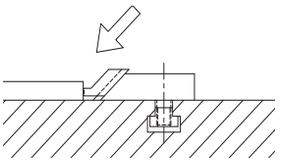


Standard Heavy



High Nose

High-nose version is best for most applications. Gripping high up on the workpiece, close to the machining plane, provides maximum clamping rigidity. A removable aluminum nose cover is furnished for clamping soft or machined parts without damage.



Low Nose

Low-nose version is ideal for thin parts, with its extra machining clearance.

This low-profile clamp is ideal for gripping the side of a workpiece to keep the top clear for machining. Clamps both forward and down simultaneously, by tightening the socket-head screw in the sliding nose with a hex wrench. V-groove in nose is excellent for clamping round parts or corners.

ADJUSTABLE — HIGH NOSE

SIZE	PART NO.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	MOUNTING SCREWS (1 OR 2 REQD)
STANDARD	CL-45-SAC	4	7/8	1-1/2	—	—	—	1-1/4	1/2	5/8	5/16	3-3/16	1/4	—	—	2-1/4	(1) CL-1/2-13x1.50-SHCS
	CL-55-SAC	5-1/2						2-1/8				4-11/16				2-1/2	
	CL-65-SAC	7-1/8						3				6-5/16				2-9/16	
HEAVY	CL-75-SAC	5-1/2	1-1/4	1-3/4	—	—	—	1-3/8	5/8	3/4	5/16	4-1/2	5/16	—	—	3-9/32	(1) CL-5/8-11x2.00-SHCS
	CL-95-SAC	8-1/4						4				7-1/4				3	(2) CL-5/8-11x2.00-SHCS

ADJUSTABLE — LOW NOSE

STANDARD	CL-40-SAC	4	7/8	1-1/2	—	—	—	1-1/4	1/2	—	5/16	3-3/16	1/4	1/4	1/4	2-1/4	(1) CL-1/2-13x1.50-SHCS
	CL-50-SAC	5-1/2						2-1/8				4-11/16				2-1/2	
	CL-60-SAC	7-1/8						3				6-5/16				2-9/16	
HEAVY	CL-70-SAC	5-1/2	1-1/4	1-3/4	—	—	—	1-3/8	5/8	—	5/16	4-1/2	5/16	5/16	5/16	3-9/32	(1) CL-5/8-11x2.00-SHCS
	CL-90-SAC	8-1/4						4				7-1/4				3	(2) CL-5/8-11x2.00-SHCS

FIXED — HIGH NOSE

STANDARD	CL-45-SFC	2-11/16	7/8	1-1/2	2	3	1	—	—	5/8	5/16	1-7/8	1/4	—	—	2-3/16	(2) CL-1/2-13x1.38-FHSS
HEAVY	CL-75-SFC	3-1/2	1-1/4	1-3/4	2	3-1/4	1-1/4	—	—	3/4	5/16	2-1/2	5/16	—	—	2-7/8	(2) CL-5/8-11x2.00-FHSS

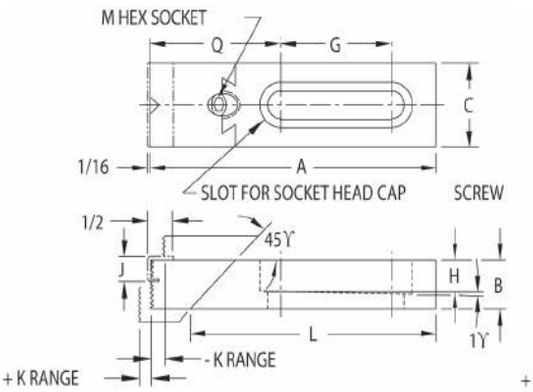
FIXED — LOW NOSE

STANDARD	CL-40-SFC	2-11/16	7/8	1-1/2	2	3	1	—	—	5/8	5/16	1-7/8	1/4	1/4	1/4	2-3/16	(2) CL-1/2-13x1.38-FHSS
HEAVY	CL-70--SFC	3-1/2	1-1/4	1-3/4	2	3-1/4	1-1/4	—	—	3/4	5/16	2-1/2	5/16	5/16	5/16	2-7/8	(2) CL-5/8-11x2.00-FHSS

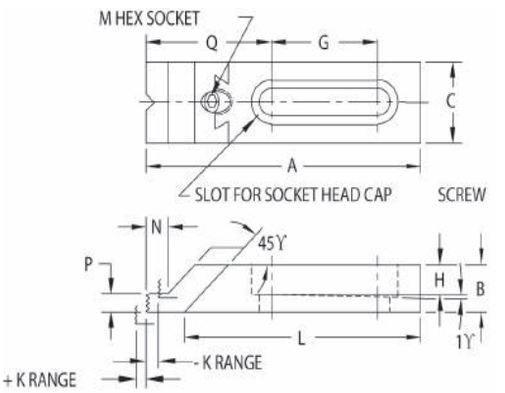
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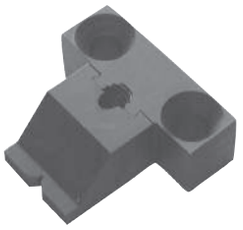
Serrated Adjustable Edge Clamp



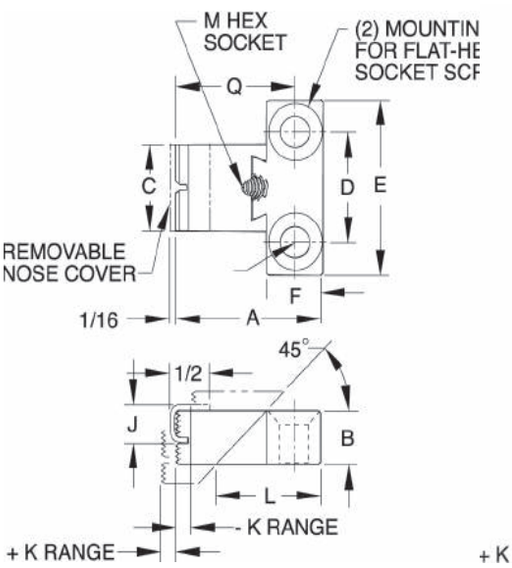
High Nose



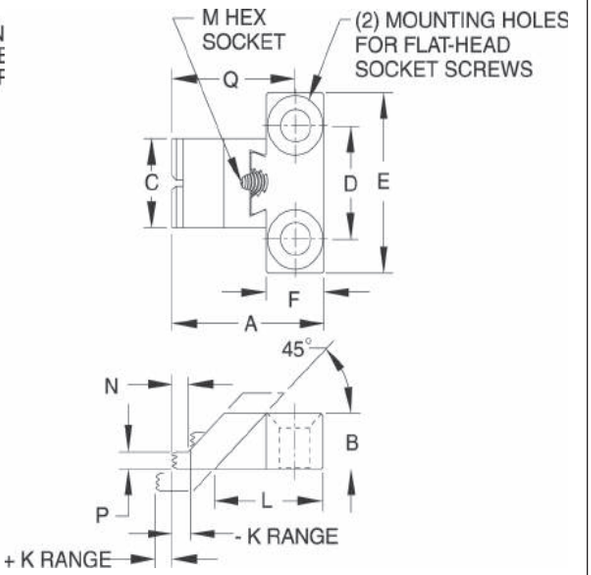
Low Nose



Serrated Fixed Edge Clamp



High Nose



Low Nose

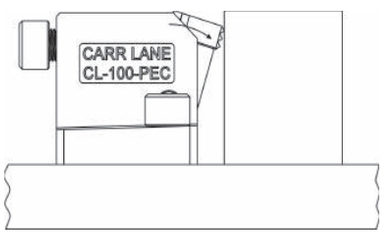
10

PIVOTING EDGE CLAMPS

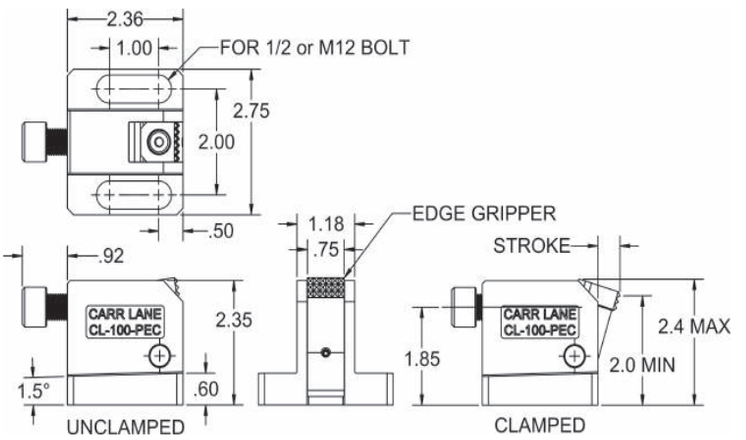
BODY & JAW: 1018 STEEL, BLACK OXIDE FINISH
EDGE GRIPPER: M-2 TOOL STEEL, HEAT TREATED Rc 60-62, BLACK OXIDE FINISH
DOWEL PIN: 4140 ALLOY STEEL



Standard



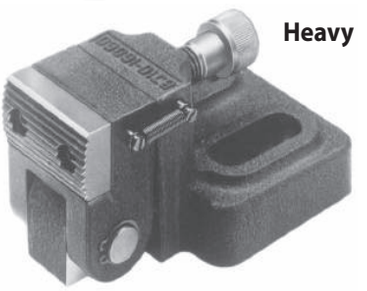
This edge clamp is well suited for holding large castings and other tall workpieces. The pivoting jaw exerts clamping force forward and downward at the same time. The jaw has a replaceable serrated gripper made of hardened tool steel for high-production durability. The slotted base provides adjustability and has a tapered top surface to prevent the clamp from moving. Fasten with two Socket-Head Cap Screws (order separately).



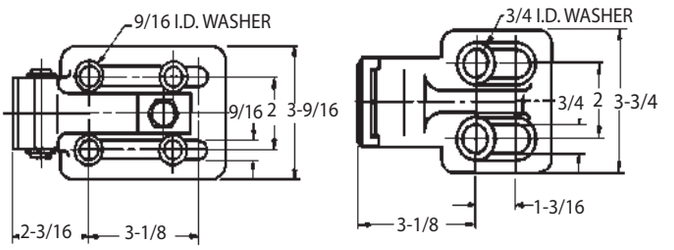
PART NO.	MAXIMUM CLAMPING STROKE	MOUNTING SCREW SIZE	THRUST SCREW SIZE	BALL-END THRUST SCREW (FURNISHED)	EDGE GRIPPER (FURNISHED)
CL-100-PEC	1/2	1/2-13 or M12	1/2-20	CL-80-BTS-1.75	CL-12-EG-6

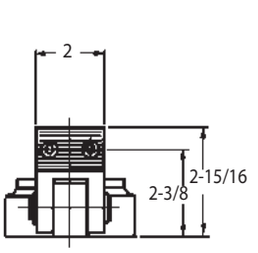


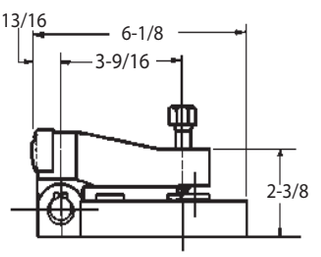
Standard



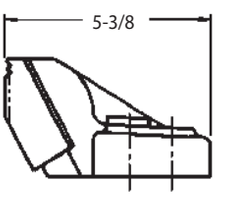
Heavy







Standard



Heavy

These large edge clamps are well suited for holding large castings and othre tall workpieces. The wide pivoting jaw exerts clamping force forweward and dowward at the same time. The slotted base provides adjustability. Available in standard (1/2″) and heavy (5/8″) sizes.

SIZE	PART NO.	MAX. CLAMPING FORCE (LBS)		SOCKET-HEAD CAP SCREWS (2 OR 4 REQD)	REPLACEMENT JAW
		HORIZ	VERT		
STANDARD	CL-MF40-1001	2000	220	(4) CL-1/2-13x2.25-SHCS	CL-MF40-1011
HEAVY	CL-MF50-1001	4200	730	(2) CL-5/8-11x3.00-SHCS	CL-MF40-1011

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TOGGLE CLAMPS



Horizontal-Handle Hold-Down Clamps



Vertical-Handle Hold-Down Clamps



Push/Pull Clamps



Latch-Action Clamps



Toggle Pliers



Air-Powered Clamps



Toggle Clamp Accessories

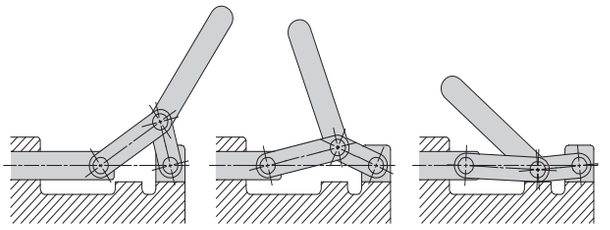
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TOGGLE CLAMPS

TOGGLE-ACTION PRINCIPLES

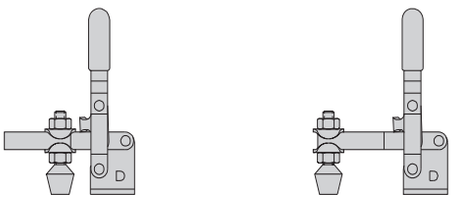
A toggle clamp is a quick-acting mechanical linkage where two of the elements make up a toggle action. Actuating the clamp first moves it into position, then applies clamping force by compressing or stretching the linkage elements after contacting the workpiece, then positively locks it by moving the toggle action's center pivot past the centerline of the other two pivots, against a stop.



1 Moving into position | 2 Applying clamping force | 3 Locking over center

HOLDING CAPACITY

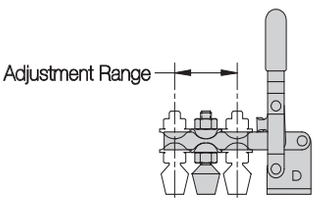
The "holding capacity" listed for each clamp refers to the maximum external force that clamp can safely resist in its locked position without incurring any permanent deformation. For hold-down clamps, holding capacity is measured with the spindle as close as possible to the handle, and will be less at the end of the clamping arm.



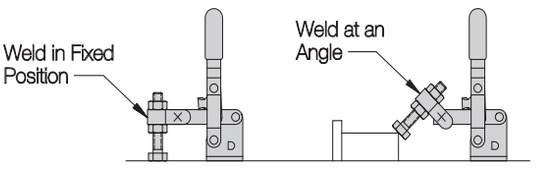
Spindle position for maximum capacity | Spindle position for maximum reach

ARM TYPES

Open-arm hold-down clamps offer maximum flexibility and adjustability. Two flanged washers hold the spindle in place anywhere along the arm by tightening the jam nuts.



Solid-arm hold-down clamps are easily customized to a particular application. Using the weld-on bolt retainer, you can locate the spindle permanently in one place. The solid-arm version allows mounting the spindle at an angle, o shortening the clamping arm.



MATERIALS

STEEL

Steel clamps are made from various types including 1008, 1010, 1018, and other fine steels. Pivot pins on most clamp models are 400-series stainless steel for extra durability. Many pivot points have hardened steel bushes for long life. Forged steel components, such as those on toggle pliers and push/pull clamps, are made from high-carbon steel. Many push/pull clamp bases are made of nodular iron for wear resistance.

STAINLESS STEEL

Many toggle-clamp models are available in 300-series stainless steel. These corrosion-resistant clamps are useful in chemical environments, plating operations, food processing, salt-spray environments, medical equipment, electronics fixturing, EDM fixturing, and marine environments. Various stainless steel grades, including 303 and 304, are used. Clamps normally furnished with a flat-cushion spindle in the steel version are supplied with a stainless steel hex-head spindle. Other clamps are available in stainless steel as specials.

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TOGGLE CLAMPS

TYPES

All Carr Lane Manufacturing toggle clamps are DFARS and RoHS compliant.



HORIZONTAL-HANDLE

Most popular of all toggle clamps. Clamping weights from 100 to 1,000 lbs. Comfortable finger grip. Options include automatically adjusting, low arm, and extra wide opening. **See page 455.**



VERTICAL-HANDLE

Similar to clamps above, except this version has a vertical handle. Clamping weights from 100 to 1,200 lbs. and heavy duty versions offering clamping power from 750 to 6,000 lbs. **See page 465.**



PUSH/PULL

Push/pull clamps feature a plunger that advances and locks by moving the handle forward. Clamp can also be used for pulling instead of pushing. Clamping weights from 100 to 16,000 lbs. **See page 490.**



LATCH-ACTION

Latch action options include adjustable U Bolt, Right-Angle Adjustable U Bolt, Adjustable Hook, and fixed length. **See page 502.**



PLIERS

Forged steel provides strong clamping action. Clamping weights from 200 to 800 lbs. Includes permanently attached and Toggle Bar Clamps as options. **See page 510.**



AIR-POWERED

This clamp linkage is operated by a double-acting air cylinder instead of by hand. Provides high holding capacity and insures positive mechanical locking even if air pressure fails. **See page 515.**

SELECTION CHART

STYLE	CAPACITY									
	0-99	100-199	200-299	300-499	500-750	751-1000	1,000-1,499	1,500-1,999	2,000-5,000	5,001+
Horizontal Handle	X	X	X	X	X	X				
Heavy-Duty Horizontal Handle								X	X	X
Vertical Handle	X	X	X	X	X	X	X			
Heavy-Duty Vertical Handle						X	X	X	X	X
Vertical Handle, Cam Clamp							X			
Push/Pull		X	X	X	X	X		X	X	X
Latch				X	X		X		X	X
Pliers			X	X	X	X				
Air Powered		X	X		X	X	X		X	

TOGGLE CLAMP CONVERSION CHART

Reference Part No.	Carr Lane Part No.
AO-100*	CL-1000-PTC
AO-1200*	CL-3000-PTC
AO-200*	CL-1000-PTC
AO-2000(HD)*	CL-3000-PTC
AO-400*	CL-2000-PTC
AO-800*	CL-2000-PTC
C-800	CL-850-VTC
GLBU1*	CL-111-HVTC
GLBU1-AW-HW*	CL-101-HVTC
GLBU3*	CL-311-HVTC
GLBU3-AW-HW*	CL-301-HVTC
GLBU5*	CL-511-HVTC
GLBU5-AW-HW*	CL-501-HVTC
GLBU6*	CL-611-HVTC
GLBU6-AW-HW*	CL-601-HVTC
GU1*	CL-120-HVTC
GU1-B*	CL-110-HVTC
GU3*	CL-320-HVTC
GU3-B*	CL-310-HVTC
GU5*	CL-520-HVTC
GU5-B*	CL-510-HVTC
GU6*	CL-620-HVTC
GU6-B*	CL-610-HVTC
H-100	CL-250-HTC
H-200	CL-350-HTC
H-200(SS)	CL-350-HTC-S
H-400*	CL-450-HTC
H-400(B)	CL-450-HTC
H-400(SS)*	CL-450-HTC-S
H-600	CL-550-HTC
H-600(SS)	CL-550-HTC-S
LUP-1203	CL-450-PL
LUP-800	CL-254-PL
LUP-800-2S	CL-254-PL-2
P-1200	CL-250-PL
P-1203	CL-450-PL
P-400*	CL-50-PL
P-400-1*	CL-50-PL
P-400-2*	CL-50-PL-2
P-400-2S*	CL-50-PL-3
P-800	CL-254-PL
P-800-2S	CL-254-PL-2
PCH-101	CL-250-PA
PCH-101(SS)	CL-250-PA-S
PCH-200	CL-250-PA
PH & PL-1600	CL-250-PL
S-100	CL-251-VTC
S-200*	CL-451-VTC
S-400*	CL-651-VTC
T-100	CL-252-VTC
T-200	CL-452-VTC
T-400	CL-652-VTC
V-100	CL-250-VTC
V-100(SS)	CL-250-VTC-S
V-1200*	CL-1050-VTC
V-200*	CL-453-VTC
V-200(SS)*	CL-450-VTC-S
V-400*	CL-650-VTC
V-400(SS)*	CL-650-VTC-S
VC-200*	CL-350-VTC
VC-400*	CL-550-VTC
102111	CL-3166-TW
102208	CL-832208-FC
102911	CL-3166-TW-S
105106	CL-832-TW
105203	CL-832203-SA
105208*	CL-832208-FC
105906	CL-832-TW-S
110122	CL-511000-BR
201	CL-150-VTC
201-B	CL-151-VTC
201-SS	CL-150-VTC-S
201-T	CL-152-VTC
201208	CL-316112-FC
201943	CL-316100-SA-S
202	CL-250-VTC
202-B	CL-251-VTC
202-SS	CL-250-VTC-S
202-T	CL-252-VTC
202-U*	CL-253-VTC
202-USS	CL-253-VTC-S
202203*	CL-14200-SA
202208	CL-14112-FC

Reference Part No.	Carr Lane Part No.
202943*	CL-14112-SA-S
205-S	CL-150-HTC
205-SB	CL-151-HTC
205-SL	CL-153-HTC
205-SR	CL-152-HTC
205-SSS	CL-150-HTC-S
205-U	CL-250-HTC
205-UB	CL-251-HTC
205-UL	CL-253-HTC
205-UR	CL-252-HTC
205-USS	CL-250-HTC-S
205105	CL-142000-BR
205203	CL-14112-SA
205943*	CL-83234-SA-S
206-HSS*	CL-51-TC
206-SS*	CL-51-TC
207-L	CL-353-VTC
207-LB*	CL-351-VTC
207-LR*	CL-350-LVTC
207-S	CL-350-VTC
207-SB	CL-351-VTC
207-TL*	CL-352-VTC
207-TS	CL-352-VTC
207-TU	CL-452-VTC
207-TUL*	CL-452-VTC
207-U	CL-450-VTC
207-UB	CL-451-VTC
207-UL	CL-453-VTC
207-ULB*	CL-451-VTC
207-UR*	CL-450-LVTC
207105	CL-518000-BR
207203	CL-516212-SA
207206	CL-14200-SF
207943*	CL-516212-SA-S
210-S	CL-550-VTC
210-SB	CL-551-VTC
210-SR*	CL-550-LVTC
210-TS	CL-552-VTC
210-TU	CL-652-VTC
210-U	CL-650-VTC
210-UB	CL-651-VTC
210-UR*	CL-650-LVTC
210-USS	CL-650-VTC-S
210114	CL-316000-BR
210203*	CL-38314-SA
210206	CL-38314-SF
210208	CL-38314-CC
211208*	CL-14200-CC
213-U*	CL-260-HTC
213-USS*	CL-260-HTC-S
213208	CL-14200-CC
213943	CL-832203-SA-S
215-S	CL-300-HTC
215-U	CL-350-HTC
215-UB	CL-351-HTC
215-USS	CL-350-HTC-S
215105*	CL-148-TW
215208	CL-14200-FC
215905*	CL-148-TW-S
217-U*	CL-350-HTC
217-USS*	CL-350-HTC-S
220	CL-600-VTC
220203	CL-12314-SA
220208*	CL-38314-CC
225-U	CL-450-HTC
225-UB	CL-451-HTC
225-UR*	CL-451-HTC
225-USS	CL-450-HTC-S
225208	CL-518208-FC
227-U*	CL-450-HTC
227-USS*	CL-450-HTC-S
227943*	CL-516212-SA-S
228	CL-601-VTC
235-U	CL-550-HTC
235-UB	CL-551-HTC
235-UR*	CL-550-HTC
235-USS	CL-550-HTC-S
235106	CL-3811-TW
235906	CL-3811-TW-S
237-U*	CL-550-HTC
237-USS*	CL-550-HTC-S
237943*	CL-38314-SA-S
240203*	CL-38314-SA

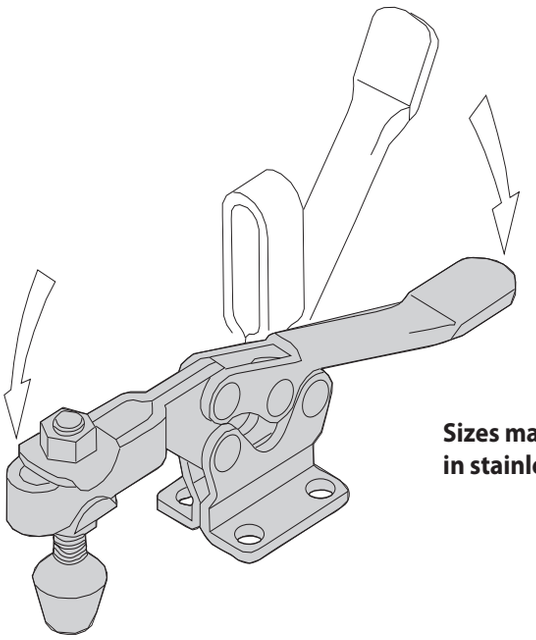
Reference Part No.	Carr Lane Part No.
240208*	CL-38314-FC
245-S	CL-600-HTC
245-U	CL-650-HTC
245943*	CL-12234-SA-S
247-S	CL-750-VTC
247-SB	CL-751-VTC
247-U	CL-850-VTC
247-UB	CL-851-VTC
247109	CL-1213-TW
247110	CL-113000-BR
250*	CL-800-VTC
250-G	CL-800-VTC
250121*	CL-113000-BR
250203	CL-58438-SA
250206*	CL-44-SSC
258*	CL-801-VTC
258-G	CL-801-VTC
267	CL-950-VTC
267-U	CL-1050-VTC
267102	CL-5811-TW
301	CL-150-PA
301-SS	CL-150-PA-S
305-U	CL-200-VTC
305-UR*	CL-200-LVTC
305-USS	CL-200-VTC-S
305203*	CL-316112-SA
305208	CL-316112-CC
307-U	CL-300-VTC
307-UR*	CL-300-LVTC
307-USS	CL-300-VTC-S
309-U	CL-500-VTC
309-UR*	CL-500-LVTC
309-USS	CL-500-VTC-S
311	CL-170-PA
317	CL-375-HTC
317-U	CL-475-HTC
323*	CL-100-PA
323-MSS*	CL-100-PA-S
323-SS	CL-100-PA-S
324*	CL-110-PA
324-SS*	CL-110-PA-S
325	CL-325-PL-S
325-SS	CL-325-PL-S
325203*	CL-12314-SA
331*	CL-200-PA
331-R*	CL-200-LPA
331-R-SS*	CL-200-LPA-S
331-SS*	CL-200-PA-S
334*	CL-210-PA
334-SS*	CL-210-PA-S
341*	CL-300-PA
341-R*	CL-300-LPA
341-R-SS*	CL-300-LPA-S
341-SS*	CL-300-PA-S
344*	CL-310-PA
344-SS*	CL-310-PA-S
345	CL-345-PL
345100	CL-345-PLA
351	CL-250-PA
351-B	CL-251-PA
351-R*	CL-257-PA
351-SS	CL-250-PA-S
375	CL-400-PA
375-R	CL-400-LPA
381	CL-350-PA
385	CL-500-PA
385-R	CL-500-LPA
385102	CL-500-PAA
424	CL-50-PL
424-2	CL-50-PL-2
424208	CL-14208-SA
431208	CL-14100-SA
441	CL-150-PL
441203*	CL-516212-SA
462	CL-254-PL
462-2	CL-254-PL-2
463	CL-454-PL
468	CL-254-PL
468206*	CL-38314-SF
474	CL-454-PL
486*	CL-550-PL
501*	CL-120-HVTC
501-B*	CL-110-HVTC

Reference Part No.	Carr Lane Part No.
503*	CL-320-HVTC
503-B*	CL-310-HVTC
503-LB*	CL-311-HVTC
505*	CL-520-HVTC
505-B*	CL-510-HVTC
505-LB*	CL-511-HVTC
506*	CL-620-HVTC
506-B*	CL-610-HVTC
506-LB*	CL-611-HVTC
507107	CL-51610-TW
507206*	CL-516212-SF
507208	CL-516212-FC
507907	CL-51610-TW-S
509208	CL-516212-CC
527208	CL-38314-FC
548*	CL-501-HVTC
578*	CL-601-HVTC
588*	CL-601-HVTC
6001-M	CLM-60-SPC
6001-MMS*	CLM-60-SPC
601*	CL-50-SPC
601-0*	CL-51-SPC
601-M*	CLM-50-SPC
601-SS*	CL-50-SPC-S
6015	CL-100-SPC
6015-M	CLM-100-SPC
6015-MR	CLM-100-LSPC
6015-MRSS*	CL-100-LSPC-S
6015-R	CL-100-LSPC
6015-RSS	CL-100-LSPC-S
6015-SS	CL-100-SPC-S
602	CL-150-TPC
602-M	CLM-150-TPC
602-SS	CL-150-TPC-S
603*	CL-100-PC
603-M*	CLM-100-PC
603-MR	CL-100-LPC
603-R*	CL-100-LPC
604	CL-250-TPC
604-M	CLM-250-TPC
604-SS	CL-250-TPC-S
604106	CL-250-TPCA
605	CL-150-SPC
605-M	CLM-150-SPC
607*	CL-350-SPC
608	CL-200-PC
610*	CL-250-SPC
610-M*	CLM-250-SPC
620*	CL-275-SPC
620-M*	CLM-275-SPC
624	CL-350-TPC
624-M	CLM-350-TPC
624-SS	CL-350-TPC-S
628*	CL-276-SPC
630	CL-350-SPC
630-M	CLM-350-SPC
630-MR*	CL-350-LPC
630-M	CL-350-LPC
640*	CL-450-SPC
640-M*	CLM-450-SPC
650	CL-650-SPC
650-M	CLM-650-SPC
7-59	CL-1000-VCC
802*	CL-500-PTC
803*	CL-1500-PPC
807-L*	CL-1001-PTC
807-LH/T*	CL-1001-PTCH
807-UL*	CL-1000-PTC
807-ULH/T*	CL-1000-PTCH
810-S*	CL-2001-PTC
810-U*	CL-2000-PTC
812*	CL-400-PTC
816*	CL-600-PPC
847-S*	CL-2001-PTC
847-U*	CL-2000-PTC
858*	CL-3000-PTC
870*	CL-1011-POC
871*	CL-1010-POC
902*	CL-516212-SL
904*	CL-38314-SL

* Functionally equivalent, but differs in some dimension and/or specification. Please check catalog before ordering.

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HORIZONTAL-HANDLE TOGGLE CLAMPS



Sizes marked * are also available in stainless steel.



100 lbs*



200 lbs*



750 lbs*



60 lbs*



150 lbs*



500 lbs*



1000 lbs

Standard HTC Design
pp. 456-461

Most-popular and widest-range series of horizontal-handle hold-down clamps. Available in seven sizes, the smaller ones with a comfortable finger grip. Most sizes are available with either a flanged base or a straight base. Choice of solid arm, or open arm for spindle adjustment.



750 lbs

Automatically Adjusting
p. 462

Self-adjusting clamp automatically compensates for different workpiece heights without resetting the spindle. Clamping force is always consistent after setting once.



250 lbs



625 lbs



850 lbs

Low-Arm TC Design
p. 463

Simple, classic-design horizontal-handle clamps. Available in three sizes, with either a flanged base or a straight base.



375 lbs

Extra-Wide Opening
p. 464

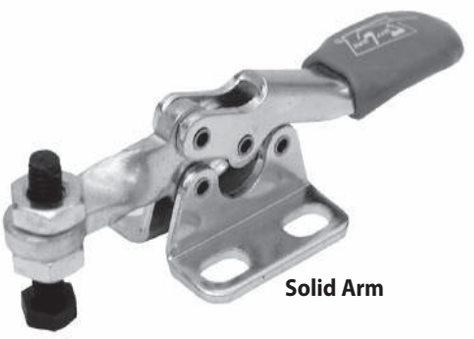
Arm opens a full 185° for maximum loading clearance. Unique up-then-down handle motion. Handle locks at a 60° downward angle. Dual flanged bases allow mounting on either horizontal or vertical surfaces. Choice of solid arm, or open arm for spindle adjustment.

Get quote

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HORIZONTAL-HANDLE TOGGLE CLAMPS

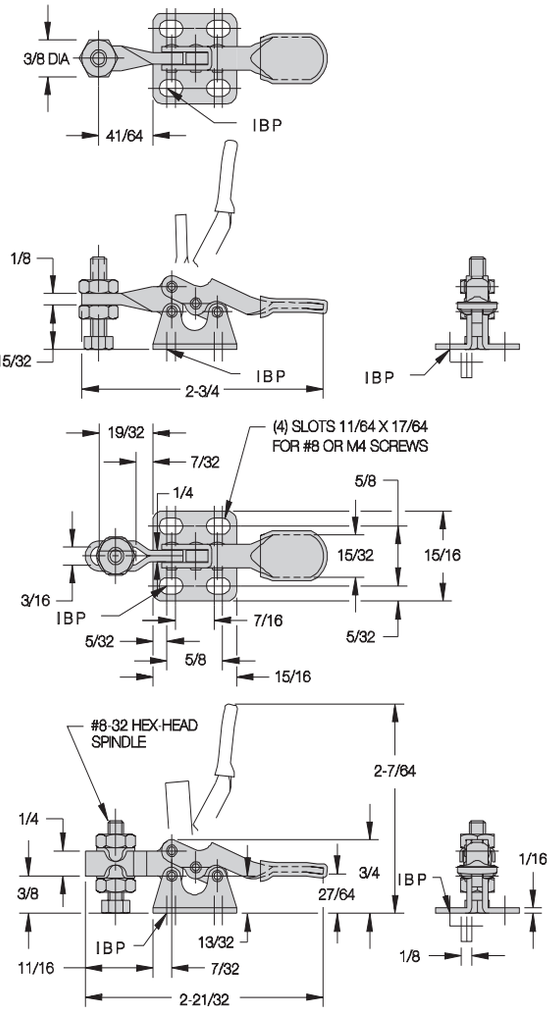
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Solid Arm



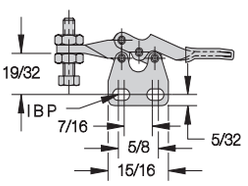
Open Arm



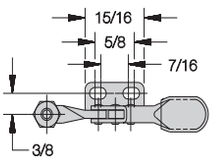
CL-150-HTC — Solid Arm, Flanged Base
CL-250-HTC — Open Arm, Flanged Base

Smallest hold-down clamp available. Choose either a solid arm, or an open arm for spindle adjustment. Arm opens 90° while handle moves 80°. Supplied with #8-32 nylon hex-head spindle CL-832203-SA. Open-arm versions also include (2) CL-832-TW flanged washers. Shipping weight 0.1 lbs.

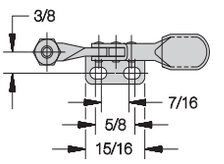
Holding capacity: **60 lbs**



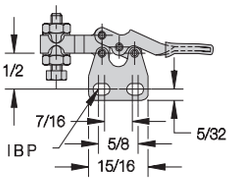
CL-151-HTC
Solid Arm
Straight Base



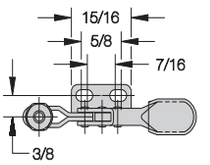
CL-152-HTC
Solid Arm
Right Flange



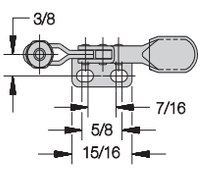
CL-153-HTC
Solid Arm
Left Flange



CL-251-HTC
Open Arm
Straight Base



CL-252-HTC
Open Arm
Right Flange



CL-253-HTC
Open Arm
Left Flange

Also available in stainless steel . . .



CL-150-HTC-S



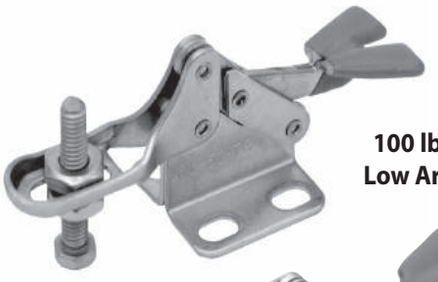
CL-250-HTC-S

Get quote

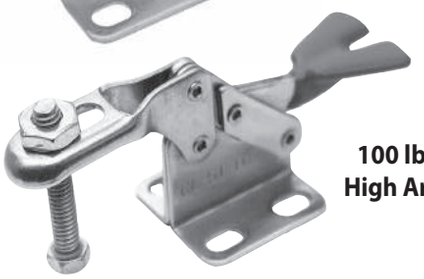
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HORIZONTAL-HANDLE TOGGLE CLAMPS

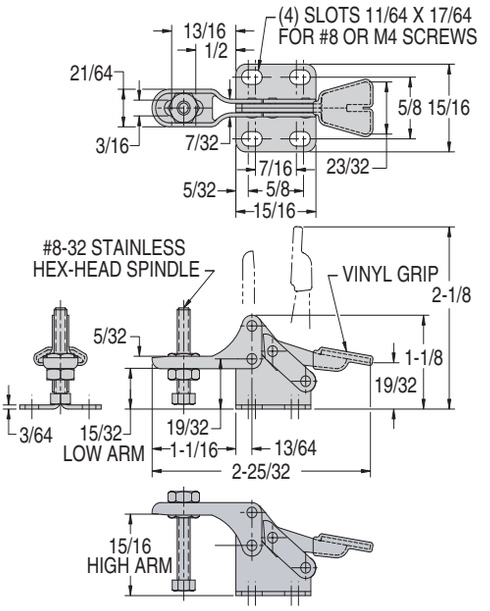
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



100 lbs
Low Arm



100 lbs
High Arm



CL-51-TC
Low Arm, Flanged Base

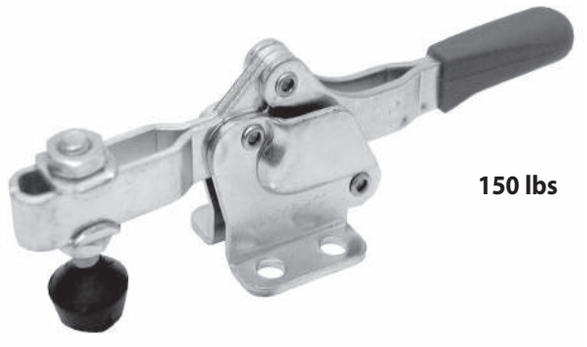
CL-53-TC
High Arm, Flanged Base

Miniature stainless steel clamp with open arm for spindle adjustment. Perfect for electronics fixturing and other light-duty application. Arm opens 90˚ while handle moves 90˚. Supplied with #8-32 stainless hex-head spindle CL-832203-SA-S. Shipping weight 0.1 lbs.

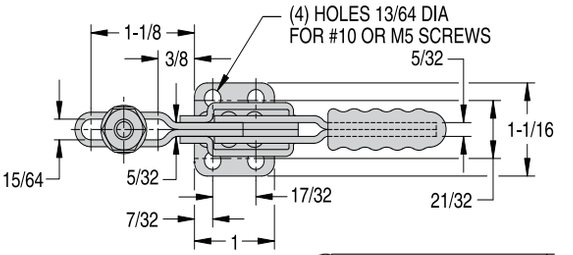
Holding capacity: **100 lbs**

HORIZONTAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



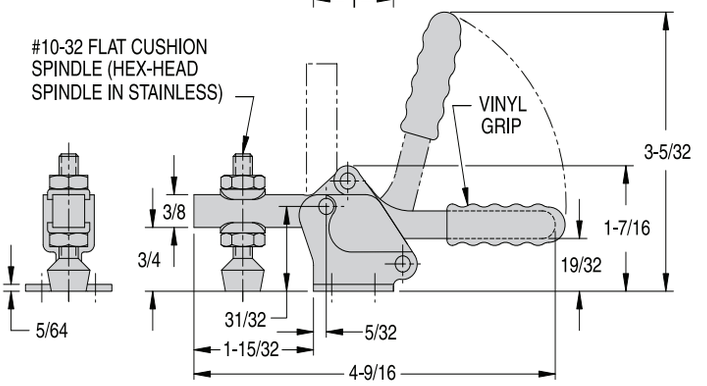
150 lbs



CL-260-HTC
Open Arm, Flanged Base

An extremely powerful clamp for its small size. Open arm allows spindle adjustment. Arm opens 90° while handle moves 75°. Supplied with #10-32 flat-cushion spindle CL-316112-FC and (2) CL-3166-TW flanged washers. Shipping weight 0.2 lbs.

Holding capacity: **150 lbs**



Also available in stainless steel . . .

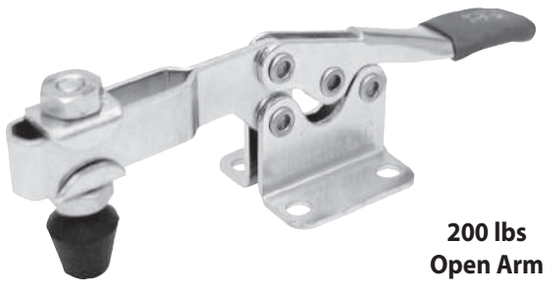


CL-260-HTC-S

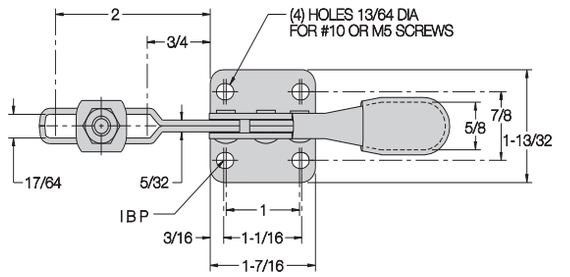
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HORIZONTAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



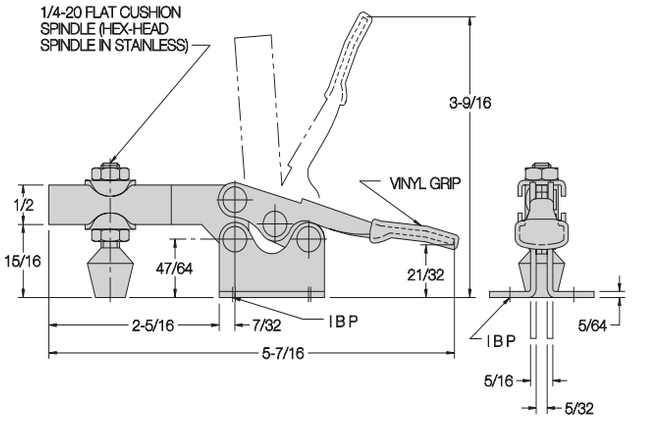
200 lbs
Open Arm

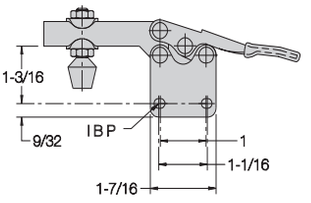


CL-350-HTC **Open Arm, Flanged Base**

Popular medium-duty clamp with an open arm for spindle adjustment. Arm opens 86˚ while handle moves 60˚. Supplied with 1/4-20 short flat-cushion spindle CL-14112-FC and (2) CL-147-TW flanged washers. Shipping weight 0.3 lbs.

Holding capacity: **200 lbs**





CL-351-HTC
Open Arm
Straight Base

Also available in stainless steel . . .



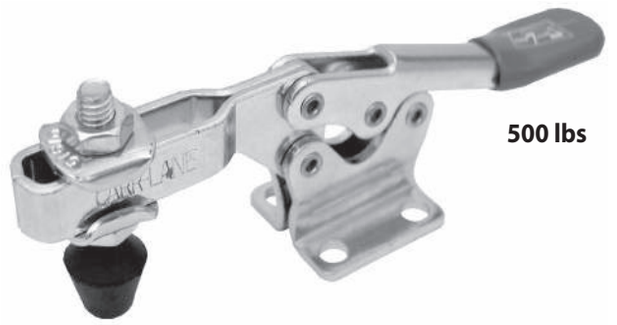
CL-350-HTC-S

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HORIZONTAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



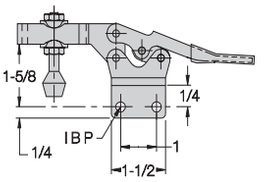
500 lbs

CL-450-HTC

Open Arm, Flanged Base

Strong-yet-compact horizontal-handle clamp, with open arm for spindle adjustment. Arm opens 90° while handle moves 65°. Supplied with 5/16-18 short flat-cushion spindle CL-518208-FC and (2) CL-51610-TW flanged washers. Shipping weight 0.6 lbs.

Holding capacity: **500 lbs**

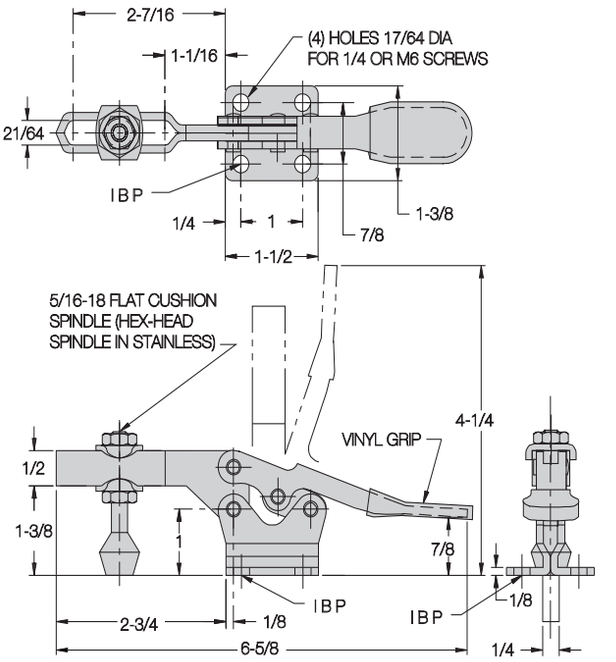


CL-451-HTC
Straight Base

Also available in stainless steel . . .



CL-450-HTC-S



HORIZONTAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



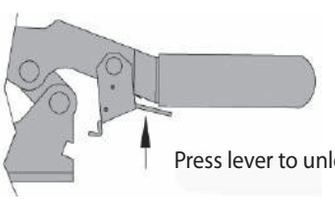
500 lbs
With Safety Lock

CL-450-LHTC

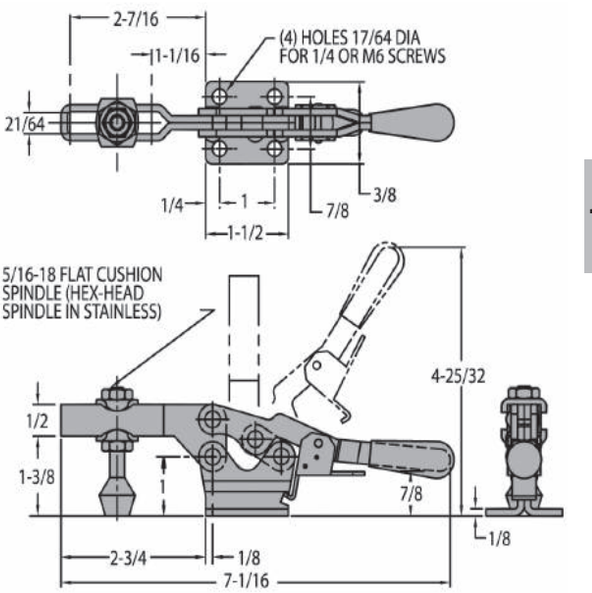
Open Arm, Flanged Base

Same as the toggle clamp shown above, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the clamp from being accidentally opened by bumping the handle. Shipping weight 0.7 lbs.

Holding capacity: **500 lbs**



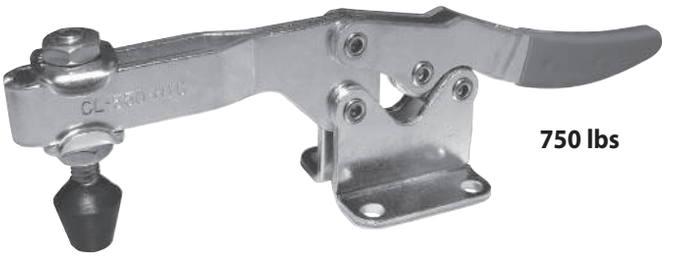
Press lever to unlock.



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HORIZONTAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

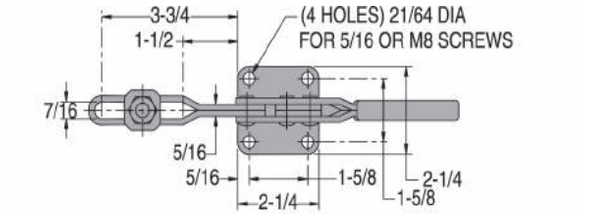


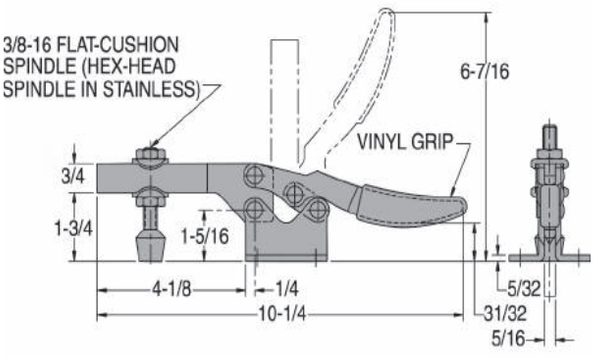
750 lbs

CL-550-HTC **Open Arm, Flanged Base**

Heavy-duty clamp with open arm for spindle adjustment. Arm opens 90° while handle moves 55°. Supplied with 3/8-16 short flat-cushion spindle CL-38212-FC and (2) CL-3811-TW flanged washers. Shipping weight 1.5 lbs.

Holding capacity: **750 lbs**

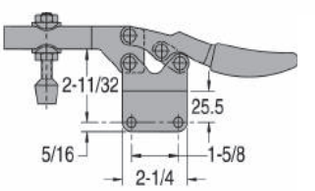




Also available in stainless steel . . .



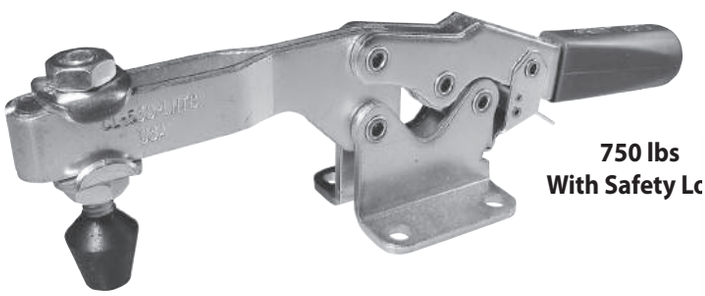
CL-551-HTC-S



CL-551-HTC
Straight Base

HORIZONTAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

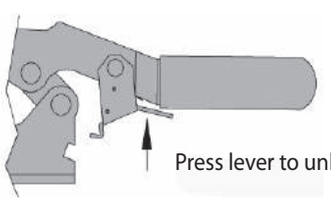


750 lbs
With Safety Lc

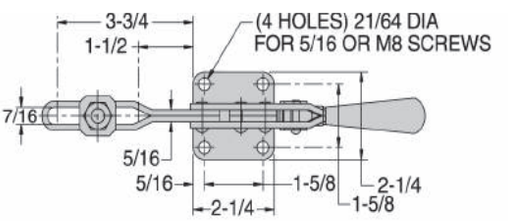
CL-550-LHTC **Open Arm, Flanged Base**

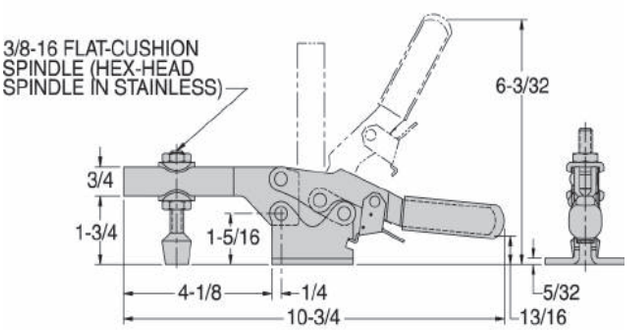
Same as the toggle clamp shown above, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the clamp from being accidentally opened by bumping the handle. Shipping weight 1.6 lbs.

Holding capacity: **750 lbs**

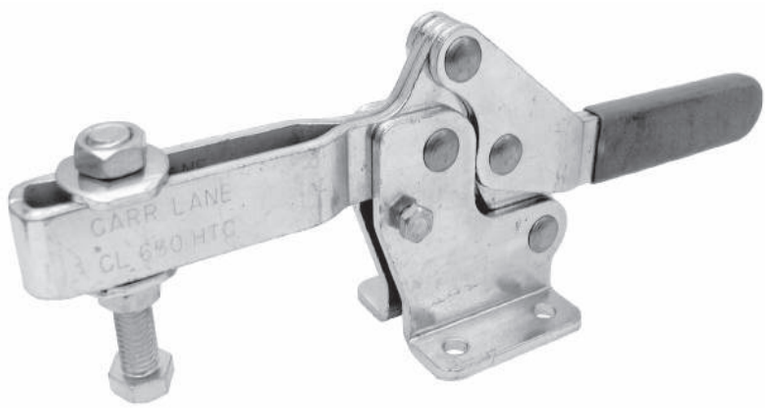


Press lever to unlock.





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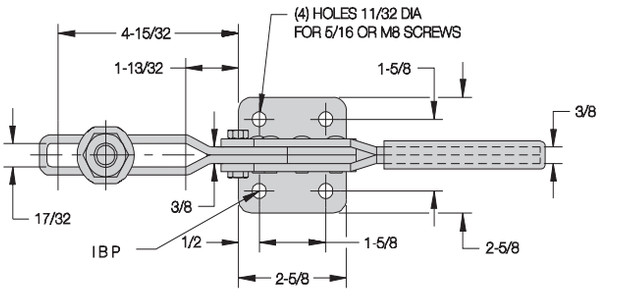


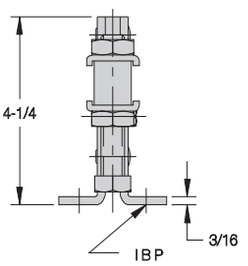
1000 lbs
Open Arm

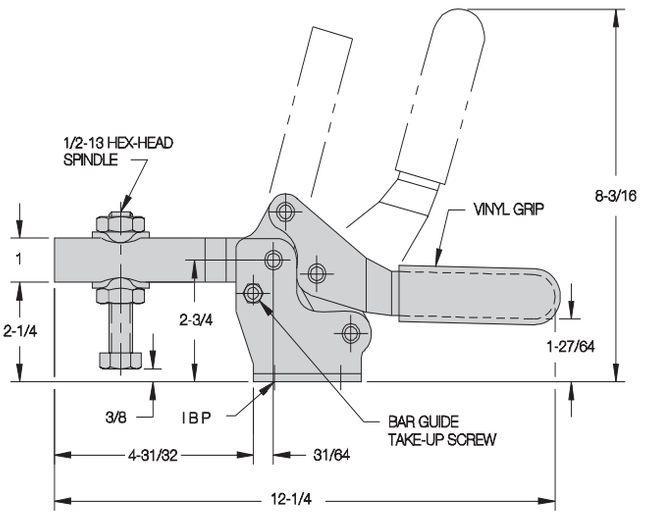
CL-650-HTC **Open Arm, Flanged Base**

Largest and strongest horizontal-handle hold-down clamp with an open arm for spindle adjustment. Arm opens a wide 105˚ while handle moves 75˚. Supplied with 1/2-13 hex-head spindle CL-12314-SA and (2) CL-1213-TW flanged washers. Shipping weight 3.3 lbs.

Holding capacity: **1000 lbs**



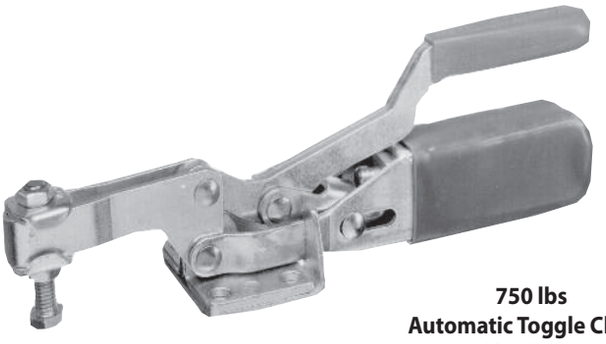




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HORIZONTAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



750 lbs
Automatic Toggle Clamp
(Self Adjusting)

CL-550-AHTC

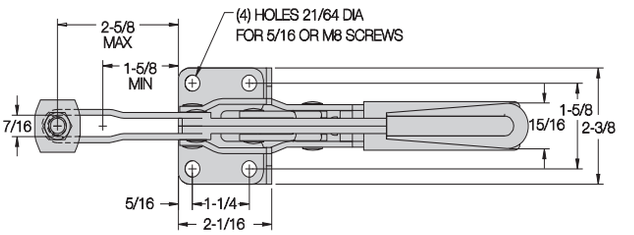
Automatically adjusts for different workpiece thicknesses! Clamps with the same, repeatable force anywhere within its 1/2" automatic-adjustment range. Perfect for welding fixtures, machining fixtures for castings, fixtures holding several part sizes within the same family, or any other application where part size can vary.

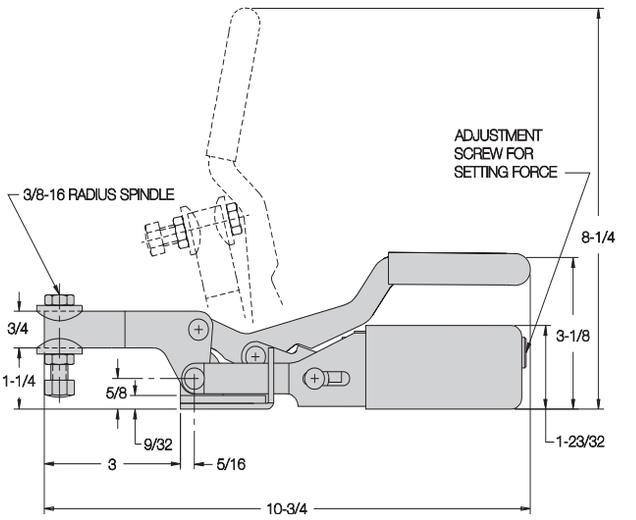
Easy to use. To set up, simply adjust the contact spindle to the average workpiece height, and set desired clamping force once. After that, operate just like a standard toggle clamp. The patented adjusting mechanism does the rest.

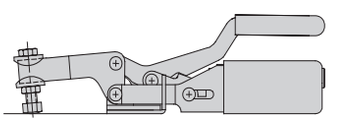
Clamping force is always consistent. The clamp's toggle action ensures that workpieces will remain clamped even under severe vibration. No additional spindle adjustment is ever needed. The clamp even compensates for wear in long production runs.

Fits in the same space, and provides the same clamping force as a standard toggle clamp. A maximum of 250 to 500 lbs clamping force (depending on spindle position) can be applied by hand. Arm opens 87° while handle moves 80°. Supplied with 3/8-16 radius spindle CL-38200-RS and (2) CL-3811-TW flanged washers. **Patent no. 4,407,493.** Shipping weight 1.9 lbs.

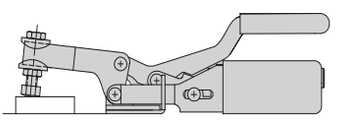
Holding capacity: **750 lbs**







Low Limit
–1/4"



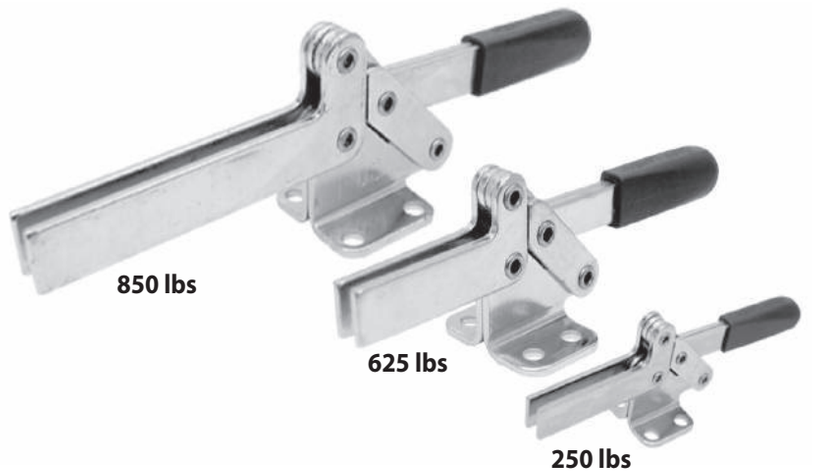
HIgh Limit
+1/4"

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HORIZONTAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Classic-design horizontal-handle clamps with open arm for spindle adjustment. Arm opens 90° while handle moves 90°. Available in three sizes.

CL-151-TC
Open Arm, Flanged Base

Smallest-size clamp. Accepts any #10-32 spindle and (2) CL-3166-TW flanged washers. For fixed spindle location, use a 1/4-20 spindle and a CL-1458-S bolt retainer. **INFO+**: See pages 522-526 to order. Shipping weight 0.4 lbs.

Holding capacity: **250 lbs**

CL-251-TC
Open Arm, Flanged Base

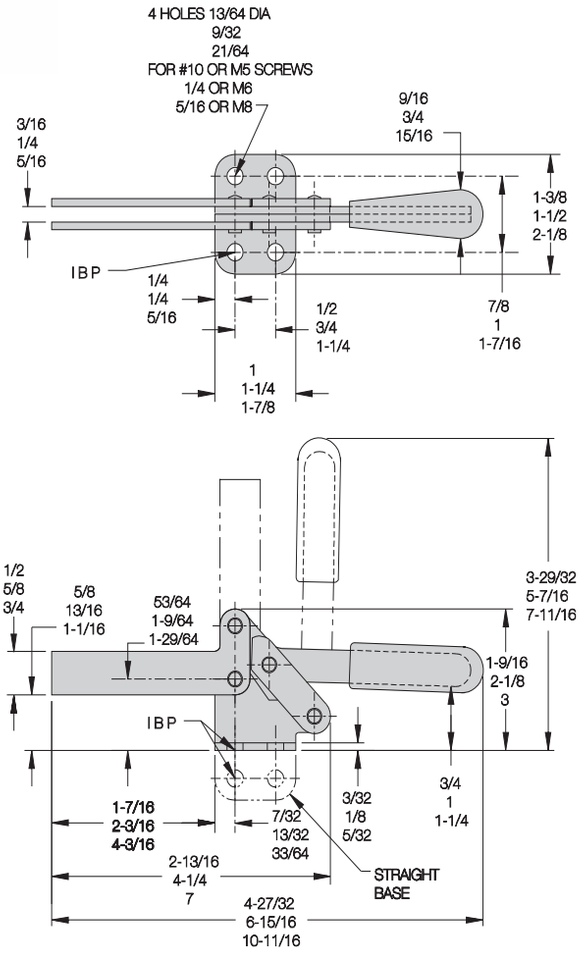
Medium-size clamp. Accepts any 1/4-20 spindle and (2) CL-148-TW flanged washers. For fixed spindle location, use a CL-1458-S bolt retainer. **INFO+**: See pages 522-526 to order. Shipping weight 0.5 lbs.

Holding capacity: **625 lbs**

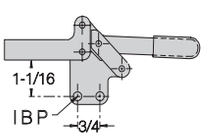
CL-351-TC
Open Arm, Flanged Base

Largest-size clamp. Accepts any 5/16-18 spindle and (2) CL-51610-TW flanged washers. For fixed spindle location, use a CL-51658-S bolt retainer. **INFO+**: See pages 522-526 to order. Shipping weight 1.4 lbs.

Holding capacity: **850 lbs**



CL-151-TC (Top dimension)
CL-251-TC (Middle dimension)
CL-351-TC (Bottom dimension)



CL-252-TC
Straight Base
625 lbs

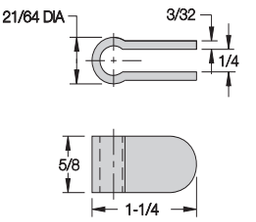
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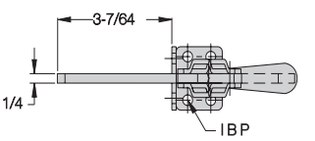
HORIZONTAL-HANDLE TOGGLE CLAMPS

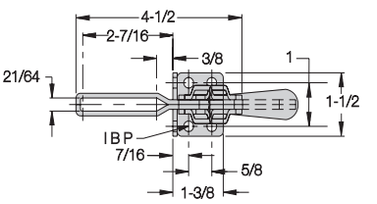
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

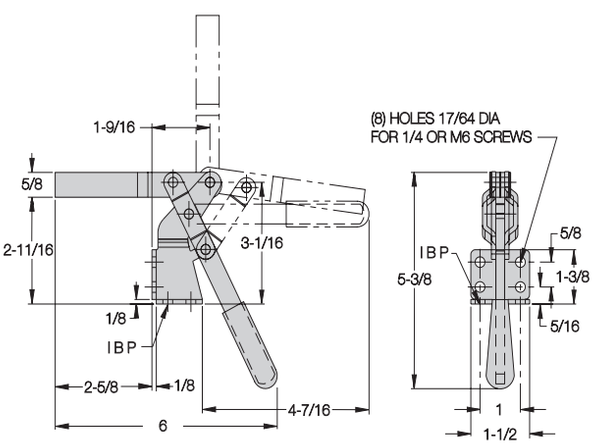








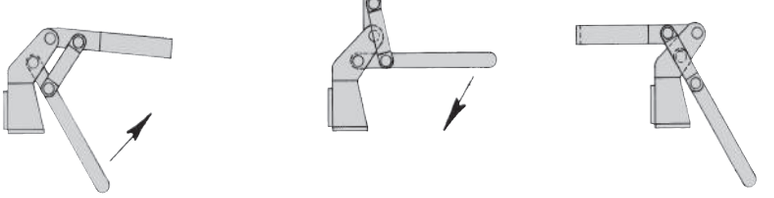




CL-375-HTC — Solid Arm
CL-475-HTC — Open Arm

Extra-wide-opening clamp with handle that locks at a downward angle. Unique up-then-down handle motion opens arm a full 185°. Dual flanged bases allow mounting on either horizontal or vertical surfaces. Available with a solid arm, or an open arm for spindle adjustment. Accepts all 5/16-18 spindles. **INFO+**: See pages 522-526 to order. Solid-arm version supplied with a CL-518000-BR bolt retainer. Open-arm version supplied with (2) CL-51610-TW flanged washers. Shipping weight 0.8 lbs.

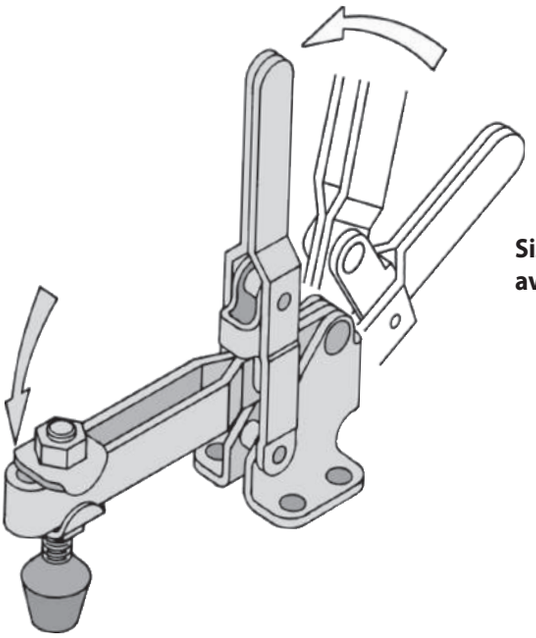
Holding capacity: **375 lbs**



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VERTICAL-HANDLE TOGGLE CLAMPS



Sizes marked * are also available in stainless steel



100 lbs* 200 lbs* 500 lbs* 750 lbs* 1000 lbs 1200 lbs

Wide Opening
pp. 467-476

Clamping arm opens past 90° for excellent loading clearance. Most-popular and widest-range series of vertical-handle hold-down clamps. Choice of flanged or straight base, solid or open arm, and regular or T handle in most of the seven available sizes.



750 lbs 1000 lbs

Wide Opening – Angle Arm
p. 477

Clamps with arm tilted upward for increased clearance underneath. Also useful for applying clamping force at an angle. Wide-opening solid arm. Choice of flanged base or straight base. Available in two sizes.



750 lbs

Wide Opening Automatically Adjusting
p. 479

Self-adjusting clamp automatically compensates for different workpiece heights without resetting the spindle. Clamping force is always consistent. Wide opening.



750 lbs 2000 lbs 3000 lbs 6000 lbs

Wide Opening – Heavy-Duty
pp. 480-483

Heavy-duty production clamps designed for extreme durability. Available either as complete clamps or as basic mechanisms for adding custom clamping arms or handles. Choice of four sizes.

CONTINUED ON NEXT PAGE

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VERTICAL-HANDLE TOGGLE CLAMPS

CONTINUED FROM PREVIOUS PAGE



150 lbs*



350 lbs*



750 lbs*

Low Profile
pp. 484-485

Extremely compact low-profile clamps with a unique finger-grip T handle. Available in three sizes.



100 lbs*



250 lbs



625 lbs



850 lbs



1500 lbs



2500 lbs



5000 lbs

Low Arm
pp. 486, 488

Simple, easy-opening clamps with excellent arm reach. Extends farther over workpiece than any clamp its size. Choice of flanged or straight base, and solid or open arm. Arm opens 83°. Available in seven sizes, the largest three forged.



100 lbs*



250 lb



625 lbs



850 lbs



1500 lbs



2500 lbs



5000 lbs

High Arm
pp. 487, 489

Simple, easy-opening clamps with extra arm height. Choice of flanged or straight base, and solid or open arm. Arm opens 83°. Available in seven sizes, the largest three forged.



1000 lbs

Vertical Handle Cam Clamps
p. 493

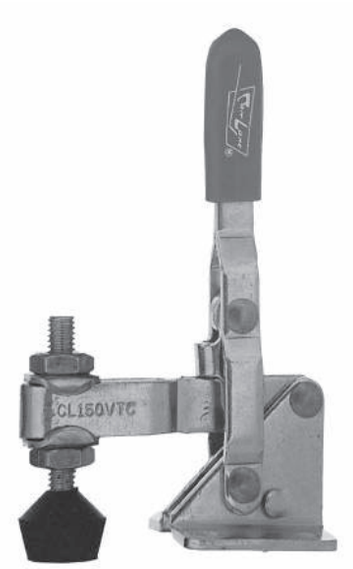
Wide-opening clamp that locks by spiral-cam action rather than toggle action. Solid arm, flanged base.

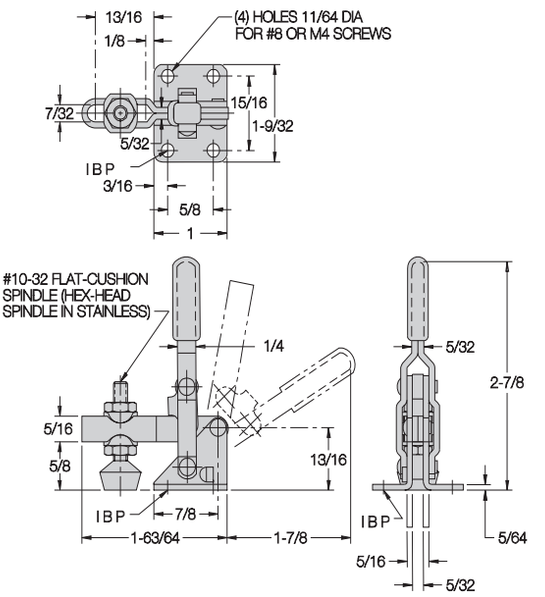
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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

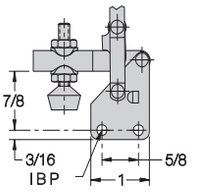




CL-150-VTC Open Arm, Flanged Base

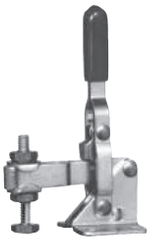
Smallest wide-opening hold-down clamp available. Open arm provides adjustable spindle location. Arm opens 100° while handle moves 56°. Supplied with #10-32 flat-cushion spindle CL-316112-FC and (2) CL-3166-TW flanged washers. Shipping weight 0.2 lbs.

Holding capacity: **100 lbs**



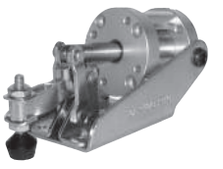
CL-151-VTC
Straight Base

Also available in stainless steel...



CL-150-VTC-S

Also available air powered...

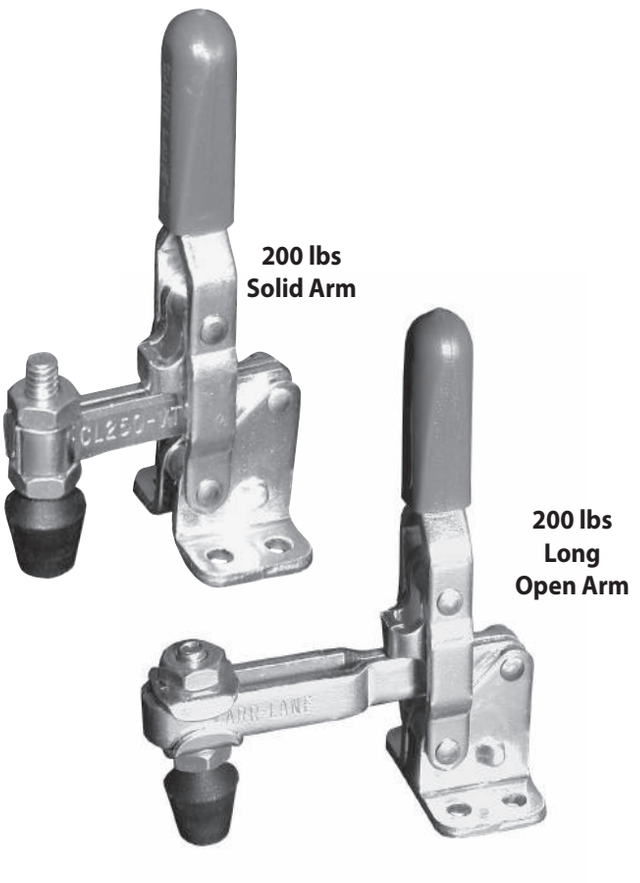


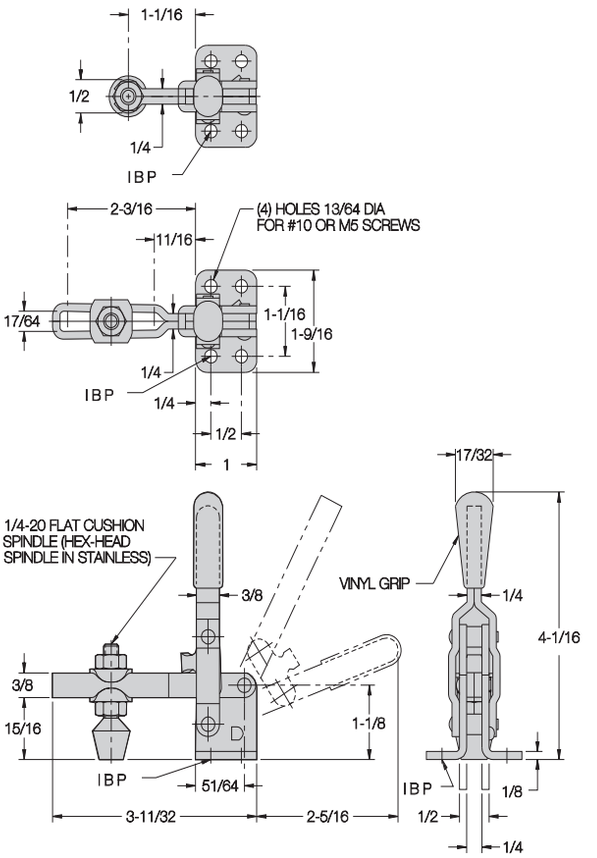
CL-400-PTC
(INFO+ page 516)

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



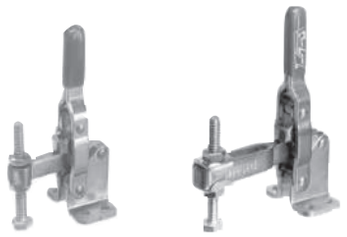


CL-250-VTC Solid Arm, Flanged Base
CL-253-VTC Open Arm, Flanged Base

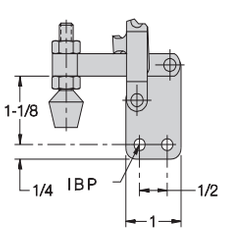
Small-yet-powerful clamp available in several configurations. Choose either a solid arm, or a long open arm for spindle adjustment. Arm opens 117° while handle moves 69°. Supplied with 1/4-20 short flat-cushion spindle CL-14112-FC. Open-arm version supplied with (2) CL-148-TW flanged washers. Shipping weight 0.4 lbs.

Holding capacity: **200 lbs**

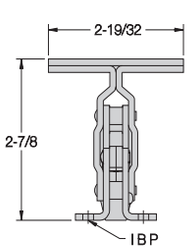
Also available in stainless steel . . .



CL-250-VTC-S **CL-253-VTC-S**



CL-251-VTC
Solid Arm
Straight Base



CL-252-VTC
Solid Arm
Flanged Base
T Handle

Also available air powered . . .



CL-500-PTC
(INFO+ page 517)

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VERTICAL-HANDLE TOGGLE CLAMPS

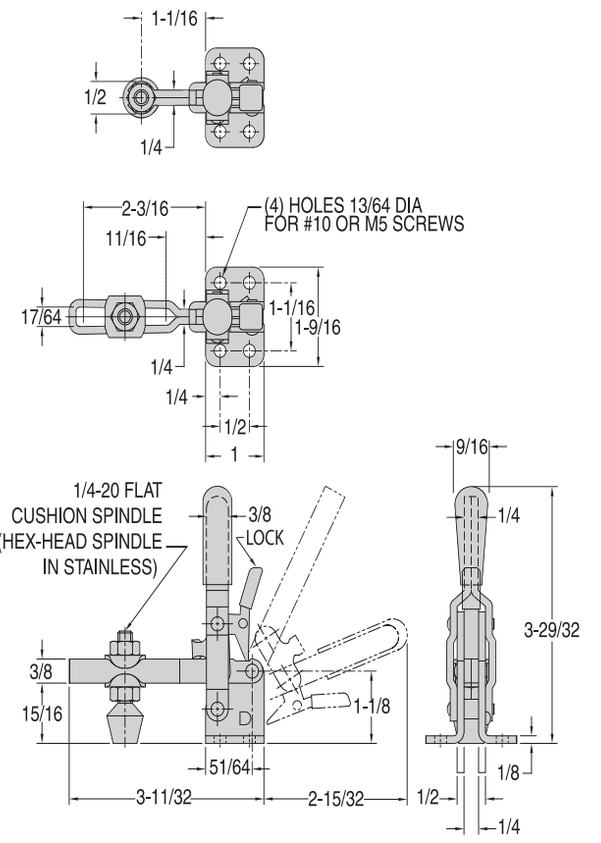
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

200 lbs
Solid Arm
With Safety Lock



200 lbs
Long Open Arm
With Safety Lock



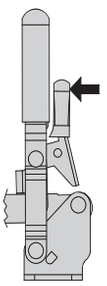


CL-250-LVTC — Solid Arm, Flanged Base
CL-253-LVTC — Long, Open Arm, Flanged Base

INFO+: Same as the wide-opening toggle clamps shown on page 468, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the handle. This prevents the clamp from being accidentally opened by bumping the handle.

Choose either a solid arm, or a long open arm for spindle adjustment. Arm opens 117º while handle moves 69º. Supplied with 1/4-20 short flat-cushion spindle CL-14112-FC. Open-arm version supplied with (2) CL-148-TW flanged washers. Shipping weight 0.4 lbs.

Holding capacity: **200 lbs**



Press Lever To Unlock

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VERTICAL-HANDLE TOGGLE CLAMPS

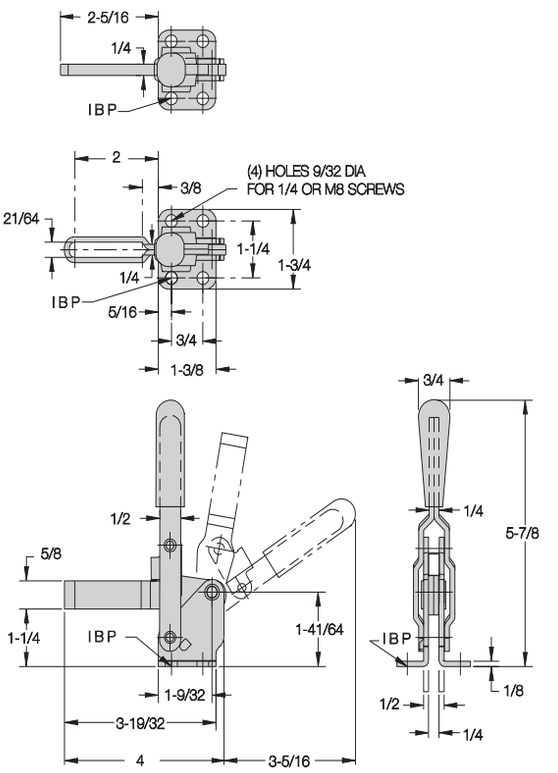
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



500 lbs
Solid Arm



500 lbs
Open Arm



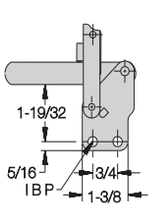
CL-350-VTC
CL-450-VTC

Solid Arm, Flanged Base

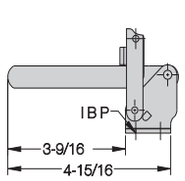
Open Arm, Flanged Base

Most-popular wide-opening clamp available in many configurations. Choose either a solid arm, or an open arm for spindle adjustment (extra-long arms also available). Arm opens 100° while handle moves 60°. Accepts any 5/16-18 short spindle. **INFO+**: See pages 522-525 to order. Solid-arm versions supplied with a CL-518000-BR bolt retainer. Open-arm versions supplied with (2) CL-51610-TW flanged washers. Shipping weight 0.8 lbs.

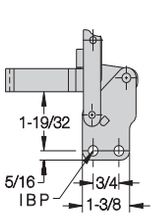
Holding capacity: **500 lbs**



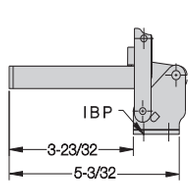
CL-351-VTC
Solid Arm
Straight Base



CL-353-VTC
Long Solid Arm
Flanged Base



CL-451-VTC
Open Arm
Straight Base



CL-453-VTC
Long Open Arm
Flanged Base

Also available in stainless steel . . .



CL-450-VTC-S

Also available air powered . . .



CL-1001-PTC
Solid Arm
(INFO+ page 518)



CL-1000-PTC
Open Arm
(INFO+ page 518)

11

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



500 lbs
Solid Arm
With Safety Lock



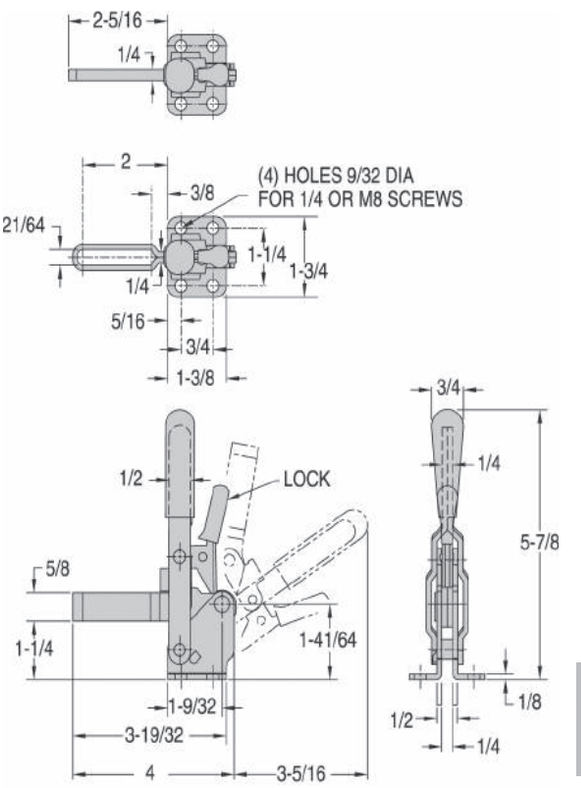
500 lbs
Open Arm
With Safety Lock

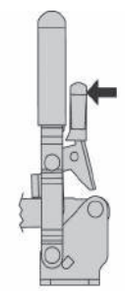
CL-350-LVTC — Solid Arm, Flanged Base
CL-450-LVTC — Open Arm, Flanged Base

INFO+: Same as the wide-opening toggle clamps shown on page 476, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the handle. This prevents the clamp from being accidentally opened by bumping the handle.

Choose either a solid arm, or an open arm for spindle adjustment. Arm opens 100° while handle moves 60°. Accepts any 5/16-18 short spindle. **INFO+**: See pages 522-525 to order. Solid-arm version supplied with CL-518000-BR bolt retainer. Open-arm version supplied with (2) CL-51610-TW flanged washers. Shipping weight 0.9 lbs.

Holding capacity: **500 lbs**





Press Lever To Unlock

Also available in stainless steel . . .

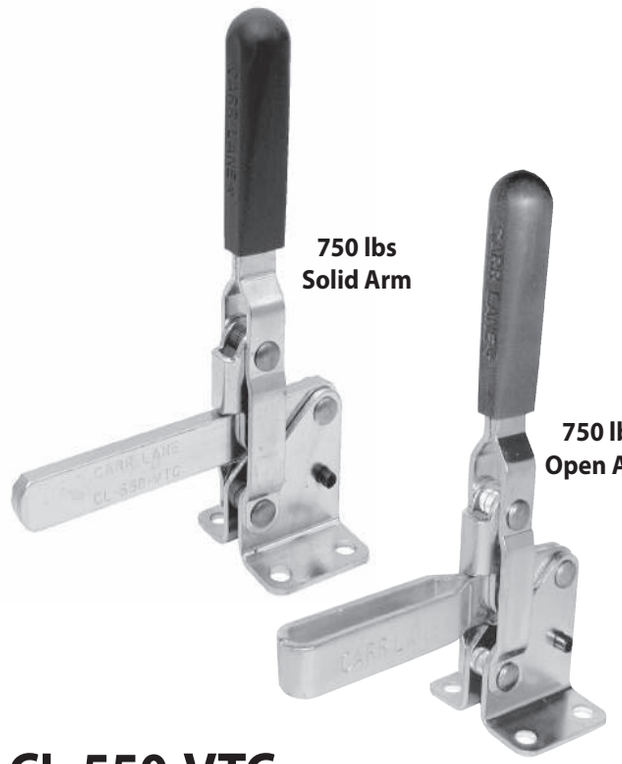


CL-450-LVTC-S

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

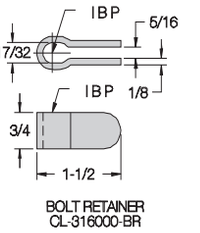


CL-550-VTC
Solid Arm, Flanged Base

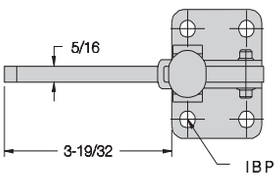
CL-650-VTC
Open Arm, Flanged Base

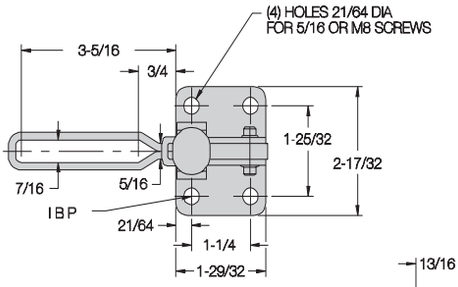
Larger wide-opening clamp available in several configurations. Choose either a solid arm, or an open arm for spindle adjustment. Arm opens 106° while handle moves 58°. Accepts any 3/8-16 spindle. **INFO+**: See pages 522-525 to order. Solid-arm version supplied with a CL-316000-BR bolt retainer. Open-arm version supplied with (2) CL-3811-TW flanged washers. Shipping weight 1.3 lbs.

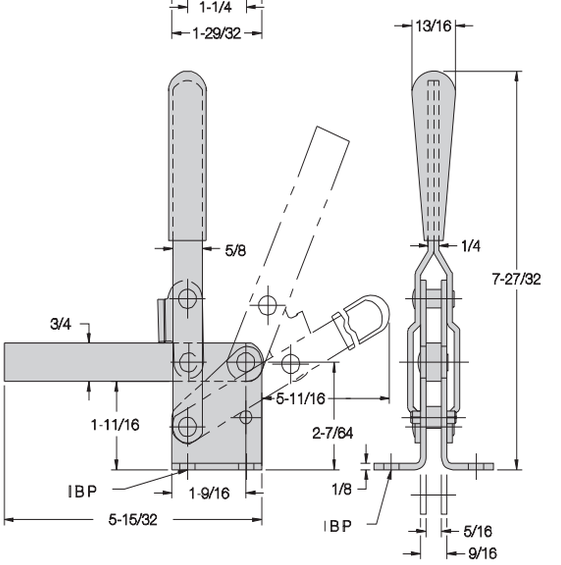
Holding capacity: **750 lbs**



BOLT RETAINER
CL-316000-BR







11

Also available with patented automatic adjustment!

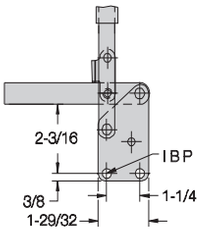


CL-650-ATC
(INFO+ page 479)

Also available in stainless steel . . .



CL-650-VTC-S

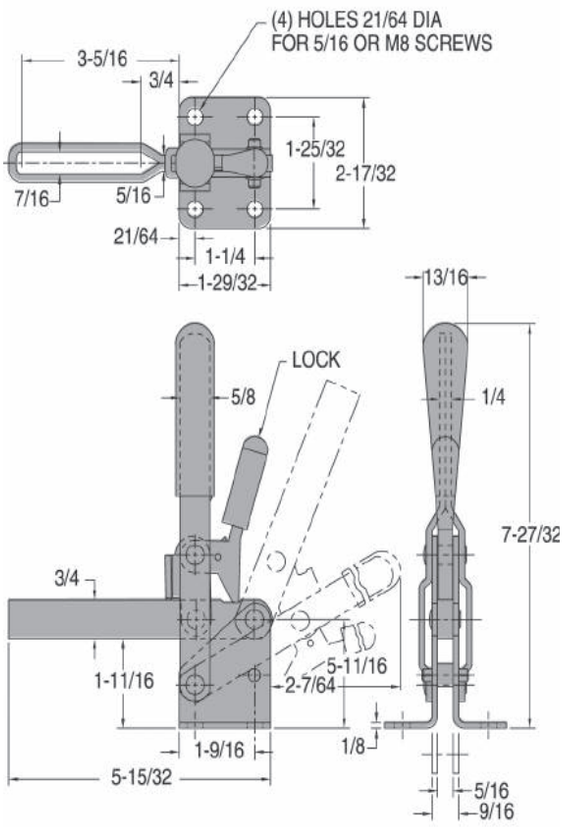


CL-651-VTC
Open Arm
Straight Base

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750 lbs
Open Arm
With Safety Lock



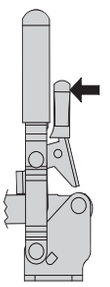
CL-650-LVTC

Open Arm, Flanged Base

INFO+: Same as the wide-opening toggle clamps shown on page 472, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the handle. This prevents the clamp from being accidentally opened by bumping the handle.

Open arm provides spindle adjustment. Arm opens 106° while handle moves 58°. Accepts any 3/8-16 spindle. **INFO+**: See pages 522-525 to order. Supplied with (2) CL-3811-TW flanged washers. Shipping weight 1.4 lbs.

Holding capacity: **750 lbs**



Press Lever To Unlock

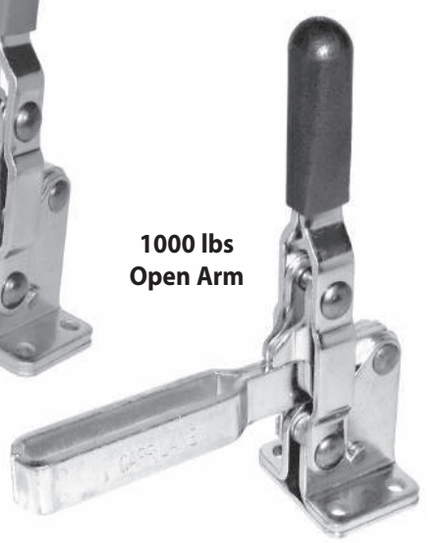
Get quote

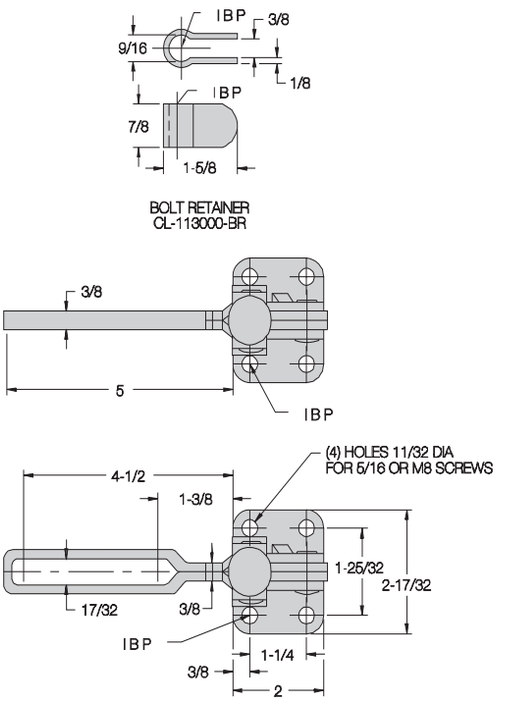
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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



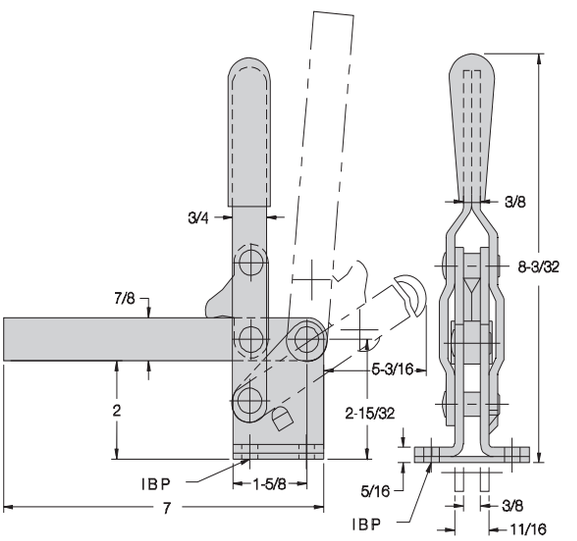




CL-750-VTC — Solid Arm, Flanged Base
CL-850-VTC — Open Arm, Flanged Base

Extra-large wide-opening clamp. Choose either a solid arm, or an open arm for spindle adjustment. Arm opens 120˚ while handle moves 67˚. Accepts any 1/2-13 spindle. **INFO+**: See pages 522-525 to order. Solid-arm version supplied with a CL-113000-BR bolt retainer. Open-arm version supplied with (2) CL-1213-TW flanged washers. Shipping weight 2.5 lbs.

Holding capacity: **1000 lbs**



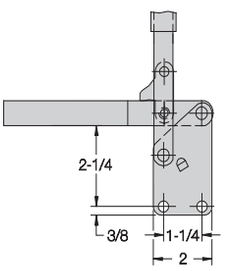
Also available air powered . . .



CL-2001-PTC
Solid Arm
(INFO+ 505)



CL-2000-PTC
Open Arm
(INFO+ 505)



CL-851-VTC
Open Arm
Straight Base

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1000 lbs
Open Arm
With Safety Lock



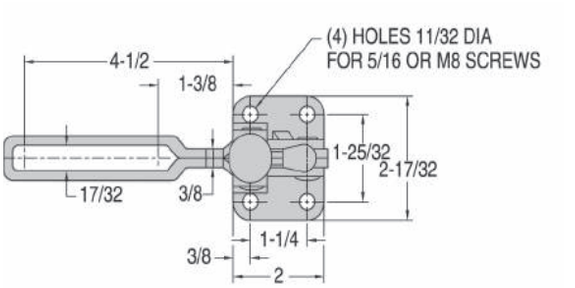
CL-850-LVTC

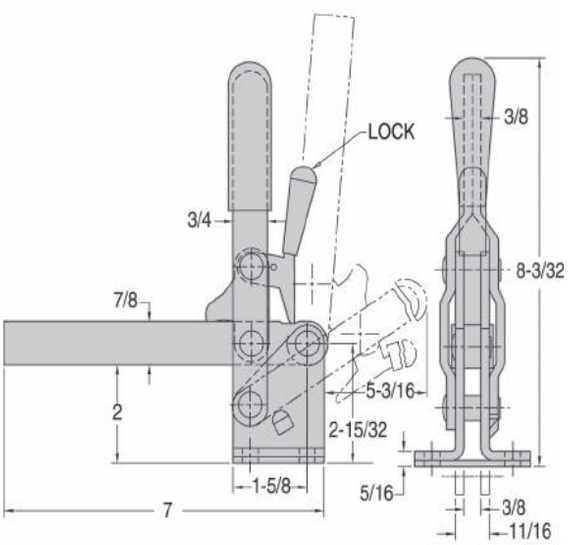
Open Arm, Flanged Base

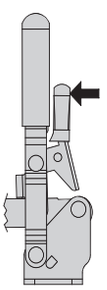
INFO+: Same as the wide-opening toggle clamps shown on page 480, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the handle. This prevents the clamp from being accidentally opened by bumping the handle.

Open arm provides spindle adjustment. Arm opens 120° while handle moves 67°. Accepts any 1/2-13 spindle. **INFO+**: See pages 522-525 to order. Supplied with (2) CL-1213-TW flanged washers. Shipping weight 2.5 lbs.

Holding capacity: **1000 lbs**







Press Lever To Unlock

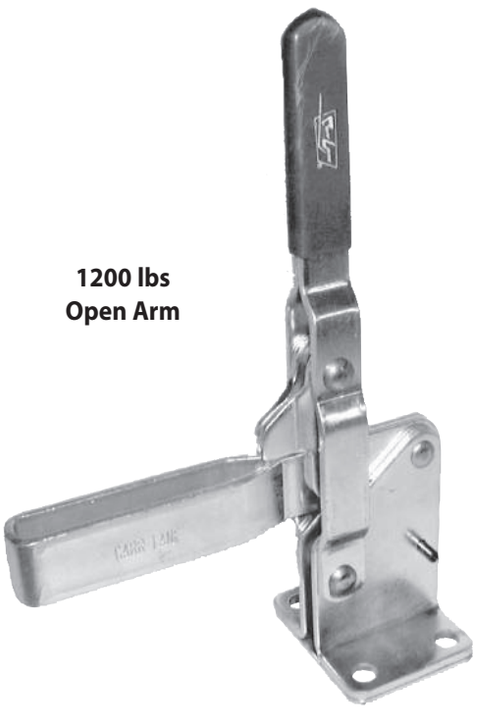
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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

1200 lbs
Open Arm

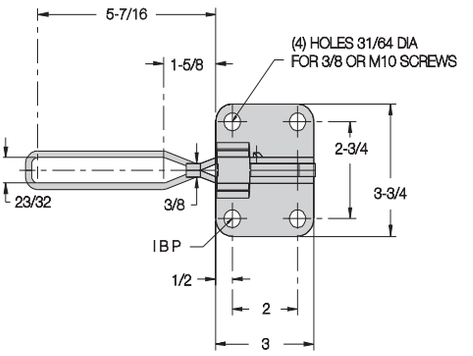


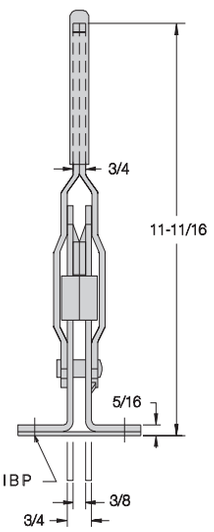
CL-1050-VTC

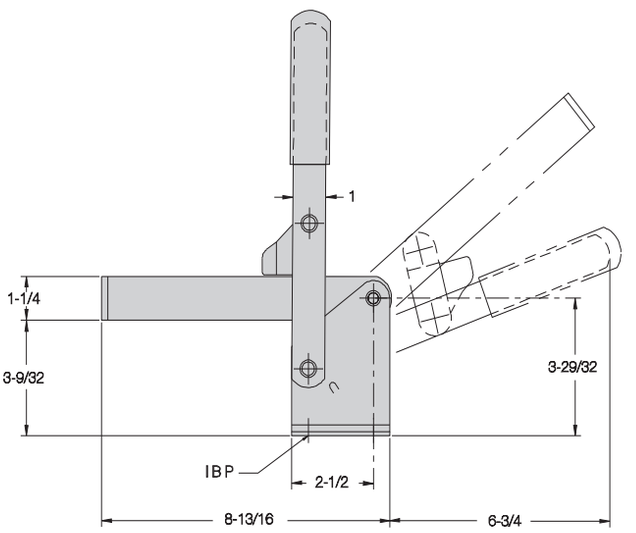
Open Arm, Flanged Base

Largest wide-opening clamp available, with an open arm for spindle adjustment. Arm opens 140° while handle moves 70°. Accepts any 5/8-11 spindle. **INFO+**: See pages 522-525 to order. Supplied with (2) CL-5811-TW flanged washers. Shipping weight 5.2 lbs.

Holding capacity: **1200 lbs**







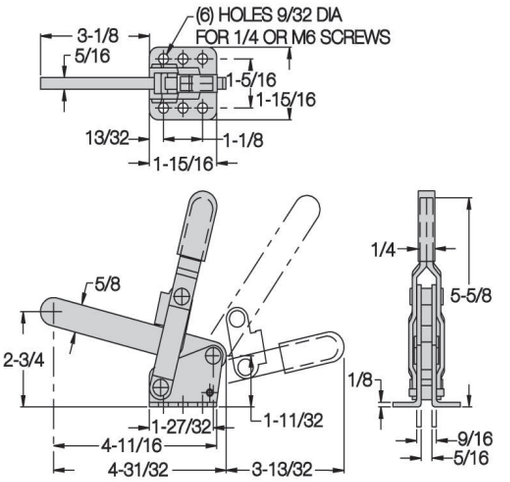
11

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INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS





CL-600-VTC Angled Arm, Flanged Base

Angled-arm clamp provides increased clearance underneath arm. Also useful for applying clamping force at an angle. Solid arm opens 113° while handle moves 66°. Accepts any 3/8-16 spindle. **INFO+**: See pages 522-525 to order. Supplied with a CL-316000-BR bolt retainer. Shipping weight 1.0 to 1.5 lbs.

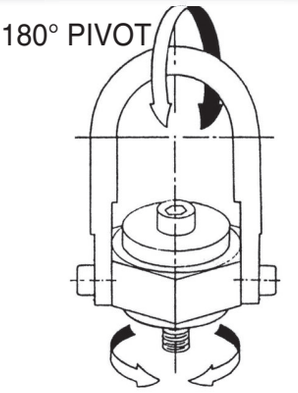
Holding capacity: **750 lbs**

Corrosion-Resistant Swivel Hoist Rings



Electroless Nickel Plating is ideal for many corrosive and marine environments.





Pivots and swivels simultaneously to allow lifting from any direction.

See Page 78

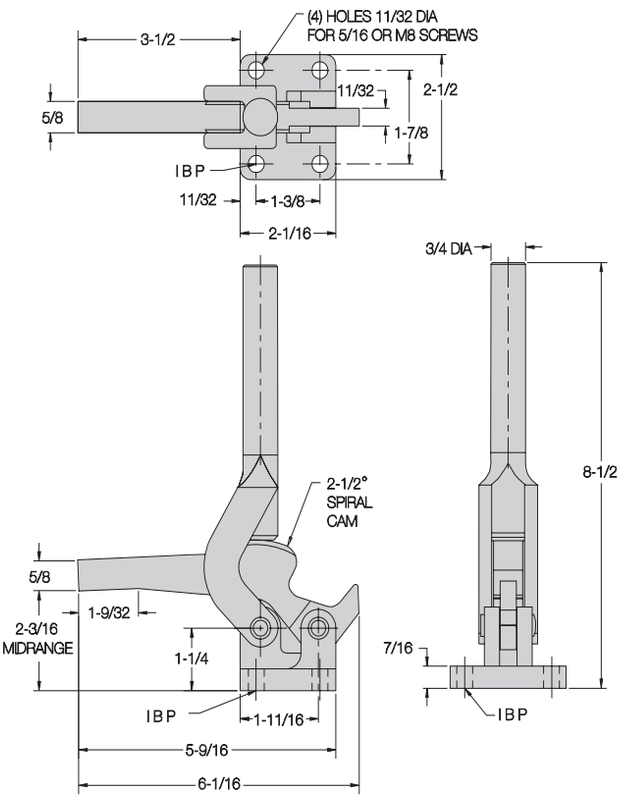
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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



1000 lbs
Cam Action



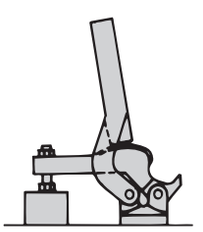
CL-1000-VCC

Wide-opening clamp that locks by cam action rather than toggle action. Smooth spiral cam locks securely anywhere within a 3/16-inch clamping range. Rugged cast-steel components are flame hardened at all wear points. Solid arm can be tapped to accept a spindle, or otherwise modified. Shipping weight 2.5 lbs.

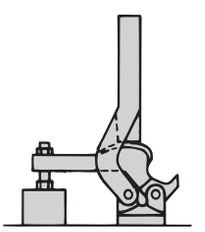
Holding capacity: **1000 lbs**



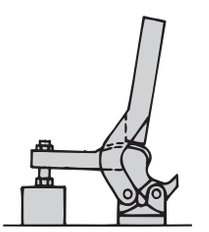
Optional Vinyl Grip
CL-3-HVTC-G



Low Limit

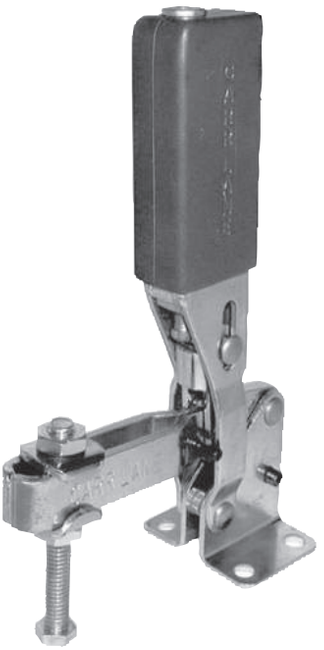


Average Setting

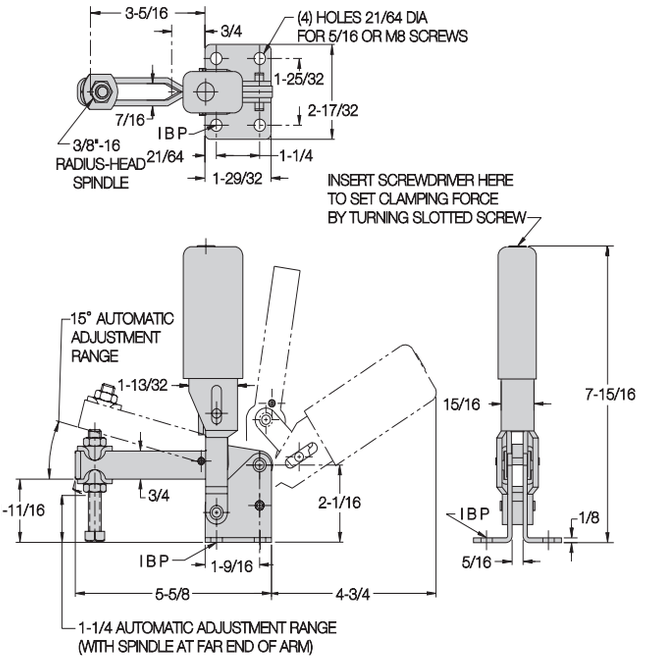


High Limit

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750 lbs
Automatic Toggle Clamp
(Self Adjusting)



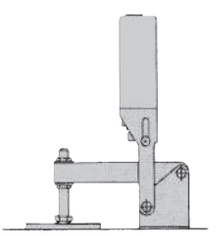
CL-650-ATC

Automatically adjusts for different workpiece thicknesses! Clamps with the same force anywhere within its adjustment range (1-1/4"). Perfect for welding fixtures, machining fixtures for castings, fixtures holding several part sizes within the same family, or any other application where part size can vary.

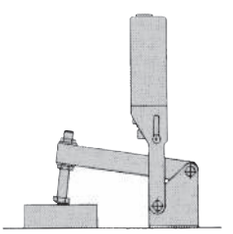
Easy to use. To set up, simply adjust the contact spindle to the average workpiece height, and set desired clamping force. After that, operate just like a standard toggle clamp. The patented adjusting mechanism does the rest.

Clamping force is always consistent. The clamp's toggle action ensures that workpieces will remain clamped even under severe vibration. No additional spindle adjustment is ever needed. The clamp even compensates for wear in long production runs.

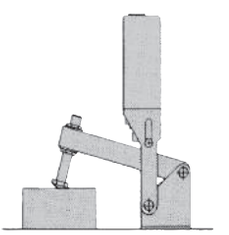
Fits in the same space, and provides the same clamping force as a standard toggle clamp. A maximum of 250 to 500 lbs clamping force (depending on spindle position) can be applied by hand. Arm opens 106° while handle moves 58°. Supplied with 3/8-16 radius spindle CL-38314-RS and (2) CL-3811-TW flanged washers. **Patent no. 4,407,493.** Shipping weight 1.9 lbs.
Holding capacity: 750 lbs



Low Limit



Average Setting



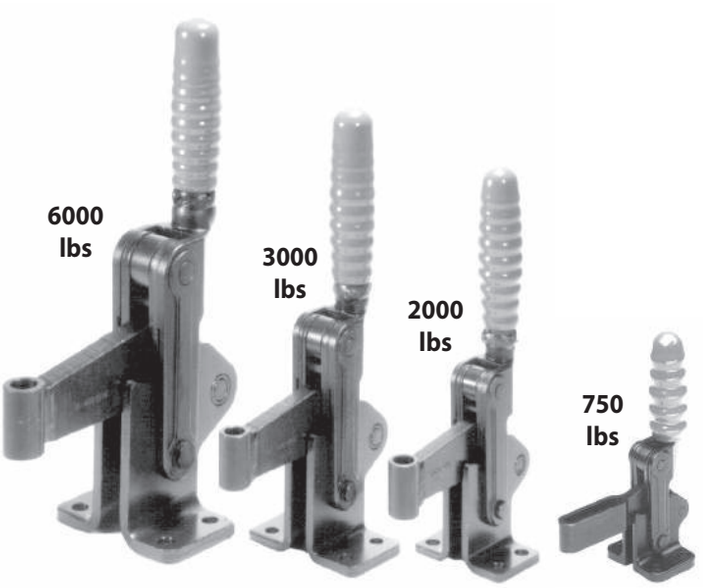
High Limit

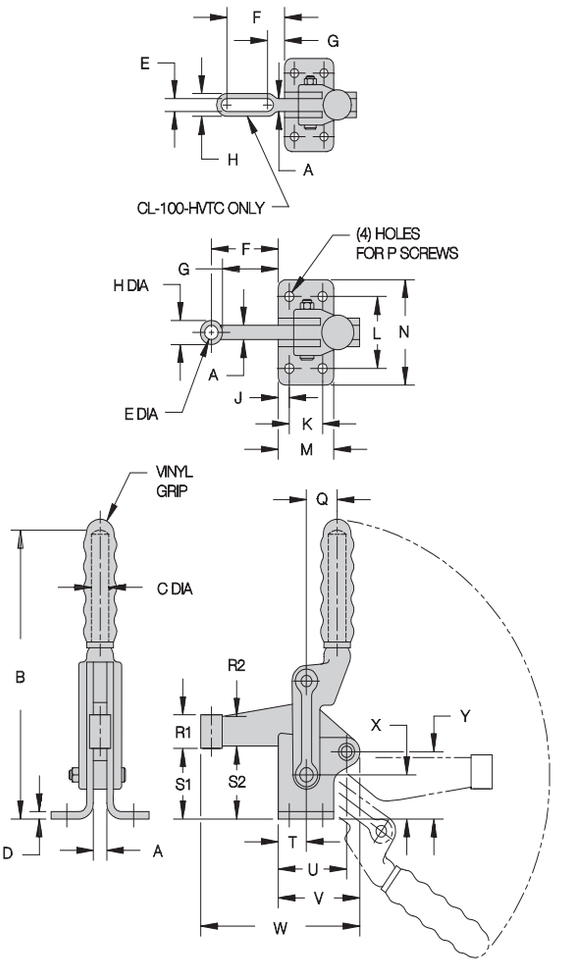
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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS





Heavy-duty automotive-type production clamps designed for extreme durability. The above configuration includes a long horizontal clamping arm with an attached bolt retainer, a vertical handle with vinyl grip, and an integral flanged base (**INFO+**: see pages 481-483 for other versions). Precision, close-tolerance steel components throughout provide exceptionally smooth operation. Rugged alloy steel handle fork. Guided-arm feature provides positive lateral arm support. All pivot pins are hardened and ground, running in either hardened bushings or the close-tolerance holes of hardened parts. The bottom pivot is a precision bolt which can be adjusted, if desired, to fine tune the amount of free play. These clamps are built to withstand abuse. With just occasional lubrication, they will provide extremely long service life. Black oxide finish. Available in four sizes.

CL-100-HVTC

Complete Clamp, Flanged Base

Smallest of the four sizes, yet still quite powerful. Cast alloy steel base and slotted open clamping arm on this size only. Arm opens 130° while handle moves 90°. Accepts any 1/4-20 spindle. **INFO+**: See pages 522-525 to order. Supplied with (2) CL-148-TW flanged washers. Shipping weight 1.0 lbs.

Holding capacity: **750 lbs**

CL-302-HVTC

Complete Clamp, Flanged Base

Solid arm opens 180° while handle moves 120°. Accepts any 1/2-13 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 2.8 lbs.

Holding capacity: **2000 lbs**

CL-502-HVTC

Complete Clamp, Flanged Base

Solid arm opens 180° while handle moves 125°. Accepts any 1/2-13 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 4.3 lbs.

Holding capacity: **3000 lbs**

CL-602-HVTC

Complete Clamp, Flanged Base

Our most-powerful hold-down toggle clamp. Solid arm opens 195° while handle moves 130°. Accepts any 5/8-11 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 9.1 lbs.

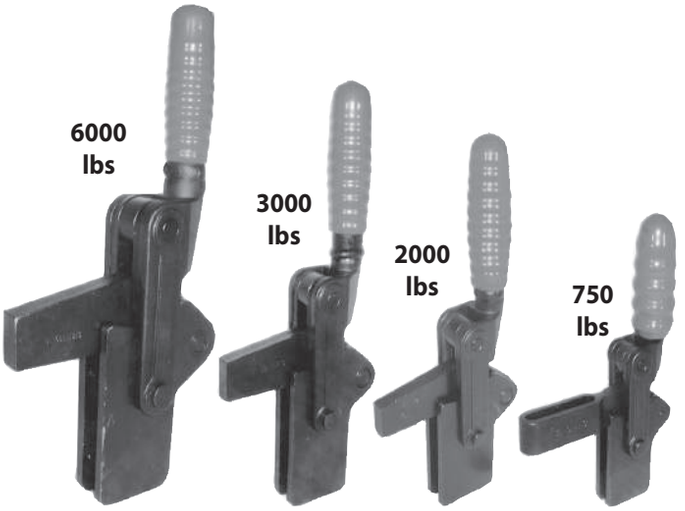
Holding capacity: **6000 lbs**

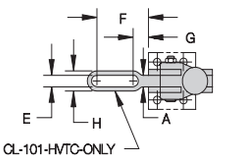
PART NO. COMPLETE CLAMP	A	B	C DIA	D	E	F	G	H	J	K	L	M	N	P	Q	R1	R2	S1	S2	T	U	V	W	X	Y
CL-100-HVTC	.236	4.45	.50	.197	.26	1.54	.35	.49	.236	.748	1.260	1.22	1.73	1/4 or M6	.55	.59	.59	.98	.98	.59	1.26	1.54	3.31	.51	.87
CL-302-HVTC	.394	8.46	.75	.197	.52	1.97	1.57	.75	.394	.984	1.969	1.77	2.64	5/16 or M8	.91	1.18	.87	1.89	1.89	.98	2.13	2.52	4.87	1.10	1.72
CL-502-HVTC	.472	9.84	.87	.236	.52	2.36	1.97	.75	.394	1.181	2.362	1.97	3.46	5/16 or M8	.98	1.18	1.02	2.28	2.32	.98	2.40	2.92	5.66	1.42	2.19
CL-602-HVTC	.630	11.61	.98	.315	.64	2.95	2.36	1.00	.472	1.575	2.953	2.48	4.13	3/8 or M10	1.38	1.50	1.26	2.76	2.95	1.57	3.31	3.98	7.43	1.81	2.76

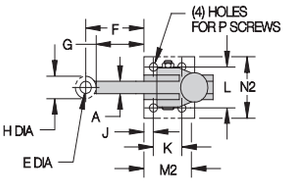
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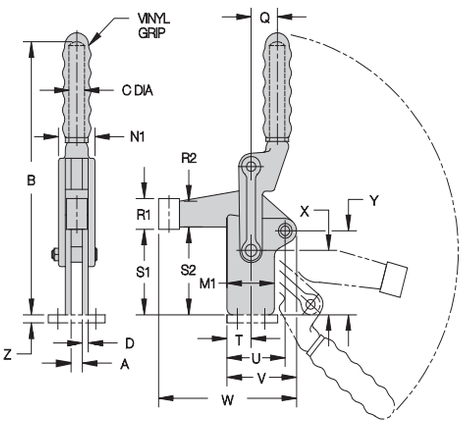
VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS









Heavy-duty automotive-type production clamps designed for extreme durability. The above configuration includes a long horizontal clamping arm furnished with a bolt retainer (not welded on), a vertical handle with vinyl grip, and a straight base for plate/tongue mounting at any angle (**INFO+**: see pages 480, 482-483 for other versions). Precision, close-tolerance steel components throughout provide exceptionally smooth operation. Rugged alloy steel handle fork. Guided-arm feature provides positive lateral arm support. All pivot pins are hardened and ground, running in either hardened bushings or the close-tolerance holes of hardened parts. The bottom pivot is a precision bolt which can be adjusted, if desired, to fine tune the amount of free play. These clamps are built to withstand abuse. With just occasional lubrication, they will provide extremely long service life. Black oxide finish. Available in four sizes.

CL-101-HVTC **Complete Clamp, Straight Base**

Smallest of the four sizes, yet still quite powerful. Cast alloy steel slotted open clamping arm on this size only. Arm opens 205° while handle moves 130°. Accepts any 1/4-20 spindle. **INFO+**: See pages 522-525 to order. Supplied with (2) CL-148-TW flanged washers. Shipping weight 0.9 lbs.

Holding capacity: **750 lbs**

CL-303-HVTC **Complete Clamp, Straight Base**

Solid arm opens 205° while handle moves 130°. Accepts any 1/2-13 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 2.5 lbs.

Holding capacity: **2000 lbs**

CL-503-HVTC **Complete Clamp, Straight Base**

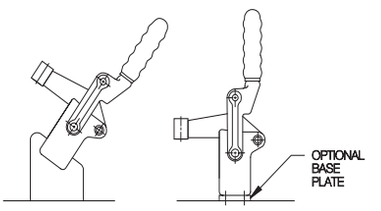
Solid arm opens 195° while handle moves 130°. Accepts any 1/2-13 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 4.0 lbs.

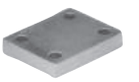
Holding capacity: **3000 lbs**

CL-601-HVTC **Complete Clamp, Straight Base**

Our most-powerful hold-down toggle clamp. Solid arm opens 195° while handle moves 130°. Accepts any 5/8-11 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 8.3 lbs.

Holding capacity: **6000 lbs**





Base Plate (order separately)

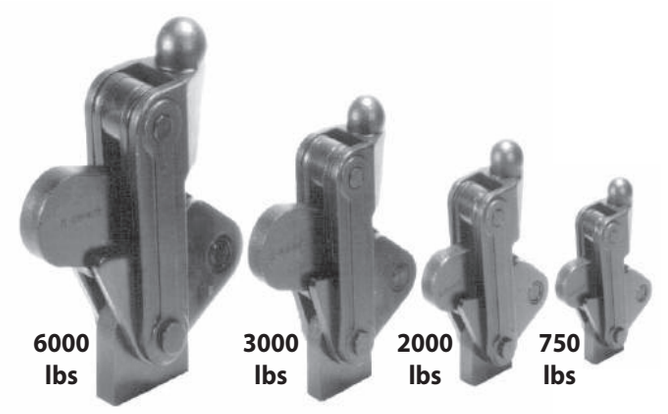
CL-1-HVTC-P (750 lbs) **CL-5-HVTC-P (3000 lbs)**
CL-3-HVTC-P (2000 lbs) **CL-6-HVTC-P (6000 lbs)**

PART NO. COMPLETE CLAMP	A	B	C DIA	D	E	F	G	H	J	K	L	M1	M2	N1	N2	P	Q	R1	R2	S1	S2	T	U	V	W	X	Y	Z
CL-101-HVTC	.236	5.08	.50	.118	.26	1.54	.35	.49	.236	.748	1.260	1.06	1.10	.79	1.73	#10 or M5	.55	.59	.59	1.61	1.61	.59	1.26	1.54	3.31	1.14	1.50	.236
CL-303-HVTC	.394	9.25	.75	.197	.52	1.97	1.57	.75	.295	.984	1.378	1.77	1.57	1.26	1.97	1/4 or M6	.91	1.18	.87	2.76	2.76	.98	2.13	2.52	4.87	1.97	2.59	.315
CL-503-HVTC	.472	10.87	.87	.236	.52	2.36	1.97	.75	.394	1.181	1.575	1.97	1.97	1.50	2.36	5/16 or M8	.98	1.18	1.02	3.35	3.39	.98	2.40	2.92	5.66	2.48	3.25	.315
CL-601-HVTC	.630	12.60	.98	.315	.64	2.95	2.36	1.00	.394	1.772	1.969	2.48	2.56	1.97	2.76	5/16 or M8	1.38	1.50	1.26	3.94	4.13	1.57	3.31	3.98	7.43	2.99	3.94	.315

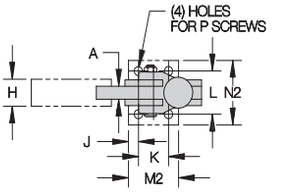
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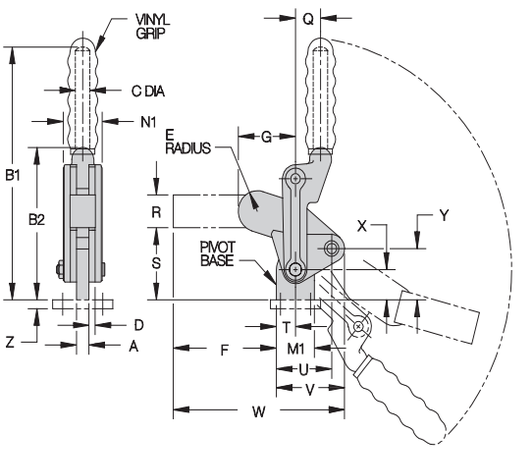
VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Heavy-duty automotive-type production clamps designed for extreme durability. The above configuration is a basic toggle mechanism onto which an arm and handle can be welded at any desired angle (**INFO+**: see pages 480-481, and 483 for other versions). The pivot base must be welded to both the clamp mechanism and the fixture, or the optional base plate, after setting the clamp at the proper angle. Precision, close-tolerance steel components throughout provide exceptionally smooth operation. Rugged alloy steel handle fork. Guided-arm feature provides positive lateral arm support. All pivot pins are hardened and ground, running in either hardened bushings or the close-tolerance holes of hardened parts. The bottom pivot is a precision bolt which can be adjusted, if desired, to fine tune the amount of free play. These clamps are built to withstand abuse. With just occasional lubrication, they will provide extremely long service life. Black oxide finish. Available in four sizes.





CL-110-HVTC **Basic Mechanism, Pivot Base**

Smallest of the four sizes, yet still quite powerful. Arm opens 205° while handle moves 130°. Shipping weight 0.6 lbs. To order basic mechanism without the pivot base, specify part no. CL-120-HVTC.

Holding capacity: **750 lbs**

CL-312-HVTC **Basic Mechanism, Pivot Base**

Arm opens 205° while handle moves 130°. Shipping weight 1.6 lbs. To order basic mechanism without the pivot base, specify part no. CL-320-HVTC.

Holding capacity: **2000 lbs**

CL-512-HVTC **Basic Mechanism, Pivot Base**

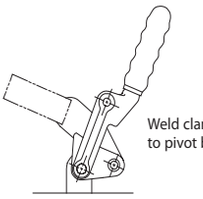
Arm opens 195° while handle moves 130°. Shipping weight 2.9 lbs. To order basic mechanism without the pivot base, specify part no. CL-520-HVTC.

Holding capacity: **3000 lbs**

CL-610-HVTC **Basic Mechanism, Pivot Base**

Our most-powerful hold-down toggle clamp. Arm opens 195° while handle moves 130°. Shipping weight 6.4 lbs. To order basic mechanism without the pivot base, specify part no. CL-620-HVTC.

Holding capacity: **6000 lbs**



Weld clamp mechanism to pivot base at any desired angle.



Clamping Arm (order separately)



Base Plate (order separately)



Handle (order separately)



Vinyl Grip (order separately)

ACCESSORIES

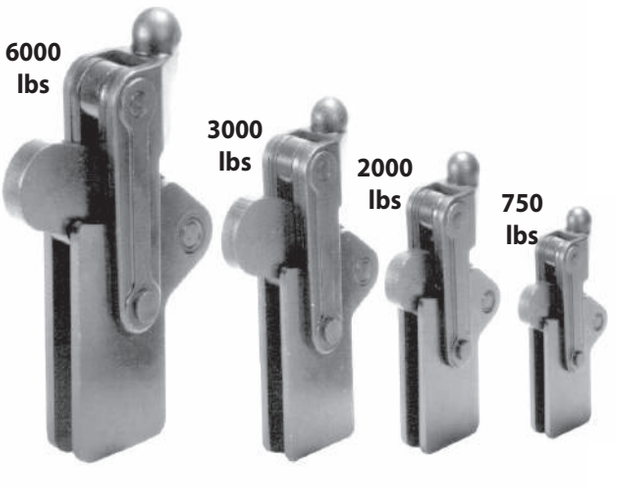
CLAMP SIZE	PART NO. CLAMPING ARM	PART NO. BASE PLATE	PART NO. HANDLE	PART NO. VINYL GRIP
750 lbs	CL-1-HVTC-A	CL-1-HVTC-P	CL-1-HVTC-H	CL-1-HVTC-G
2000 lbs	CL-3-HVTC-A	CL-3-HVTC-P	CL-3-HVTC-H	CL-3-HVTC-G
3000 lbs	CL-5-HVTC-A	CL-5-HVTC-P	CL-5-HVTC-H	CL-5-HVTC-G
6000 lbs	CL-6-HVTC-A	CL-6-HVTC-P	CL-6-HVTC-H	CL-6-HVTC-G

PART NO. BASIC MECHANISM	A	B1	B2	C DIA	D	E	F	G	H	J	K	L	M1	M2	N1	N2	P	Q	R	S	T	U	V	W	X	Y	Z
CL-110-HVTC	.236	4.33	2.60	.50	.118	.39	2.76	1.14	.472	.197	.709	.984	.71	1.10	.79	1.38	#10 or M5	.55	.630	.94	.35	1.02	1.30	4.06	.39	.75	.236
CL-312-HVTC	.394	8.07	4.49	.75	.197	.55	2.97	1.57	.787	.295	.984	1.378	1.14	1.57	1.26	1.97	1/4 or M6	.91	.984	1.79	.57	1.71	2.11	5.08	.79	1.41	.315
CL-512-HVTC	.472	9.49	5.47	.87	.236	.75	4.06	2.24	.984	.394	1.181	1.575	1.50	1.97	1.54	2.36	5/16 or M8	.98	1.181	2.64	.75	2.17	2.68	6.74	1.10	1.87	.315
CL-610-HVTC	.630	10.91	6.97	.98	.315	.87	5.16	2.83	1.181	.394	1.772	1.969	2.05	2.56	1.97	2.76	5/16 or M8	1.38	1.378	3.33	1.02	2.74	3.43	8.59	1.30	2.24	.315

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Heavy-duty automotive-type production clamps designed for extreme durability. The above configuration is a basic toggle mechanism onto which an arm and handle can be welded at any desired angle (**INFO+**: see pages 480-482 for other versions). The straight base is ideal for plate/tongue mounting at any angle. Alternatively, the optional base plate can be attached to construct a tall flanged-base clamp. Precision, close-tolerance steel components throughout provide exceptionally smooth operation. Rugged alloy steel handle fork. Guided-arm feature provides positive lateral arm support. All pivot pins are hardened and ground, running in either hardened bushings or the close-tolerance holes of hardened parts. The bottom pivot is a precision bolt which can be adjusted, if desired, to fine tune the amount of free play. These clamps are built to withstand abuse. With just occasional lubrication, they will provide extremely long service life. Black oxide finish. Available in four sizes.

CL-111-HVTC **Basic Mechanism, Straight Base**

Smallest of the four sizes, yet still quite powerful. Arm opens 205° while handle moves 130°. Shipping weight 0.8 lbs.

Holding capacity: **750 lbs**

CL-311-HVTC **Basic Mechanism, Straight Base**

Arm opens 205° while handle moves 130°. Shipping weight 1.8 lbs.

Holding capacity: **2000 lbs**

CL-513-HVTC **Basic Mechanism, Straight Base**

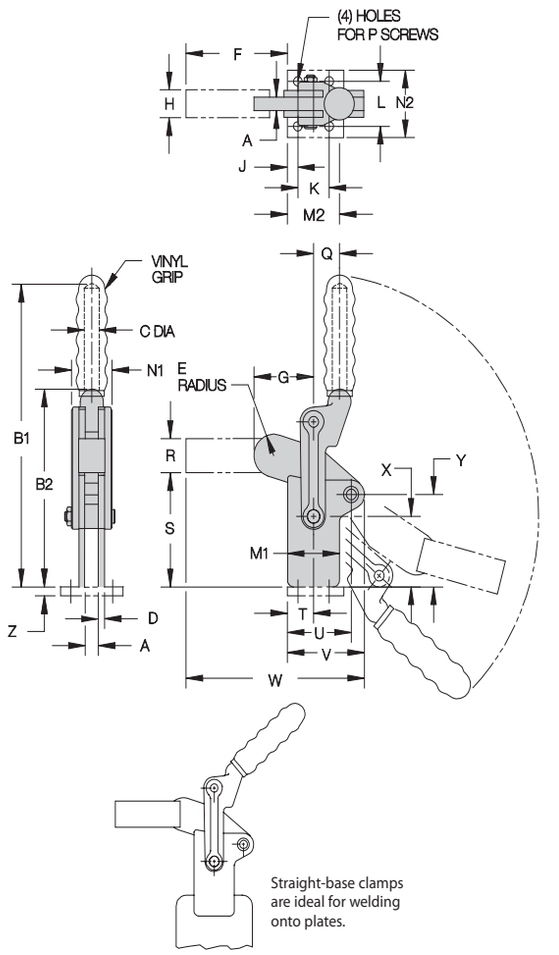
Arm opens 195° while handle moves 130°. Shipping weight 3.2 lbs.

Holding capacity: **3000 lbs**

CL-611-HVTC **Basic Mechanism, Straight Base**

Our most-powerful hold-down toggle clamp. Arm opens 195° while handle moves 130°. Shipping weight 7.1 lbs.

Holding capacity: **6000 lbs**



Straight-base clamps are ideal for welding onto plates.



Clamping Arm (order separately)



Base Plate (order separately)



Handle (order separately)



Vinyl Grip (order separately)

ACCESSORIES

CLAMP SIZE	PART NO. CLAMPING ARM	PART NO. BASE PLATE	PART NO. HANDLE	PART NO. VINYL GRIP
750 lbs	CL-1-HVTC-A	CL-1-HVTC-P	CL-1-HVTC-H	CL-1-HVTC-G
2000 lbs	CL-3-HVTC-A	CL-3-HVTC-P	CL-3-HVTC-H	CL-3-HVTC-G
3000 lbs	CL-5-HVTC-A	CL-5-HVTC-P	CL-5-HVTC-H	CL-5-HVTC-G
6000 lbs	CL-6-HVTC-A	CL-6-HVTC-P	CL-6-HVTC-H	CL-6-HVTC-G

PART NO. BASIC MECHANISM	A	B1	B2	C DIA	D	E	F	G	H	J	K	L	M1	M2	N1	N2	P	Q	R	S	T	U	V	W	X	Y	Z
CL-111-HVTC	.236	5.08	3.39	.50	.118	.39	2.52	1.14	.472	.197	.709	.984	1.06	1.10	.79	1.38	#10 or M5	.55	.630	1.73	.59	1.26	1.54	4.06	1.18	1.54	.236
CL-311-HVTC	.394	9.25	5.67	.75	.197	.55	2.56	1.57	.787	.295	.984	1.378	1.77	1.57	1.26	1.97	1/4 or M6	.91	.984	2.97	.98	2.13	2.52	5.08	1.97	2.59	.315
CL-513-HVTC	.472	10.87	6.97	.87	.236	.75	3.82	2.24	.984	.394	1.181	1.575	1.97	1.97	1.50	2.36	5/16 or M8	.98	1.181	4.02	.98	2.40	2.92	6.74	2.48	3.25	.315
CL-611-HVTC	.630	12.60	8.66	.98	.315	.87	4.61	2.83	1.181	.394	1.772	1.969	2.48	2.56	1.97	2.76	5/16 or M8	1.38	1.378	5.02	1.57	3.31	3.98	8.59	2.99	3.94	.315

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS







Hold-down toggle clamp with a unique finger-grip T handle. Extremely compact design. Open arm provides adjustable spindle location. Arm opens 92° while handle moves 175°.

CL-200-VTC

Miniature-size T-handle clamp. Supplied with #10-32 flat-cushion spindle CL-316112-FC and (2) CL-3166-TW flanged washers. Shipping weight 0.2 lbs.

Holding capacity: **150 lbs**

CL-300-VTC

Medium-size T-handle clamp. Supplied with 5/16-18 flat-cushion spindle CL-518208-FC and (2) CL-51610-TW flanged washers. Shipping weight 0.6 lbs.

Holding capacity: **350 lbs**

CL-500-VTC

Large-size T-handle clamp. Supplied with 3/8-16 flat-cushion spindle CL-38212-FC and (2) CL-3811-TW flanged washers. Shipping weight 1.3 lbs.

Holding capacity: **750 lbs**

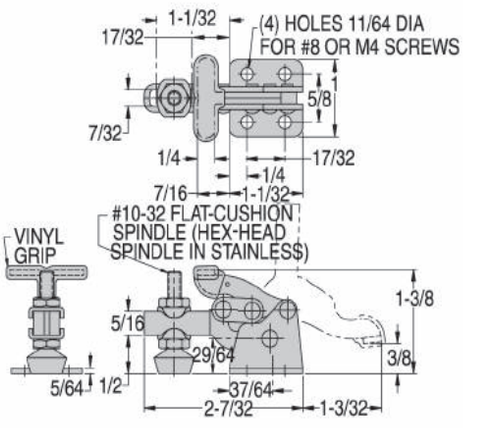
Also available in stainless steel...



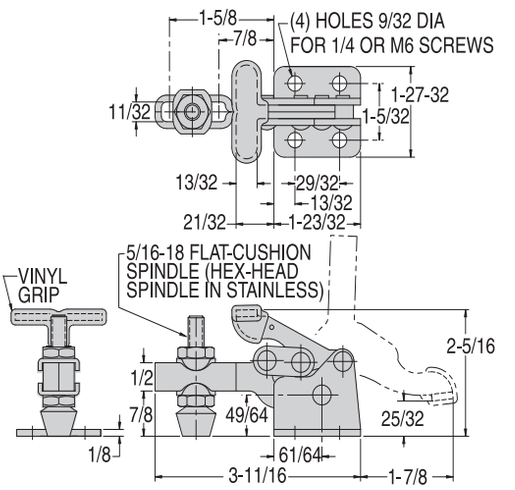
CL-200-VTC-S
150 lbs



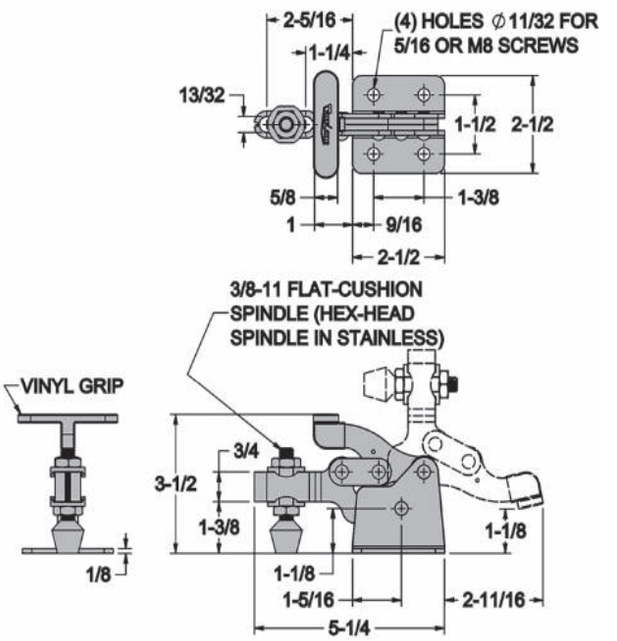
CL-300-VTC-S
350 lbs



CL-200-VTC



CL-300-VTC

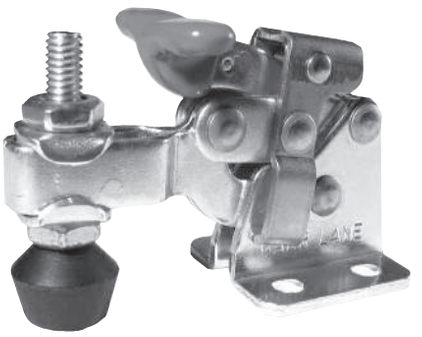


CL-500-VTC

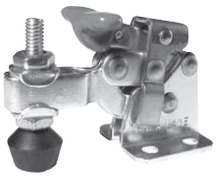
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VERTICAL-HANDLE TOGGLE CLAMPS

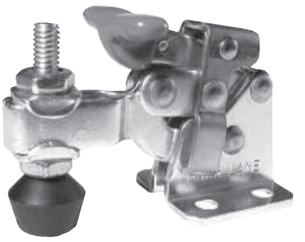
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



750 lbs
With Safety Lock



150 lbs
With Safety Lock



350 lbs
With Safety Lock

INFO+: Same as our hold-down toggle clamps on page 484, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the clamp from being accidentally opened by bumping the handle. This clamp has a unique finger-grip T handle. Extremely compact design. Open arm provides adjustable spindle location. Arm opens 92° while handle moves 175°.

CL-200-LVTC

Miniature-size T-handle clamp. Supplied with #10-32 flat-cushion spindle CL-316112-FC and (2) CL-3166-TW flanged washers. Shipping weight 0.2 lbs.

Holding capacity: **150 lbs**

CL-300-LVTC

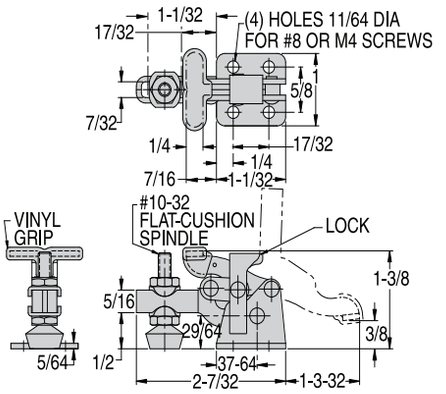
Medium-size T-handle clamp. Supplied with 5/16-18 flat-cushion spindle CL-518208-FC and (2) CL-51610-TW flanged washers. Shipping weight 0.6 lbs.

Holding capacity: **350 lbs**

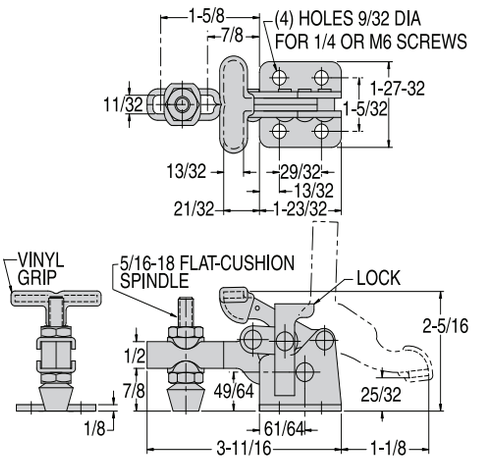
CL-500-LVTC

Large-size T-handle clamp. Supplied with 3/8-16 flat-cushion spindle CL-38212-FC and (2) CL-3811-TW flanged washers. Shipping weight 1.3 lbs.

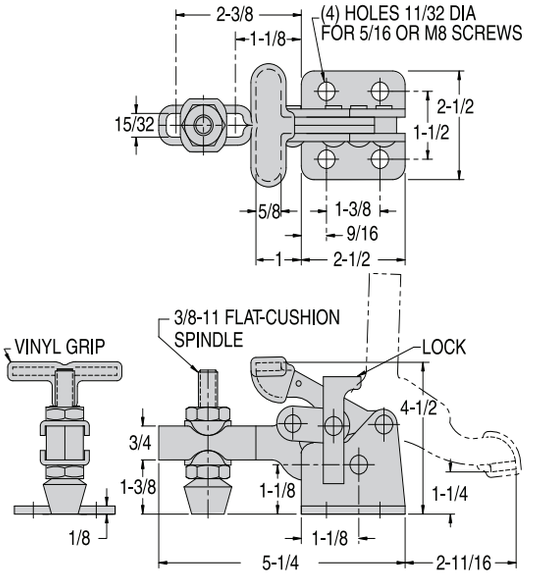
Holding capacity: **750 lbs**



CL-200-LVTC



CL-300-LVTC



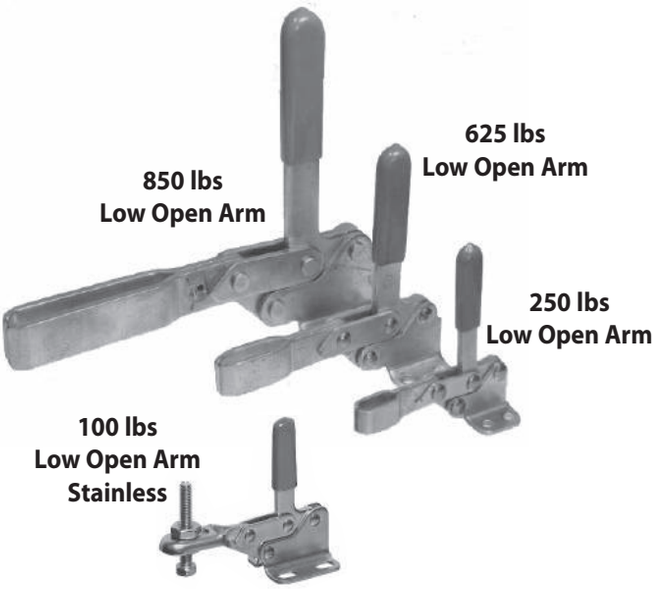
CL-500-LVTC

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Simple, easy-opening clamps with excellent arm reach, extending farther over workpiece than any other clamps their size. Open arm allows spindle adjustment. Arm opens 83° while handle moves 83°. Available in four sizes.

CL-11-TC

Low Open Arm, Flanged Base

Miniature clamp in stainless steel. Supplied with #8-32 hex-head spindle CL-832203-SA-S. Shipping weight 0.1 lbs.

Holding capacity: **100 lbs**

CL-111-TC

Low Open Arm, Flanged Base

Small-size clamp. Accepts any 1/4-20 spindle and (2) CL-147-TW flanged washers. **INFO+**: See pages 522-525 to order. Shipping weight 0.3 lbs.

Holding capacity: **250 lbs**

CL-211-TC

Low Open Arm, Flanged Base

Medium-size clamp. Accepts any 5/16-18 spindle and (2) CL-51610-TW flanged washers. **INFO+**: See pages 522-525 to order. Shipping weight 0.5 lbs.

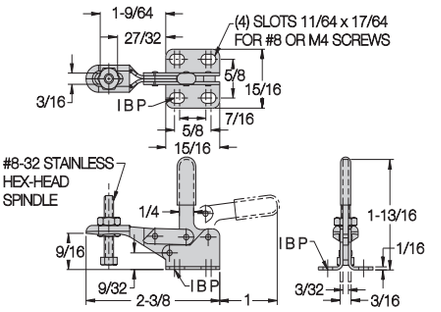
Holding capacity: **625 lbs**

CL-311-TC

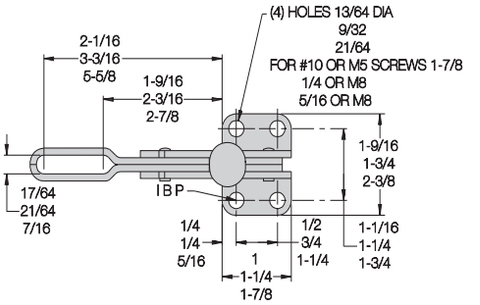
Low Open Arm, Flanged Base

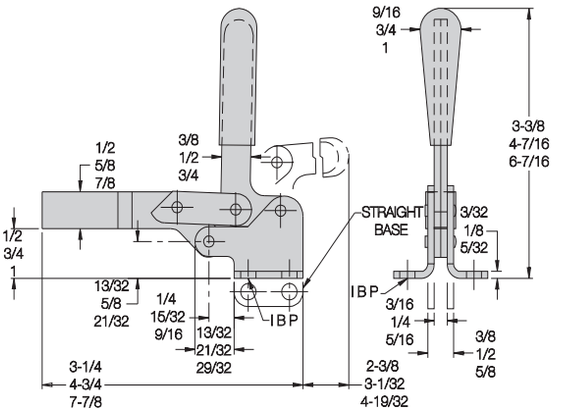
Large-size clamp. Arm extends a full 6 inches over workpiece. Accepts any 3/8-16 spindle and (2) CL-3811-TW flanged washers. **INFO+**: See pages 522-525 to order. Shipping weight 1.4 lbs.

Holding capacity: **850 lbs**



CL-11-TC





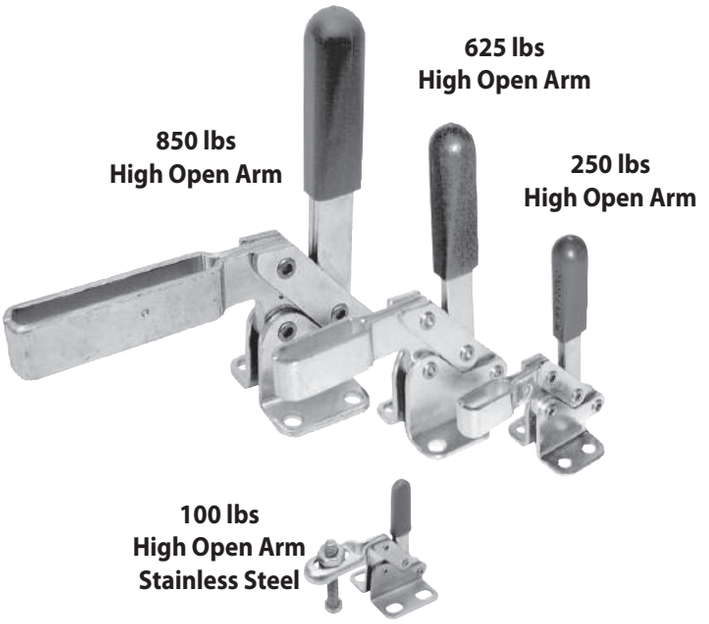
CL-111-TC (Top dimension)
CL-211-TC (Middle dimension)
CL-311-TC (Bottom dimension)

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Simple, easy-opening clamps with extra arm height. Open arm allows spindle adjustment. Arm opens 83° while handle moves 83°. Available in four sizes.

CL-21-TC

High Open Arm, Flanged Base

Miniature clamp in stainless steel. Supplied with #8-32 hex-head spindle CL-832203-SA-S. Shipping weight 0.1 lbs.

Holding capacity: **100 lbs**

CL-101-TC

High Open Arm, Flanged Base

Small-size clamp. Accepts any 1/4-20 spindle and (2) CL-147-TW flanged washers. **INFO+**: See pages 522-525 to order. Shipping weight 0.3 lbs.

Holding capacity: **250 lbs**

CL-201-TC

High Open Arm, Flanged Base

Medium-size clamp. Accepts any 5/16-18 spindle and (2) CL-51610-TW flanged washers. **INFO+**: See pages 522-525 to order. Shipping weight 0.5 lbs.

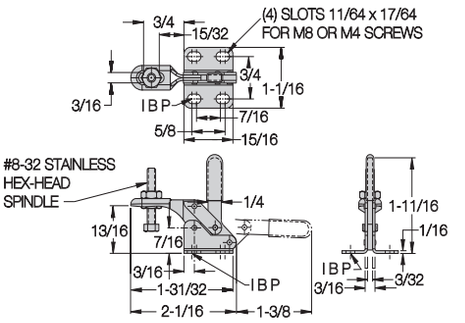
Holding capacity: **625 lbs**

CL-301-TC

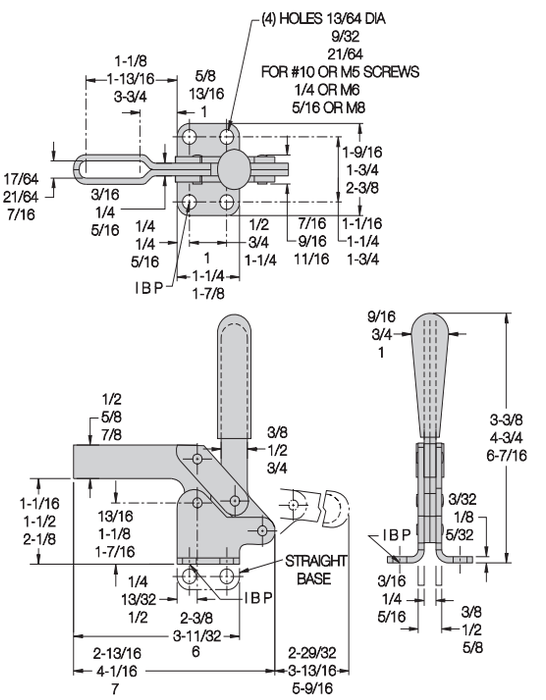
High Open Arm, Flanged Base

Large-size clamp. Accepts any 3/8-16 spindle and (2) CL-3811-TW flanged washers. **INFO+**: See pages 522-525 to order. Shipping weight 1.4 lbs.

Holding capacity: **850 lbs**



CL-21-TC



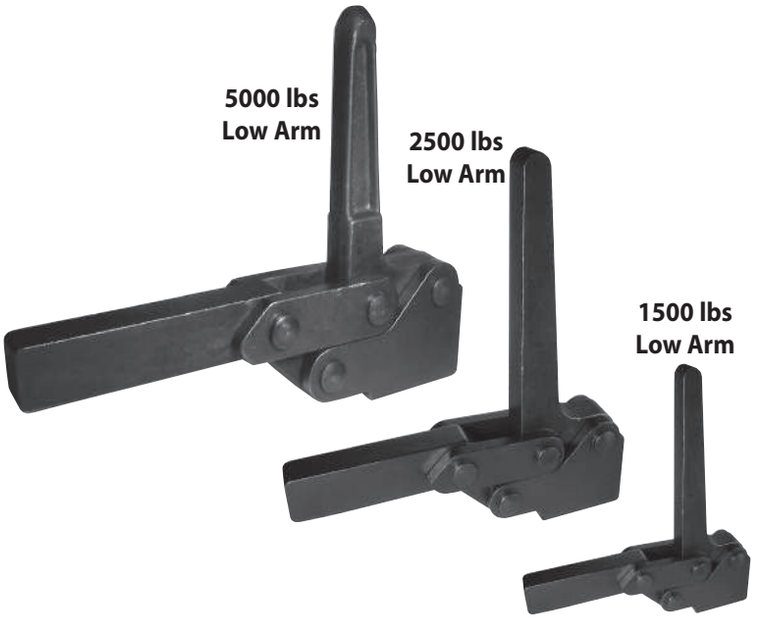
CL-101-TC (Top dimension)
CL-201-TC (Middle dimension)
CL-301-TC (Bottom dimension)

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



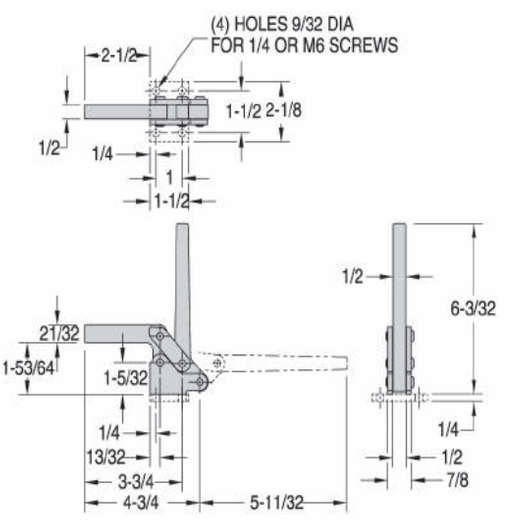
Compact heavy-duty clamps with forged steel handles and clamping arms, available in three sizes. Low clamping arm extends far over workpiece. Simple, easy-opening linkage. Arm opens 83° while handle moves 83°. Weld-on flanged base is optional. To order clamp with flanged base attached, add "S" to part no. (example: CL-45-HDC-121S).

CL-45-HDC-121

Low Arm

Smallest of the three sizes, yet still quite powerful. Shipping weight 2.0 lbs.

Holding capacity: **1500 lbs**



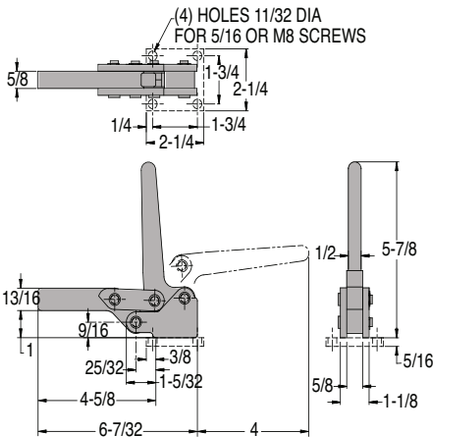
CL-45-HDC-121

CL-50-HDC-121

Low Arm

Medium-size clamp with high strength. Shipping weight 2.5 lbs.

Holding capacity: **2500 lbs**



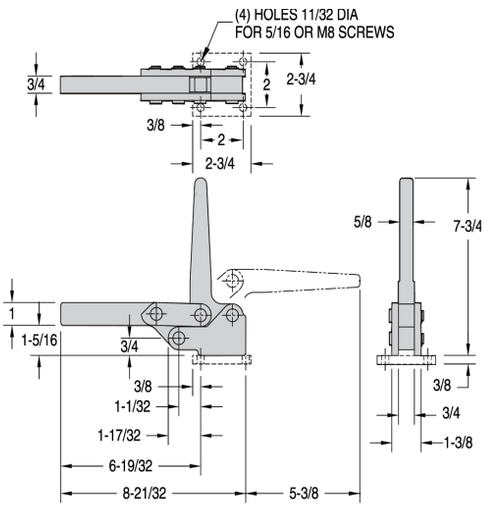
CL-50-HDC-121

CL-51-HDC-121

Low Arm

Largest of the three sizes. Shipping weight 5.0 lbs.

Holding capacity: **5000 lbs**



CL-51-HDC-121

Available with standard flanged base attached...



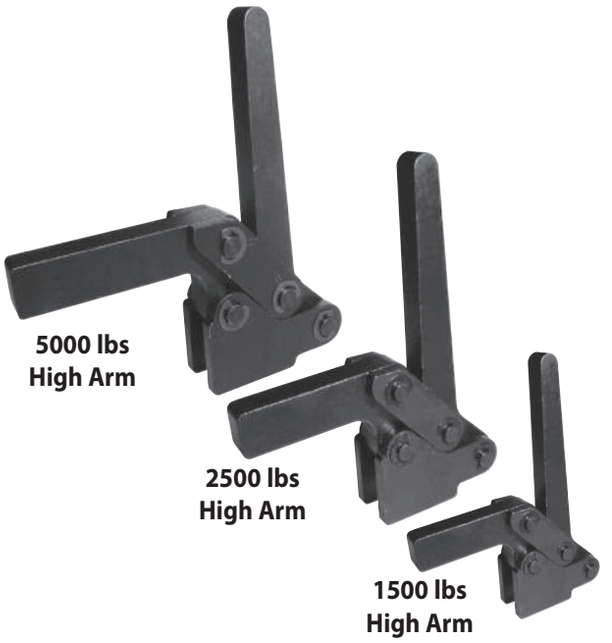
Add "S" to part no.

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VERTICAL-HANDLE TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



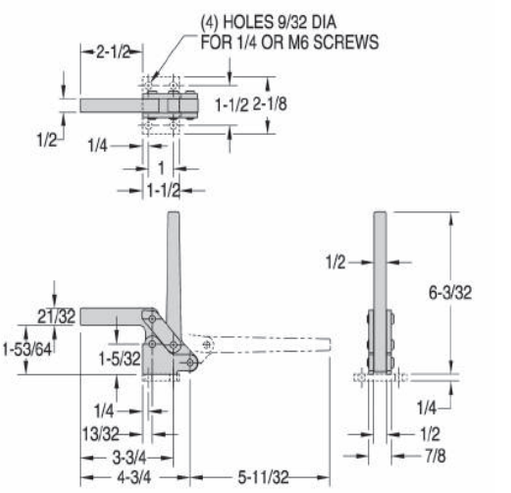
Compact heavy-duty clamps with forged steel handles and clamping arms, available in three sizes. High clamping arm provides extra room for thick workpieces. Simple, easy-opening linkage. Arm opens 83° while handle moves 83°. Weld-on flanged base is optional. To order clamp with flanged base attached, add "S" to part no. (example: CL-40-HDC-211S).

CL-40-HDC-211

High Arm

Smallest of the three sizes, yet still quite powerful. Shipping weight 2.0 lbs.

Holding capacity: **1500 lbs**



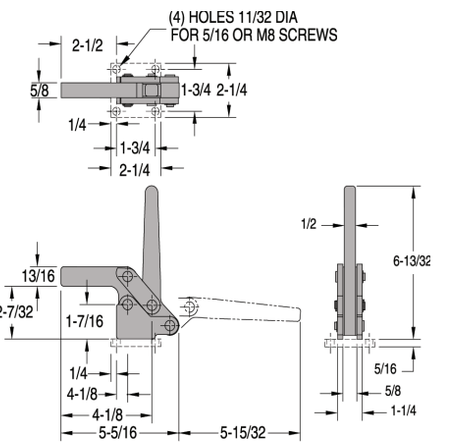
CL-40-HDC-211

CL-60-HDC-211

High Arm

Medium-size clamp with high strength. Shipping weight 2.5 lbs.

Holding capacity: **2500 lbs**



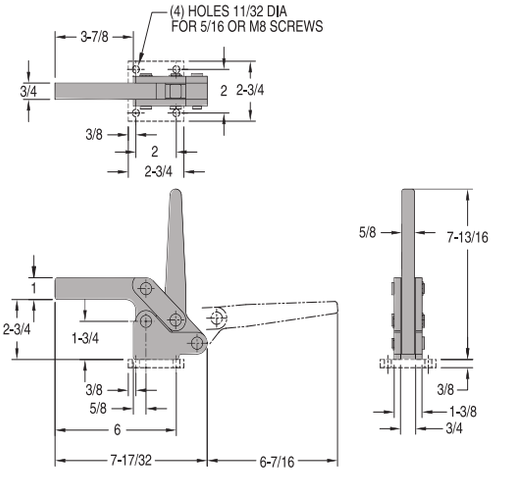
CL-60-HDC-211

CL-61-HDC-211

High Arm

Largest of the three sizes. Shipping weight 5.0 lbs.

Holding capacity: **5000 lbs**



CL-61-HDC-211

Available with standard flanged base attached . . .



Add "S" to part no.

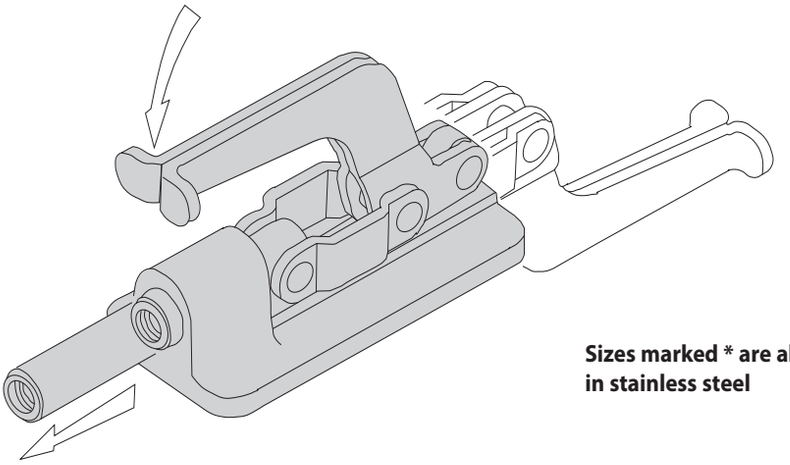
Also available air powered . . .



CL-3000-PTC
(INFO+: page 518)

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PUSH / PULL TOGGLE CLAMPS



Sizes marked * are also available in stainless steel

All Carr Lane Manufacturing toggle clamps are DFARS and RoHS compliant.



100 lbs*



300 lbs*



800 lbs



5000 lbs



150 lbs*



300 lbs



2500 lbs



16000 lbs

Standard SPC Design
pages 491-496

Most popular series of push/pull clamps. Plunger advances and locks by moving the handle forward toward it. Clamp can also be used for pulling instead of pushing (handle locks back in downward position also). Choice of eight sizes.



600 lbs

Horizontal Handle
page 497

Reverse-action push clamp. Plunger advances and locks by moving the handle backward into horizontal position.



500 lbs



850 lbs



1500 lbs

PC Design
pages 498-499

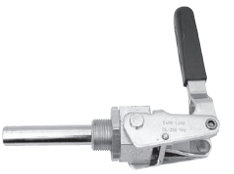
Durable push/pull clamps with nodular iron bases. Plunger advances and locks by moving the handle forward toward it. Clamp can also be used for pulling instead of pushing (handle locks back in downward position also). Choice of three sizes.



200 lbs*



300 lbs*



700 lbs

Threaded Body
pages 500-501

Compact push/pull clamps for mounting through panels, plates, or angle brackets. Install in a drilled or tapped hole. Plunger locks in either extended or retracted position. Rotate clamp to position handle anywhere within 360°. Choice of three sizes.

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PUSH/PULL TOGGLE CLAMPS

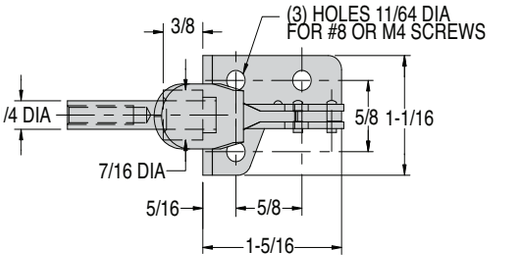
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



100 lbs
Tapped Plunger



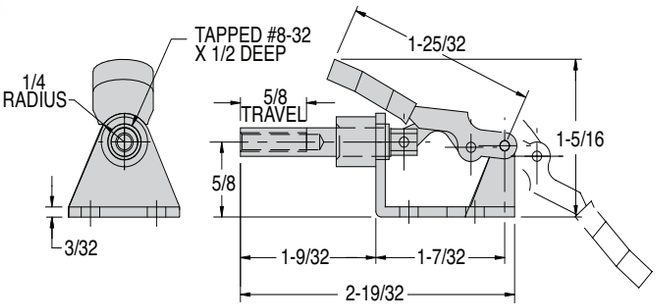
100 lbs
Externally Threaded
Plunger

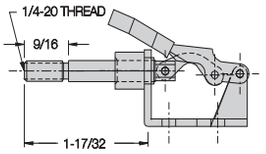


CL-50-SPC (Metric No. CLM-50-SPC)

Miniature plunger clamp, perfect for electronics fixturing and other light-duty applications. Locks in extended or retracted position. 5/8" plunger travel. Tapped-plunger version supplied with #8-32 nylon hex-head spindle CL-832203-SA (M4 in metric). Also available with 1/4-20 externally threaded plunger. Shipping weight 0.2 lbs.

Holding capacity: **100 lbs**





CL-51-SPC
Externally Threaded
Plunger

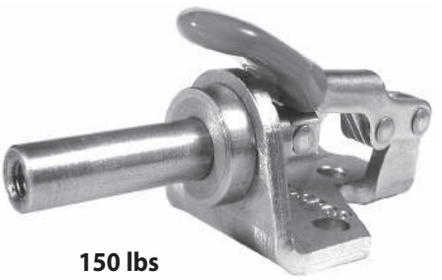
Also available
in stainless steel . . .



CL-50-SPC-S

PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

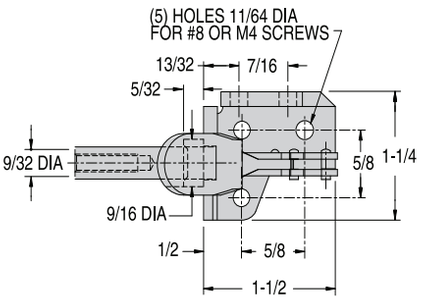


150 lbs
Tapped Plunger

Also available
in stainless steel . . .



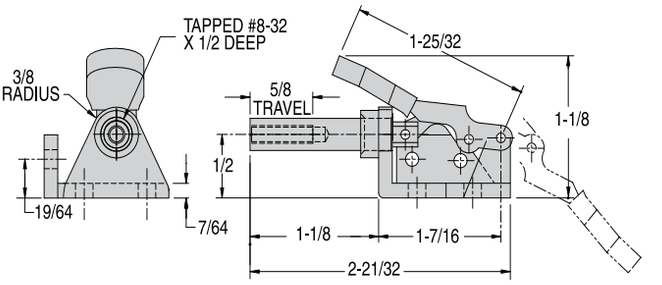
CL-60-SPC-S



CL-60-SPC (Metric No. CLM-60-SPC)

Heavier-duty version of our smallest plunger clamp above. This is a powerful clamp in an extremely compact size. Unique base allows bottom or side mounting. Locks in extended or retracted position. 5/8" plunger travel. Plunger is tapped to accept any #8-32 spindle (M4 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 0.2 lbs.

Holding capacity: **150 lbs**

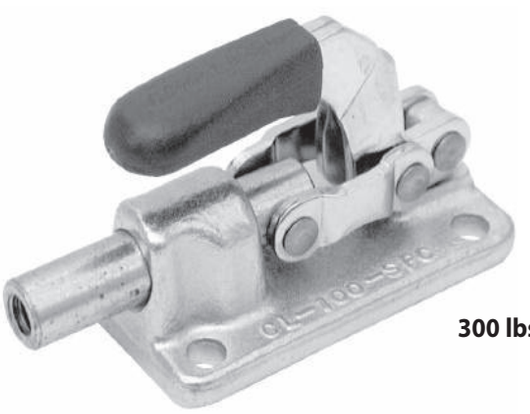


Get quote

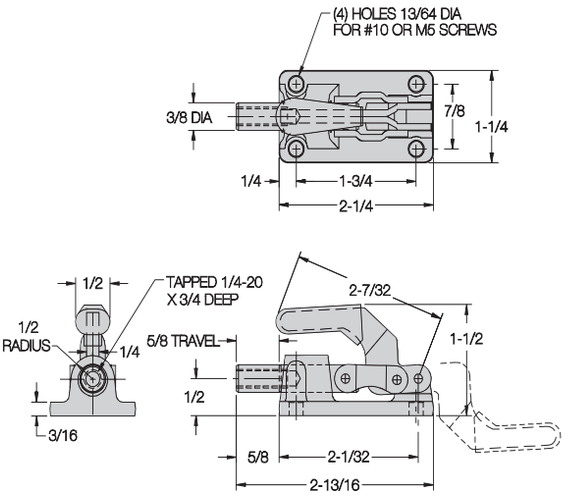
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PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



300 lbs



CL-100-SPC (Metric No. CLM-100-SPC)

Tiny, yet extremely powerful plunger clamp with a forged steel base. Requires very little mounting space due to its narrow base and compact low profile. Locks in extended or retracted position. 5/8" plunger travel. Plunger is tapped to accept any 1/4-20 spindle (M6 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 0.5 lbs.

Holding capacity: **300 lbs**

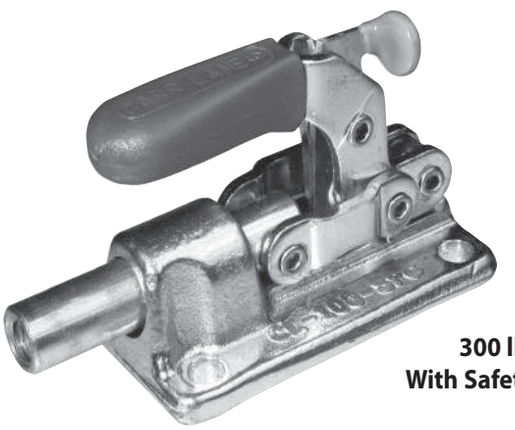
Also available in stainless steel . . .



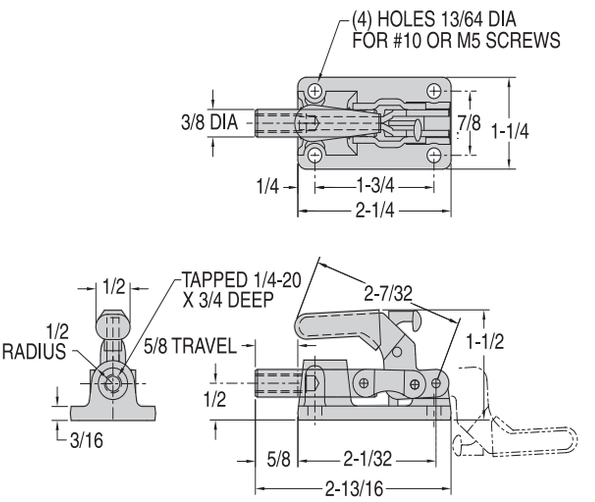
CL-100-SPC-S

PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



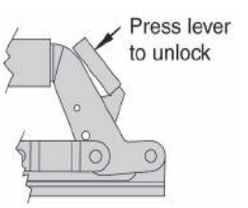
300 lbs
With Safety Lock



CL-100-LSPC (Metric No. CLM-100-LSPC)

Same as the toggle clamp shown above, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the clamp from being accidentally opened by bumping the handle. Shipping weight 0.6 lbs.

Holding capacity: **300 lbs**



Also available in stainless steel . . .

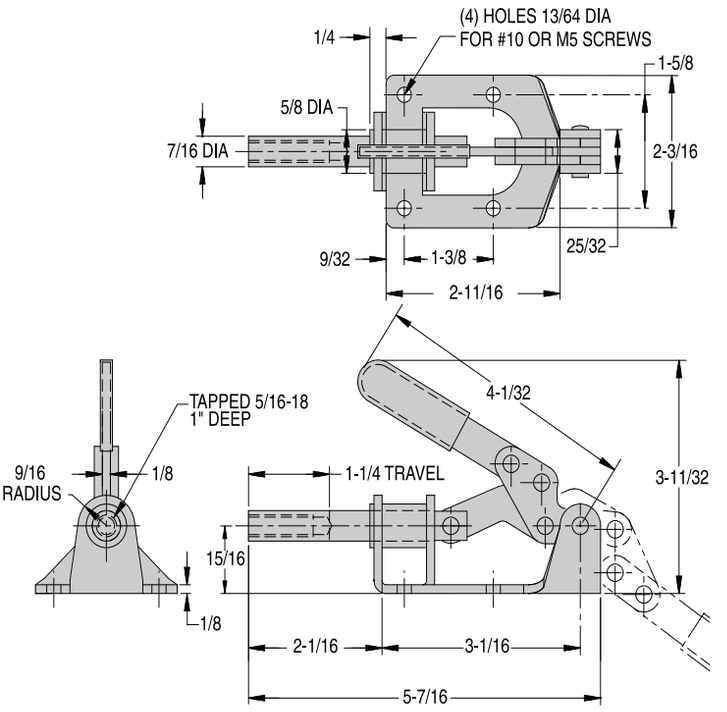


CL-100-LSPC-S

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INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



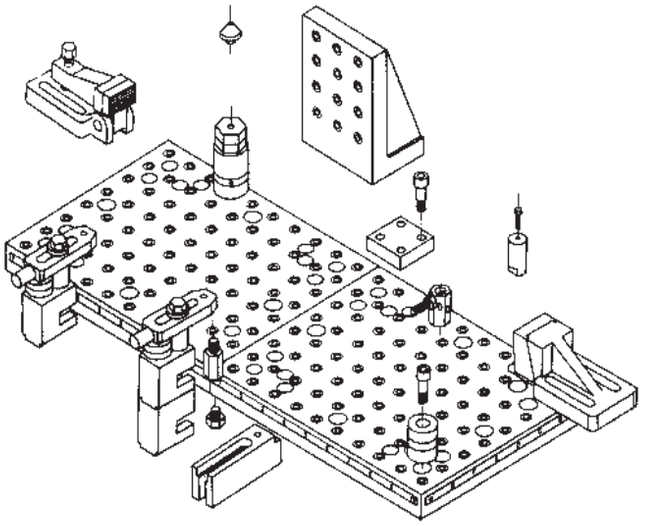


CL-150-SPC (Metric No. CLM-150-SPC)

Medium-size plunger clamp that locks in extended or retracted position. 1-1/4" plunger travel. Plunger is tapped to accept any 5/16-18 spindle (M8 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 0.7 lbs.

Holding capacity: **300 lbs**

Modular Fixturing



- Ideal for temporary fixturing, for one-time jobs, short or prototype production runs, trial fixturing or while permanent fixtures are built or repaired
- Available in mini, standard and heavy sizes
- Wide range of tooling plates and blocks, finish ground, with multipurpose positioning holes
- Order as components, or in handy starter sets

See Modular Fixturing on pages 415-450

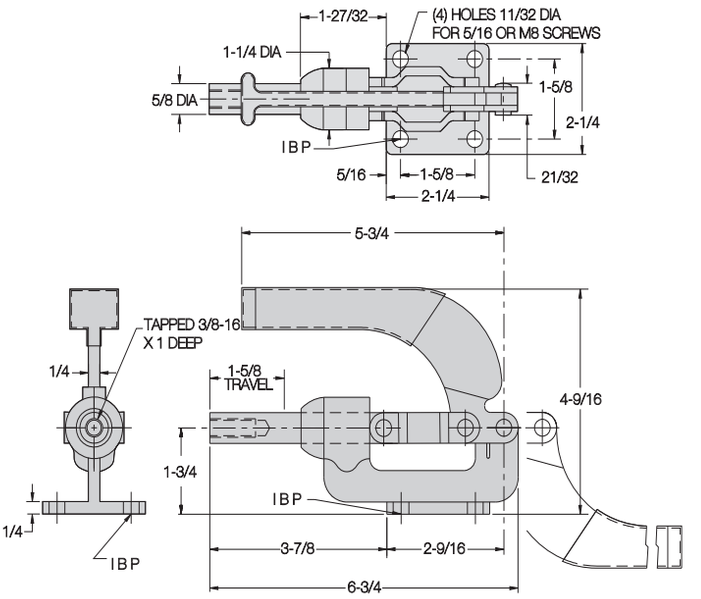
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PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



800 lbs



CL-250-SPC **(Metric No. CLM-250-SPC)**

Heavier clamp with extra plunger height. Locks in extended or retracted position. 1-5/8" plunger travel. Plunger is tapped to accept any 3/8-16 spindle (M10 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 1.9 lbs.

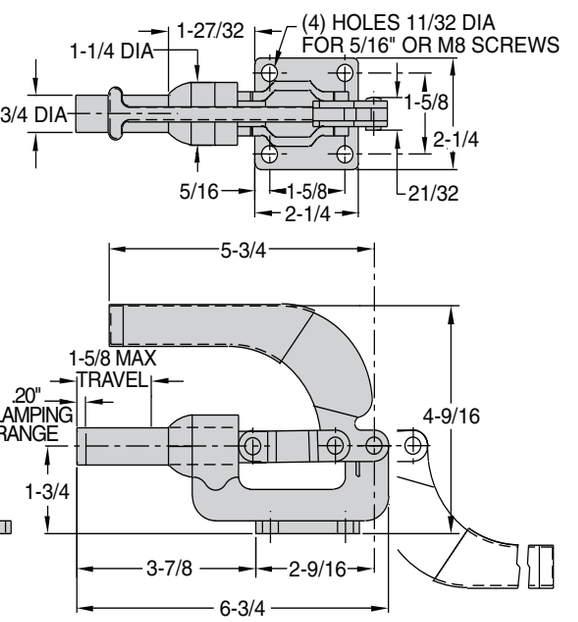
Holding capacity: **800 lbs**

PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



200 lbs
Self-Adjusting
Spring Force



CL-255-SPC

This toggle clamp is the same size as our CL-250-SPC above, and features our patented self-adjusting spring-loaded plunger. The self-adjusting version applies a consistent spring clamping force of 200 lbs (+/- 10%) anywhere within its .20" clamping range. 1-5/8" maximum plunger travel. This version locks only in the "push" direction, and cannot be tapped for a spindle. Optionally available as reverse-acting with a horizontal handle. **Patent no. 6,905,116.** Shipping weight 1.9 lbs.

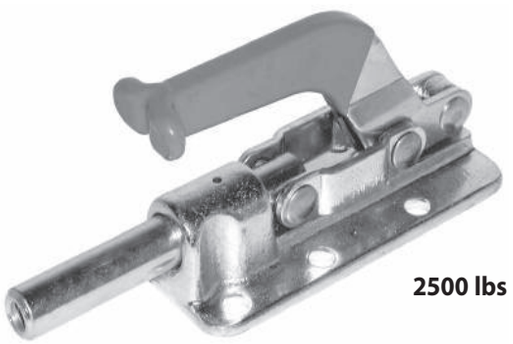
Spring force (±10%): **200 lbs**

Get quote

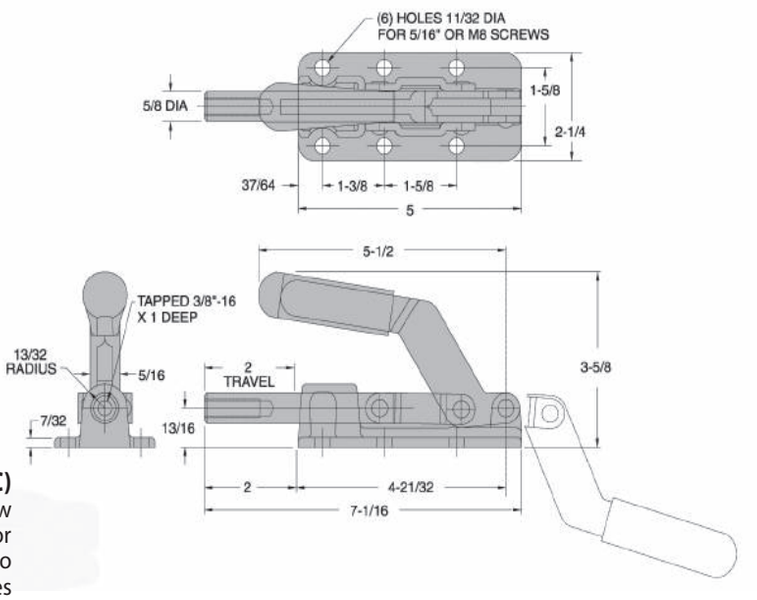
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PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



2500 lbs



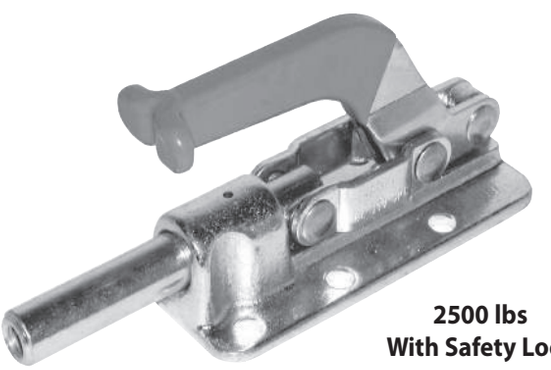
CL-350-SPC **(Metric No. CLM-350-SPC)**

Compact heavy-duty plunger clamp with an extremely low profile. Rugged forged steel base. Locks in extended or retracted position. 2" plunger travel. Plunger is tapped to accept any 3/8-16 spindle (M10 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 2.0 lbs.

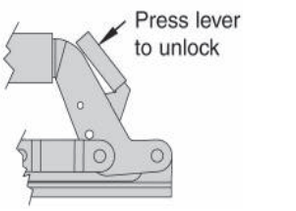
Holding capacity: **2500 lbs**

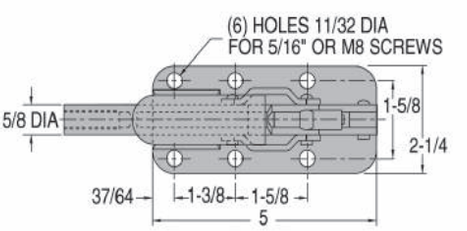
PUSH/PULL TOGGLE CLAMPS

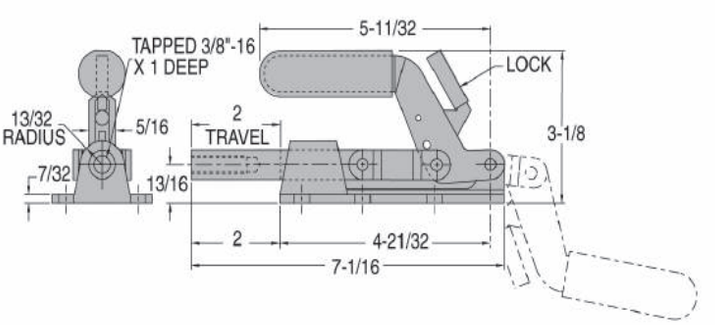
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



2500 lbs
With Safety Lock







CL-350-LSPC

Same as the toggle clamp shown above, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the clamp from being accidentally opened by bumping the handle. Shipping weight 2.0 lbs.

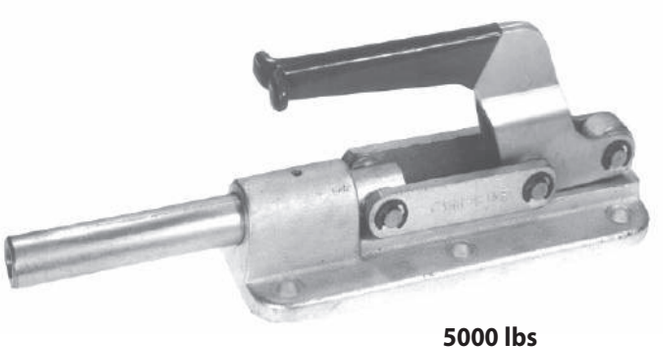
Holding capacity: **2500 lbs**

Get quote

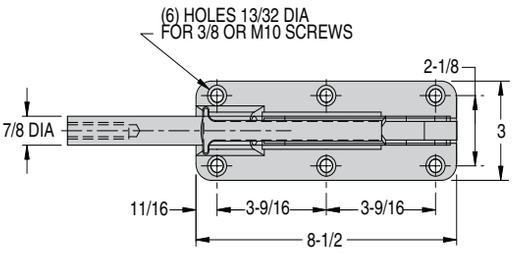
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PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



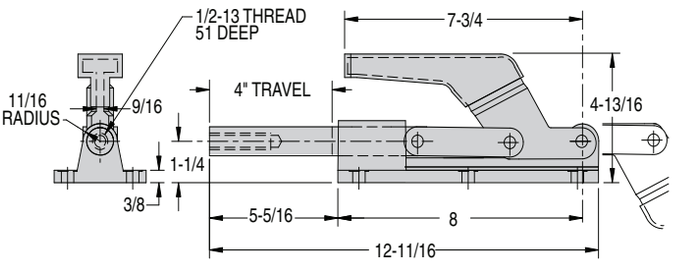
5000 lbs



CL-450-SPC (Metric No. CLM-450-SPC)

Extra-heavy-duty clamp features a full 4" plunger travel! Rugged nodular iron base and a 7/8"-diameter plunger combine to handle the toughest clamping jobs. Locks in extended or retracted position. Plunger is tapped to accept any 1/2-13 spindle (M12 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 7.0 lbs.

Holding capacity: **5000 lbs**

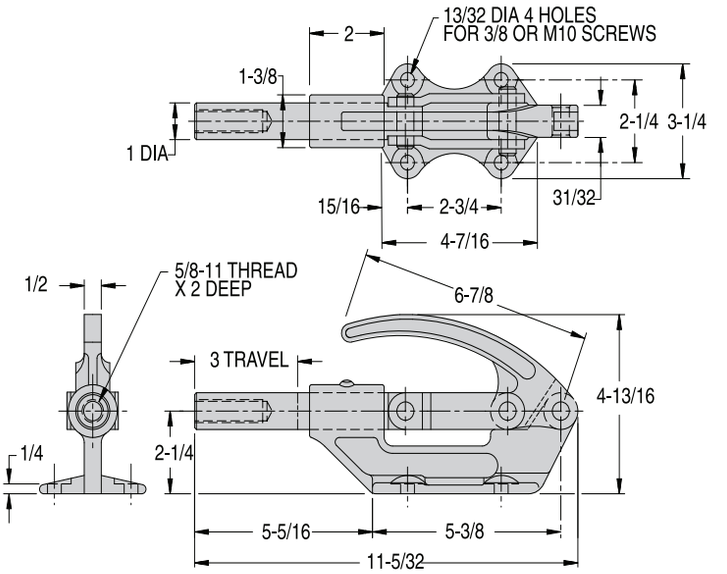


PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



16000 lbs



CL-650-SPC (Metric No. CLM-650-SPC)

Strongest plunger clamp available. Handle and base are made of alloy steel. Precision unit with snap-ring pivot pins to allow removing the plunger even after the clamp is mounted. Locks in extended or retracted position. 3" plunger travel. Plunger is tapped to accept any 5/8-11 spindle (M16 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 5.7 lbs.

Holding capacity: **16000 lbs**

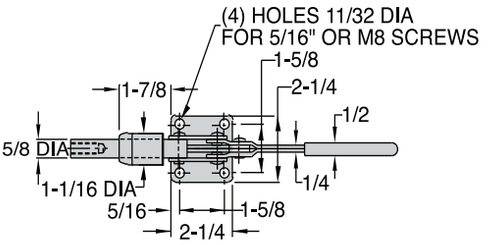
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PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

600 lbs

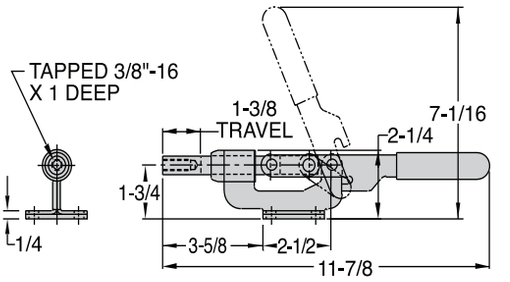


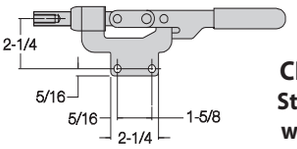


CL-275-SPC **(Metric No. CLM-275-SPC)**

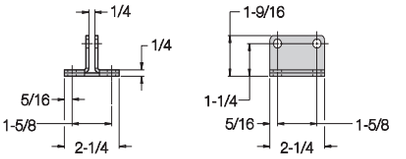
Similar to CL-250-SPC except with reverse handle action. Plunger advances and locks by moving handle backward into horizontal position. 1-3/16" plunger travel. Plunger is tapped to accept any 3/8-16 spindle (M10 in metric). **INFO+**: See pages 522-525 to order. Straight-base version supplied with separate base bracket to allow mounting clamp at an angle. Shipping weight 1.5 lbs.

Holding capacity: **600 lbs**





CL-276-SPC
Straight Base with Bracket



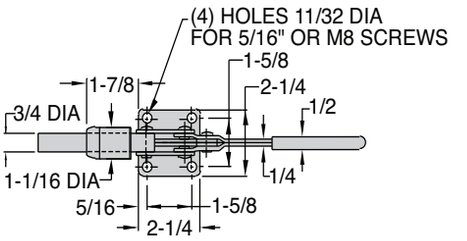
Bracket included with CL-276-SPC

PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

200 lbs Spring Force
Self-Adjusting Plunger

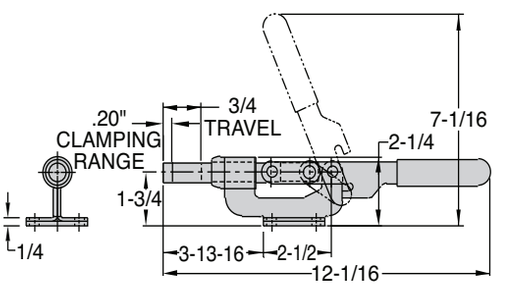




CL-285-SPC

This reverse-action toggle clamp is the same size as our CL-275-SPC above, and features our patented self-adjusting spring-loaded plunger. Reverse action advances and locks the plunger by pivoting the handle backward into horizontal position. The self-adjusting version applies a consistent spring clamping force of 200 lbs (+/-10%) anywhere within its .20" clamping range. 1-3/16" maximum plunger travel. This version locks only in the "push" direction, and cannot be tapped for a spindle. **Patent no. 6,905,116.** Shipping weight 1.5 lbs.

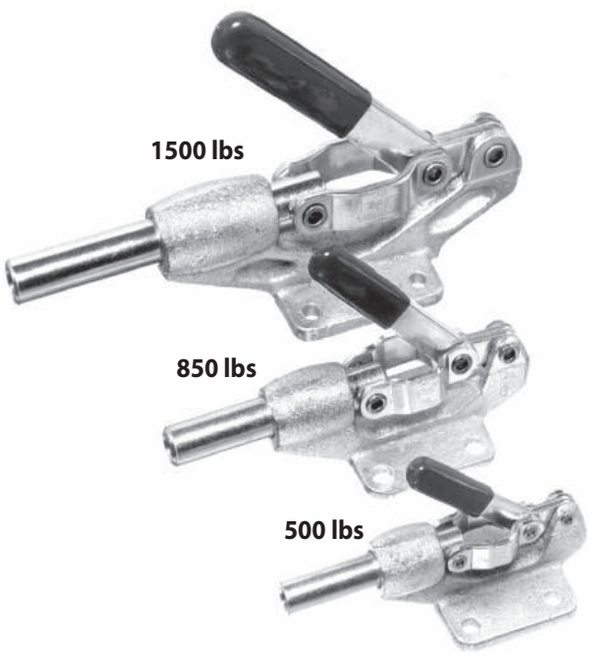
Spring force (±10%): **200 lbs**



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PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Durable plunger clamp with nodular iron base. Locks in either extended or retracted position. Choice of three sizes.

CL-100-PC (Metric No. CLM-100-PC)

Small-size clamp with 1-3/16" plunger travel. Accepts any 5/16-18 spindle (M8 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 0.9 lbs.

Holding capacity: **500 lbs**

CL-200-PC (Metric No. CLM-200-PC)

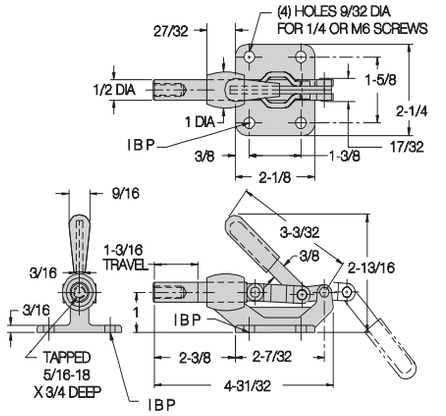
Medium-size clamp with 1-5/8" plunger travel. Accepts any 3/8-16 spindle (M10 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 1.4 lbs.

Holding capacity: **850 lbs**

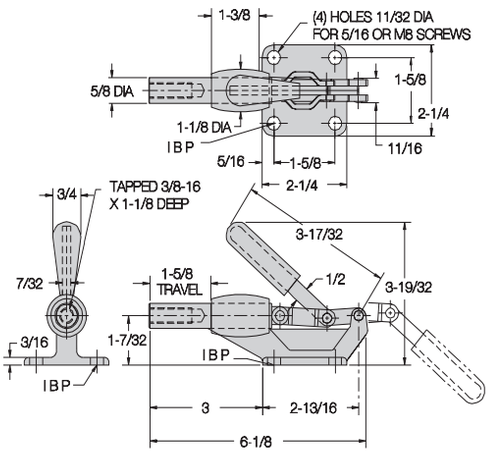
CL-300-PC (Metric No. CLM-300-PC)

Large-size clamp with 2-11/32" plunger travel. Accepts any 1/2-13 spindle (M12 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 3.2 lbs.

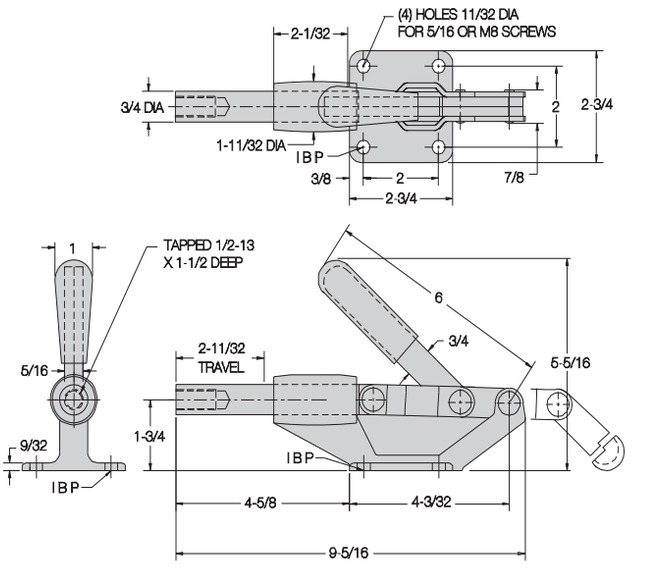
Holding capacity: **1500 lbs**



CL-100-PC



CL-200-PC

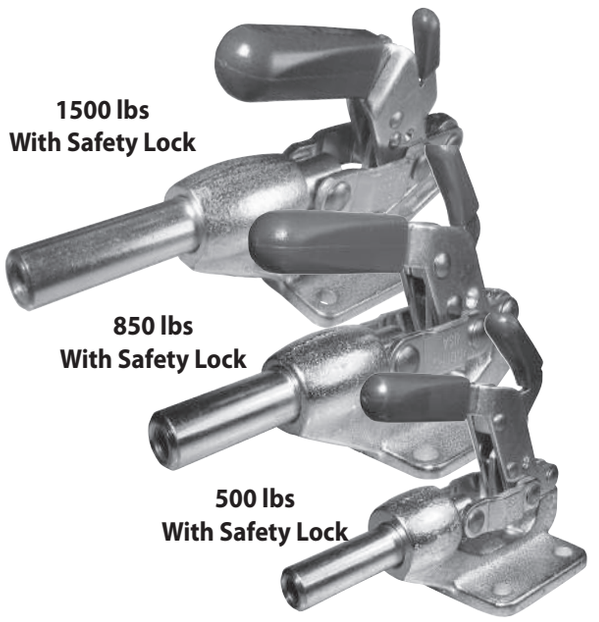


CL-300-PC

11

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INFO+: Same as the toggle clamps shown on page 498, except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the clamp from being accidentally opened by bumping the handle.

Durable plunger clamp with nodular iron base. Locks in extended or retracted position (safety lock functions only in extended position). Choice of three sizes.

CL-100-LPC

Small-size clamp with 1-3/16" plunger travel. Accepts any 5/16-18 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 0.9 lbs.

Holding capacity: **500 lbs**

CL-200-LPC

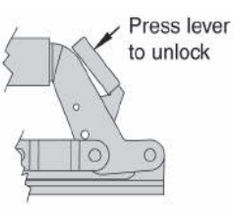
Medium-size clamp with 1-5/8" plunger travel. Accepts any 3/8-16 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 1.4 lbs.

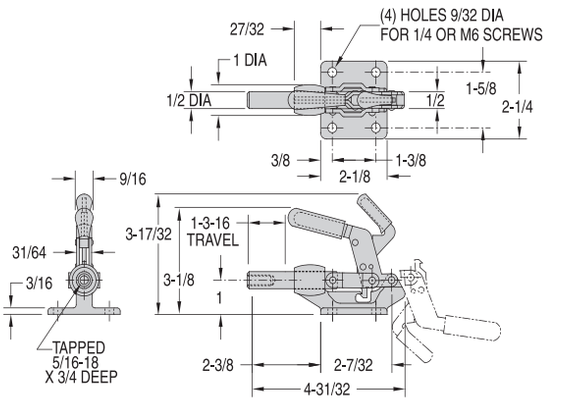
Holding capacity: **850 lbs**

CL-300-LPC

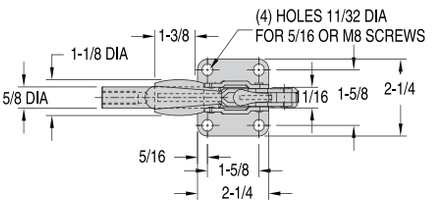
Large-size clamp with 2-11/32" plunger travel. Accepts any 1/2-13 spindle. **INFO+**: See pages 522-525 to order. Shipping weight 3.2 lbs.

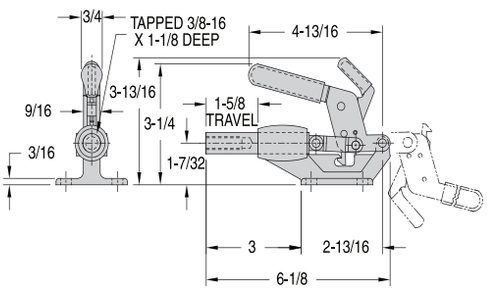
Holding capacity: **1500 lbs**



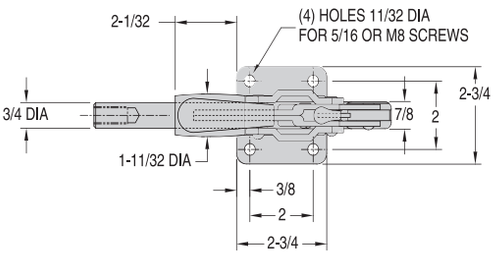


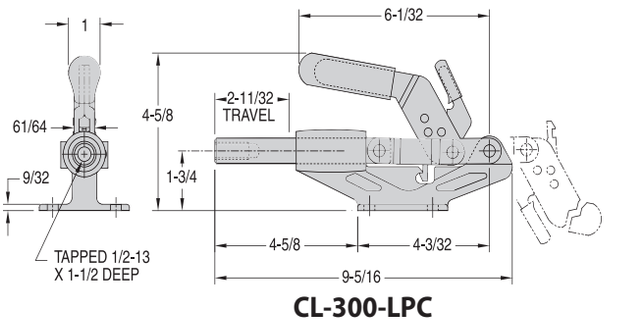
CL-100-LPC





CL-200-LPC



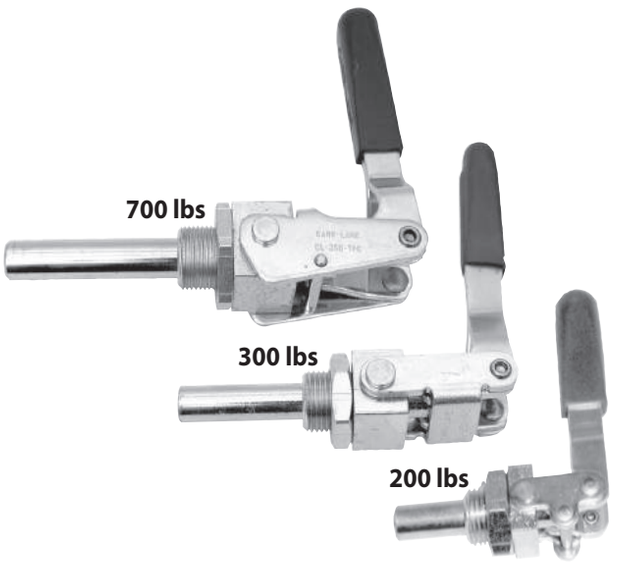


CL-300-LPC

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PUSH/PULL TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Compact plunger clamps for mounting through panels, plates, or angle brackets. Install in a drilled or tapped hole, securing with the locknut provided. Plunger locks in either extended or retracted position. Rotate clamp to position handle anywhere within 360°. Choice of three sizes.

CL-150-TPC (Metric No. CLM-150-TPC)

Small-size clamp with 3/4" plunger travel. Installs in a 5/8"-diameter drilled hole, or a 5/8-18 tapped hole (M16x1.5 in metric). Accepts any 1/4-20 spindle (M6 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 0.4 lbs.

Holding capacity: **200 lbs**

CL-250-TPC (Metric No. CLM-250-TPC)

Medium-size clamp with 1-1/2" plunger travel. Installs in a 3/4"-diameter drilled hole, or a 3/4-16 tapped hole (M20x1.5 in metric). Accepts any 5/16-18 spindle (M8 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 0.7 lbs.

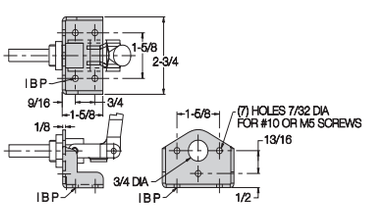
Holding capacity: **300 lbs**

CL-350-TPC (Metric No. CLM-350-TPC)

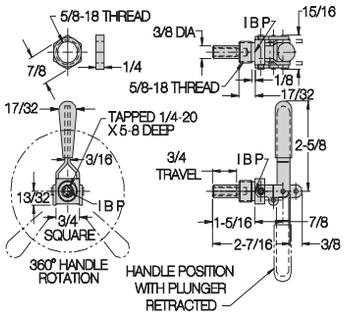
Large-size clamp with 2-5/8" plunger travel. Installs in a 1"-diameter drilled hole, or a 1"-14 (M27x2 in metric) tapped hole. Accepts any 3/8-16 spindle (M10 in metric). **INFO+**: See pages 522-525 to order. Shipping weight 1.5 lbs.

Holding capacity: **700 lbs**

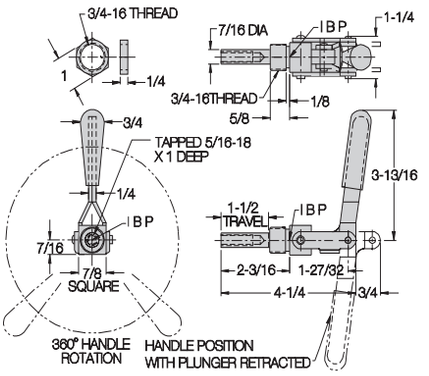
Mounting Bracket for CL-250-TPC:



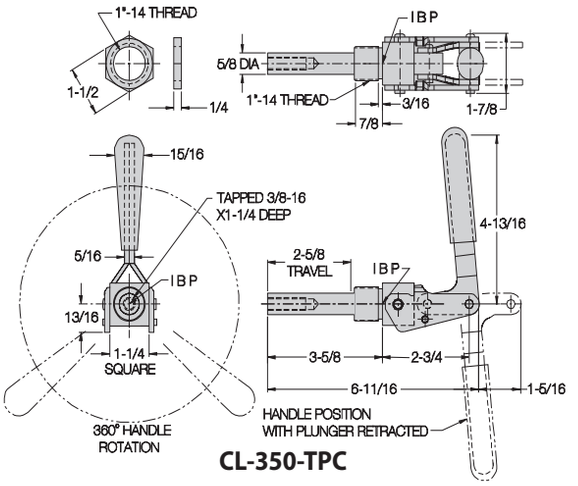
CL-250-TPCA



CL-150-TPC



CL-250-TPC



CL-350-TPC

Also available in stainless steel . . .



CL-150-TPC-S
200 lbs

CL-250-TPC-S
300 lbs

CL-350-TPC-S
700 lbs

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These toggle clamps are the same size as our CL-250-TPC and CL-350-TPC on the opposite page, and feature our patented self-adjusting spring-loaded plunger. The self-adjusting version applies a consistent spring clamping force anywhere within its clamping range. This version locks only in the "push" direction, and cannot be tapped for a spindle. Compact plunger clamps for mounting through panels, plates, or angle brackets. Install in a drilled or tapped hole, securing with the locknut provided. Rotate clamp to position handle anywhere within 360°. **Patent no. 6,905,116.** Choice of two sizes.

CL-255-TPC

This medium-size self-adjusting clamp applies a consistent spring clamping force of 100 lbs (+/-10%) anywhere within its .20" clamping range. 1-1/2" maximum plunger travel. Installs in a 3/4"-diameter drilled hole, or a 3/4-16 tapped hole. Shipping weight 0.7 lbs.

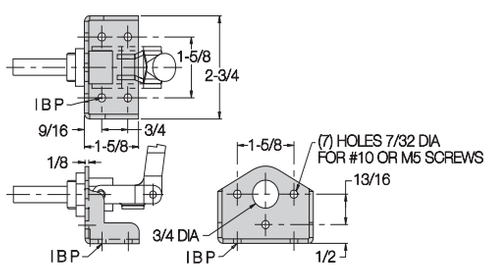
Spring force (±10%): **100 lbs**

CL-355-TPC

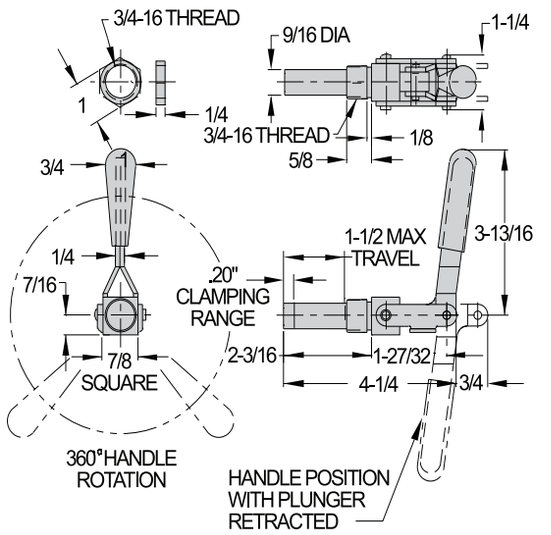
This large-size self-adjusting clamp applies a consistent spring clamping force of 200 lbs (+/-10%) anywhere within its .20" clamping range. 2-5/8" maximum plunger travel. Installs in a 1"-diameter drilled hole, or a 1"-14 tapped hole. Shipping weight 1.5 lbs.

Spring force (±10%): **200 lbs**

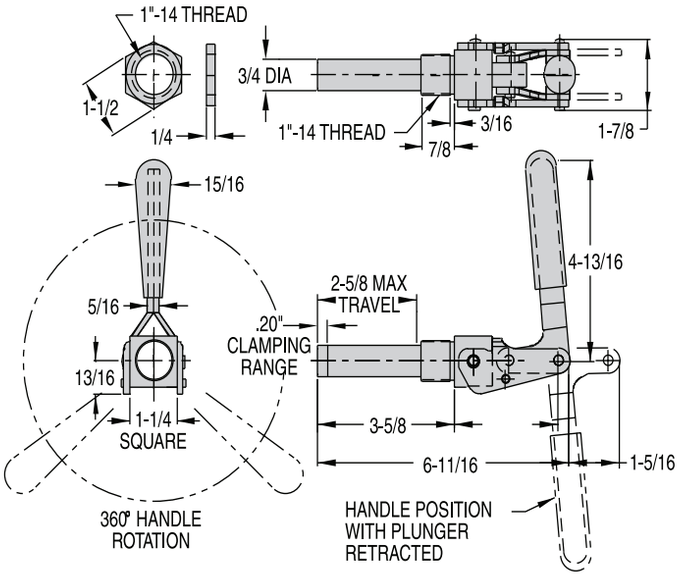
Mounting Bracket for CL-255-TPC:



CL-250-TPCA



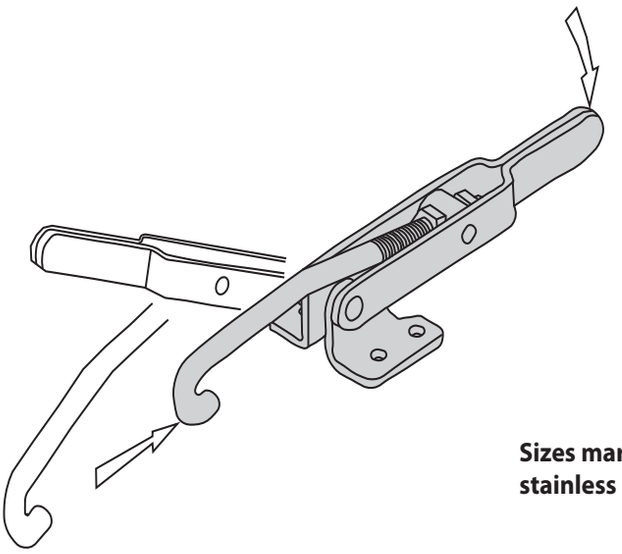
CL-255-TPC



CL-355-TPC

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LATCH-ACTION TOGGLE CLAMPS



Sizes marked * are also available in stainless steel

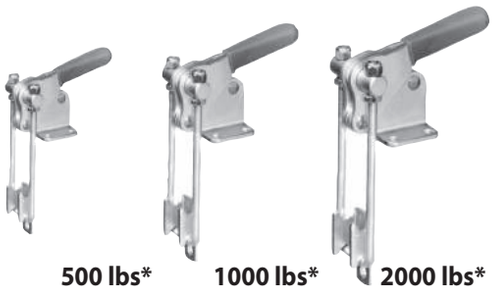
All Carr Lane Manufacturing toggle clamps are DFARS and RoHS compliant.



360 lbs* **700 lbs*** **2000 lbs*** **4000 lbs** **7500 lbs**

Adjustable U Bolt
pages 504-507

Latch-action clamp with a threaded U bolt for adjustability. Supplied with matching latch plate (smallest three sizes). Large, comfortable handle grip. Available in five sizes.



500 lbs* **1000 lbs*** **2000 lbs***

Right-Angle Adjustable U Bolt
page 508

Similar to the latch clamp above, except with its pulling direction perpendicular to the base. Supplied with matching latch plate. Large, comfortable handle grip. Available in three sizes.



375 lbs* **1000 lbs**

Adjustable Hook
page 503

Popular hook-type latch clamp. Hook is threaded at one end for easy adjustment. Base rotates 90° to allow horizontal or vertical latching. Available in two sizes.



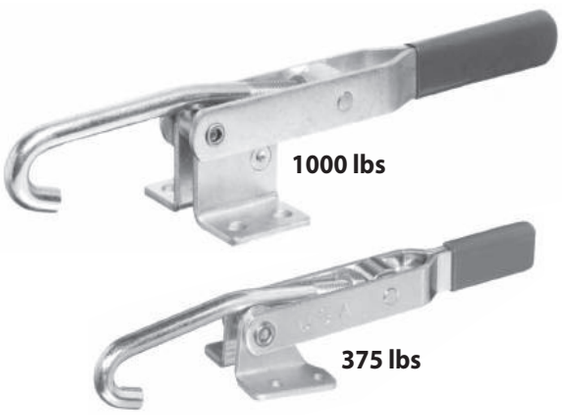
375 lbs*

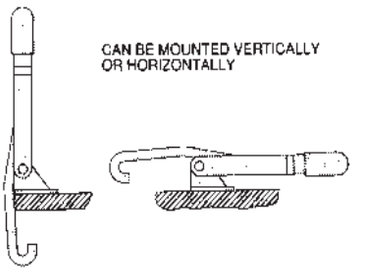
Fixed Length
page 509

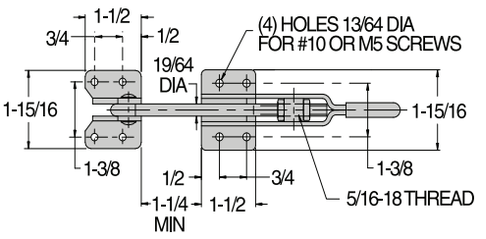
Latch clamp with fixed reach for installation where no length adjustment is required. Adjustable stop allows latching at different heights.

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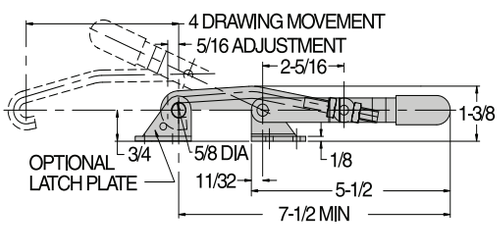


Latch clamp with a versatile hook for grasping a rod or rim. Hook is threaded at one end to allow adjustment after mounting. Base pivots to allow horizontal or vertical latching. Choice of two sizes. Optional latch plate can be mounted as shown in the drawings, or reversed, for mounting flexibility.

CL-250-PA

Medium-size latch clamp with a 4-inch drawing movement. Threaded hook allows a 5/16-inch adjustment range. Shipping weight 0.8 lbs. Order matching latch plate CL-250-PA-L separately (CL-250-PA-S-L in stainless).

Holding capacity: **375 lbs**



CL-250-PA

CL-350-PA

Large-capacity latch clamp with 6-1/8-inch drawing movement. Threaded hook allows a 3/4-inch adjustment range. Shipping weight 2.5 lbs. Order matching latch plate CL-350-PA-L separately.

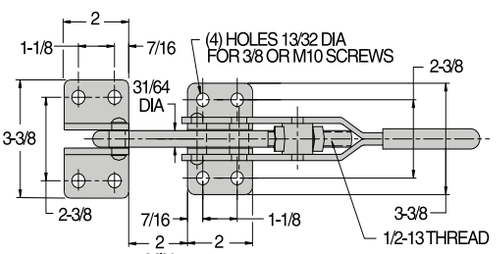
Holding capacity: **1000 lbs**

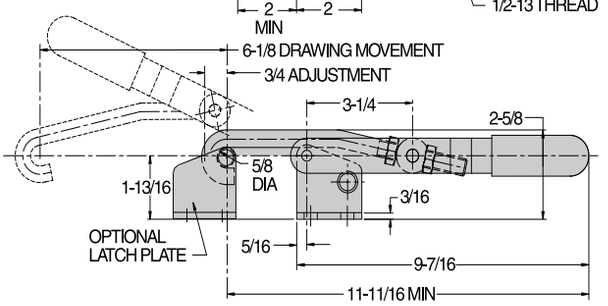


CL-257-PA

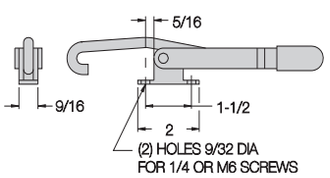
Same as CL-250-PA except with a manual safety lock. Push knob in to lock, pull knob out to unlock.

Holding capacity: **375 lbs**





CL-350-PA



CL-251-PA
Narrow Base
375 lbs

Also available in stainless steel . . .



CL-250-PA-S

Extra hooks available . . .



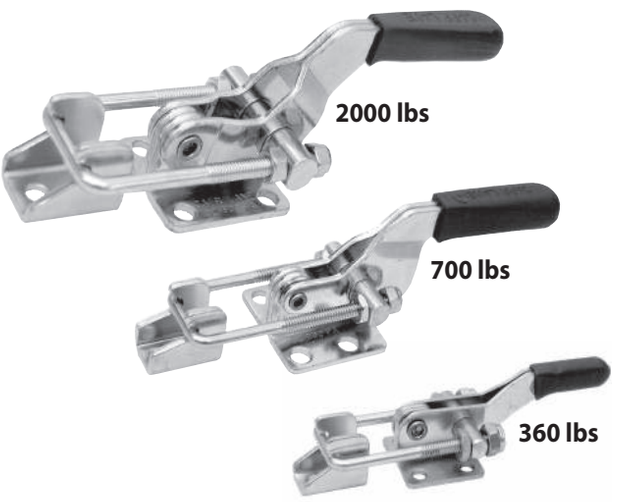
CL-250-PA-HOOK
CL-250-PA-S-HOOK
CL-350-PA-HOOK

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LATCH-ACTION TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



Versatile latch clamp with a threaded U bolt for adjustability. Supplied with matching latch plate. Large, comfortable handle grip. Available in three sizes (**INFO+**: See page 505 for two larger sizes).

CL-100-PA

Miniature latch clamp with high holding capacity. 1-3/16-inch drawing movement. Threaded U bolt allows a 25/64-inch adjustment range. Shipping weight 0.2 lbs.

Holding capacity: **360 lbs**

CL-200-PA

Medium-size latch clamp with 2-inch drawing movement. Threaded U bolt allows a 3/8-inch adjustment range. Shipping weight 0.4 lbs.

Holding capacity: **700 lbs**

CL-300-PA

Heavy-duty latch clamp. Well-suited for applications such as plastic molding. 2-1/2-inch drawing movement. Threaded U bolt allows a 15/16-inch adjustment range. Shipping weight 1.5 lbs.

Holding capacity: **2000 lbs**

Also available in stainless steel. . .



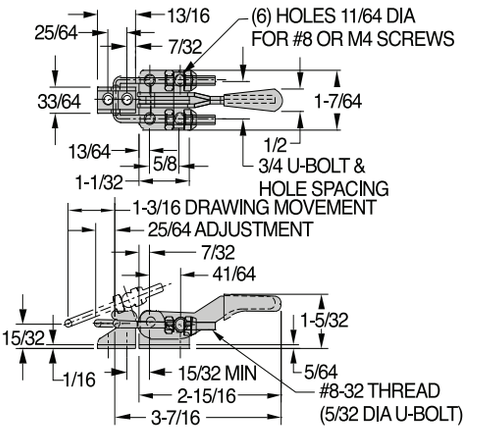
CL-100-PA-S
360 lbs



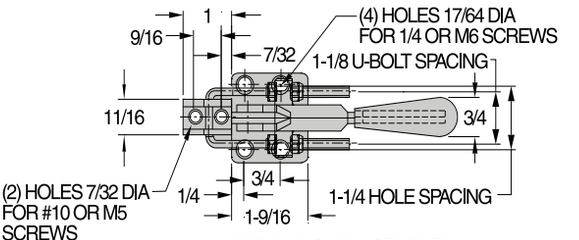
CL-200-PA-S
700 lbs

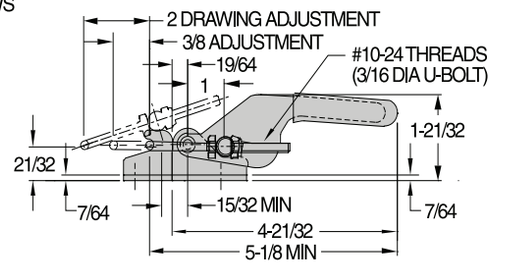


CL-300-PA-S
2000 lbs

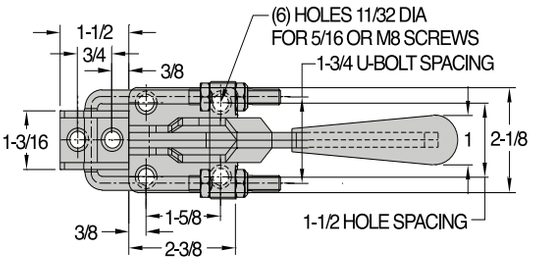


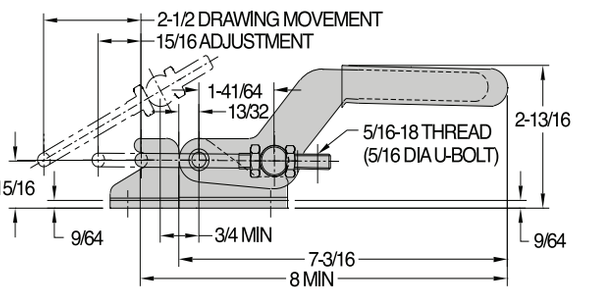
CL-100-PA





CL-200-PA





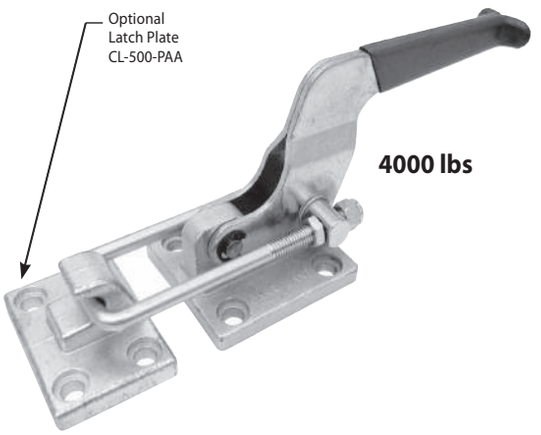
CL-300-PA

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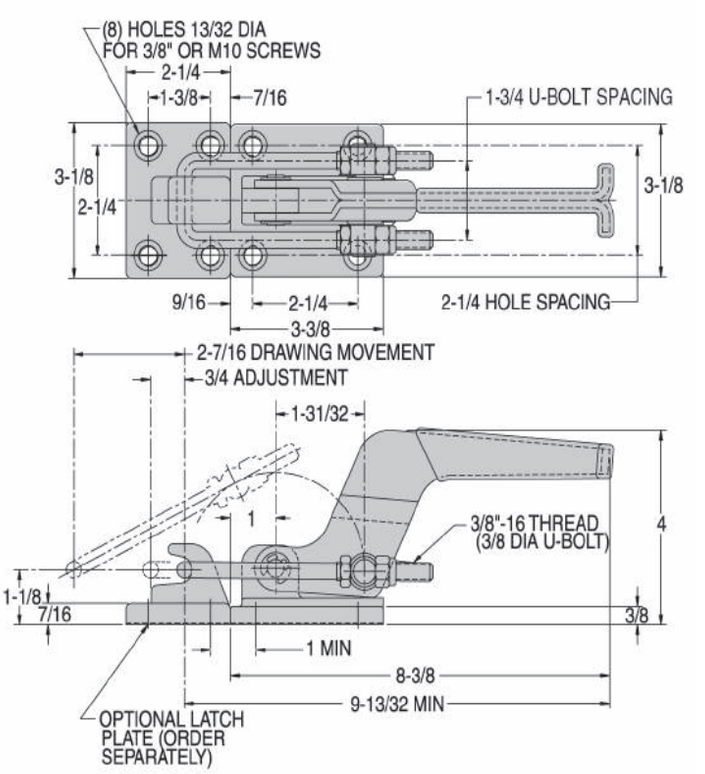
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LATCH-ACTION TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



4000 lbs



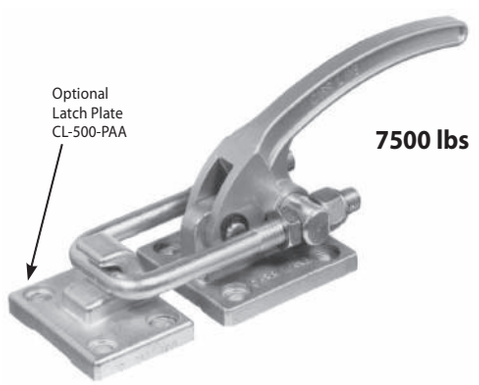
CL-400-PA

INFO+: Heavier-duty version of the latch clamps on page 516. Strong enough to resist the high expansion forces generated in polyurethane molds. Rugged alloy steel base and latch plate (order latch plate separately). Threaded U bolt allows a 3/4-inch adjustment range. 2-7/16" drawing movement. Shipping weight 2.8 lbs.

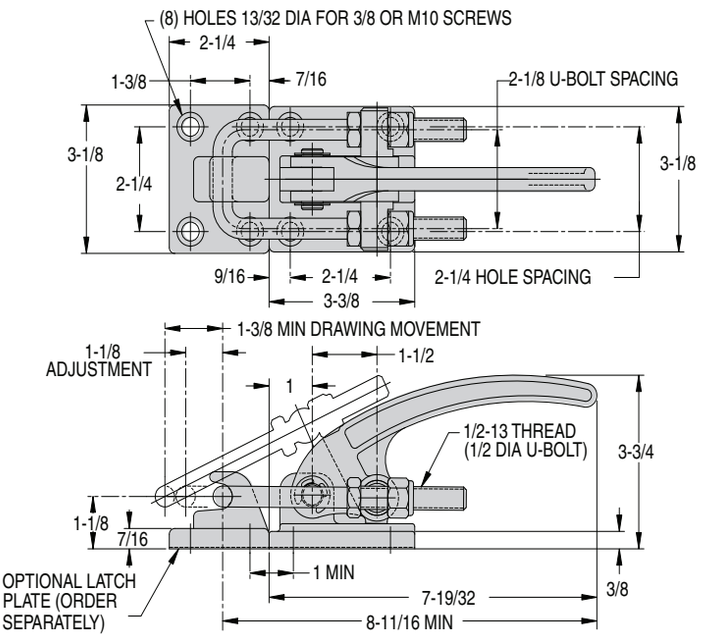
Holding capacity: **4000 lbs**

LATCH-ACTION TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



7500 lbs



CL-500-PA

Strongest latch clamp available. Alloy steel handle provides even greater strength than the CL-400-PA above, yet with a more-compact overall size. Rugged alloy steel base and latch plate (order latch plate separately). Threaded U bolt allows a 1-1/8-inch adjustment range. 1-3/8" drawing movement. Shipping weight 3.3 lbs.

Holding capacity: **7500 lbs**

Also available in stainless steel...



CL-500-PA-S (Clamp)



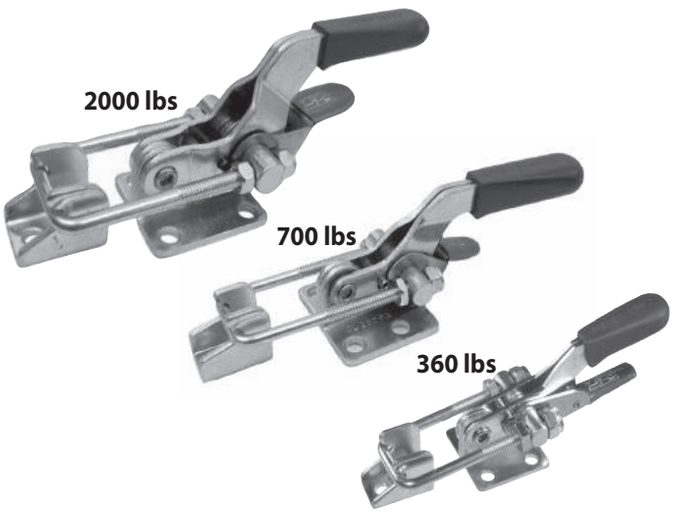
CL-500-PAA-S (Latch Plate)

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LATCH-ACTION TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



INFO+: Same as our latch clamps on page 504 except with safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the latch clamp from being accidentally opened by bumping the handle.

Versatile latch clamp with a threaded U bolt for adjustability. Supplied with matching latch plate. Large, comfortable handle grip. Available in two sizes (**INFO+**: also see page 505 for two larger sizes).

CL-100-LPA

Miniature latch action clamp with high holding capacity. 1-3/16-inch drawing movement. Threaded U bolt allows a 25/64-inch adjustment range. Shipping weight 0.2 lbs.

Holding capacity: **360 lbs**

CL-200-LPA

Medium-size latch clamp with 2-inch drawing movement. Threaded U bolt allows a 3/8-inch adjustment range. Shipping weight 0.4 lbs.

Holding capacity: **700 lbs**

CL-300-LPA

Heavy-duty latch clamp. Well-suited for applications such as plastic molding. 2-1/2-inch drawing movement. Threaded U bolt allows a 15/16-inch adjustment range. Shipping weight 1.5 lbs.

Holding capacity: **2000 lbs**

Also available in stainless steel. . .



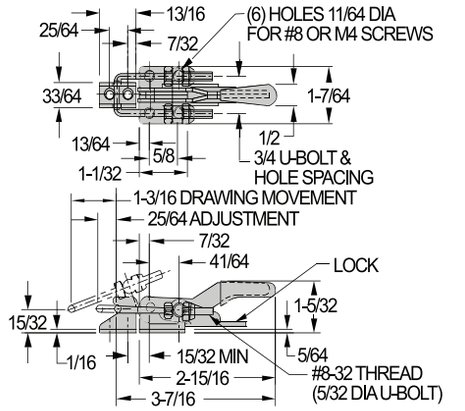
CL-100-LPA-S
360 lbs



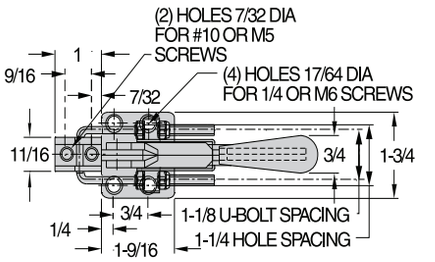
CL-200-LPA-S
700 lbs

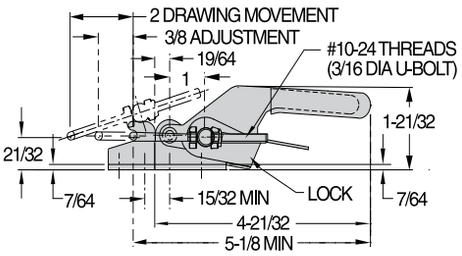


CL-300-LPA-S
2000 lbs

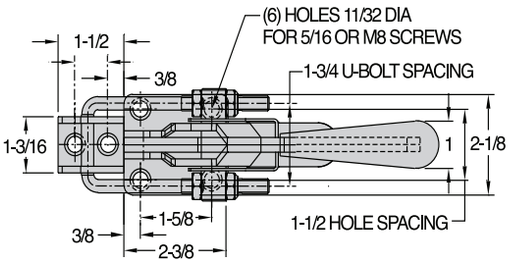


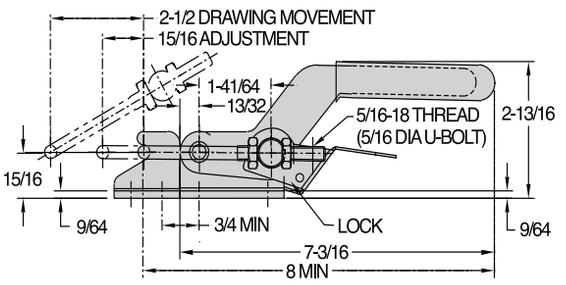
CL-100-LPA





CL-200-LPA



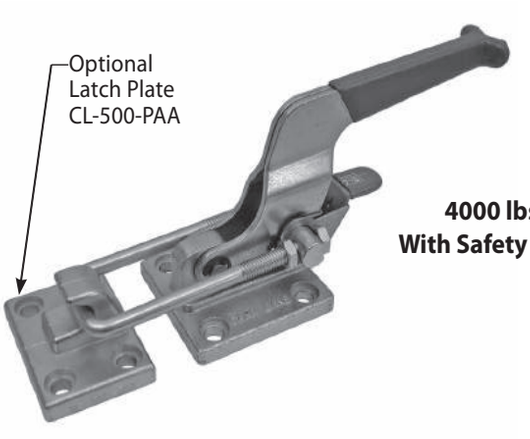


CL-300-LPA

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LATCH-ACTION TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



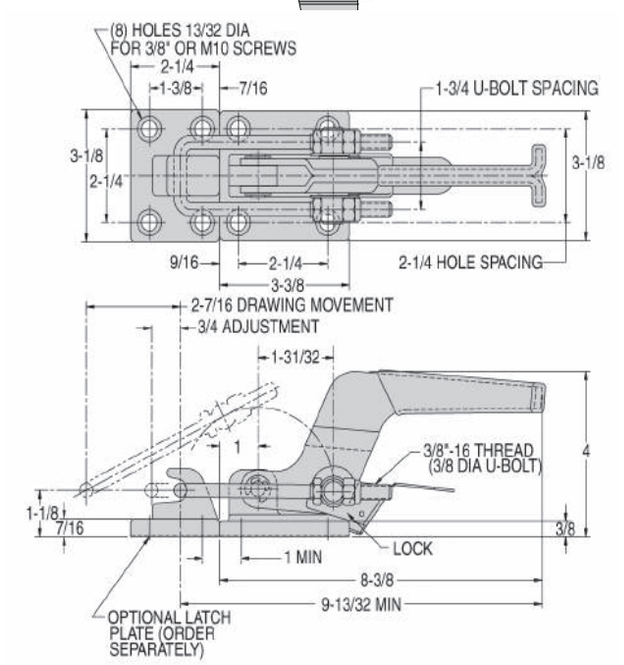
4000 lbs
With Safety Lock

CL-400-LPA

INFO+: Same as our latch clamps on page 505 except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the latch clamp from being accidentally opened by bumping the handle. Rugged alloy steel base and latch plate (order latch plate separately). Threaded U bolt allows a 3/4-inch adjustment range. 2-7/16" drawing movement. Shipping weight 2.8 lbs.

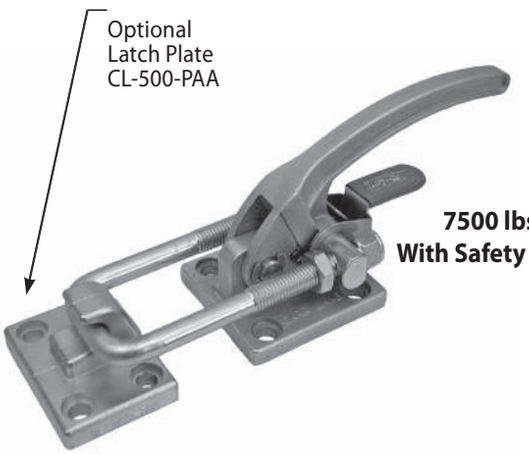
Holding capacity: **4000 lbs**





LATCH-ACTION TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

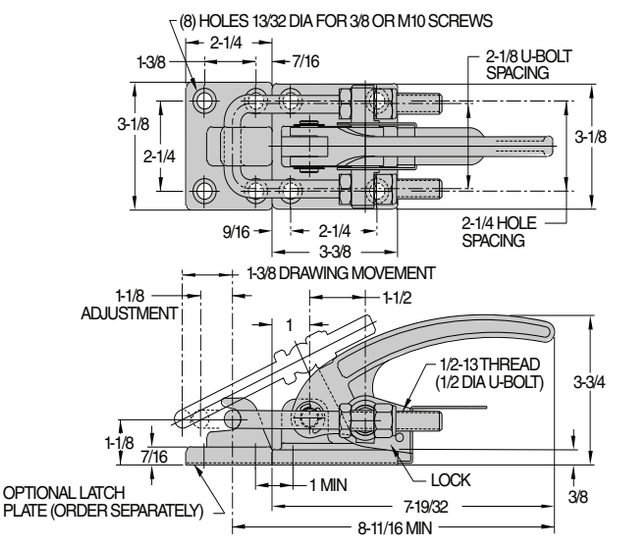


7500 lbs
With Safety Lock

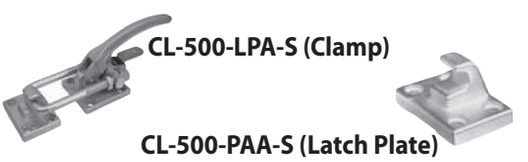
CL-500-LPA

INFO+: Same as our latch clamps on page 505 except with our unique safety-lock feature. This safety lock automatically engages when the clamp is closed, then remains locked until manually disengaged by pressing the lever before opening. This prevents the latch clamp from being accidentally opened by bumping the handle. Rugged alloy steel base and latch plate (order latch plate separately). Threaded U bolt allows a 1-1/8-inch adjustment range. 1-3/8" drawing movement. Shipping weight 3.3 lbs.

Holding capacity: **7500 lbs**



Also available in stainless steel...



CL-500-LPA-S (Clamp)

CL-500-PAA-S (Latch Plate)

LATCH-ACTION TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



INFO+: Similar to the adjustable-U-bolt latch clamps on page 504, except with their pulling direction perpendicular to the base. Supplied with matching latch plate. Large, comfortable handle grip. Available in three sizes.

CL-110-PA

Miniature latch clamp with high holding capacity. 1-1/2-inch drawing movement. Threaded U bolt allows a 7/16-inch adjustment range. Shipping weight 0.3 lbs.

Holding capacity: **500 lbs**

CL-210-PA

Medium-size latch clamp with 2-1/16-inch drawing movement. Threaded U bolt allows an 11/16-inch adjustment range. Shipping weight 0.6 lbs.

Holding capacity: **1000 lbs**

CL-310-PA

Heavy-duty latch clamp. Well-suited for applications such as plastic molding. 2-1/2-inch drawing movement. Threaded U bolt allows an 1-1/8-inch adjustment range. Shipping weight 1.4 lbs.

Holding capacity: **2000 lbs**

Also available in stainless steel. . .



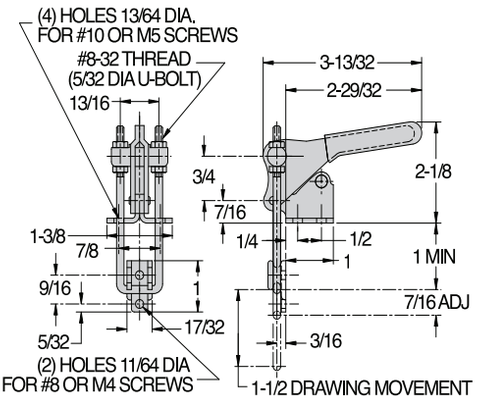
CL-110-PA-S
500 lbs



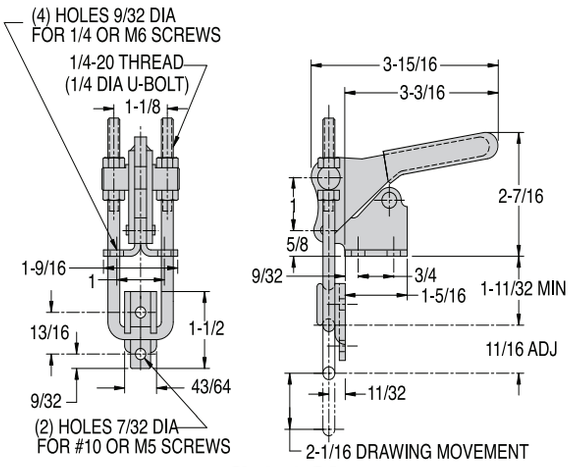
CL-210-PA-S
1000 lbs



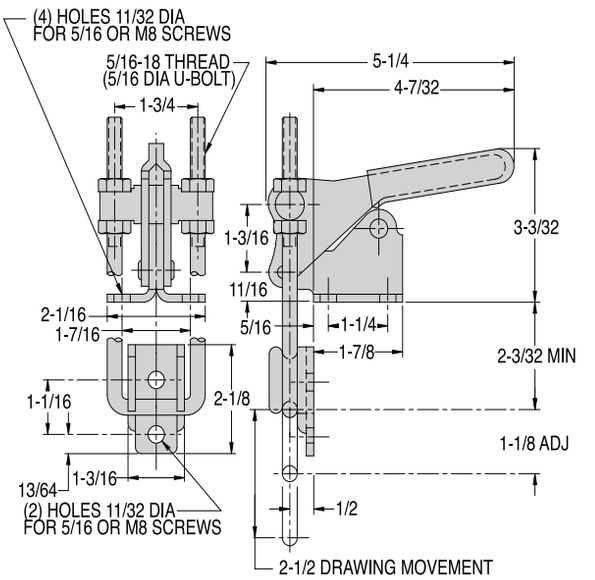
CL-310-PA-S
2000 lbs



CL-110-PA

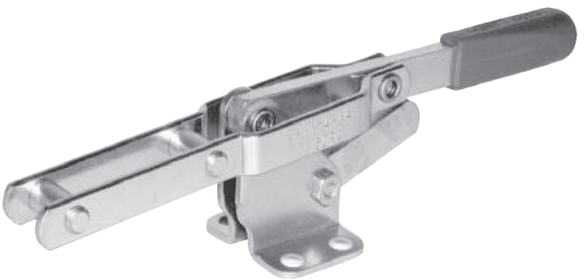


CL-210-PA

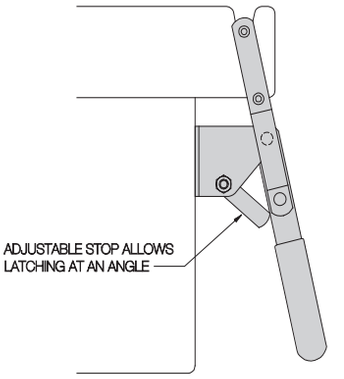


CL-310-PA

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375 lbs

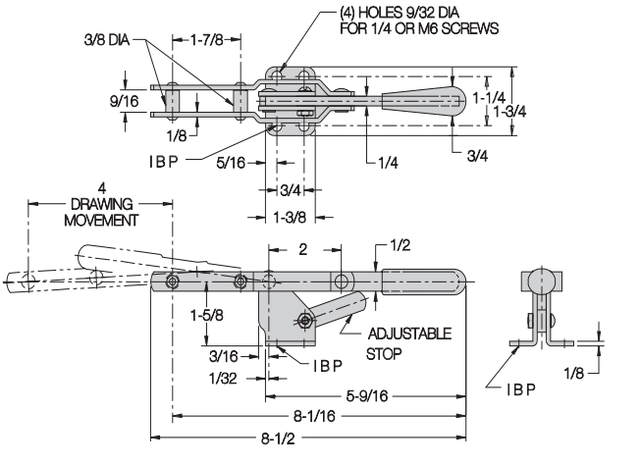


Latch clamp with fixed reach for installation where no length adjustment is required. An adjustable stop allows latching at different angles.

CL-150-PA

Medium-size clamp with 4-inch drawing movement. Shipping weight 0.8 lbs.

Holding capacity: **375 lbs**



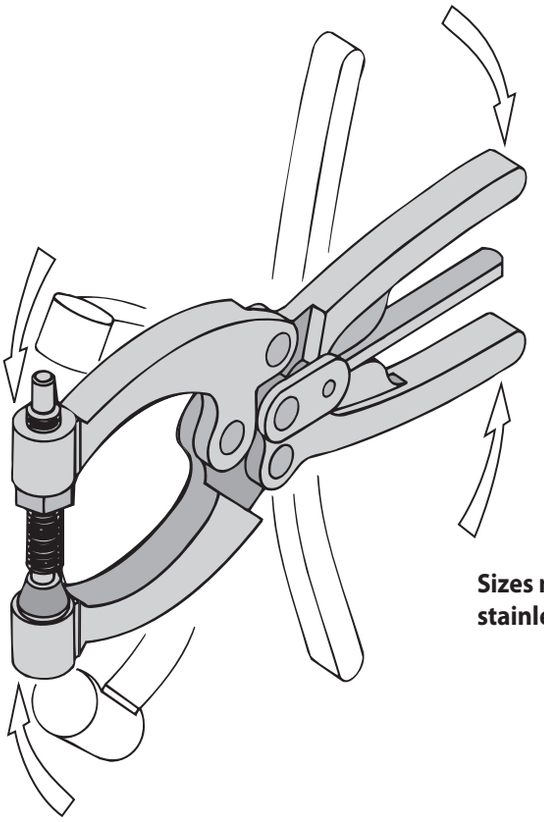
CL-150-PA

Also available in stainless steel...



CL-150-PA-S

TOGGLE PLIERS



Sizes marked * are also available in stainless steel

All Carr Lane Manufacturing toggle clamps are DFARS and RoHS compliant.



200 lbs **350 lbs** **700 lbs** **700 lbs** **700 lbs**

Forged Toggle Pliers
pp. 511-513
Powerful forged steel toggle pliers. Available in five sizes. Larger sizes feature a quick-release lever for easy opening.

11



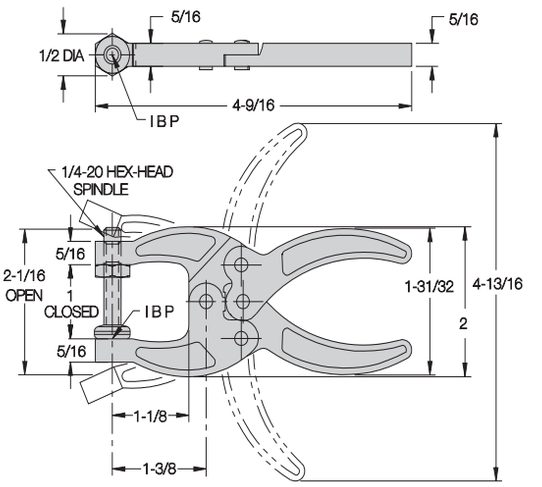
800 lbs*

Permanently Attached
p. 514
Handy weld-on/bolt-on clamp for holding down lids, covers etc. Clamping jaw opens a full 90° for extra clearance.

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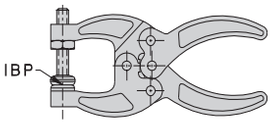
200 lbs



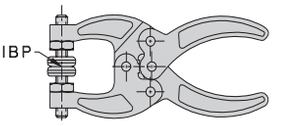
CL-50-PL

Tiny-yet-powerful toggle pliers made of forged steel. 1-inch jaw width. Supplied with 1/4-20 vinyl-coated hex-head spindle CL-14208-SA. Optionally available as CL-50-PL-2 with a bottom-jaw cushion, or as CL-50-PL-3 with (2) vinyl-coated hex-head spindles, CL-14100-SA. Shipping weight 0.4 lbs.

Holding capacity: **200 lbs**



CL-50-PL-2
Hex-Head Spindle
and Bottom Cushion



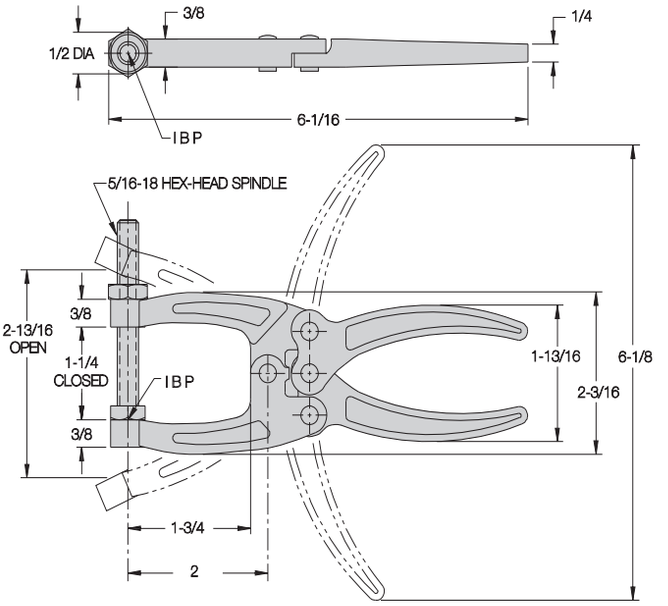
CL-50-PL-3
Dual Hex-Head Spindle

TOGGLE PLIERS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



350 lbs



CL-150-PL

Medium-size toggle pliers made of forged steel. 1-1/4-inch jaw width. Supplied with 5/16-18 hex-head spindle CL-516212-SA. Shipping weight 0.5 lbs.

Holding capacity: **350 lbs**

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TOGGLE PLIERS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS

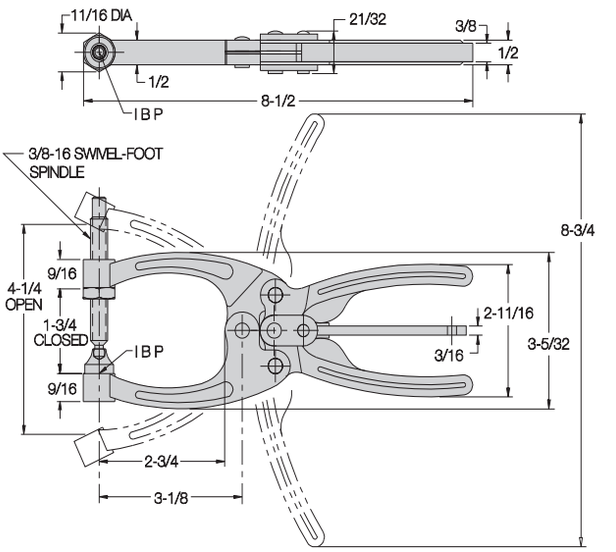


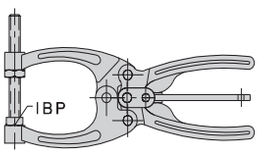
700 lbs

CL-254-PL

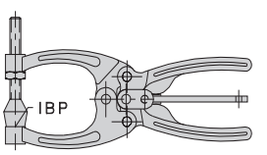
Heavy-duty toggle pliers made of forged steel. 1-3/4 inch jaw width. Two-way quick-release lever for easy opening. Supplied with 3/8-16 swivel-foot spindle CL-38314-SF. Optionally available as CL-250-PL with hex-head spindle CL-38314-SA, as CL-254-PL-2 with (2) hex-head spindles CL-38314-SA, or as CL-252-PL with flat-cushion spindle CL-38314-FC. Shipping weight 1.3 lbs.

Holding capacity: **700 Lbs**

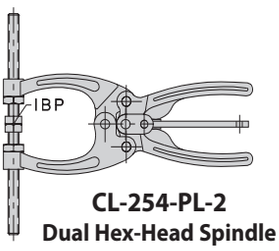




CL-250-PL
Hex-Head Spindle



CL-252-PL
Flat Cushion Spindle



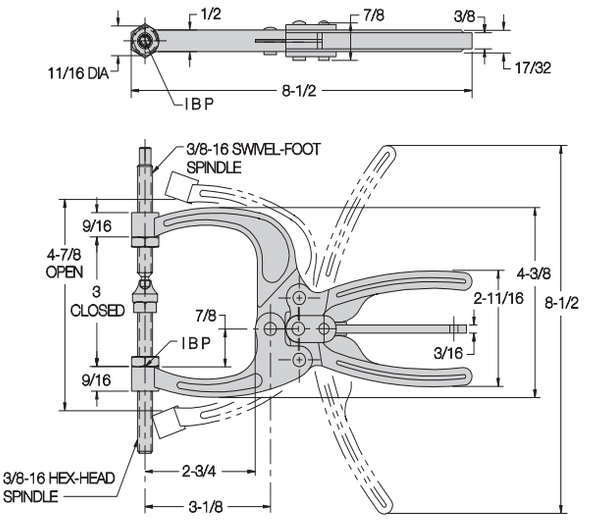
CL-254-PL-2
Dual Hex-Head Spindle

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INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS





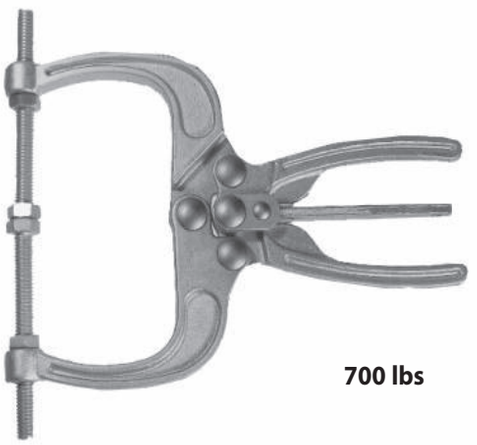
CL-454-PL

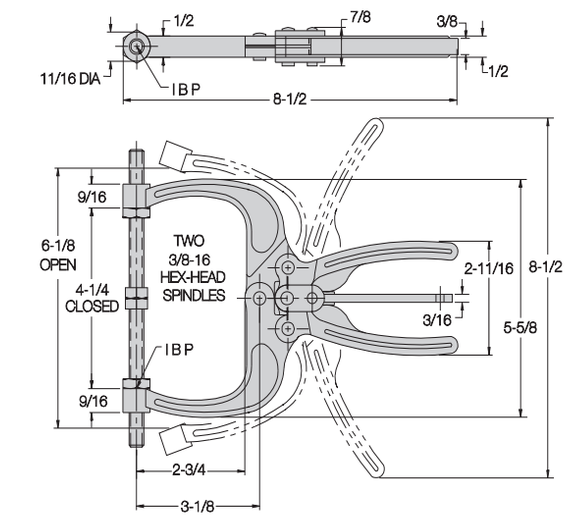
Wide-jaw heavy-duty toggle pliers made of forged steel. 3-inch jaw width. Two-way quick-release lever for easy opening. Supplied with 3/8-16 swivel-foot spindle CL-38314-SF and hex-head spindle CL-38314-SA. Shipping weight 1.4 lbs.

Holding capacity: **700 lbs**

TOGGLE PLIERS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS





CL-550-PL

Extra-wide-jaw heavy-duty toggle pliers made of forged steel. 4-1/4-inch jaw width. Two-way quick-release lever for easy opening. Supplied with (2) 3/8-16 hex-head spindles CL-38314-SA. Shipping weight 1.6 lbs.

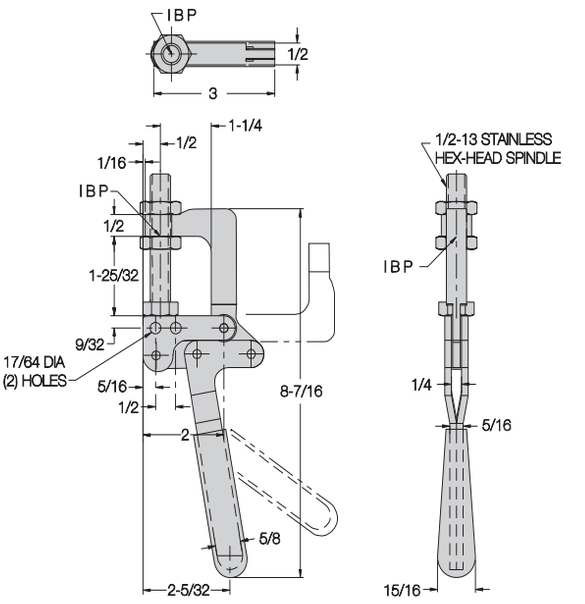
Holding capacity: **700 lbs**

TOGGLE PLIERS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



800 lbs
Stainless



CL-325-PL-S

Handy weld-on/bolt-on stainless steel clamp for holding down lids, covers, etc. Clamping jaw opens a full 90° for extra clearance, while handle moves 50°. Supplied with 1/2-13 stainless hex-head spindle CL-12234-SA-S. Shipping weight 1.0 lbs.

Holding capacity: **800 lbs**

Nice shell.





Round & Diamond Locating Pins Now Available With LIFE-EX® Coating

Made from a proprietary PVD coating, **LIFE-EX® Locating Pins are very hard, abrasion resistant, and slippery.**

The result is a component that has a longer lifecycle for high-production applications.

LIFE-EX® coating from Carr Lane Manufacturing extends the lifecycle of your locating pins, allowing them to remain in production longer with less need for replacement than standard uncoated items.

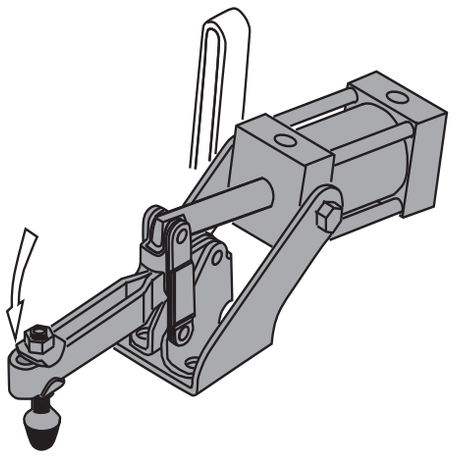
LIFE-EX® Locating Pins from Carr Lane will have you saying, *"That's one shell of a coating!"*

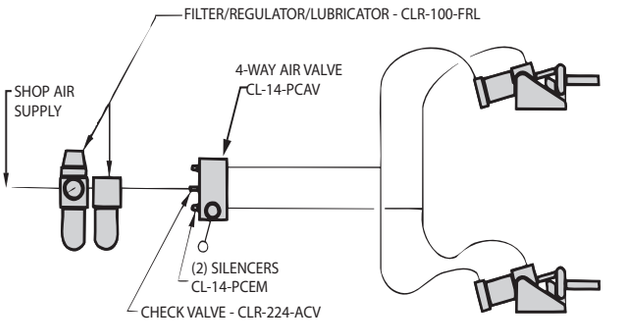
See Pages 238-239

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AIR-POWERED CLAMPS





All Carr Lane Manufacturing toggle clamps are DFARS and RoHS compliant.



100 lbs **200 lbs** **500 lbs** **1000 lbs** **5000 lbs**

Toggle Hold-Down Clamps
pp. 516-520

Similar to a vertical-handle hold-down clamp, except linkage is operated by a double-acting air cylinder instead of by hand. Toggle linkage provides high holding capacity and insures positive mechanical locking even if air pressure fails.



14 lbs **25 lbs** **66 lbs** **100 lbs** **165 lbs** **277 lbs**

Swing Clamps
pp. 628-629

Hold-down clamp with a clamping arm that rotates 90° for clear loading. Sturdy helical-cam mechanism first rotates arm, then clamps down. Double acting.



Clamping Valves



Check Valves



Exhaust Mufflers



Air Fittings

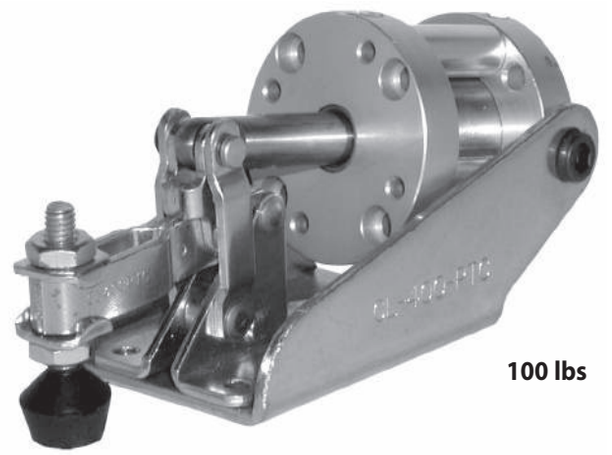
Air Accessories
p. 521

Complete selection of accessories including clamping valves, check valves, exhaust mufflers, and air fittings.

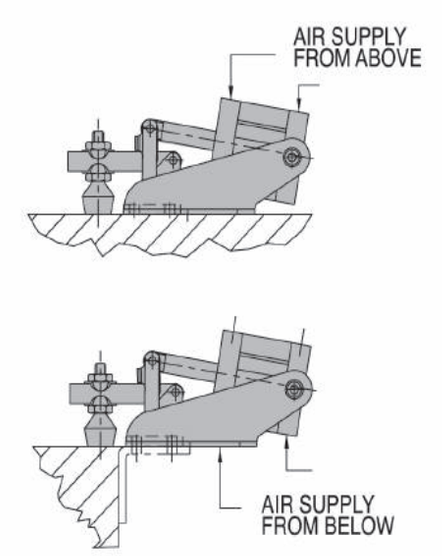
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AIR-POWERED TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



100 lbs

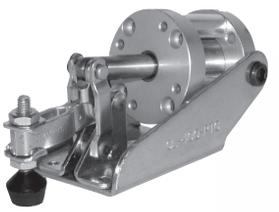


CL-400-PTC

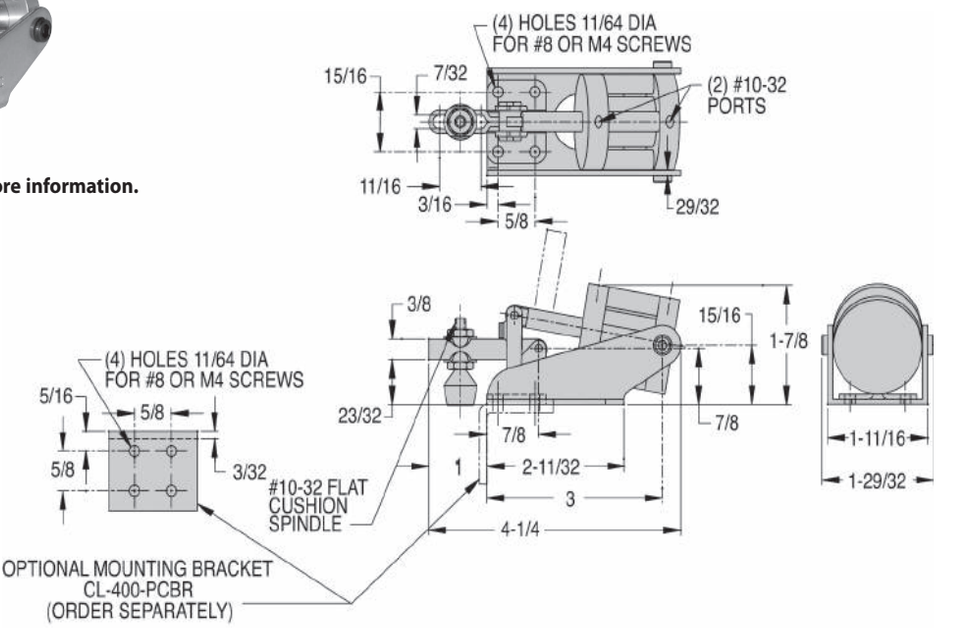
Super-compact hold-down clamp for applications where space is at a premium. Open arm allows spindle adjustment. Toggle linkage provides high holding capacity and insures positive mechanical locking even if air pressure fails. Arm opens 100°. 3/4"-bore double-acting air cylinder with #10-32 ports (**INFO+**: see page 521 to order fittings). Supplied with #10-32 flat-cushion spindle CL-316112-FC and (2) CL-3166-TW flanged washers. 100-psi maximum input air pressure. Shipping weight 0.8 lbs. An optional bracket for side mounting is also available (CL-400-PCBR).

Holding capacity:	**100 lbs**
Clamping force at 100 psi, at center of arm:	**100 lbs**

Also available with position sensing...



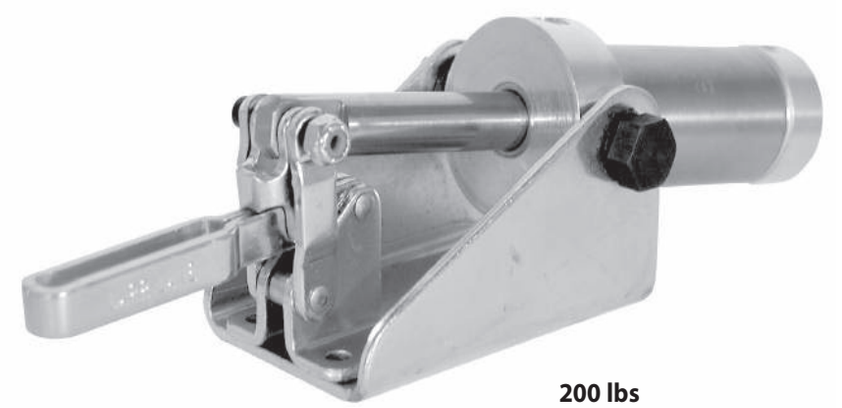
Please see our web catalog for more information.



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INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



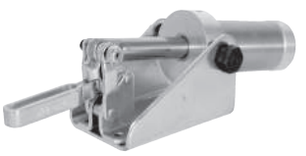
200 lbs

CL-500-PTC

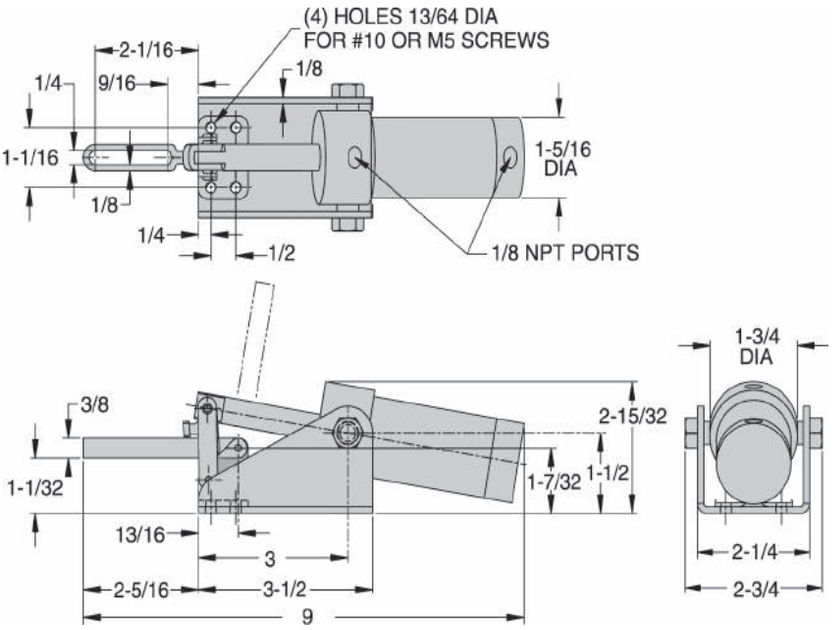
Small-yet-powerful hold-down clamp with a long open arm. Toggle linkage provides high holding capacity and insures positive mechanical locking even if air pressure fails. Arm opens 100°. 1-1/4″-bore double-acting air cylinder with 1/8-NPT ports. Accepts any 1/4-20 short spindle and (2) CL-148-TW flanged washers. **INFO+**: See pages 522-526 to order. 100-psi maximum input air pressure. Shipping weight 2.5 lbs.

Holding capacity:	**200 lbs**
Clamping force at 100 psi, at center of arm:	**200 lbs**

Also available with position sensing:



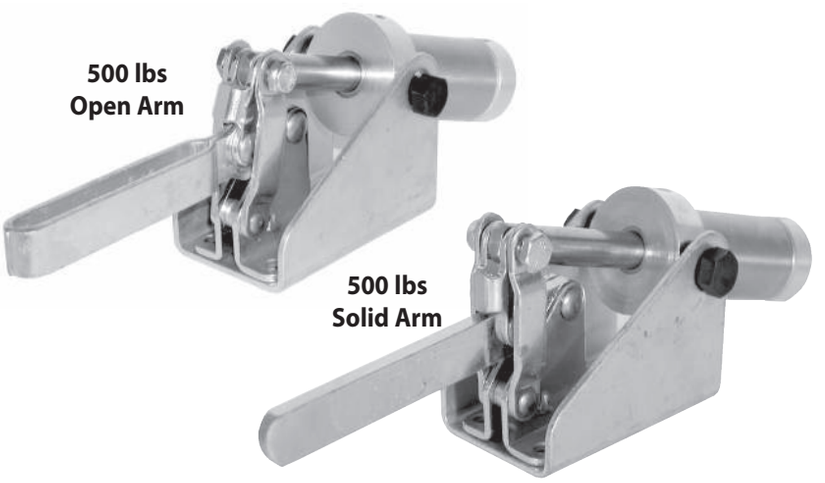
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AIR-POWERED TOGGLE CLAMPS

INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



CL-1000-PTC
CL-1001-PTC

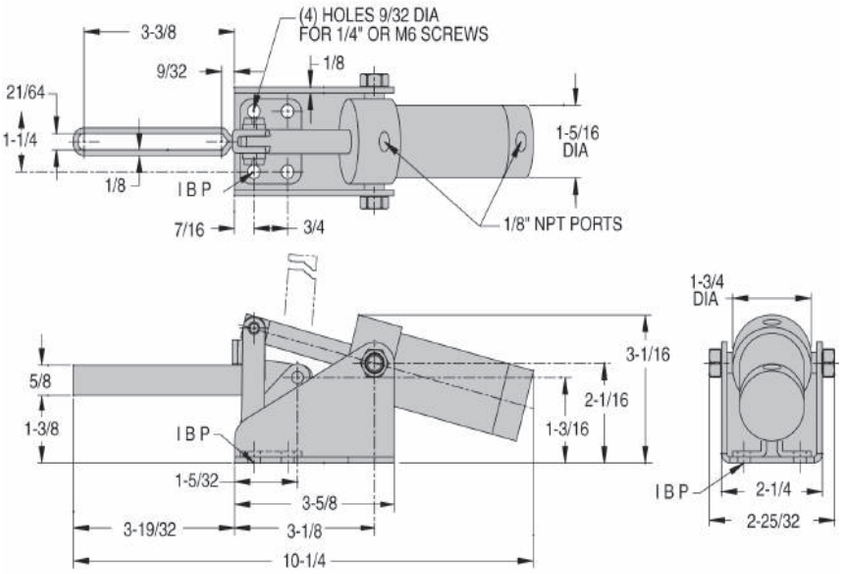
Popular medium-size hold-down clamp available with a solid arm, or an open arm for spindle adjustment. Toggle linkage provides high holding capacity and insures positive mechanical locking even if air pressure fails. Arm opens 92°. 1-1/4"-bore double-acting air cylinder with 1/8-NPT ports. Accepts any 5/16-18 short spindle and (2) CL-51610-TW flanged washers. **INFO+:** See pages 522-526 to order. Solid-arm version accepts a CL-518000-BR bolt retainer. 100-psi maximum input air pressure. Shipping weight 3.0 lbs.

Holding capacity:	**500 lbs**
Clamping force at 100 psi, at center of arm:	**390 lbs**

Also available with position sensing:



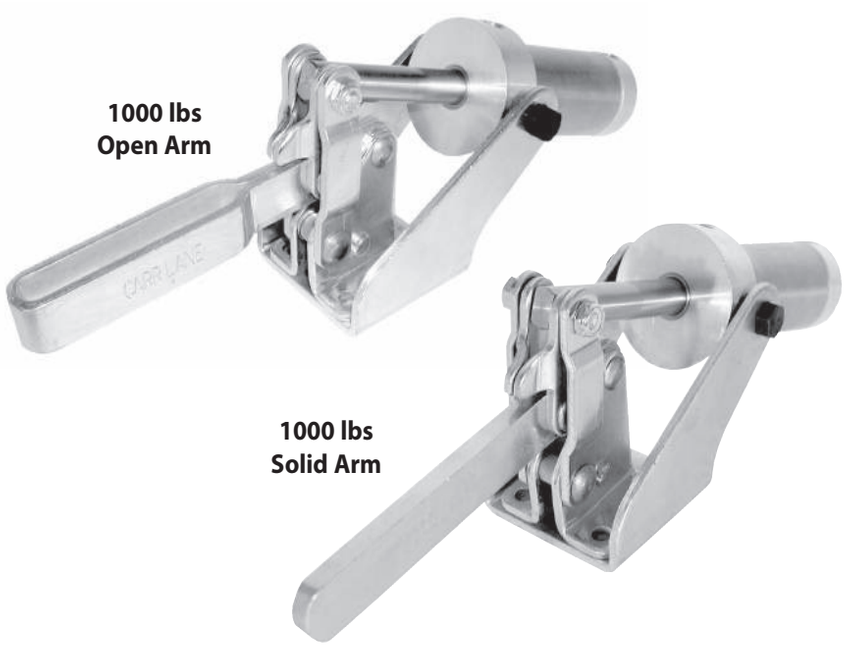
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INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



CL-2000-PTC Open Arm
CL-2001-PTC Solid Arm

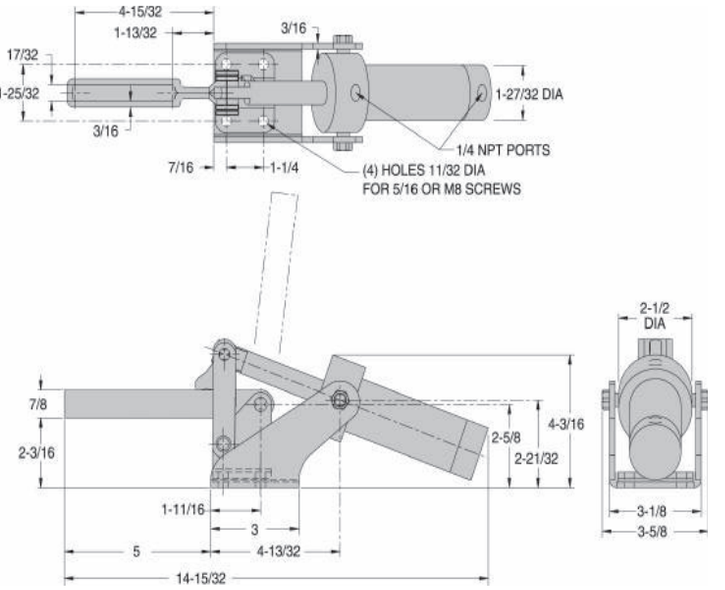
Extra-large hold-down clamp available with a solid arm, or an open arm for spindle adjustment. Toggle linkage provides high holding capacity and insures positive mechanical locking even if air pressure fails. Arm opens 83°. 1-3/4″-bore double-acting air cylinder with 1/4-NPT ports. Accepts any 1/2-13 spindle and (2) CL-1213-TW flanged washers. **INFO+**: See pages 522-526 to order. Solid-arm version accepts a CL-113000-BR bolt retainer. 100 psi maximum input air pressure. Shipping weight 6.0 lbs.

Holding capacity:	**1000 lbs**
Clamping force at 100 psi, at center of arm	**680 lbs**

Also available with position sensing:

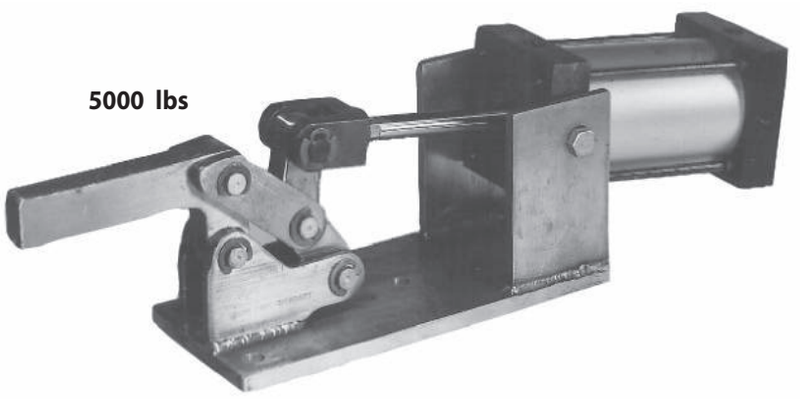


Please see our web catalog for more information.



AIR-POWERED TOGGLE CLAMPS

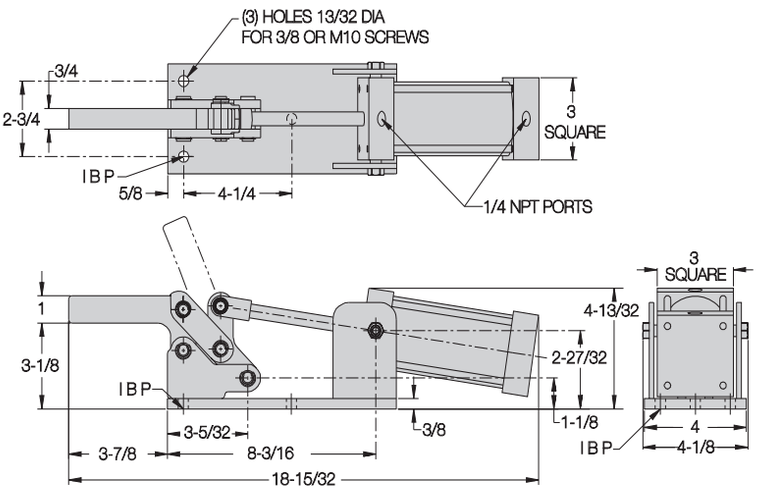
INFO+: SEE PAGE 452 FOR MATERIAL SPECIFICATIONS



CL-3000-PTC

Heavy-duty hold-down clamp with a solid forged steel clamping arm. Toggle linkage provides high holding capacity and insures positive mechanical locking even if air pressure fails. Arm opens 83°. 2-1/2″-bore double-acting air cylinder with 1/4-NPT ports. 150-psi maximum input air pressure. Shipping weight 15.0 lbs.

Holding capacity:	**5000 lbs**
Clamping force at 100 psi, at center of arm:	**1600 lbs**

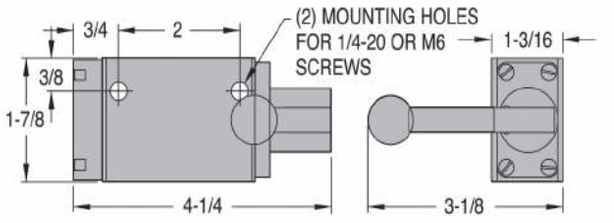


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CLAMPING VALVES*





CL-14-PCAV
Versatile two-position, four-way valve for simple and convenient clamp control. Five 1/4-NPT ports. 150 psi maximum pressure.

CHECK VALVES*



CLR-224-ACV
Allows air to flow in one direction only. 1/4-NPT male x 2.

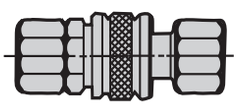
EXHAUST MUFFLERS*



CL-14-PCEM
Durable, compact, sintered-bronze exhaust muffler. 1/4-NPT male.

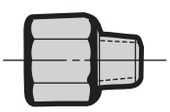
AIR FITTINGS*

Quick-Disconnect Coupler



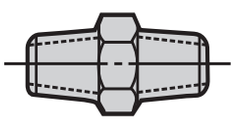
CL-14-PCQD
Both halves, 1/4-NPT female
CL-14-PCQDS
Female socket, 1/4-NPT female
CL-14-PCQDP
Male plug, 1/4-NPT female
(Industrial Interchange)

Adapter



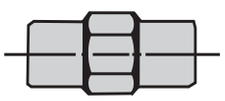
CL-1014-PCA
#10-32 female x 1/4-NPT male
CL-1418-PCA
1/4-NPT female x 1/8-NPT male
CL-3814-PCA
3/8-NPT female x 1/4-NPT male

Hex Nipple



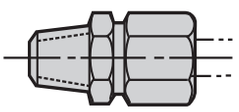
CL-10-PCHN
#10-32 male x 2
CL-14-PCHN
1/4-NPT male x 2
CL-38-PCHN
3/8-NPT male x 2
CL-3814-PCHN
3/8-NPT male x 1/4-NPT male

Coupling



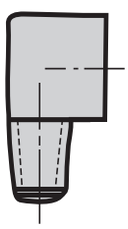
CL-10-PCCP
#10-32 female x 2
CL-14-PCCP
1/4-NPT female x 2

Tubing Connector



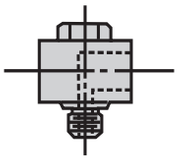
CL-1810-PCTC
1/8-OD tube x #10-32 male
CL-14-PCTC
1/4-OD tube x 1/4-NPT male
(Includes compression sleeve and nut)

Street Elbow



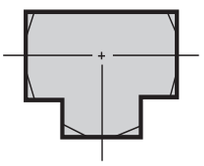
CL-14-PCSE
1/4-NPT
Female x 1/4-NPT male

Banjo Elbow



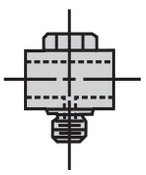
CL-10-PCBE
#10-32 female x #10-32 male

Tee



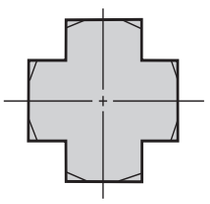
CL-10-PCTE
#10-32 female x 3
CL-14-PCTE
1/4-NPT female x 3

Branch Tee



CL-10-PCBT
#10-32 female x 2,
#10-32 male

Cross



CL-14-PCCR
1/4-NPT female x 4

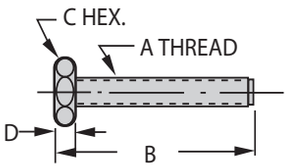
* Do not use in high-pressure hydraulic lines.

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HEX-HEAD SPINDLES



Simple spindle design provides maximum clamping force. Fully threaded for maximum adjustment range. Assembly includes two jam nuts. Available in thread sizes from #8-32 to 5/8-11 (M4 to M16 in metric).



STEEL (INCH)

PART NO.	A	B	C	D
CL-316112-SA	#10-32	1-3/8	5/16	1/8
CL-14112-SA	1/4-20	1-11/16	7/16	3/16
CL-14200-SA		2-3/16		
CL-516212-SA	5/16-18	2-11/16	1/2	3/16
CL-38314-SA	3/8-16	3-1/4	9/16	1/4
CL-12314-SA	1/2-13	3-5/16	3/4	5/16
CL-58438-SA	5/8-11	4-3/8	15/16	3/8

VINYL-DIPPED STEEL (INCH)

CL-832208-FC	#8-32	1-3/16	1/4	1/8
CL-14100-SA	1/4-20	1	7/16	3/16
CL-14208-SA		1-1/2		

STAINLESS STEEL (INCH)

CL-83234-SA-S	#8-32	7/8	1/4	1/8
CL-832203-SA-S		1-1/8		
CL-316100-SA-S	#10-32	1-1/8	5/16	1/8
CL-14112-SA-S	1/4-20	1-11/16	7/16	3/16
CL-516200-SA-S	5/16-18	1-15/16	1/2	3/16
CL-516212-SA-S		2-11/16		
CL-38212-SA-S	3/8-16	2-1/2	9/16	1/4
CL-38314-SA-S		3-1/4		
CL-12234-SA-S	1/2-13	2-13/16	3/4	5/16

NYLON (INCH)

CL-832203-SA	#8-32	7/8	1/4	1/8

STEEL (METRIC)

PART NO.	A	B	C	D
CLM-530-SA	M5	1.32	8mm	.14
CLM-640-SA	M6	1.75	10mm	.18
CLM-650-SA		2.15		
CLM-850-SA	M8	2.19	13mm	.22
CLM-865-SA		2.78		
CLM-1070-SA	M10	3.03	17mm	.28
CLM-1275-SA	M12	3.27	19mm	.31
CLM-16100-SA	M16	4.33	24mm	.39

STAINLESS STEEL (METRIC)

CLM-416-SA-S	M4	.75	7mm	.12
CLM-425-SA-S		1.10		
CLM-530-SA-S	M5	1.32	8mm	.14
CLM-640-SA-S	M6	1.75	10mm	.18
CLM-650-SA-S		2.15		
CLM-850-SA-S	M8	2.19	13mm	.22
CLM-865-SA-S		2.78		
CLM-1070-SA-S	M10	3.03	17mm	.28

NYLON (METRIC)

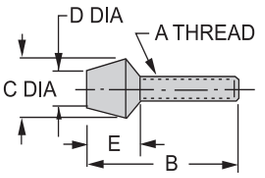
CLM-416-SA	M4	.75	7mm	.12

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FLAT-CUSHION SPINDLES



This is the standard spindle supplied with most clamps. Molded neoprene tip provides medium clamping force with some compensation for part-size variation. Also provides scratchfree clamping. Neoprene cushion has a durometer hardness of 70 shore A, and an operating temperature range of -40ºF to 220ºF. Spindle is fully threaded for maximum adjustment range. Assembly includes two jam nuts.



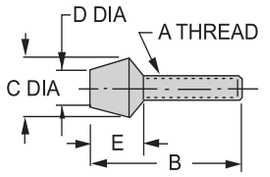
STEEL (INCH)

PART NO.	A	B	C DIA	D	E
CL-316112-FC	#10-32	1-3/8	9/16	7/16	7/16
CL-14112-FC	1/4-20	1-5/8	5/8	13/32	5/8
CL-14200-FC		2-1/8			
CL-518208-FC	5/16-18	2-1/4	3/4	1/2	3/4
CL-516212-FC		3			
CL-38212-FC	3/8-16	2-1/2	13/16	5/8	7/8
CL-38314-FC		3-1/2			

FLAT-CUSHION SPINDLES, QUICK ADJUSTING



Same as the Flat-Cushion Spindles above, except with two knurled nuts, instead of hex jam nuts, for convenient hand tightening. Use for quick spindle adjustment in applications where high-torque tightening with a wrench is not required.



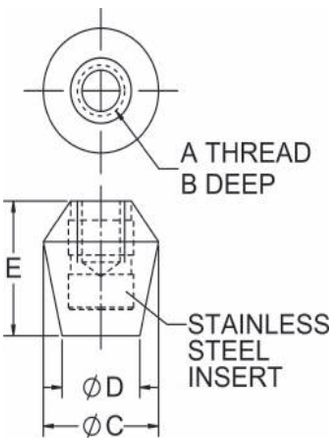
STEEL (INCH)

PART NO.	A	B	C DIA	D	E
CL-316112-FCQA	#10-32	1-3/8	9/16	7/16	7/16
CL-14112-FCQA	1/4-20	1-5/8	5/8	13/32	5/8
CL-14200-FCQA		2-1/8			
CL-518208-FCQA	5/16-18	2-1/4	3/4	1/2	3/4
CL-516212-FCQA		3			
CL-38212-FCQA	3/8-16	2-1/2	13/16	5/8	7/8
CL-38314-FCQA		3-1/2			

POLYURETHANE FLAT CUSHIONS



Polyurethane cushions are tougher and slightly harder than standard neoprene cushions. Ideal when greater clamping force is required while still providing scratchfree clamping and some compensation for part-size variation. Molded-in stainless steel insert provides superior thread strength. Ideal for making custom-length Flat Cushion Spindles by inserting a threaded stud. Polyurethane cushion has a hardness 85 Shore A, operating temperature range -90ºF to 200ºF.



STAINLESS (INCH)

PART NO.	A	B	C DIA	D DIA	E
CL-1032-FCP	#10-32	.19	.56	.44	.53
CL-1420-FCP	1/4-20	.30	.63	.47	.63
CL-51618-FCP	5/16-18	.33	.75	.50	.75
CL-3816-FCP	3/8-16	.38	.81	.63	.88

STAINLESS (METRIC)

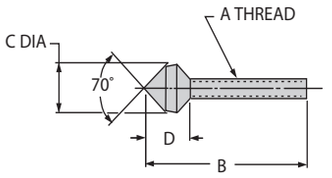
CLM-5-FCP	M5	.19	.56	.44	.53
CLM-6-FCP	M6	.24	.63	.47	.63
CLM-8-FCP	M8	.30	.75	.50	.75
CLM-10-FCP	M10	.35	.81	.63	.88

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CONE-CUSHION SPINDLES



Excellent for clamping into drilled holes, slots, or corners. Molded neoprene tip provides medium clamping force with some compensation for part-size variation. Also provides scratchfree clamping. Neoprene cushion has a durometer hardness of 70 shore A, and an operating temperature range of -40ºF to 220ºF. Spindle is fully threaded for maximum adjustment range. Assembly includes two jam nuts.



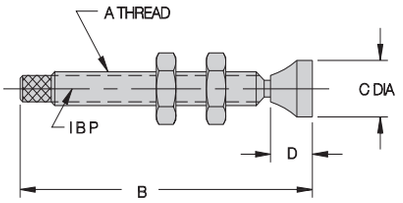
STEEL (INCH)

PART NO.	A	B	C DIA	D
CL-316112-CC	#10-32	1-3/8	9/16	7/16
CL-14112-CC	1/4-20	1-5/8	5/8	5/8
CL-14200-CC		2-1/8		5/8
CL-516212-CC	5/16-18	3	3/4	3/4
CL-38314-CC	3/8-16	3-1/2	13/16	7/8

SWIVEL-FOOT SPINDLES



Swivel foot provides full contact on uneven or sloped surfaces. Assembly includes two jam nuts.



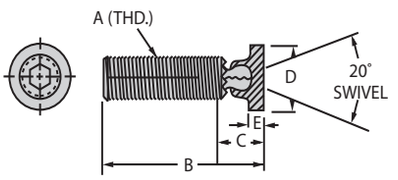
STEEL (INCH)

PART NO.	A	B	C DIA	D
CL-14112-SF	1/4-20	1-3/4	1/2	3/8
CL-14200-SF		2-1/4		
CL-516212-SF	5/16-18	2-3/4	9/16	7/16
CL-38314-SF	3/8-16	3-1/2	5/8	1/2

SWIVEL SCREW CLAMPS



Screw clamp with patented removable, interchangeable swivel foot, available in many sizes and varieties. Add "N" to part no. for Delrin® foot, e.g. CL-23-SSCN. **INFO+**: See pages 118-119 for additional lengths and foot options. Order two jam nuts separately.



STEEL (INCH)

PART NO.	JAM NUT PART NO. (2 REQD)	A	B	C	D DIA	E
CL-23-SSC	CL-4-JN	1/4-20	1-19/32	23/64	3/8	1/8
CL-27-SSC	CL-5-JN	5/16-18	2-3/32	27/64	1/2	5/32
CL-43-SSC	CL-6-JN	3/8-16	3-1/8	1/2	9/16	3/16
CL-44-SSC	CL-8-JN	1/2-13	4-1/16	17/32	3/4	3/16
CL-46-SSC	CL-10-JN	5/8-11	5-3/64	21/32	15/16	7/32

STEEL (METRIC)

CLM-23-SSC	CLM-6-JN	M6	1.67	.36	3/8	1/8
CLM-27-SSC	CLM-8-JN	M8	2.06	.42	1/2	5/32
CLM-32-SSC	CLM-10-JN	M10	3.08	.62	9/16	3/16
CLM-36-SSC	CLM-12-JN	M12	4.00	.53	3/4	3/16
CLM-40-SSC	CLM-16-JN	M16	4.97	.66	15/16	7/32

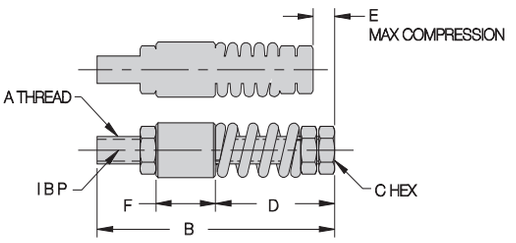
STAINLESS STEEL (INCH)

CL-23-SSC-S	CL-4-JN-S	1/4-20	1-19/32	23/64	3/8	1/8
CL-27-SSC-S	CL-5-JN-S	5/16-18	2-3/32	27/64	1/2	5/32
CL-43-SSC-S	CL-6-JN-S	3/8-16	3-1/8	1/2	9/16	3/16

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Clamps with strong spring force to compensate for varying part thicknesses. Excellent for clamping castings that vary slightly in size. To install, weld bolt retainer to clamping arm. Assembly includes two jam nuts, a die spring, and a bolt retainer.



STEEL (INCH)

PART NO.	A	B	C	D MIN	D MAX	E	FORCE AT "E" (lbs)	F
CL-14200-SL	1/4-20	2-1/4	7/16	1-9/32	1-3/8	1/4	50	5/8
CL-516212-SL	5/16-18	2-3/4	1/2	1-11/16	1-7/8	1/4	100	5/8
CL-38314-SL	3/8-16	3-1/2	9/16	1-3/4	2-9/32	5/16	200	7/8

Air Gap Sensors Giving You Trouble?



Here's Your Solution:

Air Rest Buttons

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Take the guesswork out of loading your parts. Whether you run your operations with robot or human guidance, Carr Lane Manufacturing's Air Rest Buttons deliver feedback with every load.

See Pages 222-223

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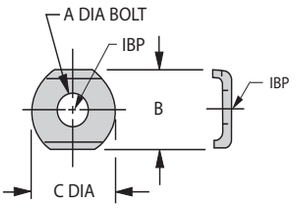
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FLANGED WASHERS



Two flanged washers required per clamp

For open-arm clamps. Use two flanged washers to mount spindle, one above the arm and one below.



STEEL

PART NO.	A	B	C DIA
CL-832-TW	#8-32 or M4	7/16	15/32
CL-3166-TW	#10-32 or M5	1/2	9/16
CL-147-TW	1/4-20 or M6	9/16	5/8
CL-148-TW		19/32	11/16
CL-51610-TW	5/16-18 or M8	3/4	7/8
CL-3811-TW	3/8-16 or M10	15/16	1
CL-1213-TW	1/2-13 or M12	1-5/32	1-1/4
CL-5811-TW	5/8-11or M16	1-3/8	1-15/32

STAINLESS STEEL

CL-832-TW-S	#8-32 or M4	7/16	15/32
CL-3166-TW-S	#10-32 or M5	1/2	9/16
CL-147-TW-S	1/4-20 or M6	9/16	5/8
CL-148-TW-S		19/32	11/16
CL-51610-TW-S	5/16-18 or M8	3/4	7/8
CL-3811-TW-S	3/8-16 or M10	15/16	1

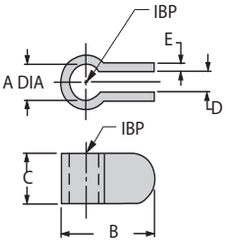
BOLT RETAINERS



BR
For VTC clamps



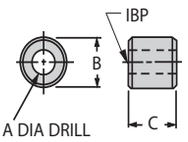
S
For TC clamps



BR (FOR HTC & VTC CLAMPS)

PART NO.	SPINDLE SIZE	A DIA	B	C	D	E
CL-142000-BR	1/4-20 or M6	9/32	1-1/4	1/2	3/16	3/32
CL-518000-BR	5/16-18 or M8	21/64	1-1/4	5/8	1/4	3/32
CL-316000-BR	3/8-16 or M10	17/32	1-1/2	3/4	5/16	1/8
CL-113000-BR	1/2-13 or M12	9/16	1-5/8	7/8	3/8	1/8
CL-511000-BR	5/8-11 or M16	11/16	1-7/8	1-1/4	3/8	1/8

For solid-arm clamps. Weld on bolt retainer at desired arm length and spindle angle.



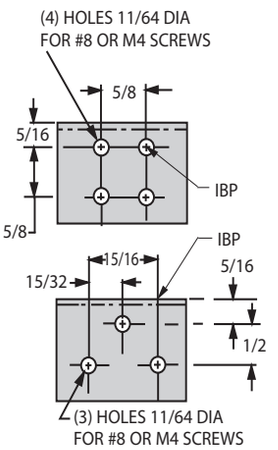
S (FOR TC CLAMPS)

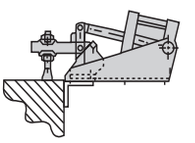
PART NO.	SPINDLE SIZE	A DIA	B DIA	C
CL-1458-S	1/4-20 or M6	.257	5/8	5/8
CL-51658-S	5/16-18 or M8	.316	5/8	5/8
CL-3878-S	3/8-16 or M10	.397	3/4	7/8

MOUNTING BRACKETS

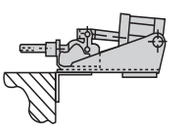


Handy bracket for side-mounting small clamps. One reversible bracket fits several clamps.





Downholding



Push/Pull

PART NO.	FITS DOWNHOLDING CLAMPS	FITS PUSH CLAMPS
CL-400-PCBR	CL-150-VTC	CL-50-SPC
	CL-400-PTC	CL-600-PPC

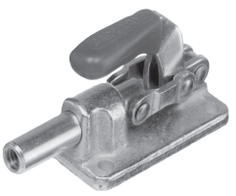
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STAGE AND FILM



Glow Wagon Brakes

Also see:



Push/Pull Toggle Clamps
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Lifting Pins
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Ball Lock Pins
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Hoist Rings
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Threaded Inserts
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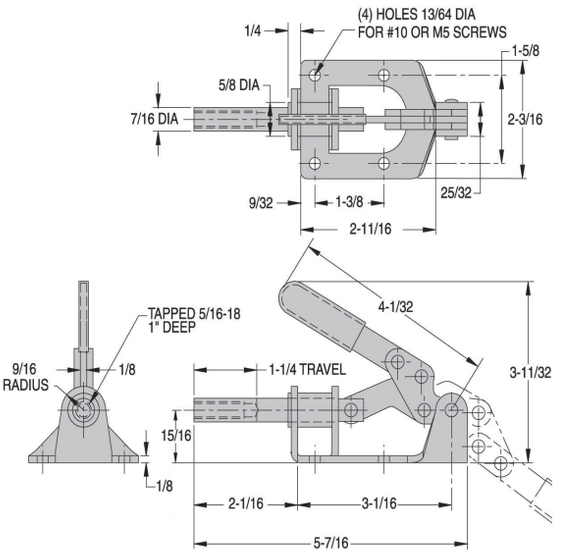
Hi-Viz Hammers
p. 342

GLOW WAGON BRAKES

CLAMP BODY: 12L14, 1008, 1010, AND/OR 1018 STEEL, ZINC PLATED BLACK CHROMATE
RIVETS: 400-SERIES STAINLESS
HANDLE: GLOW-IN-THE-DARK VINYL



Medium-sized clamp locks in extended or retracted position.

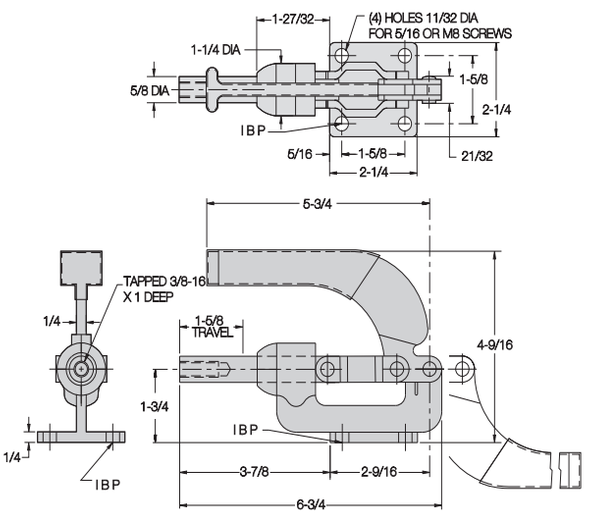


CL-150-SPC-BZ

Wagon Brakes with a black finish and glow-in-the-dark handles are specifically designed for use on stage-set designs, but can be used with other mobile jigs and carts. Wagon Brakes provide secure stabilization of your set designs, the ability to effortlessly re-arrange sets in an instant, and safety for your crew with special handles that glow in the dark for at least 8 hours. Glow-in-the-dark handles reduce the worry of trip hazards for stagehands as they work to set the scene.

Wagon Brakes literally lift your scenery off its movable casters, securing it in place and preventing any movement until you are ready to change the scene. A rugged toggle action provides the mechanical advantage to make lifting easy, and locks "over center" for safety. No drilling is ever required on your stage floor – just lock these Wagon Brakes in place to secure your stage set underneath the actors' feet.

The medium-size plunger clamp shown here (CL-150-SPC-BZ) has a 1-1/4" plunger travel, is tapped to accept any 5/16-18 threaded foot and has a 300 lbs holding capacity. CL-250-SPC-BZ has a 1-5/8" plunger travel, is tapped to accept any 3/8-16 threaded foot and has an 800 pound holding capacity. Both lock in extended and retracted position. Made in USA.



CL-250-SPC-BZ

PART NO.	DESCRIPTION	TAPPED HOLE IN PLUNGER	HOLDING CAPACITY	SHIPPING WEIGHT
CL-150-SPC-BZ	Tapped Plunger, Flanged Base	5/16-18	300 lbs.	.7 lbs.
CL-250-SPC-BZ	Tapped Plunger, Flanged Base	3/8-16	800 lbs.	1.9 lbs.

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Quick-Ship Drill Bushings



Press-Fit Bushings



Renewable Bushings



Liner Bushings



Bushing Handles



Lockscrews & Clamps



Castable Bushings



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Threaded-Template Bushings



Air-Feed-Drill Bushings

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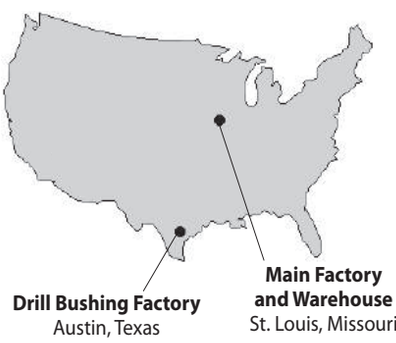
WHAT MAKES A CARR LANE MANUFACTURING DRILL BUSHING BETTER?

1 TOP QUALITY



Carr Lane Manufacturing drill bushings are all precision honed and ground, the finest quality available. They exceed all ANSI drill-bushing standards. Unlike some of our competitors, we manufacture only first-quality drill bushings, never "economy grade."

2 FAST DELIVERY



Our nationwide network of stocking distributors, plus huge inventories at two warehouse locations, guarantees same-day shipment for standard bushings. In addition, our quick-response manufacturing capabilities allow us to ship almost all special and modified bushings in less than 10 days.

3 ECONOMICAL PRICES



As you expect with all Carr Lane Manufacturing products, our drill-bushing prices are the most competitive around. Our production volumes and advanced manufacturing techniques mean excellent value for you.

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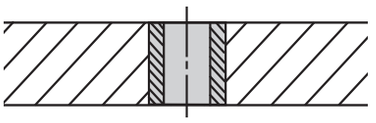
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BUSHING SELECTION

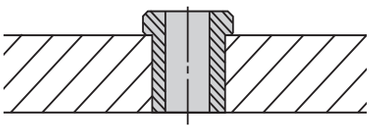
INCH				METRIC			
P -	20 -	8 -	.1250	PM -	8 -	12 -	4.50
Type	OD in 64ths of an inch	Length in 16ths of an inch	ID as 4-place decimal inch	Type	OD in mm	Length in mm	ID as 2-place decimal mm

PRESS FIT:

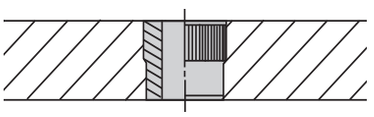
Types **P, PC** (carbide), and **PM** (metric). This is the most-popular and least-expensive drill bushing. P bushings are permanently pressed into the jig plate, usually flush with the top surface. They are generally used for single-step drilling or reaming operations when you do not expect to replace bushings during the tooling's lifetime. P bushings can be mounted closer together than headed bushings, but offer less resistance to heavy axial loads.

HEAD PRESS FIT:

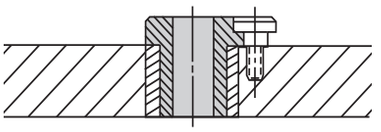
Types **H**, **HC** (carbide), and **HM** (metric). Similar to a P bushing, but with a head to resist heavy axial loads. H bushings are permanently pressed into the jig plate. They are generally used for single-step drilling or reaming operations when you do not expect to replace bushings during the tooling's lifetime. The head can be left exposed, or recessed by counterboring the installation hole. Note: The "length" listed for a inch head-press-fit bushing refers to its length under the head, while the metric version's "length" is its overall length.

SERRATED PRESS FIT:

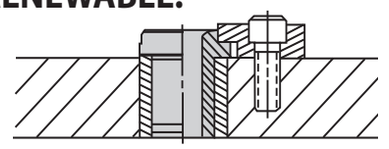
Types **SP** and **SPM** (metric). Similar to a P bushing, but with top serrations to prevent rotation in soft materials. Recommended in high-torque situations for materials such as magnesium, aluminum, masonite, or wood. Finish-ground OD ensures accurate ID location. Serrations also resist axial force to prevent pushing the bushing through the jig plate.

SLIP/FIXED RENEWABLE:

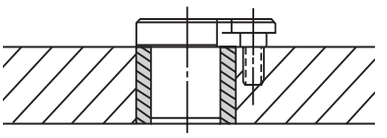
Types **SF, SFC** (carbide), and **SFM** (metric). Replaceable bushing generally used with a liner bushing and lockscrew. Use when you expect to replace bushings during the tooling's lifetime, or when you want to switch bushings to perform multi-step operations with the same tooling. SF bushings combine the benefits of older S-type slip-renewable and F-type fixed-renewable bushings: One side has a small recess for fixed mounting; the other has a locking recess that allows the bushing to slip down, then lock in place by rotating it. S and F types are now obsolete and combination SF bushings will be furnished at no extra charge.

FLAT MILLED RENEWABLE:

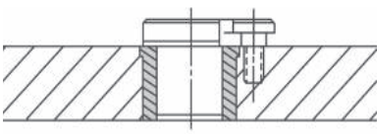
Types **FM** and **FMC** (carbide). Replaceable bushing used for extra resistance to rotational forces under harsh conditions. This bushing, generally used with a liner, has a milled locking flat to allow fastening securely with a flat clamp. FM bushings also have a standard recess on the other side to allow using a lockscrew instead.

LINER:

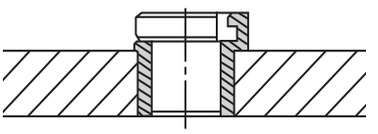
Types **L** and **PM** (metric). Liners are permanent bushings used to hold renewable drill bushings. The liner's ID has a precise sliding fit with the renewable bushing's OD. The hardened liner accurately locates the renewable bushing and protects the jig plate from wear caused by frequent bushing replacement. Note: Metric liner bushings are the same as metric press-fit bushings.

HEAD LINER:

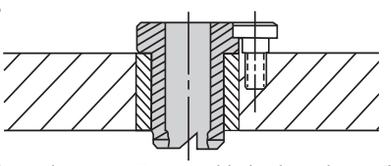
Types **HL** and **HM** (metric). Similar to an L bushing, but with a head to resist heavy axial loads. Head liners are permanent bushings used to hold renewable drill bushings. The head liner's ID has a precise sliding fit with the renewable bushing's OD. The hardened head liner accurately locates the renewable bushing and protects the jig plate from wear caused by frequent bushing replacement. Note: The "length" listed for a head liner refers to its overall length, not its length under the head. Metric head-liner bushings are the same as metric head-press-fit bushings.

UN-A-LOK™ LINER:

Types **UL** and **ULM** (metric). Similar to an HL head liner, but incorporating a special locking tab that eliminates the need for a lockscrew. Un-A-Lok liners are permanent bushings used to hold SF renewable drill bushings (on the "slip" side only, not the "fixed" side). Although slightly more expensive than a head liner plus a lock screw, installation time is dramatically reduced.

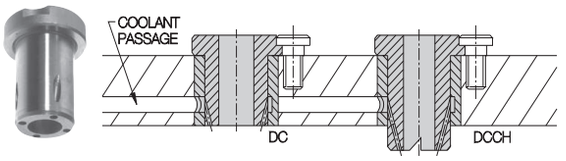
CHIP BREAKER:

Types **CH** and **CHM** (metric). Similar to an SF renewable bushing, but with specially designed chip-breaking notches on the drill-exit end. Use to break up chips from tough, stringy materials, to reduce friction and heat buildup. Reduces bushing wear at the drill-exit end and reduces the chance of tool or workpiece damage. A chip-breaker bushing should extend beyond its liner to allow chips to escape. Chip breakers are also available on other bushing types such as P, H, and DC.

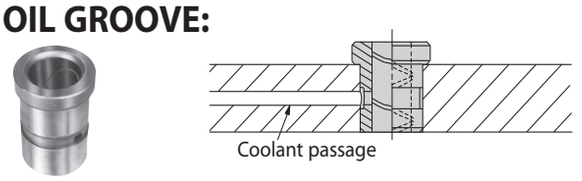
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DIRECTED COOLANT:



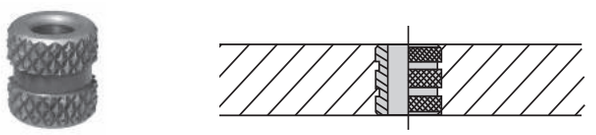
Types **DC, DCCH** (chip breaker), **DCL** (liner), and **DCHL** (head liner). Similar to an SF renewable bushing, but with passages to direct coolant to the cutting area. This design is particularly good for washing away chips, especially when ordered as the combination Directed Coolant Chip Breaker (DCCH). DC bushings require special liners, DCL or DCHL, to direct coolant from a drilled manifold passage to the holes in the bushing's OD wall.

OIL GROOVE:



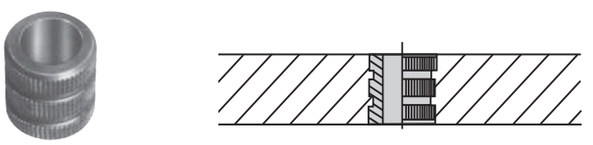
Oil grooves are available on most drill-bushing types, including P, H, and SF. Use when you need complete drill lubrication and cooling, such as when drilling hardened steel. Oil grooves are specially designed coolant passageways in the bushing's ID wall. Choose from 25 different groove styles. End wipers are also available, to keep out dirt and chips.

DIAMOND GROOVE:



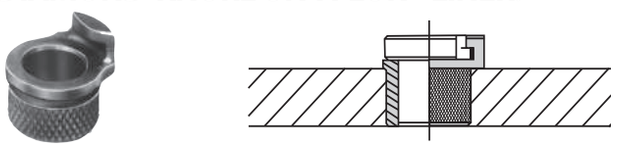
Types **DG** and **DGM** (metric). A bushing for cast-in-place or potted installation. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.

SERRATA GROOVE:



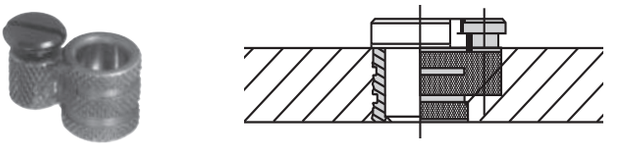
Type **SG.** Can be cast in place or potted, just as a diamond-groove bushing, or can also be pressed into an installation hole. Straight knurl provides less resistance to axial loads than the diamond knurl on a DG bushing. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.

DIAMOND-KNURL UN-A-LOK™ LINER:



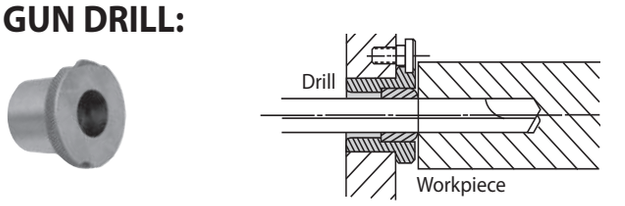
Types **ULD** and **ULDM** (metric). A liner for cast-in-place or potted installation, used to hold SF renewable drill bushings. Un-A-Lok™ liners incorporate a special locking tab that eliminates the need for a lockscrew. Holds only the "slip" side of an SF bushing, not the "fixed" side. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.

EZ CAST LINER:



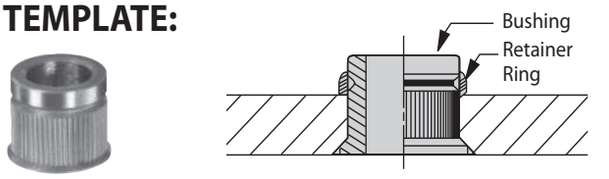
Type **EZ**. Another liner for cast-in-place or potted installation, used to hold SF renewable drill bushings. Unlike diamond-knurl unilock liners, EZ-cast liners hold either the "slip" or "fixed" side of an SF bushing, since they include an integral lockscrew holder. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.

GUN DRILL:



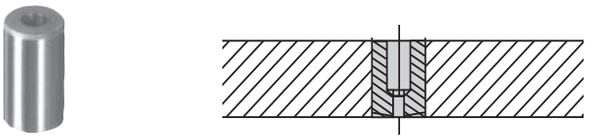
Types **GD, GDL** (liner), and **GDI** (insert). Drill bushings for gun-drilling machines, such as Eldorado, Drillmation, DeHoff, and Lahr. Gun drill bushings are similar to SF renewable bushings, but with the drill bearing at the bushing's head end. Depending on the gun-drilling machine, bushings are either one-piece or two-piece (a liner and an insert).

TEMPLATE:



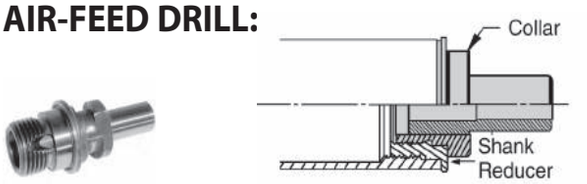
Type **TB.** An economical bushing designed for thin template jig plates from 1/16- to 3/8-inch thick. Bushings are held in place by a retainer ring. The OD serrations prevent the bushing from spinning. Bushings can be removed and reused by breaking the aluminum retainer ring (extra retainer rings available).

CIRCUIT BOARD:



Types **CB** and **CBC** (carbide). Headless and head-type bushings made especially for circuit-board drilling machines. Available for Electro-Mechano, Excellon, Waco, Digital, Nationwide, Edlund, Tektronix, Leland-Gifford, Palomar, Hughes, Rapidrill, and Reliable drilling machines.

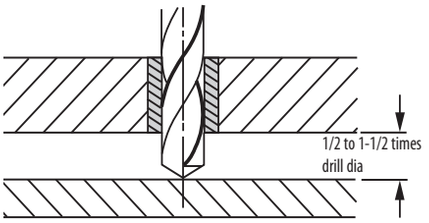
AIR-FEED DRILL:



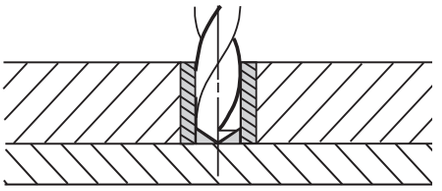
Type **A**. Drill-bushing shanks, collars, adaptors, and locking accessories for air-feed drills, tappers, and back-spotfacers. Available for all standard drill motors, including Gardner-Denver, Keller, Aro, Buckeye, Quackenbush, Desoutter, and Ingersoll-Rand.

INSTALLATION AND TECHNICAL DATA

RECOMMENDED CHIP CLEARANCE:

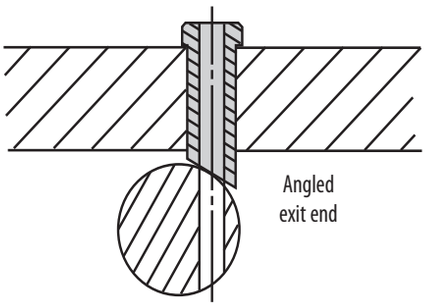


To minimize drill bending and maximize hole accuracy, mount drill bushings as close to the workpiece as possible while still allowing adequate chip clearance. The necessary clearance depends on workpiece material and chip stringiness. For example, cast iron, with fine chips requires about 1/2 times drill diameter for chip clearance. Materials that produce long, stringy chips, such as cold-rolled steel and aluminum, require at least one-drill-diameter clearance. To reduce clearance even with long, stringy chips, exit-end chip breakers are available. **INFO+:** See pages 568-569.



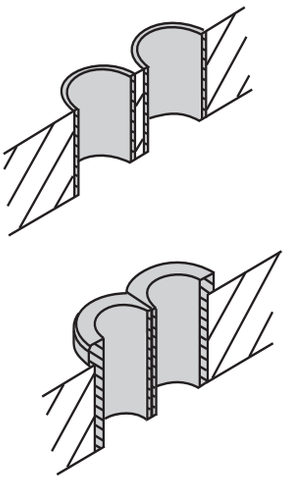
Direct workpiece contact is usually not recommended. Chips can escape only up through the drill's flutes, drill-bearing length is shortened by the drill point's length, and drill-withdrawal burrs can raise the jig plate. Direct contact may be necessary, though, for maximum bearing length when drilling sloped surfaces (see below). Also, reamer bushings can be mounted much closer than drill bushings, due to much finer chips, for more-accurate hole finishing.

SPECIAL BUSHINGS FOR SLOPED WORKPIECE SURFACES:



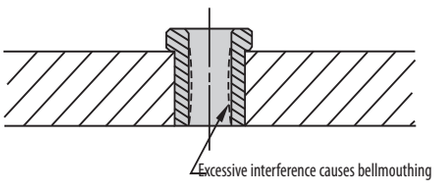
Whenever the drilling axis is not perpendicular to the workpiece surface, locate the exit end as close to the part as possible. Otherwise the drill will tend to wander. For maximum drill guiding, we recommend specifying bushings with an angle milled on the exit end, tangent to the workpiece surface at point of entry.

SPECIAL BUSHINGS FOR CLOSE HOLE SPACING:



When holes are located close together, special bushings are sometimes required. Thinwall bushings, where the bushing ID is larger than the normal ID range for a given OD, are often a good solution. Holes for thinwall bushings must be very accurate and round, because these bushings are more easily distorted. For very-close hole spacing, especially with headed bushings, specify bushings with ground flats.

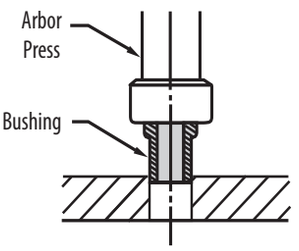
INSTALLATION-HOLE PREPARATION FOR PRESS-FIT BUSHINGS:

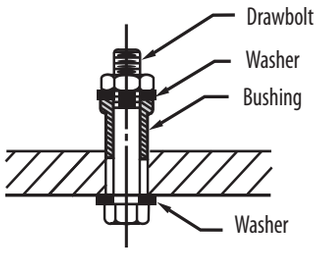


To avoid jig-plate or bushing distortion, do not use excessive interference fits on press-fit bushings. See tables on opposite page for recommended hole sizes in unhardened steel or cast iron jig plates. Always prepare installation holes using a jig borer or reamer. Standard chucking reamers (with a plus tolerance) usually produce installation holes to the tolerances shown in the table. Other factors to consider are: (1) headed bushings require less interference to resist drilling thrust; (2) longer bushings in thick plates require less interference; (3) bushings with thinner walls are more prone to distortion; (4) less-ductile jig-plate materials require less interference.

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INSTALLATION PROCEDURE:





We recommend installing bushings with an arbor press whenever possible. If the bushing's OD is large enough, you can also use a drawbolt with two washers as shown above. If a hammer is the only tool available, do not strike the bushing directly or it could fracture. Use a soft-metal punch to cushion the blows. Before installing a press-fit bushing, lubricate the inside of the mounting hole and outside of the bushing with a lubricant such as lithium grease. Otherwise the bushing may score the mounting hole, and may be difficult to replace later.

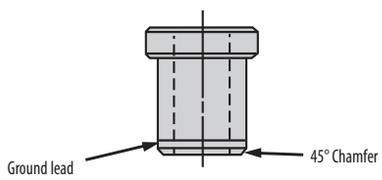
INCH

PRESS-FIT BUSHING OD		RECOMMENDED HOLE SIZE
NOMINAL	ACTUAL	
5/32	.1578-.1575	.1565-.1570
3/16	.1891-.1888	.1880-.1883
13/64	.2046-.2043	.2037-.2040
1/4	.2516-.2513	.2507-.2510
5/16	.3141-.3138	.3132-.3135
3/8	.3766-.3763	.3757-.3760
13/32	.4078-.4075	.4069-.4072
7/16	.4392-.4389	.4382-.4385
1/2	.5017-.5014	.5007-.5010
9/16	.5642-.5639	.5632-.5635
5/8	.6267-.6264	.6257-.6260
3/4	.7518-.7515	.7507-.7510
7/8	.8768-.8765	.8757-.8760
1	1.0018-1.0015	1.0007-1.0010
1-1/8	1.1270-1.1267	1.1257-1.1260
1-1/4	1.2520-1.2517	1.2507-1.2510
1-3/8	1.3772-1.3768	1.3757-1.3760
1-1/2	1.5021-1.5018	1.5007-1.5010
1-3/4	1.7523-1.7519	1.7507-1.7510
2-1/4	2.2525-2.2521	2.2507-2.2510
2-3/4	2.7526-2.7522	2.7507-2.7510

METRIC

PRESS-FIT BUSHING OD		RECOMMENDED HOLE SIZE (H7)
NOMINAL	ACTUAL (s6)	
3mm	3.020-3.014mm	3.000-3.010mm
4mm	4.027-4.019mm	4.000-4.012mm
5mm	5.027-5.019mm	5.000-5.012mm
6mm	6.027-6.019mm	6.000-6.012mm
7mm	7.032-7.023mm	7.000-7.015mm
8mm	8.032-8.023mm	8.000-8.015mm
10mm	10.032-10.023mm	10.000-10.015mm
12mm	12.039-12.028mm	12.000-12.018mm
15mm	15.039-15.028mm	15.000-15.018mm
18mm	18.039-18.028mm	18.000-18.018mm
22mm	22.048-22.035mm	22.000-22.021mm
26mm	26.048-26.035mm	26.000-26.021mm
30mm	30.048-30.035mm	30.000-30.021mm
35mm	35.059-35.043mm	35.000-35.025mm
42mm	42.059-42.043mm	42.000-42.025mm
48mm	48.059-48.043mm	48.000-48.025mm
55mm	55.072-55.053mm	55.000-55.030mm
62mm	62.072-62.053mm	62.000-62.030mm
70mm	70.078-70.059mm	70.000-70.030mm
78mm	78.078-78.059mm	78.000-78.030mm
85mm	85.093-85.071mm	85.000-85.035mm
95mm	95.093-95.071mm	95.000-95.035mm
105mm	105.101-105.079mm	105.000-105.035mm
115mm	115.101-115.079mm	115.000-115.035mm
125mm	125.117-125.092mm	125.000-125.040mm

GROUND LEAD FOR EASY INSTALLATION:

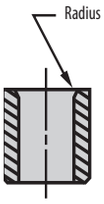


All bushings feature a concentric ground lead and a 45° chamfer on the exit end to ensure perfect alignment during installation.

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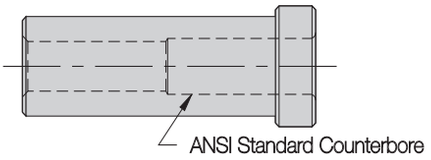
INSTALLATION AND TECHNICAL DATA

DRILL ENTRANCE RADIUS:



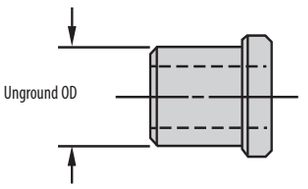
Bushings feature a blended and polished radius at the drill-entrance end for smooth drill entry and proper alignment, preventing drill wear and breakage. Radius size varies in proportion to drill size.

COUNTERBORES ON LONG BUSHINGS:



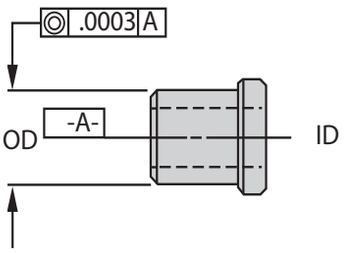
Long bushings with small IDs are slightly counterbored for proper drill-bearing length and chip clearance, as specified by ANSI standards. Counterbores prevent binding and heat buildup due to excessive bearing length. **INFO+:** See chart on page 534 for ANSI counterbore depths. Counterbore diameters are generally 1/32 inch larger than the inside diameter, and are angled at the bottom for smooth entrance. No-counterbore bushings are available on request as specials.

UNGROUND BUSHINGS AVAILABLE FOR OVERSIZE HOLES:



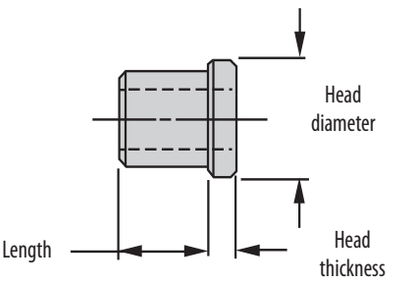
We offer bushings with unfinished ODs for custom-fitting to oversize holes. They are slightly larger than nominal diameter to provide grinding stock, .005-.020 extra, depending on the OD size (see charts under each specific bushing type). We recommend grinding on a mandrel to hold ID/OD concentricity.

CONCENTRICITY:



Bushing OD is ground concentric to the ID to within .0003 TIR for ID sizes from 1/8 inch to 1/2 inch (3mm to 12mm), unless otherwise indicated. For larger or smaller sizes, concentricity is within .0005 TIR. Unground bushings are concentric to within .006 TIR. On counterbored bushings, concentricity applies only over the drill-bearing length.

OTHER TOLERANCES:



Any dimensions where tolerances are not specifically listed are held to +/- .015 inches on standard ANSI sizes. Special tolerances for any dimension are available on request as specials.

MATERIAL:

Standard drill-bushing material is 1144 or 52100 steel, heat treated to achieve RC 62-64 ID hardness, and other high-carbon steels. Optional materials such as tungsten carbide (Grade C2 carbide with steel head), 52100 steel, A2 tool steel, D2 tool steel, M2 tool steel, 416 stainless, 440C stainless, 17-4PH stainless, 303 stainless, 660 bronze, Ampco 18 bronze, Ampco 21 bronze, Oilite, and brass are available as specials. **INFO+:** See pages 543, 544, and 555 for carbide bushings.

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COUNTERBORE DATA



TYPE P DRILL BEARING LENGTH

DRILL SIZE (ID)	OD	BUSHING LENGTH											
		1/4	5/16	3/8	1/2	3/4	1	1-3/8	1-1/2	1-3/4	2-1/8	2-1/2	3
.0135 - .0291	5/32	FULL	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0625													
.0135 - .0291	3/16	FULL	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0634													
.0635 - .0995					FULL	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0135 - .0291	13/64	FULL	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0634													
.0635 - .0995					FULL	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0980 - .1406	1/4	FULL	FULL	FULL	FULL	7/16	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1250 - .1935	5/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1935 - .2880	3/8	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1875 - .2570	13/32	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.2340 - .2900	7/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1875 - .3160	1/2	FULL	FULL	FULL	FULL	FULL	5/8	3/4	3/4	3/4	3/4	3/4	3/4
.3125 - .4375	5/8	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2
.3125 - .5313	3/4	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2



TYPE H DRILL BEARING LENGTH

RANGE (ID)	OD	BUSHING LENGTH (UNDER HEAD)											
		1/4	5/16	3/8	1/2	3/4	1	1-3/8	1-1/2	1-3/4	2-1/8	2-1/2	3
.0135 - .0291	5/32	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0625				FULL									
.0135 - .0291	13/64	FULL	FULL	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519													
.0520 - .0634				FULL									
.0635 - .0995					7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0980 - .1406	1/4	FULL	FULL	FULL	7/16	7/16	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1250 - .1935	5/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1935 - .2280	3/8	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1875 - .2570	13/32	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.2340 - .2900	7/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1875 - .3160	1/2	FULL	FULL	FULL	FULL	FULL	3/4	3/4	3/4	3/4	3/4	3/4	3/4
.3125 - .4375	5/8	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2
.3125 - .5313	3/4	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2



TYPE SF & FM DRILL BEARING LENGTH

DRILL SIZE (ID)	OD	BUSHING LENGTH (UNDER HEAD)											
		1/4	5/16	3/8	1/2	3/4	1	1-3/8	1-1/2	1-3/4	2-1/8	2-1/2	3
.0135 - .0291	3/16	1/4	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519		FULL											
.0520 - .0634													
.0635 - .0980				3/8	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0995 - .1405	1/4	FULL	FULL	3/8	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0135 - .0291	5/16	1/4	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
.0292 - .0519		FULL											
.0520 - .0634													
.0635 - .0934			FULL	3/8	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
.0935 - .1249				FULL									
.1250 - .1935				FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1935 - .2280	3/8	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.2340 - .2900	7/16	FULL	FULL	FULL	FULL	FULL	5/8	5/8	5/8	5/8	5/8	5/8	5/8
.1405 - .1889	1/2	FULL	FULL	FULL	FULL	FULL	5/7	5/8	5/8	5/8	5/8	5/8	5/8
.1890 - .3438							7/8	1	1	1	1	1	1
.2950 - .5625	3/4	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	FULL	1-1/2	1-1/2

QUICK SHIP DRILL BUSHINGS



Quick-Ship Drill Bushings are popular bushing sizes that we do our best to keep in stock and ready for same-day shipment 100% of the time. These bushings include most common ID drill sizes.

PRESS-FIT BUSHINGS (P)

PART NO.	ID	OD	LENGTH
P-13-4-.0980	#40 (.0980)	13/64	1/4
P-13-8-.0980			1/2
P-16-4-.0980	#40 (.0980)	1/4	1/4
P-16-6-.0980			3/8
P-16-8-.0980			1/2
P-16-16-.0980			1
P-16-8-.0995	#39 (.0995)	1/4	1/2
P-16-8-.1065	#36 (.1065)	1/4	1/2
P-16-8-.1094	7/64 (.1094)	1/4	1/2
P-16-8-.1110	#34 (.1110)	1/4	1/2
P-16-8-.1130	#33 (.1130)	1/4	1/2
P-16-8-.1200	#31 (.1200)	1/4	1/2
P-16-4-.1250	1/8 (.1250)	1/4	1/4
P-16-8-.1250			1/2
P-20-4-.1250	1/8 (.1250)	5/16	1/4
P-20-6-.1250			3/8
P-20-8-.1250			1/2
P-20-12-.1250			3/4
P-16-4-.1285	#30 (.1285)	1/4	1/4
P-16-8-.1285			1/2
P-20-4-.1285	#30 (.1285)	5/16	1/4
P-20-8-.1285			1/2
P-16-8-.1360	#29 (.1360)	1/4	1/2
P-16-8-.1405	#28 (.1405)	1/4	1/2
P-16-8-.1406	9/64 (.1406)	1/4	1/2
P-20-4-.1406	9/64 (.1406)	5/16	1/4
P-20-8-.1406			1/2
P-20-12-.1406			3/4
P-20-8-.1440	#27 (.1440)	5/16	1/2
P-20-6-.1470	#26 (.1470)	5/16	3/8
P-20-8-.1470			1/2
P-20-6-.1495	#25 (.1495)	5/16	3/8
P-20-8-.1495			1/2
P-20-10-.1495			5/8
P-20-6-.1520	#24 (.1520)	5/16	3/8
P-20-6-.1562	5/32 (.1562)	5/16	3/8
P-20-8-.1562			1/2
P-20-12-.1562			3/4
P-20-4-.1570	#22 (.1570)	5/16	1/4
P-20-6-.1590	#21 (.1590)	5/16	3/8
P-20-8-.1590			1/2
P-20-12-.1590			3/4
P-20-6-.1610	#20 (.1610)	5/16	3/8
P-20-8-.1610			1/2
P-20-5-.1660	#19 (.1660)	5/16	5/16
P-20-8-.1660			1/2
P-20-6-.1719	11/64 (.1719)	5/16	3/8
P-20-8-.1719			1/2
P-20-12-.1719			3/4
P-20-6-.1730	#17 (.1730)	5/16	3/8
P-20-8-.1730			1/2
P-20-8-.1770	#16 (.1779)	5/16	1/2

PART NO.	ID	OD	LENGTH
P-20-6-.1800	#15 (.1800)	5/16	3/8
P-20-8-.1800			1/2
P-26-6-.1865	.1865	13/32	3/8
P-20-4-.1875	3/16 (.1875)	5/16	1/4
P-20-5-.1875			5/16
P-20-6-.1875			3/8
P-20-8-.1875			1/2
P-20-10-.1875			5/8
P-20-12-.1875			3/4
P-20-16-.1875			1
P-26-4-.1875	3/16 (.1875)	13/32	1/4
P-26-8-.1875			1/2
P-26-12-.1875			3/4
P-26-16-.1875			1
P-32-6-.1875	3/16 (.1875)	1/2	3/8
P-32-8-.1875			1/2
P-32-12-.1875			3/4
P-32-16-.1875			1
P-20-4-.1890	#12 (.1890)	5/16	1/4
P-20-6-.1890			3/8
P-20-8-.1890			1/2
P-20-4-.1910	#11 (.1910)	5/16	1/4
P-20-6-.1910			3/8
P-20-8-.1910			1/2
P-20-12-.1910			3/4
P-20-16-.1910			1
P-26-4-.1910	#11 (.1910)	13/32	1/4
P-26-6-.1910			3/8
P-26-8-.1910			1/2
P-32-8-.1910	#11 (.1910)	1/2	1/2
P-20-5-.1935	#10 (.1935)	5/16	5/16
P-20-8-.1935			1/2
P-26-8-.1935	#10 (.1935)	13/32	1/2
P-32-6-.1935	#10 (.1935)	1/2	3/8
P-32-8-.1935			1/2
P-26-8-.1960	#9 (.1960)	13/32	1/2
P-32-6-.1960	#9 (.1960)	1/2	3/8
P-32-8-.1960			1/2
P-32-12-.1960			3/4
P-24-8-.2010	#7 (.2010)	3/8	1/2
P-26-8-.2010	#7 (.2010)	13/32	1/2
P-32-6-.2010	#7 (.2010)	1/2	3/8
P-32-8-.2010			1/2
P-32-12-.2010			3/4
P-32-6-.2031	13/64 (.2031)	1/2	3/8
P-32-8-.2031			1/2
P-32-12-.2031			3/4
P-32-6-.2130	#3 (.2130)	1/2	3/8
P-32-8-.2130			1/2
P-32-16-.2130			1
P-26-6-.2188	7/32 (.2188)	13/32	3/8
P-26-8-.2188			1/2
P-32-6-.2188	7/32 (.2188)	1/2	3/8
P-32-8-.2188			1/2
P-32-12-.2188			3/4
P-32-16-.2188			1
P-26-16-.2210	#2 (.2210)	13/32	1
P-32-6-.2210	#2 (.2210)	1/2	3/8
P-32-8-.2210			1/2
P-32-12-.2210			3/4
P-32-8-.2280	#1 (.2280)	1/2	1/2
P-32-12-.2280			3/4
P-28-6-.2344	15/64 (.2344)	7/16	3/8
P-28-8-.2344			1/2
P-28-12-.2344			3/4
P-32-6-.2380	B (.2380)	1/2	3/8

PART NO.	ID	OD	LENGTH
P-26-6-.2490	.2490	13/32	3/8
P-20-6-.2500	1/4 (.2500)	5/16	3/8
P-24-8-.2500	1/4 (.2500)	3/8	1/2
P-26-4-.2500	1/4 (.2500)	13/32	1/4
P-26-5-.2500			5/16
P-26-6-.2500			3/8
P-26-8-.2500			1/2
P-26-12-.2500			3/4
P-26-16-.2500			1
P-28-4-.2500	1/4 (.2500)	7/16	1/4
P-28-5-.2500			5/16
P-28-6-.2500			3/8
P-28-8-.2500			1/2
P-28-10-.2500			5/8
P-28-12-.2500			3/4
P-28-16-.2500			1
P-32-4-.2500	1/4 (.2500)	1/2	1/4
P-32-6-.2500			3/8
P-32-8-.2500			1/2
P-32-12-.2500			3/4
P-32-16-.2500			1
P-26-8-.2510	.2510	13/32	1/2
P-26-12-.2510			3/4
P-28-8-.2510	.2510	7/16	1/2
P-32-8-.2520	6.40mm (.2520)	1/2	1/2
P-26-4-.2570	F (.2570)	13/32	1/4
P-26-5-.2570			5/16
P-26-8-.2570			1/2
P-28-16-.2570	F (.2570)	7/16	1
P-32-6-.2570	F (.2570)	1/2	3/8
P-32-8-.2570			1/2
P-32-12-.2570			3/4
P-32-8-.2610	G (.2610)	1/2	1/2
P-28-8-.2656	17/64 (.2656)	7/16	1/2
P-32-6-.2656	17/64 (.2656)	1/2	3/8
P-32-8-.2656			1/2
P-32-12-.2656			3/4
P-32-16-.2656			1
P-28-5-.2660	H (.2660)	7/16	5/16
P-32-16-.2660	H (.2660)	1/2	1
P-32-8-.2720	I (.2720)	1/2	1/2
P-32-8-.2770	J (.2770)	1/2	1/2
P-32-12-.2770			3/4
P-28-4-.2812	9/32 (.2812)	7/16	1/4
P-28-8-.2812			1/2
P-28-12-.2812			3/4
P-32-6-.2812	9/32 (.2812)	1/2	3/8
P-32-8-.2812			1/2
P-32-12-.2812			3/4
P-32-16-.2812			1
P-32-12-.2969	19/64 (.2969)	1/2	3/4
P-32-8-.3020	N (.3020)	1/2	1/2
P-32-12-.3020			3/4
P-32-6-.3115	.3115	1/2	3/8
P-32-6-.3125	5/16 (.3125)	1/2	3/8
P-32-8-.3125			1/2
P-32-12-.3125			3/4
P-32-16-.3125			1
P-40-8-.3125	5/16 (.3125)	5/8	1/2
P-40-16-.3125			1
P-40-22-.3125			1-3/8
P-32-6-.3160	O (.3160)	1/2	3/8
P-32-8-.3160			1/2
P-32-12-.3160			3/4
P-32-16-.3160			1
P-40-8-.3281	21/64 (.3281)	5/8	1/2

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QUICK SHIP DRILL BUSHINGS

PRESS-FIT BUSHINGS (P), continued

PART NO.	ID	OD	LENGTH
P-40-8-.3438	11/32 (.3438)	5/8	1/2
P-40-8-.3740	9.50mm (.3740)	5/8	1/2
P-32-6-.3750	3/8 (.3750)	1/2	3/8
P-32-8-.3750			1/2
P-40-6-.3750	3/8 (.3750)	5/8	3/8
P-40-8-.3750			1/2
P-40-12-.3750			3/4
P-40-16-.3750			1
P-48-8-.3750	3/8 (.3750)	3/4	1/2
P-48-10-.3750			5/8
P-48-12-.3750			3/4
P-48-16-.3750			1
P-48-22-.3750			1-3/8
P-40-8-.3770	V (.3770)	5/8	1/2
P-40-12-.3770			3/4
P-40-8-.3906	25/64 (.3906)	5/8	1/2
P-40-16-.3906			1
P-40-8-.4062	13/32 (.4062)	5/8	1/2
P-40-16-.4062			1
P-40-8-.4219	27/64 (.4219)	5/8	1/2
P-48-16-.4219	27/64 (.4219)	3/4	1
P-40-8-.4375	7/16 (.4375)	5/8	1/2
P-40-12-.4375			3/4
P-40-16-.4375			1
P-48-8-.4375	7/16 (.4375)	3/4	1/2
P-48-12-.4375			3/4
P-48-16-.4375			1
P-48-22-.4375			1-3/8
P-48-8-.4531	29/64 (.4531)	3/4	1/2
P-48-12-.4531			3/4
P-48-8-.4688	15/32 (.4688)	3/4	1/2
P-48-8-.4844	31/64 (.4844)	3/4	1/2
P-48-12-.4990	.4990	3/4	3/4
P-40-8-.5000	1/2 (.5000)	5/8	1/2
P-40-12-.5000			3/4
P-40-16-.5000			1
P-48-8-.5000	1/2 (.5000)	3/4	1/2
P-48-10-.5000			5/8
P-48-12-.5000			3/4
P-48-16-.5000			1
P-48-20-.5000			1-1/4
P-48-22-.5000			1-3/8
P-48-24-.5000			1-1/2
P-56-10-.5000	1/2 (.5000)	7/8	5/8
P-56-12-.5000			3/4
P-56-16-.5000			1
P-64-8-.5000	1/2 (.5000)	1	1/2
P-64-12-.5000			3/4
P-64-16-.5000			1
P-48-8-.5010	.5010	3/4	1/2
P-48-10-.5156	33/64 (.5156)	3/4	5/8
P-48-5-.5312	17/32 (.5312)	3/4	5/16
P-48-12-.5312			3/4
P-48-22-.5312			1-3/8
P-56-8-.5625	9/16 (.5625)	7/8	1/2
P-56-10-.5625			5/8
P-56-12-.5625			3/4
P-56-16-.5938	19/32 (.5938)	7/8	1
P-48-24-.6250	5/8 (.6250)	3/4	1-1/2
P-56-8-.6250	5/8 (.6250)	7/8	1/2
P-56-10-.6250			5/8
P-56-12-.6250			3/4
P-56-16-.6250			1
P-56-20-.6250			1-1/4
P-56-22-.6250			1-3/8
P-56-24-.6250			1-1/2
P-64-8-.6250	5/8 (.6250)	1	1/2
P-64-12-.6250			3/4
P-64-16-.6250			1
P-64-22-.6250			1-3/8
P-56-8-.6406	41/64 (.6406)	7/8	1/2
P-64-8-.6562	21/32 (.6562)	1	1/2
P-64-12-.6562			3/4
P-64-16-.6562			1
P-64-20-.6719	43/64 (.6719)	1	1-1/4
P-64-8-.6875	11/16 (.6875)	1	1/2
P-64-16-.6875			1
P-64-20-.6875			1-1/4
P-64-8-.7500	3/4 (.7500)	1	1/2
P-64-12-.7500			3/4
P-64-16-.7500			1
P-64-20-.7500			1-1/4
P-64-22-.7500			1-3/8
P-64-24-.7500			1-1/2

PRESS-FIT BUSHINGS METRIC (PM)

PART NO.	ID	OD	LENGTH
PM-6-8-3.00	3.00mm	6mm	8mm
PM-8-12-5.00	5.00mm	8mm	12mm
PM-10-10-6.00	6.00mm	10mm	10mm
PM-12-10-6.80	6.80mm	12mm	10mm
PM-12-10-8.00	8.00mm	12mm	10mm
PM-12-16-8.00			16mm
PM-15-12-8.40	8.40mm	15mm	12mm
PM-15-12-10.00	10.00mm	15mm	12mm
PM-18-12-12.00	12.00mm	18mm	12mm
PM-22-16-15.00	15.00mm	22mm	16mm
PM-30-20-20.00	20.00mm	30mm	20mm
PM-42-25-30.00	30.00mm	42mm	25mm

HEAD PRESS-FIT BUSHINGS (H)

PART NO.	ID	OD	LENGTH UNDER HEAD	HEAD DIA	HEAD HEIGHT
H-16-8-.0980	#40 (.0980)	1/4	1/2	23/64	3/32
H-16-6-.1285	#30 (.1285)	1/4	3/8	23/64	3/32
H-16-8-.1285			1/2		
H-24-4-.2210	#2 (.2210)	3/8	1/4	1/2	3/32
H-26-6-.2500	1/4 (.2500)	13/32	3/8	1/2	5/32
H-32-8-.3125	5/16 (.3125)	1/2	1/2	39/64	7/32
H-40-8-.3750	3/8 (.3750)	5/8	1/2	51/64	7/32
H-48-4-.5000	1/2 (.5000)	3/4	1/4	59/64	7/32
H-48-6-.5000			3/8		
H-48-8-.5000			1/2		
H-56-8-.6250	5/8 (.6250)	7/8	1/2	1-7/64	1/4
H-56-16-.6250			1		
H-64-8-.7500	3/4 (.7500)	1	1/2	1-15/64	5/16

HEAD PRESS-FIT BUSHINGS METRIC (HM)

PART NO.	ID	OD	OVERALL LENGTH	HEAD DIA	HEAD HEIGHT
HM-12-16-8.00	8.00mm	12mm	16mm	15mm	3mm
HM-15-12-10.00	10.00mm	15mm	12mm	18mm	3mm
HM-18-20-12.00	12.00mm	18mm	20mm	22mm	4mm
HM-22-16-15.00	15.00mm	22mm	16mm	26mm	4mm
HM-30-20-20.00	20.00mm	30mm	20mm	34mm	5mm
HM-30-20-22.00	22.00mm	30mm	20mm	34mm	5mm
HM-55-30-42.00	42.00mm	55mm	30mm	59mm	5mm

LINER BUSHINGS (L)

PART NO.	ID	OD	LENGTH
L-28-8	1/4	7/16	1/2
L-32-4	5/16	1/2	1/4
L-32-8			1/2
L-32-16			1
L-40-6-24	3/8	5/8	3/8
L-40-8-24			1/2
L-48-8	1/2	3/4	1/2
L-48-12			3/4
L-64-8	3/4	1	1/2
L-64-12			3/4
L-64-16			1
L-64-24			1-1/2
L-88-12	1	1-3/8	3/4
L-88-16			1
L-88-22			1-3/8

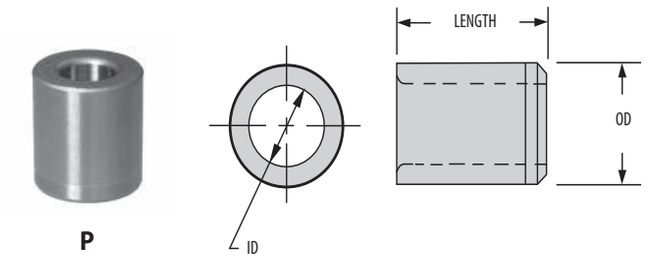
HEAD LINER BUSHINGS (HL)

PART NO.	ID	OD	LENGTH	F DIA	G
HL-48-12	1/2	3/4	3/4	7/8	3/32
HL-64-12	3/4	1	3/4	1-1	1/8

UN-A-LOK® LINER BUSHINGS (UL)

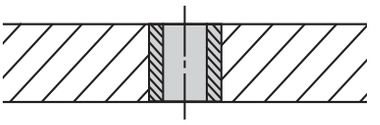
PART NO.	ID	OD	LENGTH	E	F DIA	G
UL-32-8	5/16	1/2	1/2	3/8	9/16	3/32
UL-48-8	1/2	3/4	1/2	1/2	13/16	3/32

PRESS FIT BUSHINGS



P

APPLICATIONS:
This is the most-popular and least-expensive drill bushing. P bushings are permanently pressed into the jig plate, usually flush with the top surface. They are generally used for single-step drilling or reaming operations when you do not expect to replace bushings during the tooling's lifetime. P bushings can be mounted closer together than headed bushings, but offer less resistance to heavy axial loads.



ORDERING EXAMPLES:

P-20-16-.1250	Standard inch bushing, inch ID
P-20-16-.1772	Standard inch bushing, mm ID (.1772 = 4.50mm)
P-20-16U-.1250	Unground OD
P-20-16-.1250 REAMER	Reamer tolerance on ID
P-20-16-.1250 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
PC-20-16-.1250	Carbide bushing
PM-8-12-4.50	Standard metric bushing

Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:

From #80 to 1/4"	+ .0001/+.0004	From .35 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+ .0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to 1-1/2"	+ .0002/+.0006	Over 18 to 30mm	+.007/+.020mm
		Over 30 to 50mm	+.009/+.025mm
Over 1-1/2 to 2-3/4"	+ .0003/+.0007	Over 50 to 80mm	+.010/+.029mm
		Over 80 to 120mm	+.012/+.034mm
		(G6 tolerance)	

REAMER ID TOLERANCES:

From #60 to 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
Over 1" to 1-1/2"	+.0008/+.0012	Over 18 to 30mm	+.020/+.033mm
		(F6 tolerance)	

ID RANGE	OD	LENGTH	ANSI PART NO.
.0135-.0291 #80-#70 .35-.70mm	**5/32** .1578-.1575 (.166-.161 UNG)	1/4	P-10-4
		5/16	P-10-5
		3/8	P-10-6
		*1/2	P-10-8
.0292-.0519 #69-3/64 .75-1.25mm		1/4	P-10-4
		5/16	P-10-5
		3/8	P-10-6
		*1/2	P-10-8
		*3/4	P-10-12
.0520-.0625 #55-1/16 1.30-1.60mm		1/4	P-10-4
		5/16	P-10-5
		3/8	P-10-6
		*1/2	P-10-8
		*3/4	P-10-12
.0520-.0634 #55-1/16 1.30-1.60mm	**3/16** .1891-.1888 (.201-.197 UNG)	1/4	P-12-4
		5/16	P-12-5
		3/8	P-12-6
		*1/2	P-12-8
		*5/8	P-12-10
		*3/4	P-12-12
.0635-.0995 #52-#39 1.65-2.50mm		1/4	P-12-4
		5/16	P-12-5
		3/8	P-12-6
		1/2	P-12-8
		5/8	P-12-10
		*3/4	P-12-12
.0135-.0291 #80-#70 .35-.70mm	**13/64** .2046-.2043 (.213-.208 UNG)	1/4	P-13-4
		5/16	P-13-5
		3/8	P-13-6
		*1/2	P-13-8
.0292-.0519 #69-3/64 .75-1.30mm		1/4	P-13-4
		5/16	P-13-5
		3/8	P-13-6
		*1/2	P-13-8
		*3/4	P-13-12
.0520-.0634 #55-1/16 1.35mm-1.60mm		1/4	P-13-4
		5/16	P-13-5
		3/8	P-13-6
		*1/2	P-13-8
		*3/4	P-13-12
		*1	P-13-16
.0635-.0995 #52-#39 1.65-2.50mm		1/4	P-13-4
		5/16	P-13-5
		3/8	P-13-6
		1/2	P-13-8
		*3/4	P-13-12
		*1	P-13-16
		*1-3/8	P-13-22

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

CONTINUED ON NEXT PAGE

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ID RANGE	OD	LENGTH	ANSI PART NO.
.0980-.1406 #40-9/64 2.50-3.50mm	**1/4** .2516-.2513 (.265-.260 UNG)	1/4	P-16-4
		5/16	P-16-5
		3/8	P-16-6
		1/2	P-16-8
		5/8	P-16-10
		*3/4	P-16-12
		*1	P-16-16
		*1-3/8	P-16-22
		*1-1/2	P-16-24
		*1-3/4	P-16-28
.1250-.1935 1/8-#10 3.20-4.90mm	**5/16** .3141-.3138 (.327-.322 UNG)	1/4	P-20-4
		5/16	P-20-5
		3/8	P-20-6
		1/2	P-20-8
		5/8	P-20-10
		3/4	P-20-12
		*1	P-20-16
		*1-3/8	P-20-22
		*1-1/2	P-20-24
		*1-3/4	P-20-28
.1935-.2280 #10-#1 4.90-5.80mm	**3/8** .3766-.3763 (.390-.385 UNG)	1/4	P-24-4
		5/16	P-24-5
		3/8	P-24-6
		1/2	P-24-8
		5/8	P-24-10
		3/4	P-24-12
		*1	P-24-16
.1875-.2570 3/16-F 4.75-6.50mm	**13/32** .4078-.4075 (.421-.416 UNG)	1/4	P-26-4
		5/16	P-26-5
		3/8	P-26-6
		1/2	P-26-8
		3/4	P-26-12
		*1	P-26-16
		*1-3/8	P-26-22
		*1-1/2	P-26-24
		*1-3/4	P-26-28
.2340-.2900 A-L 5.90-7.40mm	**7/16** .4392-.4389 (.453-.448 UNG)	1/4	P-28-4
		5/16	P-28-5
		3/8	P-28-6
		1/2	P-28-8
		5/8	P-28-10
		3/4	P-28-12
		*1	P-28-16
.1875-.3160 3/16-O 4.75-8.00mm	**1/2** .5017-.5014 (.520-.515 UNG)	1/4	P-32-4
		5/16	P-32-5
		3/8	P-32-6
		1/2	P-32-8
		3/4	P-32-12
		*1	P-32-16
		*1-3/8	P-32-22
		*1-1/2	P-32-24
		*1-3/4	P-32-28
		*2-1/8	P-32-34

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

ID RANGE	OD	LENGTH	ANSI PART NO.
.2950-.3438 M-11/32 7.50-8.75mm	**9/16** .5642-.5639 (.582-.577 UNG)	1/4	P-36-4
		5/16	P-36-5
		3/8	P-36-6
		1/2	P-36-8
		5/8	P-36-10
		3/4	P-36-12
		1	P-36-16
.3125-.4375 5/16-7/16 7.90-11.00mm	**5/8** .6267-.6264 (.645-.640 UNG)	1/4	P-40-4
		5/16	P-40-5
		3/8	P-40-6
		1/2	P-40-8
		5/8	P-40-10
		3/4	P-40-12
		1	P-40-16
		1-1/4	P-40-20
		1-3/8	P-40-22
		1-1/2	P-40-24
		1-3/4	P-40-28
		2-1/8	P-40-34
.3125-.5312 5/16-17/32 7.90-13.50mm	**3/4** .7518-.7515 (.770-.765 UNG)	1/4	P-48-4
		5/16	P-48-5
		3/8	P-48-6
		1/2	P-48-8
		5/8	P-48-10
		3/4	P-48-12
		1	P-48-16
		1-1/4	P-48-20
		1-3/8	P-48-22
		1-1/2	P-48-24
		1-3/4	P-48-28
		2-1/8	P-48-34
		*2-1/2	P-48-40
.5000-.6562 1/2-21/32 12.50-16.50mm	**7/8** .8768-.8765 (.895-.890 UNG)	5/16	P-56-5
		3/8	P-56-6
		1/2	P-56-8
		5/8	P-56-10
		3/4	P-56-12
		1	P-56-16
		1-1/4	P-56-20
		1-3/8	P-56-22
		1-1/2	P-56-24
		1-3/4	P-56-28
		2-1/8	P-56-34
		2-1/2	P-56-40

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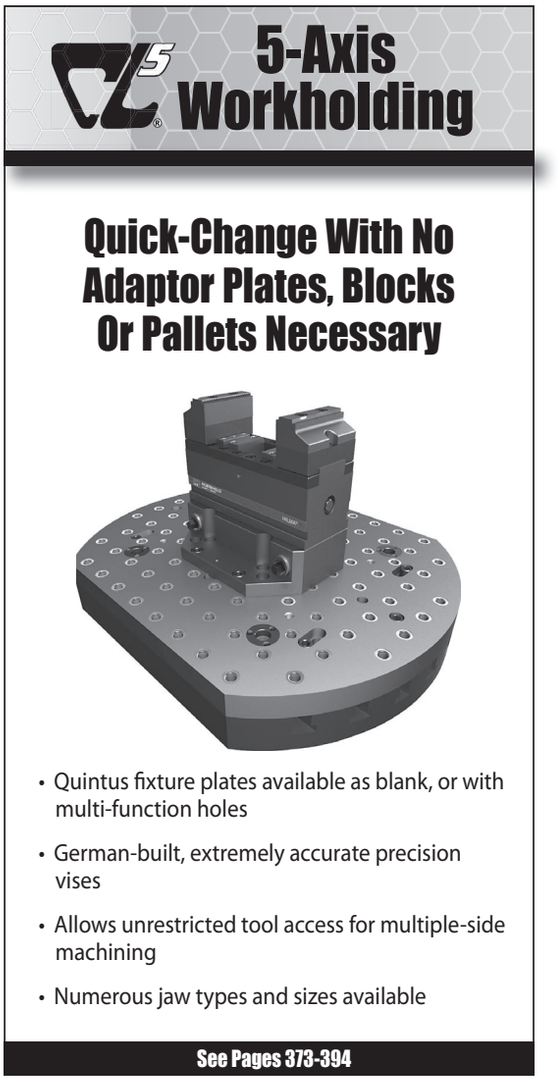
PRESS FIT BUSHINGS

ID RANGE	OD	LENGTH	ANSI PART NO.
.5000-.7656 1/2-49/64 12.50-19.50mm	**1** 1.0018-1.0015 (1.020-1.015 UNG)	1/2	P-64-8
		5/8	P-64-10
		3/4	P-64-12
		1	P-64-16
		1-1/4	P-64-20
		1-3/8	P-64-22
		1-1/2	P-64-24
		1-3/4	P-64-28
		2-1/8	P-64-34
		2-1/2	P-64-40
		3	P-64-48
.7656-.8438 49/64-27/32 19.50-21.50mm	**1-1/8** 1.1270-1.1267 (1.145-1.140 UNG)	1/2	P-72-8
		5/8	P-72-10
		3/4	P-72-12
		1	P-72-16
		1-1/4	P-72-20
		1-1/2	P-72-24
		1-3/4	P-72-28
.8594-.9375 55/64-15/16 22.00-24.00mm	**1-1/4** 1.2520-1.2517 (1.270-1.265 UNG)	5/8	P-80-10
		3/4	P-80-12
		1	P-80-16
		1-1/4	P-80-20
		1-1/2	P-80-24
		1-3/4	P-80-28
		2	P-80-32
.6250-1.0312 5/8-1-1/32 16.00-26.00mm	**1-3/8** 1.3772-1.3768 (1.395-1.390 UNG)	1/2	P-88-8
		5/8	P-88-10
		3/4	P-88-12
		1	P-88-16
		1-1/4	P-88-20
		1-3/8	P-88-22
		1-1/2	P-88-24
		1-3/4	P-88-28
		2	P-88-32
		2-1/8	P-88-34
		2-1/2	P-88-40
		3	P-88-48
1.0156-1.1250 1-1/64-1-1/8 26.00-29.00mm	**1-1/2** 1.5021-1.5018 (1.520-1.515 UNG)	3/4	P-96-12
		1	P-96-16
		1-1/4	P-96-20
		1-1/2	P-96-24
		1-3/4	P-96-28
		2	P-96-32
		2-1/4	P-96-36

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

ID RANGE	OD	LENGTH	ANSI PART NO.
1.0000-1.3906 1-1-25/64 25.00-35.00mm	**1-3/4** 1.7523-1.7519 (1.770-1.765 UNG)	3/4	P-112-12
		1	P-112-16
		1-3/8	P-112-22
		1-1/2	P-112-24
		1-3/4	P-112-28
		2-1/8	P-112-34
		2-1/2	P-112-40
		3	P-112-48
1.3750-1.7656 1-3/8-1-49/64 35.00-45.00mm	**2-1/4** 2.2525-2.2521 (2.270-2.265 UNG)	1	P-144-16
		1-3/8	P-144-22
		1-1/2	P-144-24
		1-3/4	P-144-28
		2-1/8	P-144-34
		2-1/2	P-144-40
		3	P-144-48

For extended-range bushings (larger sizes) please see our web catalog.



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PRESS FIT BUSHINGS – CARBIDE



PC

ID RANGE	OD	LENGTH	ANSI PART NO.
.0280-.0468 #70-#56 .75-1.15mm	**5/32** .1578-.1575	5/16	PC-10-5
		1/2	PC-10-8
.0469-.0625 3/64-1/16 1.20-1.55mm		5/16	PC-10-5
		1/2	PC-10-8
.0550-.0995 #54-#39 1.40-2.50mm	**13/64** .2046-.2043	5/16	PC-13-5
		1/2	PC-13-8
.0995-.1360 #39-#29 2.55-3.40mm	**1/4** .2516-.2513	5/16	PC-16-5
		1/2	PC-16-8
.1285-.1875 #30-3/16 3.30-4.75mm	**5/16** .3141-.3138	5/16	PC-20-5
		1/2	PC-20-8
		3/4	PC-20-12
		1	PC-20-16
.1875-.2500 3/16-1/4 4.80-6.30mm	**13/32** .4078-.4075	5/16	PC-26-5
		1/2	PC-26-8
		3/4	PC-26-12
		1	PC-26-16
.2188-.3125 7/32-5/16 5.60-7.90mm	**1/2** .5017-.5014	5/16	PC-32-5
		1/2	PC-32-8
		3/4	PC-32-12
		1	PC-32-16
		1-3/8	PC-32-22
.3125-.4219 5/16-27/64 8.00-10.50mm	**5/8** .6267-.6264	1/2	PC-40-8
		3/4	PC-40-12
		1	PC-40-16
		1-3/8	PC-40-22
.3750-.5000 3/8-1/2 9.60-12.50mm	**3/4** .7518-.7515	1/2	PC-48-8
		3/4	PC-48-12
		1	PC-48-16
		1-3/8	PC-48-22
.5000-.6250 1/2-5/8 13.00-15.50mm	**7/8** .8768-.8765	1/2	PC-56-8
		3/4	PC-56-12
		1	PC-56-16
		1-3/8	PC-56-22
		1-3/4	PC-56-28

ID RANGE	OD	LENGTH	ANSI PART NO.
.5000-.7500 1/2-3/4 13.00-19.00mm	**1** 1.0018-1.0015	1/2	PC-64-8
		3/4	PC-64-12
		1	PC-64-16
		1-3/8	PC-64-22
		1-3/4	PC-64-28
.7500-1.0000 3/4-1 19.50-25.00mm	**1-3/8** 1.3772-1.3768	3/4	PC-88-12
		1	PC-88-16
		1-3/8	PC-88-22
		1-3/4	PC-88-28
		2-1/8	PC-88-34
		2-1/2	PC-88-40
1.0000-1.3750 1–1-3/8 26.00-34.00mm	**1-3/4** 1.7523-1.7519	1	PC-112-16
		1-3/8	PC-112-22
		1-3/4	PC-112-28
		2-1/8	PC-112-34
		2-1/2	PC-112-40
		3	PC-112-48
1.3750-1.7500 1-3/8-1-3/4 35.00-44.00mm	**2-1/4** 2.2525-2.2521	1	PC-144-16
		1-3/8	PC-144-22
		1-3/4	PC-144-28
		2-1/8	PC-144-34
		2-1/2	PC-144-40
		3	PC-144-48

Alignment Pins

Strength and Precision



- Wide assortment of quality ball lock and detent pins for precision alignment
- In steel or stainless steel
- Wide selection of other alignment pins are available

See Pages 27-65

PRESS FIT BUSHINGS – METRIC



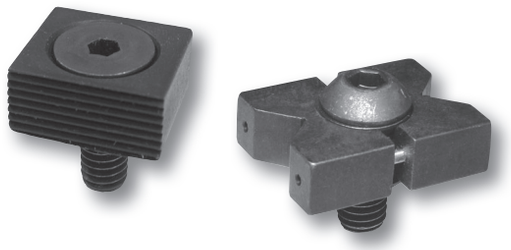
PM

ID RANGE (G6)	OD (s6)	LENGTH	ANSI PART NO.
.35-1.00mm	**4mm** 4.027-4.019mm	*6mm	PM-4-6
		*9mm	PM-4-9
1.01-1.80mm		6mm	PM-4-6
		9mm	PM-4-9
1.81-2.60mm	**5mm** 5.027-5.019mm	6mm	PM-5-6
		9mm	PM-5-9
2.61-3.30mm	**6mm** 6.027-6.019mm	8mm	PM-6-8
		12mm	PM-6-12
		16mm	PM-6-16
3.31-4.00mm	**7mm** 7.032-7.023mm	8mm	PM-7-8
		12mm	PM-7-12
		16mm	PM-7-16
4.01-5.00mm	**8mm** 8.032-8.023mm	8mm	PM-8-8
		12mm	PM-8-12
		16mm	PM-8-16
5.01-6.00mm	**10mm** 10.032-10.023mm	10mm	PM-10-10
		16mm	PM-10-16
		20mm	PM-10-20
6.01-8.00mm	**12mm** 12.039-12.028mm	10mm	PM-12-10
		16mm	PM-12-16
		20mm	PM-12-20
8.01-10.00mm	**15mm** 15.039-15.028mm	12mm	PM-15-12
		20mm	PM-15-20
		25mm	PM-15-25
10.01-12.00mm	**18mm** 18.039-18.028mm	12mm	PM-18-12
		20mm	PM-18-20
		25mm	PM-18-25
12.01-15.00mm	**22mm** 22.048-22.035mm	16mm	PM-22-16
		28mm	PM-22-28
		36mm	PM-22-36
15.01-18.00mm	**26mm** 26.048-26.035mm	16mm	PM-26-16
		28mm	PM-26-28
		36mm	PM-26-36
18.01-22.00mm	**30mm** 30.048-30.035mm	20mm	PM-30-20
		36mm	PM-30-36
		45mm	PM-30-45
22.01-26.00mm	**35mm** 35.059-35.043mm	20mm	PM-35-20
		36mm	PM-35-36
		45mm	PM-35-45
26.01-30.00mm	**42mm** 42.059-42.043mm	25mm	PM-42-25
		45mm	PM-42-45
		56mm	PM-42-56
30.01-35.00mm	**48mm** 48.059-48.043mm	25mm	PM-48-25
		45mm	PM-48-45
		56mm	PM-48-56
35.01-42.00mm	**55mm** 55.072-55.053mm	30mm	PM-55-30
		56mm	PM-55-56
		67mm	PM-55-67
42.01-48.00mm	**62mm** 62.072-62.053mm	30mm	PM-62-30
		56mm	PM-62-56
		67mm	PM-62-67
48.01-55.00mm	**70mm** 70.078-70.059mm	30mm	PM-70-30
		56mm	PM-70-56
		67mm	PM-70-67
55.01-63.00mm	**78mm** 78.078-78.059mm	35mm	PM-78-35
		67mm	PM-78-67
		78mm	PM-78-78
63.01-70.00mm	**85mm** 85.093-85.071mm	35mm	PM-85-35
		67mm	PM-85-67
		78mm	PM-85-78
70.01-78.00mm	**95mm** 95.093-95.071mm	40mm	PM-95-40
		78mm	PM-95-78
		105mm	PM-95-105
78.01-85.00mm	**105mm** 105.101-105.079mm	40mm	PM-105-40
		78mm	PM-105-78
		105mm	PM-105-105
85.01-95.00mm	**115mm** 115.101-115.079mm	45mm	PM-115-45
		89mm	PM-115-89
		112mm	PM-115-112
95.01-105.00mm	**125mm** 125.117-125.092mm	45mm	PM-125-45
		89mm	PM-125-89
		112mm	PM-125-112

* Small metric drill sizes through .80mm are counterbored 1.00mm diameter, with 3mm drill-bearing length.

TINY VISE®
Edge Clamps

Strong Clamping Action For Fixturing Small Parts



- Patented Tiny Vise® edge clamps grip the side of the workpiece to keep the top clear for machining
- Clamping force is applied by positive screw action with the easy turn of a hex wrench
- Only Tiny Vise® Edge Clamps truly exert down thrust force on the workpiece, to prevent it from lifting
- Four types in a wide range of sizes from #8-32 thread to 1"-8 thread with 2,500 lbs. clamping force
- Patented, more durable than similar clamps

See Pages 282-290

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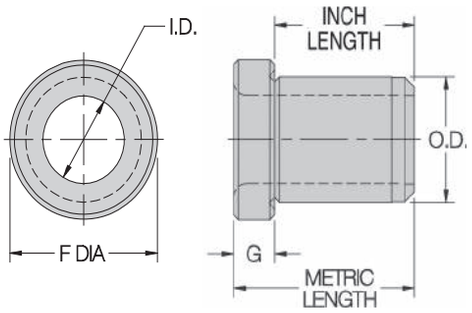
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HEAD PRESS FIT BUSHINGS



H



ORDERING EXAMPLES:

H-20-16-.1250	Standard inch bushing, inch ID
H-20-16-.1772	Standard inch bushing, mm ID (.1772 = 4.50mm)
H-20-16U-.1250	Unground OD
H-20-16-.1250 REAMER	Reamer tolerance on ID
H-20-16-.1250 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
HC-20-16-.1250	Carbide bushing
HM-8-12-4.50	Standard metric bushing

Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

INCH

BODY OD	F DIA	G
5/32	1/4	3/32
13/64	19/64	3/32
1/4	23/64	3/32
5/16	27/64	1/8
3/8	1/2	3/32
13/32	1/2	5/32
7/16	9/16	3/32
1/2	39/64	7/32
9/16	11/16	3/32
5/8	51/64	7/32
3/4	59/64	7/32
7/8	1-7/64	1/4
1	1-15/64	5/16
1-1/4	1-1/2	1/4
1-3/8	1-39/64	3/8
1-3/4	1-63/64	3/8
2-1/4	2-31/6	3/8

METRIC

BODY OD	F DIA	G
4mm	7mm	2mm
5mm	8mm	2mm
6mm	9mm	2.5mm
7mm	10mm	2.5mm
8mm	11mm	2.5mm
10mm	13mm	3mm
12mm	15mm	3mm
15mm	18mm	3mm
18mm	22mm	4mm
22mm	26mm	4mm
26mm	30mm	4mm
30mm	34mm	5mm
35mm	39mm	5mm
42mm	46mm	5mm
48mm	52mm	5mm
55mm	59mm	5mm
62mm	66mm	6mm
70mm	74mm	6mm
78mm	82mm	6mm
85mm	90mm	6mm
95mm	100mm	6mm
105mm	110mm	6mm
115mm	120mm	6mm
125mm	130mm	6mm

STANDARD ID TOLERANCES:

From #80 to 1/4"	+.0001/+.0004	From .35 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to 1-1/2"	+.0002/+.0006	Over 18 to 30mm	+.007/+.020mm
		Over 30 to 50mm	+.009/+.025mm
Over 1-1/2 to 2-3/4"	+.0003/+.0007	Over 50 to 80mm	+.010/+.029mm
		Over 80 to 120mm	+.012/+.034mm

(G6 tolerance)

REAMER ID TOLERANCES:

From #60 a 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
Over 1 to 1-1/2"	+.0008/+.0012	Over 18 to 30mm	+.020/+.033mm

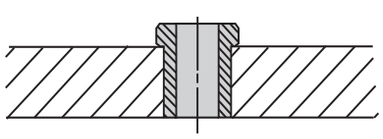
(F6 tolerance)

ID RANGE	OD	LENGTH	ANSI PART NO.
.0135-.0291 #80-#70 .35-.70mm	**5/32** .1578-.1575 (.166-.161 UNG)	1/4	H-10-4
		5/16	H-10-5
		*3/8	H-10-6
		*1/2	H-10-8
.0292-.0519 #69-3/64 .75-1.25mm		1/4	H-10-4
		5/16	H-10-5
		*3/8	H-10-6
		*1/2	H-10-8
		*3/4	H-10-12
.0520-.0625 #55-1/16 1.30-1.60mm		1/4	H-10-4
		5/16	H-10-5
		3/8	H-10-6
		*1/2	H-10-8
		*3/4	H-10-12

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

APPLICATIONS:

Similar to a P bushing, but with a head to resist heavy axial loads. H bushings are permanently pressed into the jig plate. They are generally used for single-step drilling or reaming operations when you do not expect to replace bushings during the tooling's lifetime. The head can be left exposed, or recessed by counterboring the installation hole. **Note: The "length" listed for an inch head-press-fit bushing refers to its length under the head, while the metric version's "length" is its overall length.**



CONTINUED ON NEXT PAGE

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HEAD PRESS FIT BUSHINGS

ID RANGE	OD	LENGTH	ANSI PART NO.
.0135-.0291 #80-#70 .35-.70mm	**13/64** .2046-.2043 (.213-.208 UNG)	1/4	H-13-4
		5/16	H-13-5
		*3/8	H-13-6
		*1/2	H-13-8
.0292-.0519 #69-3/64 .75-1.30mm		1/4	H-13-4
		5/16	H-13-5
		*3/8	H-13-6
		*1/2	H-13-8
		*3/4	H-13-12
.0520-.0634 #55-1/16 1.35-1.60mm		1/4	H-13-4
		5/16	H-13-5
		3/8	H-13-6
		*1/2	H-13-8
		*3/4	H-13-12
		*1	H-13-16
.0635-.0995 #52-#39 1.65-2.50mm		1/4	H-13-4
		5/16	H-13-5
		3/8	H-13-6
		*1/2	H-13-8
		*3/4	H-13-12
		*1	H-13-16
.0980-.1406 #40-9/64 2.50-3.50mm	**1/4** .2516-.2513 (.265-.260 UNG)	1/4	H-16-4
		5/16	H-16-5
		3/8	H-16-6
		*1/2	H-16-8
		*5/8	H-16-10
		*3/4	H-16-12
		*1	H-16-16
		*1-3/8	H-16-22
		*1-1/2	H-16-24
.1250-.1935 1/8-#10 3.20-4.90mm	**5/16** .3141-.3138 (.327-.322 UNG)	1/4	H-20-4
		5/16	H-20-5
		3/8	H-20-6
		1/2	H-20-8
		5/8	H-20-10
		3/4	H-20-12
		*1	H-20-16
		*1-3/8	H-20-22
		*1-1/2	H-20-24
.1935-.2280 #10-#1 4.90-5.80mm	**3/8** .3766-.3763 (.390-.385 UNG)	1/4	H-24-4
		5/16	H-24-5
		3/8	H-24-6
		1/2	H-24-8
		5/8	H-24-10
		3/4	H-24-12
		*1	H-24-16
.1875-.2570 3/16-F 4.75-6.50mm	**13/32** .4078-.4075 (.421-.416 UNG)	1/4	H-26-4
		5/16	H-26-5
		3/8	H-26-6
		1/2	H-26-8
		3/4	H-26-12
		*1	H-26-16
		*1-3/8	H-26-22
		*1-1/2	H-26-24
		*1-3/4	H-26-28

* **INFO+**: Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

ID RANGE	OD	LENGTH	ANSI PART NO.
.2340-.2900 A-L 5.90-7.40mm	**7/16** .4392-.4389 (.453-.448 UNG)	1/4	H-28-4
		5/16	H-28-5
		3/8	H-28-6
		1/2	H-28-8
		5/8	H-28-10
		3/4	H-28-12
		*1	H-28-16
.1875-.3160 3/16-O 4.75-8.00mm	**1/2** .5017-.5014 (.520-.515 UNG)	1/4	H-32-4
		5/16	H-32-5
		3/8	H-32-6
		1/2	H-32-8
		3/4	H-32-12
		*1	H-32-16
		*1-3/8	H-32-22
		*1-1/2	H-32-24
		*1-3/4	H-32-28
.2950-.3438 M-11/32 7.50-8.75mm	**9/16** .5642-.5639 (.582-.577 UNG)	1/4	H-36-4
		5/16	H-36-5
		3/8	H-36-6
		1/2	H-36-8
		5/8	H-36-10
		3/4	H-36-12
		1	H-36-16
.3125-.4375 5/16-7/16 7.90-11.00mm	**5/8** .6267-.6264 (.645-.640 UNG)	1/4	H-40-4
		5/16	H-40-5
		3/8	H-40-6
		1/2	H-40-8
		5/8	H-40-10
		3/4	H-40-12
		1	H-40-16
		1-3/8	H-40-22
		1-1/2	H-40-24
		1-3/4	H-40-28
		2-1/8	H-40-34
.3125-.5312 5/16-17/32 7.90-13.50mm	**3/4** .7518-.7515 (.770-.765 UNG)	1/4	H-48-4
		5/16	H-48-5
		3/8	H-48-6
		1/2	H-48-8
		5/8	H-48-10
		3/4	H-48-12
		1	H-48-16
		1-1/4	H-48-20
		1-3/8	H-48-22
		1-1/2	H-48-24
		1-3/4	H-48-28
		2-1/8	H-48-34

CONTINUED ON NEXT PAGE

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ID RANGE	OD	LENGTH	ANSI PART NO.
.5000-.6562 1/2-21/32 12.50-16.50mm	**7/8** .8768-.8765 (.895-.890 UNG)	1/2	H-56-8
		5/8	H-56-10
		3/4	H-56-12
		1	H-56-16
		1-1/4	H-56-20
		1-3/8	H-56-22
		1-1/2	H-56-24
		1-3/4	H-56-28
		2-1/8	H-56-34
		2-1/2	H-56-40
.5000-.7656 1/2-49/64 12.50-19.50mm	**1** 1.0018-1.0015 (1.020-1.015 UNG)	1/2	H-64-8
		3/4	H-64-12
		1	H-64-16
		1-3/8	H-64-22
		1-1/2	H-64-24
		1-3/4	H-64-28
		2-1/8	H-64-34
		2-1/2	H-64-40
		3	H-64-48
.8594-.9375 55/64-15/16 22.00-24.00mm	**1-1/4** 1.2520-1.2517 (1.270-1.265 UNG)	5/8	H-80-10
		3/4	H-80-12
		1	H-80-16
		1-1/4	H-80-20
		1-1/2	H-80-24
		1-3/4	H-80-28
		2	H-80-32
.6250-1.0312 5/8–1-1/32 16.00-26.00mm	**1-3/8** 1.3772-1.3768 (1.395-1.390 UNG)	1/2	H-88-8
		3/4	H-88-12
		1	H-88-16
		1-3/8	H-88-22
		1-1/2	H-88-24
		1-3/4	H-88-28
		2-1/8	H-88-34
		2-1/2	H-88-40
		3	H-88-48
1.0000-1.3906 1–1-25/64 26.00-35.00mm	**1-3/4** 1.7523-1.7519 (1.770-1.765 UNG)	3/4	H-112-12
		1	H-112-16
		1-3/8	H-112-22
		1-1/2	H-112-24
		1-3/4	H-112-28
		2-1/8	H-112-34
		2-1/2	H-112-40
		3	H-112-48
1.3750-1.7656 1-3/8-1-49/64 35.00-45.00mm	**2-1/4** 2.2525-2.2521 (2.270-2.265 UNG)	1	H-144-16
		1-3/8	H-144-22
		1-1/2	H-144-24
		1-3/4	H-144-28
		2-1/8	H-144-34
		2-1/2	H-144-40
		3	H-144-48

For extended-range bushings (larger sizes) please see our web catalog.

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- Pivoting Hoist Rings
- Lifting Eyes
- Side-Pull Hoist Rings

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HEAD PRESS FIT BUSHINGS – CARBIDE



HC

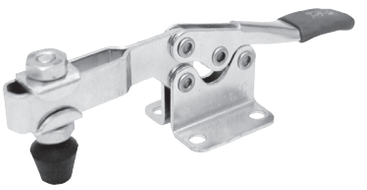
ID RANGE	OD	LENGTH	ANSI PART NO.
.0280-.0468 #70-#56 .75-1.15mm	**5/32** .1578-.1575	5/16	HC-10-5
		1/2	HC-10-8
.0469-.0625 3/64-1/16 1.20-1.55mm		5/16	HC-10-5
		1/2	HC-10-8
.0550-.0995 #54-#39 1.40-2.50mm	**13/64** .2046-.2043	5/16	HC-13-5
		1/2	HC-13-8
.0995-.1360 #39-#29 2.55-3.40mm	**1/4** .2516-.2513	5/16	HC-16-5
		1/2	HC-16-8
.1285-.1875 #30-3/16 3.30-4.75mm	**5/16** .3141-.3138	5/16	HC-20-5
		1/2	HC-20-8
		3/4	HC-20-12
		1	HC-20-16
.1875-.2500 3/16-1/4 4.80-6.30mm	**13/32** .4078-.4075	5/16	HC-26-5
		1/2	HC-26-8
		3/4	HC-26-12
		1	HC-26-16
.2188-.3125 7/32-5/16 5.60-7.90mm	**1/2** .5017-.5014	5/16	HC-32-5
		1/2	HC-32-8
		3/4	HC-32-12
		1	HC-32-16
		1-3/8	HC-32-22
.3125-.4219 5/16-27/64 8.00-10.50mm	**5/8** .6267-.6264	1/2	HC-40-8
		3/4	HC-40-12
		1	HC-40-16
		1-3/8	HC-40-22
.3750-.5000 3/8-1/2 9.60-12.50mm	**3/4** .7518-.7515	1/2	HC-48-8
		3/4	HC-48-12
		1	HC-48-16
		1-3/8	HC-48-22
.5000-.6250 1/2-5/8 13.00-15.50mm	**7/8** .8768-.8765	1/2	HC-56-8
		3/4	HC-56-12
		1	HC-56-16
		1-3/8	HC-56-22
		1-3/4	HC-56-28

Note: Due to manufacturing requirements, head dimensions of some carbide bushings may differ slightly from ANSI standards. Most carbide bushings have steel heads.

ID RANGE	OD	LENGTH	ANSI PART NO.
.5000-.7500 1/2-3/4 13.00-19.00mm	**1** 1.0018-1.0015	1/2	HC-64-8
		3/4	HC-64-12
		1	HC-64-16
		1-3/8	HC-64-22
		1-3/4	HC-64-28
.7500-1.0000 3/4-1 19.50-25.00mm	**1-3/8** 1.3772-1.3768	3/4	HC-88-12
		1	HC-88-16
		1-3/8	HC-88-22
		1-3/4	HC-88-28
		2-1/8	HC-88-34
		2-1/2	HC-88-40
1.0000-1.3750 1–1-3/8 26.00-34.00mm	**1-3/4** 1.7523-1.7519	1	HC-112-16
		1-3/8	HC-112-22
		1-3/4	HC-112-28
		2	HC-112-32
		2-1/8	HC-112-34
		2-1/2	HC-112-40
		3	HC-112-48
1.3750-1.7500 1-3/8–1-3/4 35.00-44.00mm	**2-1/4** 2.2525-2.2521	1	HC-144-16
		1-3/8	HC-144-22
		1-3/4	HC-144-28
		2-1/8	HC-144-34
		2-1/2	HC-144-40
		3	HC-144-48

Toggle Clamps

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- Made of durable high grade steel
- Many varieties available
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HEAD PRESS FIT BUSHINGS – METRIC



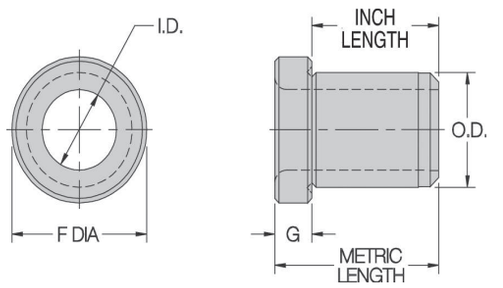
HM

ID RANGE (G6)	OD (s6)	LENGTH	ANSI PART NO.
.35-1.00mm	**4mm** 4.027-4.019mm	*6mm	HM-4-6
		*9mm	HM-4-9
1.01-1.80mm		6mm	HM-4-6
		9mm	HM-4-9
1.81-2.60mm	**5mm** 5.027-5.019mm	6mm	HM-5-6
		9mm	HM-5-9
2.61-3.30mm	**6mm** 6.027-6.019mm	8mm	HM-6-8
		12mm	HM-6-12
		16mm	HM-6-16
3.31-4.00mm	**7mm** 7.032-7.023mm	8mm	HM-7-8
		12mm	HM-7-12
		16mm	HM-7-16
4.01-5.00mm	**8mm** 8.032-8.023mm	8mm	HM-8-8
		12mm	HM-8-12
		16mm	HM-8-16
5.01-6.00mm	**10mm** 10.032-10.023mm	10mm	HM-10-10
		16mm	HM-10-16
		20mm	HM-10-20
6.01-8.00mm	**12mm** 12.039-12.028mm	10mm	HM-12-10
		16mm	HM-12-16
		20mm	HM-12-20
8.01-10.00mm	**15mm** 15.039-15.028mm	12mm	HM-15-12
		20mm	HM-15-20
		25mm	HM-15-25
10.01-12.00mm	**18mm** 18.039-18.028mm	12mm	HM-18-12
		20mm	HM-18-20
		25mm	HM-18-25
12.01-15.00mm	**22mm** 22.048-22.035mm	16mm	HM-22-16
		28mm	HM-22-28
		36mm	HM-22-36
15.01-18.00mm	**26mm** 26.048-26.035mm	16mm	HM-26-16
		28mm	HM-26-28
		36mm	HM-26-36
18.01-22.00mm	**30mm** 30.048-30.035mm	20mm	HM-30-20
		36mm	HM-30-36
		45mm	HM-30-45
22.01-26.00mm	**35mm** 35.059-35.043mm	20mm	HM-35-20
		36mm	HM-35-36
		45mm	HM-35-45
26.01-30.00mm	**42mm** 42.059-42.043mm	25mm	HM-42-25
		45mm	HM-42-45
		56mm	HM-42-56
30.01-35.00mm	**48mm** 48.059-48.043mm	25mm	HM-48-25
		45mm	HM-48-45
		56mm	HM-48-56
35.01-42.00mm	**55mm** 55.072-55.053mm	30mm	HM-55-30
		56mm	HM-55-56
		67mm	HM-55-67
42.01-48.00mm	**62mm** 62.072-62.053mm	30mm	HM-62-30
		56mm	HM-62-56
		67mm	HM-62-67

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

ID RANGE (G6)	OD (s6)	LENGTH	ANSI PART NO.
48.01-55.00mm	**70mm** 70.078-70.059mm	30mm	HM-70-30
		56mm	HM-70-56
		67mm	HM-70-67
55.01-63.00mm	**78mm** 78.078-78.059mm	35mm	HM-78-35
		67mm	HM-78-67
		78mm	HM-78-78
63.01-70.00mm	**85mm** 85.093-85.071mm	35mm	HM-85-35
		67mm	HM-85-67
		78mm	HM-85-78
70.01-78.00mm	**95mm** 95.093-95.071mm	40mm	HM-95-40
		78mm	HM-95-78
		105mm	HM-95-105
78.01-85.00mm	**105mm** 105.101-105.079mm	40mm	HM-105-40
		78mm	HM-105-78
		105mm	HM-105-105
85.01-95.00mm	**115mm** 115.101-115.079mm	45mm	HM-115-45
		89mm	HM-115-89
		112mm	HM-115-112
95.01-105.00mm	**125mm** 125.117-125.092mm	45mm	HM-125-45
		89mm	HM-125-89
		112mm	HM-125-112

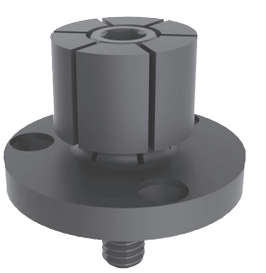
* Small metric drill sizes through .80mm are counterbored 1.00mm diameter, with 3mm drill-bearing length.



Note: The "length" listed on this page for a metric head-press-fit bushing refers to its overall length, while the inch version's "length" is its length under the head.

ID Clamps Provide 5-Side Machining Access

Self-Centering, Allowing Precise Clamping on Inner Diameter Of Your Part



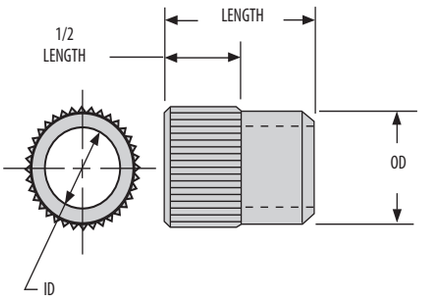
- Machinable to precisely fit the desired hole
- Clamp a part using an existing hole
- Allows access to five sides without any clamp interference

See Pages 308-309

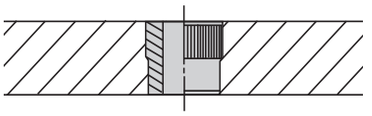
SERRATED PRESS FIT BUSHINGS



SP



APPLICATIONS:
Similar to a P bushing, but with top serrations to prevent rotation in soft materials. Recommended in high-torque situations for materials such as magnesium, aluminum, masonite, or wood. Finish-ground OD ensures accurate ID location. Serrations also resist axial force to prevent pushing the bushing through the jig plate.



ORDERING EXAMPLES:

SP-26-16-.1875	Standard inch bushing, inch ID
SP-26-16-.1772	Standard inch bushing, mm ID (.1772 - 4.50mm)
SP-26-16-.1875 REAMER	Reamer tolerance on ID
SP-26-16-.1875 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
SPM-8-12-4.50	Standard metric bushing

Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:

From #55 to 1/4"	+.0001/+.0004	From 1 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to 1-1/2"	+.0002/+.0006	Over 18 to 19mm	+.007/+.020mm
		(G6 tolerance)	

REAMER ID TOLERANCES:

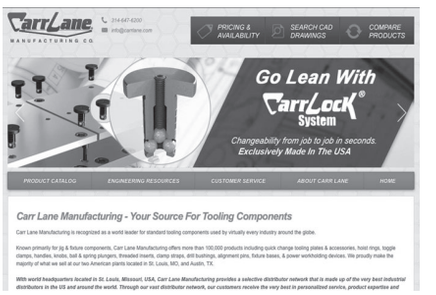
From #60 to 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
		Over 18 to 19mm	+.020/+.033mm
		(F6 tolerance)	

ID RANGE	OD	LENGTH	ANSI PART NO.
.0520-.0995 #55-#39 1.35-2.50mm	**13/64** .2031-.2029	1/4	SP-13-4
		5/16	SP-13-5
		3/8	SP-13-6
		1/2	SP-13-8
.0980-.1406 #40-9/64 2.50-3.50mm	**1/4** .2500-.2498	1/4	SP-16-4
		5/16	SP-16-5
		3/8	SP-16-6
		1/2	SP-16-8
.1250-.1935 1/8-#10 3.20-4.90mm	**5/16** .3125-.3123	1/4	SP-20-4
		5/16	SP-20-5
		3/8	SP-20-6
		1/2	SP-20-8
		3/4	SP-20-12
.1562-.2570 5/32-F 4.00-6.50mm	**13/32** .4062-.4060	5/16	SP-26-5
		3/8	SP-26-6
		1/2	SP-26-8
		3/4	SP-26-12
		*1	SP-26-16
.1562-.3160 5/32-O 4.00-8.00mm	**1/2** .5000-.4998	5/16	SP-32-5
		3/8	SP-32-6
		1/2	SP-32-8
		3/4	SP-32-12
		*1	SP-32-16
.3125-.4375 5/16-7/16 7.90-11.00mm	**5/8** .6250-.6248	3/8	SP-40-6
		1/2	SP-40-8
		3/4	SP-40-12
		1	SP-40-16
.3125-.5312 5/16-17/32 8.00-13.00mm	**3/4** .7500-.7498	3/8	SP-48-6
		1/2	SP-48-8
		3/4	SP-48-12
		1	SP-48-16
.5000-.6562 1/2-21/32 13.00-16.50mm	**7/8** .8750-.8748	3/8	SP-56-6
		1/2	SP-56-8
		3/4	SP-56-12
		1	SP-56-16
.5000-.7656 1/2-49/64 13.00-19.00mm	**1** 1.0000-.9998	1/2	SP-64-8
		3/4	SP-64-12
		1	SP-64-16
		1-3/8	SP-64-22

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

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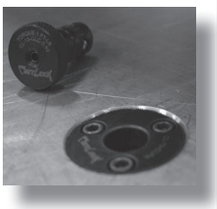
SERRATED PRESS FIT BUSHINGS – METRIC



SPM

ID RANGE (G6)	OD (h5)	LENGTH	ANSI PART NO.
1.00-1.80mm	**5mm** 5.000-4.995mm	6mm	SPM-5-6
		9mm	SPM-5-9
1.81-2.60mm		6mm	SPM-5-6
		9mm	SPM-5-9
2.61-3.30mm	**6mm** 6.000-5.995mm	8mm	SPM-6-8
		12mm	SPM-6-12
		16mm	SPM-6-16
3.31-4.00mm	**7mm** 7.000-6.994mm	8mm	SPM-7-8
		12mm	SPM-7-12
		16mm	SPM-7-16
4.01-5.00mm	**8mm** 8.000-7.994mm	8mm	SPM-8-8
		12mm	SPM-8-12
		16mm	SPM-8-16
5.01-6.00mm	**10mm** 10.000-9.994mm	10mm	SPM-10-10
		16mm	SPM-10-16
		20mm	SPM-10-20
6.01-8.00mm	**12mm** 12.000-11.992mm	10mm	SPM-12-10
		16mm	SPM-12-16
		20mm	SPM-12-20
8.01-10.00mm	**15mm** 15.000-14.992mm	12mm	SPM-15-12
		20mm	SPM-15-20
		25mm	SPM-15-25
10.01-12.00mm	**18mm** 18.000-17.992mm	12mm	SPM-18-12
		20mm	SPM-18-20
		25mm	SPM-18-25
12.01-15.00mm	**22mm** 22.000-21.991mm	16mm	SPM-22-16
		28mm	SPM-22-28
		36mm	SPM-22-36
15.01-18.00mm	**26mm** 26.000-25.991mm	16mm	SPM-26-16
		28mm	SPM-26-28
		36mm	SPM-26-36

CarrLock®
System for Fast Fixturing



PROBLEM:

"We are an aerospace prototype shop making the transition from prototype to production on an important UAV project. We've developed elaborate fixturing of all shapes and sizes. We found ourselves leaving our trim fixtures set up on a large gantry style table and then having to tear everything down when a large part came along to make way for it.

This tied up one of our most valuable spindles, and dust collection was nearly impossible. Change over and setup times were totally out of control."



Machine Operator Tyler Vaughn, of the Flying S, places a carbon trim fixture. The Carr Lock® receiver bushings allow for fixtures in various configurations.

SOLUTION:

"I discovered that I could combine 80% of our trim fixtures into just one fixture plate using just two Carr Lock pins, with excellent locating ability and much better clamping than before.

Our setup times have gone from an average of about 25 minutes to literally 30 seconds, thus saving us hundreds of hours."

Peter Bowman
Production Manager/Mfg Engineer
Flying S Inc.

Exclusively Made in the USA

www.carrlane.com/carrlock

See Pages 358-372

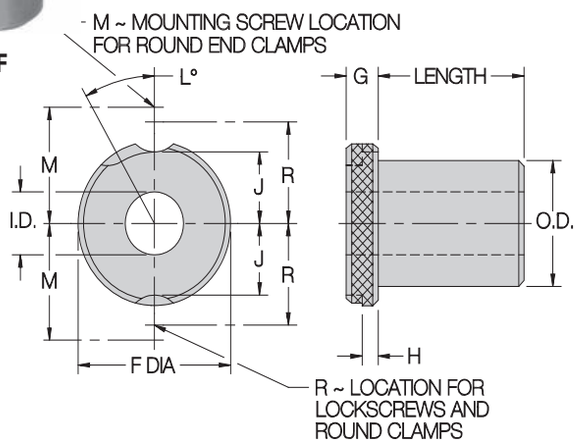
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SLIP/FIXED RENEWABLE BUSHINGS

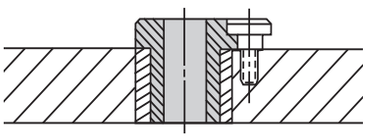


SF



APPLICATIONS:

Replaceable bushing generally used with a liner bushing and lockscrew. Use when you expect to replace bushings during the tooling's lifetime, or when you want to switch bushings to perform multi-step operations with the same tooling. SF bushings combine the benefits of older S-type slip-renewable and F-type fixed-renewable bushings: One side has a small recess for fixed mounting; the other has a locking recess that allows the bushing to slip down, then lock in place by rotating it. S and F types are now obsolete and combination SF bushings will be furnished at no extra charge.



ORDERING EXAMPLES:

SF-20-16-.1250	Standard inch bushing, inch ID
SF-20-16-.1772	Standard inch bushing, mm ID (.1772 = 4.50mm)
SF-20-16-.1250 REAMER	Reamer tolerance on ID
SF-20-16-.1250 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
SFC-20-16-.1250	Carbide bushing
SFM-8-16-4.50	Standard metric bushing

Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

INCH

BODY OD	F DIA	G	H	J	L	M	R	LOCK SCREW
3/16	5/16	3/16	3/32	3/32	55°		17/64	LS-0
1/4	7/16	1/4	1/8	9/64	30°		23/64	TW-2
5/16	35/64			11/64	65°	5/8	1/2	LS-1
3/8	5/8			15/64	30°		29/64	TW-2
7/16	5/8			15/64	30°		29/64	TW-2
1/2	51/64			19/64	65°	3/4	5/8	LS-1
9/16	7/8			23/64	65°		37/64	TW-2
5/8	7/8			23/64	30°		37/64	TW-2
3/4	1-3/64			27/64	50°	7/8	3/4	LS-1
7/8	1-1/4	3/8	3/16	31/64	30°		53/64	TW-7
1	1-27/64			19/32	35°	1-7/64	59/64	LS-2
1-1/4	1-5/8			43/64	30°		1-1/64	
1-3/8	1-51/64			25/32	30°	1-19/64	1-7/64	
1-1/2	1-7/8			51/64	30°		1-9/64	
1-3/4	2-19/64	3/8	3/16	1	30°	1-41/64	1-25/64	LS-3
2-1/4	2-51/64			1-1/4	25°	1-57/64	1-41/64	

METRIC

8mm	15mm	6mm	3mm	4.5mm	65°		11.5mm	LSM-1
10mm	18mm			6mm	65°		13mm	LSM-2
12mm	22mm	8mm	4mm	7.5mm	60°		16mm	LSM-3 LSM-4
15mm	26mm			9.5mm	50°		18mm	
18mm	30mm			11.5mm	50°		20mm	
22mm	34mm	10mm	5.5mm	13mm	35°		23.5mm	LSM-5 LSM-6
26mm	39mm			15.5mm	35°		26mm	
30mm	46mm			19mm	30°		29.5mm	
35mm	52mm			22mm	30°		32.5mm	
42mm	59mm			25.5mm	30°		36mm	
48mm	66mm	12mm	7mm	28.5mm	30°		41mm	LSM-7 LSM-8
55mm	74mm			32.5mm	25°		45mm	
62mm	82mm			36.5mm	25°		49mm	
70mm	90mm			40.5mm	25°		53mm	
78mm	100mm			45.5mm	25°		58mm	
85mm	110mm			50.5mm	20°		63mm	
95mm	120mm			55.5mm	20°		68mm	
105mm	130mm			60.5mm	20°		73mm	

STANDARD ID TOLERANCES:

From #80 to 1/4"	+.0001/+.0004	From .35 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to 1-1/2"	+.0002/+.0006	Over 18 to 30mm	+.007/+.020mm
		Over 30 to 50mm	+.009/+.025mm
Over 1-1/2 to 2-3/4"	+.0003/+.0007	Over 50 to 80mm	+.010/+.029mm
		Over 80 to 120mm	+.012/+.034mm

(G6 tolerance)

REAMER ID TOLERANCES:

From #60 to 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
Over 1 to 1-1/2"	+.0008/+.0012	Over 18 to 30mm	+.020/+.033mm

(F6 tolerance)

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SLIP/FIXED RENEWABLE BUSHINGS

ID RANGE	OD	LENGTH	ANSI PART NO.	LOCK SCREW
.0135-.0291 #80-#70 .35-.70mm	**3/16** .1875-.1873	*1/4	SF-12-4	LS-0
		*5/16	SF-12-5	
		*3/8	SF-12-6	
		*1/2	SF-12-8	
		*5/8	SF-12-10	
		*3/4	SF-12-12	
.0292-.0519 #69-3/64 .75-1.25mm		1/4	SF-12-4	
		*5/16	SF-12-5	
		*3/8	SF-12-6	
		*1/2	SF-12-8	
		*5/8	SF-12-10	
		*3/4	SF-12-12	
.0520-.0634 #55-1/16 1.30-1.60mm		1/4	SF-12-4	
		*5/16	SF-12-5	
		*3/8	SF-12-6	
		*1/2	SF-12-8	
		*5/8	SF-12-10	
		*3/4	SF-12-12	
.0635-.0980 #52-#40 1.65-2.50mm		1/4	SF-12-4	
		*5/16	SF-12-5	
		*3/8	SF-12-6	
		*1/2	SF-12-8	
		*5/8	SF-12-10	
		*3/4	SF-12-12	
.0995-.1405 #39-#28 2.55-3.50mm	**1/4** .2500-.2498	1/4	SF-16-4	TW-2
		5/16	SF-16-5	
		*3/8	SF-16-6	
		*1/2	SF-16-8	
		*5/8	SF-16-10	
		*3/4	SF-16-12	

ID RANGE	OD	LENGTH	ANSI PART NO.	LOCK SCREW
.0135-.0291 #80-#70 .35-.70mm	**5/16** .3125-.3123	*1/4	SF-20-4	LS-1 RC-01 RK-01 RK-10
		*5/16	SF-20-5	
		*3/8	SF-20-6	
		*1/2	SF-20-8	
		*3/4	SF-20-12	
.0292-.0519 #69-3/64 .75-1.30mm		*5/16	SF-20-5	
		*3/8	SF-20-6	
		*1/2	SF-20-8	
		*3/4	SF-20-12	
.0520-.0634 #55-1/16 1.35-1.60mm		*5/16	SF-20-5	
		*3/8	SF-20-6	
		*1/2	SF-20-8	
		*3/4	SF-20-12	
.0635-.0934 #52-#43 1.65-2.35mm		5/16	SF-20-5	
		*3/8	SF-20-6	
		*1/2	SF-20-8	
		*3/4	SF-20-12	
		*1	SF-20-16	
.0935-.1249 #42-#31 2.40-3.15mm		5/16	SF-20-5	
		3/8	SF-20-6	
		*1/2	SF-20-8	
		*3/4	SF-20-12	
		*1	SF-20-16	
		*1-3/8	SF-20-22	
.1250-.1935 1/8-#10 3.20-4.90mm		5/16	SF-20-5	
		3/8	SF-20-6	
		1/2	SF-20-8	
		5/8	SF-20-10	
		*3/4	SF-20-12	
		*1	SF-20-16	
		*1-3/8	SF-20-22	
.1935-.2280 #10-#1 4.90-5.80mm	**3/8** .3750-.3748	1/4	SF-24-4	TW-2
		5/16	SF-24-5	
		3/8	SF-24-6	
		1/2	SF-24-8	
		5/8	SF-24-10	
		3/4	SF-24-12	
		*1	SF-24-16	
.2340-.2900 A-L 5.90-7.40mm	**7/16** .4375-.4373	1/4	SF-28-4	TW-2
		5/16	SF-28-5	
		3/8	SF-28-6	
		1/2	SF-28-8	
		5/8	SF-28-10	
		3/4	SF-28-12	
		*1	SF-28-16	

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

CONTINUED ON NEXT PAGE

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SLIP/FIXED RENEWABLE BUSHINGS

ID RANGE	OD	LENGTH	ANSI PART NO.	LOCK SCREW
.1405-.1889 #28-3/16 3.60-4.75mm	**1/2** .5000-.4998	5/16	SF-32-5	LS-1 RC-01 RK-01 RK-10
		3/8	SF-32-6	
		1/2	SF-32-8	
		*3/4	SF-32-12	
		*1	SF-32-16	
		*1-3/8	SF-32-22	
		*1-1/2	SF-32-24	
		*1-3/4	SF-32-28	
.1890-.3438 #12-11/32 4.80-8.70mm		5/16	SF-32-5	
		3/8	SF-32-6	
		1/2	SF-32-8	
		3/4	SF-32-12	
		*1	SF-32-16	
		*1-3/8	SF-32-22	
		*1-1/2	SF-32-24	
		*1-3/4	SF-32-28	
		*2-1/8	SF-32-34	
.2950-.3438 M-11/32 7.50-8.80mm	**9/16** .5625-.5623	1/4	SF-36-4	TW-2
		5/16	SF-36-5	
		3/8	SF-36-6	
		1/2	SF-36-8	
		5/8	SF-36-10	
		3/4	SF-36-12	
		1	SF-36-16	
.3480-.4375 S-7/16 8.90-11.00mm	**5/8** .6250-.6248	3/8	SF-40-6	TW-2
		1/2	SF-40-8	
		5/8	SF-40-10	
		3/4	SF-40-12	
		1	SF-40-16	
		1-1/4	SF-40-20	
.2812-.5625 9/32-9/16 7.20-14.00mm	**3/4** .7500-.7498	3/8	SF-48-6	LS-1 RC-01 RK-01 RK-11
		1/2	SF-48-8	
		3/4	SF-48-12	
		1	SF-48-16	
		1-3/8	SF-48-22	
		1-1/2	SF-48-24	
		1-3/4	SF-48-28	
		2-1/8	SF-48-34	
		*2-1/2	SF-48-40	
		*3	SF-48-48	
.5469-.6562 35/64-21/32 13.50-16.50mm	**7/8** .8750-.8748	1/2	SF-56-8	TW-7
		5/8	SF-56-10	
		3/4	SF-56-12	
		1	SF-56-16	
		1-1/4	SF-56-20	
		1-1/2	SF-56-24	
.4688-.7812 15/32-25/32 12.00-19.50mm	**1** 1.0000-.9998	1/2	SF-64-8	LS-2 RC-02 RK-02 RK-12
		3/4	SF-64-12	
		1	SF-64-16	
		1-3/8	SF-64-22	
		1-1/2	SF-64-24	
		1-3/4	SF-64-28	
		2-1/8	SF-64-34	
		2-1/2	SF-64-40	
		3	SF-64-48	

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

ID RANGE	OD	LENGTH	ANSI PART NO.	LOCK SCREW
.7188-1.0625 23/32–1-1/16 18.50-27.00mm	1-3/8 1.3750-1.3747	3/4	SF-88-12	LS-2 RC-02 RK-02 RK-12
		1	SF-88-16	
		1-3/8	SF-88-22	
		1-1/2	SF-88-24	
		1-3/4	SF-88-28	
		2-1/8	SF-88-34	
		2-1/2	SF-88-40	
		3	SF-88-48	
.9688-1.4062 31/32–1-13/32 25.00-35.00mm	1-3/4 1.7500-1.7497	3/4	SF-112-12	LS-3 RC-03 RK-03 RK-14
		1	SF-112-16	
		1-3/8	SF-112-22	
		1-1/2	SF-112-24	
		1-3/4	SF-112-28	
		2-1/8	SF-112-34	
		2-1/2	SF-112-40	
		3	SF-112-48	
1.3438-1.8750 1-11/32–1-7/8 35.00-47.00mm	2-1/4 2.2500-2.2496	3/4	SF-144-12	LS-3 RC-03 RK-03 RK-14
		1	SF-144-16	
		1-3/8	SF-144-22	
		1-1/2	SF-144-24	
		1-3/4	SF-144-28	
		2-1/8	SF-144-34	
		2-1/2	SF-144-40	
		3	SF-144-48	

For extended-range bushings (larger sizes) please see our web catalog.

Alignment Pins

Strength and Precision



Ball Lock Pins (L, T. button or Ring Handles)



Detent Pins

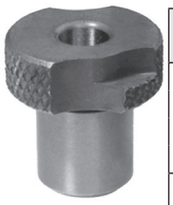
- Wide assortment of quality ball lock and detent pins for precision alignment
- In steel or stainless steel
- A wide selection of other alignment pins are available

See Pages 27-65

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SLIP/FIXED RENEWABLE BUSHINGS – CARBIDE



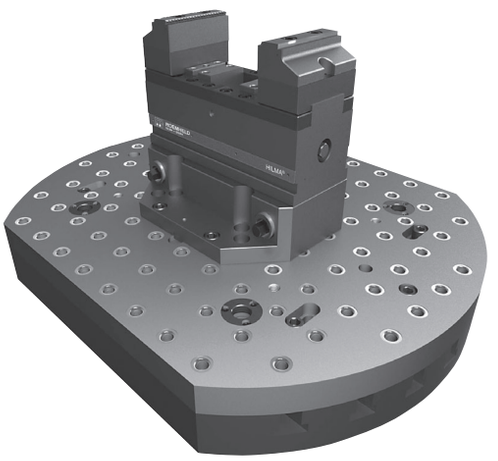
SFC

ID RANGE	OD	LENGTH	ANSI PART NO.	LOCK SCREW
.0520-.0934 #55-#43 1.35-2.35mm	**5/16** .3125-.3123	5/16	SFC-20-5	LS-1 RC-01 RK-01 RK-10
		1/2	SFC-20-8	
		3/4	SFC-20-12	
		1	SFC-20-16	
.0935-.1562 #42-5/32 2.40-3.90mm		5/16	SFC-20-5	
		1/2	SFC-20-8	
		3/4	SFC-20-12	
		1	SFC-20-16	
.1406-.1889 9/64-3/16 3.60-4.75mm	**1/2** .5000-.4998	5/16	SFC-32-5	LS-1 RC-01 RK-01 RK-10
		1/2	SFC-32-8	
		3/4	SFC-32-12	
		1	SFC-32-16	
		1-3/8	SFC-32-22	
.1890-.3438 #12-11/32 4.80-8.70mm		5/16	SFC-32-5	
		1/2	SFC-32-8	
		3/4	SFC-32-12	
		1	SFC-32-16	
		1-3/8	SFC-32-22	
.2812-.5312 9/32-17/32 7.20-13.00mm	**3/4** .7500-.7498	1/2	SFC-48-8	LS-1 RC-01 RK-01 RK-10
		3/4	SFC-48-12	
		1	SFC-48-16	
		1-3/8	SFC-48-22	
.4688-.7812 15/32-25/32 12.00-19.50mm	**1** 1.0000-.9998	1/2	SFC-64-8	LS-2 RC-02 RK-02 RK-12
		3/4	SFC-64-12	
		1	SFC-64-16	
		1-3/8	SFC-64-22	
		1-3/4	SFC-64-28	
.7188-1.0312 23/32 - 1-1/32 18.50-27.00mm	**1-3/8** 1.3750-1.3747	3/4	SFC-88-12	LS-2 RC-02 RK-02 RK-12
		1	SFC-88-16	
		1-3/8	SFC-88-22	
		1-3/4	SFC-88-28	
		2-1/8	SFC-88-34	
		2-1/2	SFC-88-40	
.9688-1.4062 31/32 - 1-13/32 25.00-35.00mm	**1-3/4** 1.7500-1.7497	1	SFC-112-16	LS-3 RC-03 RK-03 RK-14
		1-3/8	SFC-112-22	
		1-3/4	SFC-112-28	
		2-1/8	SFC-112-34	
		2-1/2	SFC-112-40	
		3	SFC-112-48	
1.3438-1.7812 1-11/32 - 1-25/32 35.00-45.00mm	**2-1/4** 2.2500-2.2496	1	SFC-144-16	LS-3 RC-03 RK-03 RK-14
		1-3/8	SFC-144-22	
		1-3/4	SFC-144-28	
		2-1/8	SFC-144-34	
		2-1/2	SFC-144-40	
		3	SFC-144-48	

Note: Due to manufacturing requirements, head dimensions of some carbide bushings may differ slightly from ANSI standards. Most carbide bushings have steel heads.

5-Axis Workholding

Quick-Change With No Adaptor Plates, Blocks Or Pallets Necessary



- Quintus fixture plates available as blank, or with multi-function holes
- German-built, extremely accurate precision vises
- Allows unrestricted tool access for multiple-side machining
- Numerous jaw types and sizes available

See Pages 373-394

SLIP/FIXED RENEWABLE BUSHINGS – METRIC



SFM

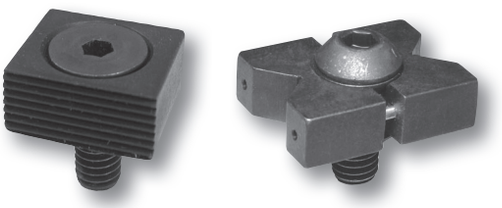
ID RANGE	OD	LENGTH	ANSI PART NO.	LOCK SCREW
.35-1.00mm	**8mm** 8.000-7.994mm	*10mm	SFM-8-10	LSM-1 LSM-2 RCM-1 RCM-2
		*16mm	SFM-8-16	
1.01-1.80mm		10mm	SFM-8-10	
		16mm	SFM-8-16	
1.81-4.00mm		10mm	SFM-8-10	
		16mm	SFM-8-16	
4.01-6.00mm	**10mm** 10.000-9.994mm	12mm	SFM-10-12	
		20mm	SFM-10-20	
		25mm	SFM-10-25	
6.01-8.00mm	**12mm** 12.000-11.992mm	12mm	SFM-12-12	LSM-3 LSM-4 RCM-3 RCM-4
		20mm	SFM-12-20	
		25mm	SFM-12-25	
8.01-10.00mm	**15mm** 15.000-14.992mm	16mm	SFM-15-16	
		28mm	SFM-15-28	
		36mm	SFM-15-36	
10.01-12.00mm	**18mm** 18.000-17.992mm	16mm	SFM-18-16	
		28mm	SFM-18-28	
		36mm	SFM-18-36	
12.01-15.00mm	**22mm** 22.000-21.991mm	20mm	SFM-22-20	LSM-5 LSM-6 RCM-5 RCM-6
		36mm	SFM-22-36	
		45mm	SFM-22-45	
15.01-18.00mm	**26mm** 26.000-25.991mm	20mm	SFM-26-20	
		36mm	SFM-26-36	
		45mm	SFM-26-45	
18.01-22.00mm	**30mm** 30.000-29.991mm	25mm	SFM-30-25	
		45mm	SFM-30-45	
		56mm	SFM-30-56	
22.01-26.00mm	**35mm** 35.000-34.989mm	25mm	SFM-35-25	
		45mm	SFM-35-45	
		56mm	SFM-35-56	
26.01-30.00mm	**42mm** 42.000-41.989mm	30mm	SFM-42-30	
		56mm	SFM-42-56	
		67mm	SFM-42-67	
30.01-35.00mm	**48mm** 48.000-47.989mm	30mm	SFM-48-30	LSM-7 LSM-8 RCM-7 RCM-8
		56mm	SFM-48-56	
		67mm	SFM-48-67	
35.01-42.00mm	**55mm** 55.000-54.987mm	30mm	SFM-55-30	
		56mm	SFM-55-56	
		67mm	SFM-55-67	
42.01-48.00mm	**62mm** 62.000-61.987mm	35mm	SFM-62-35	
		67mm	SFM-62-67	
		78mm	SFM-62-78	

ID RANGE (G6)	OD (h5)	LENGTH	ANSI PART NO.	LOCK SCREW
48.01-55.00mm	**70mm** 70.000-69.987mm	35mm	SFM-70-35	LSM-7 LSM-8 RCM-7 RCM-8
		67mm	SFM-70-67	
		78mm	SFM-70-78	
55.01-62.00mm	**78mm** 78.000-77.987mm	40mm	SFM-78-40	
		78mm	SFM-78-78	
		105mm	SFM-78-105	
62.01-70.00mm	**85mm** 85.000-84.985mm	40mm	SFM-85-40	
		78mm	SFM-85-78	
		105mm	SFM-85-105	
70.01-78.00mm	**95mm** 95.000-94.985mm	45mm	SFM-95-45	
		89mm	SFM-95-89	
		112mm	SFM-95-112	
78.01-85.00mm	**105mm** 105.000-104.985mm	45mm	SFM-105-45	
		89mm	SFM-105-89	
		112mm	SFM-105-112	

* Small metric drill sizes through .80mm are counterbored 1.00mm diameter, with 3mm drill-bearing length.

TINY VISE® Edge Clamps

Strong Clamping Action For Fixturing Small Parts



- Patented Tiny Vise® edge clamps grip the side of the workhpiece to keep the top clear for machining
- Clamping force is applied by positive screw action with the easy turn of a hex wrench
- Only Tiny Vise® Edge Clamps truly exert down thrust force on the workpiece, to prevent it from lifting
- Four types in a wide range of sizes from #8-32 thread to 1"-8 thread with 2,500 lbs. clamping force
- Patented, more durable than similar clamps

See Pages 282-290

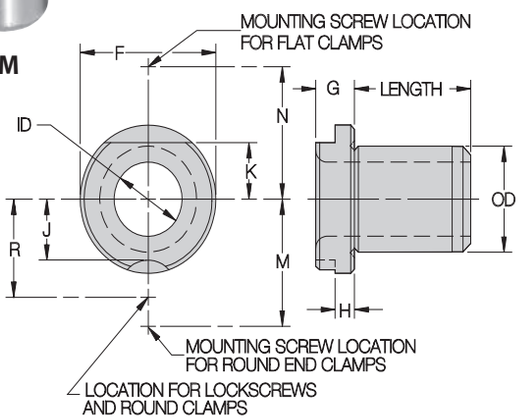
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FLAT MILLED RENEWABLE BUSHINGS



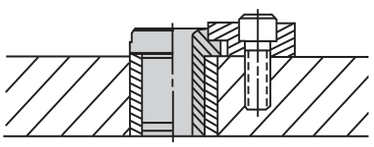
FM



BODY OD	F	G	H	J	K	M	N	R	FLAT CLAMP	LOCK SCREW
5/16	35/64	1/4	1/8	11/64	11/64	5/8	11/16	1/2	FC-01 FC-10	LS-1
1/2	51/64			19/64	17/64	3/4	25/32	5/8		
3/4	1-3/64			27/64	25/64	7/78	57/64	3/4		
1	1-27/64	3/8	3/16	19/32	1/2	1-7/64	1-9/64	59/64	FC-02 FC-12	LS-2
1-3/8	1-51/64			25/32	11/16	1-19/54	1-21/64	1-7/64		
1-3/4	2-19/64	3/8	3/16	1	7/8	1-41/64	1-33/64	1-25/64	FC-03 FC-14 FC-15	LS-3
2-1/4	2-51/64			1-1/4	1-1/8	1-57/64	1-49/64	1-41/64		

APPLICATIONS:

Replaceable bushing used for extra resistance to rotational forces under harsh conditions. This bushing, generally used with a liner, has a milled locking flat to allow fastening securely with a flat clamp. FM bushings also have a standard recess on the other side to allow using a lockscrew instead.



ORDERING EXAMPLES:

FM-20-16-.1250	Standard inch Bushing, inch ID
FM-20-16-.1772	Standard inch Bushing, mm ID (.1772 = 4.50mm)
FM-20-16-.1250 REAMER	Reamer Tolerance on ID
FM-20-16-.1250 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
FMC-20-16-.1250	Carbide Bushing

Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:

From #80 to 1/4"	+.0001/+.0004	From .35 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to1-1/2"	+.0002/+.0006	Over 18 to 30mm	+.007/+.020mm
		Over 30 to 50mm	+.009/+.025mm
Over 1-1/2 to 2-3/4"	+.0003/+.0007	(G6 tolerance)	

REAMER ID TOLERANCES:

From #60 to 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
Over 1" to 1-1/2"	+.0008/+.0012	Over 18 to 30mm	+.020/+.033mm
		(F6 tolerance)	

ID RANGE	OD	LENGTH	ANSI PART NO.	CLAMP
.0135-.0291 #80-#70 .35-.70mm	**5/16** .3125-.3123	*1/4	FM-20-4	FC-01 FC-10 LS-1 RC-01 RK-01 RK-10
		*5/16	FM-20-5	
		*3/8	FM-20-6	
		*1/2	FM-20-8	
		*3/4	FM-20-12	
.0292-.0519 #69-3/64 .75-1.30mm		*5/16	FM-20-5	
		*3/8	FM-20-6	
		*1/2	FM-20-8	
		*3/4	FM-20-12	
.0520-.0634 #55-1/16 1.35-1.60mm		*5/16	FM-20-5	
		*3/8	FM-20-6	
		*1/2	FM-20-8	
		*3/4	FM-20-12	
.0635-.0934 #52-#43 1.65-2.35mm		5/16	FM-20-5	
		*3/8	FM-20-6	
		*1/2	FM-20-8	
		*3/4	FM-20-12	
		*1	FM-20-16	
.0935-.1249 #42-#31 2.40-3.15mm		5/16	FM-20-5	
		3/8	FM-20-6	
		*1/2	FM-20-8	
		*3/4	FM-20-12	
		*1	FM-20-16	
		*1-3/8	FM-20-22	
.1250-.1935 1/8-#10 3.20-4.90mm		5/16	FM-20-5	
		3/8	FM-20-6	
		1/2	FM-20-8	
		5/8	FM-20-10	
		*3/4	FM-20-12	
		*1	FM-20-16	
		*1-3/8	FM-20-22	

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

CONTINUED ON NEXT PAGE

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FLAT MILLED RENEWABLE BUSHINGS

ID RANGE	OD	LENGTH	ANSI PART NO.	CLAMP
.1405-.1889 #28-3/16 3.60-4.75mm	**1/2** .5000-.4998	5/16	FM-32-5	FC-01 FC-10 LS-1 RC-01 RK-01 RK-10
		3/8	FM-32-6	
		1/2	FM-32-8	
		*3/4	FM-32-12	
		*1	FM-32-16	
		*1-3/8	FM-32-22	
		*1-1/2	FM-32-24	
		*1-3/4	FM-32-28	
.1890-.3438 #12-11/32 4.80-8.70mm		5/16	FM-32-5	
		3/8	FM-32-6	
		1/2	FM-32-8	
		3/4	FM-32-12	
		*1	FM-32-16	
		*1-3/8	FM-32-22	
		*1-1/2	FM-32-24	
		*1-3/4	FM-32-28	
		*2-1/8	FM-32-34	
.2812-.5625 9/32-9/16 7.20-14.00mm	**3/4** .7500-.7498	3/8	FM-48-6	FC-01 FC-11 LS-1 RC-01 RK-01 RK-11
		1/2	FM-48-8	
		3/4	FM-48-12	
		1	FM-48-16	
		1-3/8	FM-48-22	
		1-1/2	FM-48-24	
		1-3/4	FM-48-28	
		2-1/8	FM-48-34	
		*2-1/2	FM-48-40	
		*3	FM-48-48	
.4688-.7812 15/32-25/32 12.00-19.50mm	**1** 1.0000-.9998	1/2	FM-64-8	FC-02 FC-12 LS-2 RC-02 RK-02 RK-12
		3/4	FM-64-12	
		1	FM-64-16	
		1-3/8	FM-64-22	
		1-1/2	FM-64-24	
		1-3/4	FM-64-28	
		2-1/8	FM-64-34	
		2-1/2	FM-64-40	
		3	FM-64-48	
.7188-1.0625 23/32 – 1-1/16 18.50-27.00mm	1-3/8 1.3750-1.3747	3/4	FM-88-12	FC-02 FC-12 LS-2 RC-02 RK-02 RK-12
		1	FM-88-16	
		1-3/8	FM-88-22	
		1-1/2	FM-88-24	
		1-3/4	FM-88-28	
		2-1/8	FM-88-34	
		2-1/2	FM-88-40	
		3	FM-88-48	

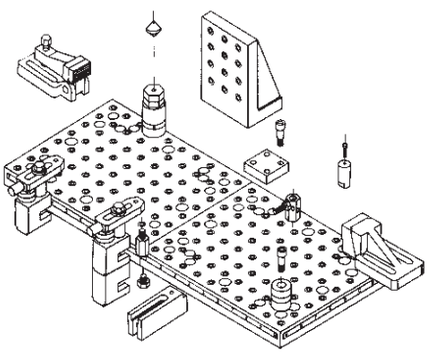
* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 551 for bearing length).

ID RANGE	OD	LENGTH	ANSI PART NO.	CLAMP
.9688-1.4062 31/32 – 1-13/32 25.00-35.00mm	**1-3/4** 1.7500-1.7497	3/4	FM-112-12	FC-03 FC-14 FC-15 LS-3 RC-03 RK-03 RK-14
		1	FM-112-16	
		1-3/8	FM-112-22	
		1-1/2	FM-112-24	
		1-3/4	FM-112-28	
		2-1/8	FM-112-34	
		2-1/2	FM-112-40	
		3	FM-112-48	
1.3438-1.8750 1-11/32 – 1-7/8 35.00-47.00mm	**2-1/4** 2.2500-2.2496	3/4	FM-144-12	FC-03 FC-14 FC-15 LS-3 RC-03 RK-03 RK-14
		1	FM-144-16	
		1-3/8	FM-144-22	
		1-1/2	FM-144-24	
		1-3/4	FM-144-28	
		2-1/8	FM-144-34	
		2-1/2	FM-144-40	
		3	FM-144-48	

For extended-range bushings (larger sizes) please see our web catalog.

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- Great for temporary fixturing: one-time jobs, short or prototype production runs, trial fixturing or while permanent fixtures are built or repaired
- Available in mini, standard and heavy sizes
- Wide range of tooling plates and blocks, finish ground, with multipurpose positioning holes
- Order as components, or in handy starter sets

See Pages 415-450

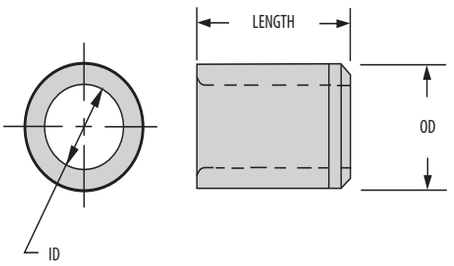
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LINER BUSHINGS

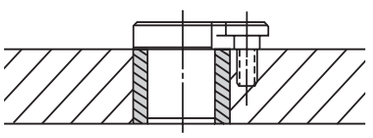


L



APPLICATIONS:

Liners are permanent bushings used to hold renewable drill bushings. The liner's ID has a precise sliding fit with the renewable bushing's OD. The hardened liner accurately locates the renewable bushing and protects the jig plate from wear caused by frequent bushing replacement. Note: Metric liner bushings are the same as metric press-fit bushings.



ORDERING EXAMPLES:

L-32-16	Standard inch liner bushing
L-32-16U	Unground OD
L-40-16-24	Standard inch liner bushing with a choice of ID in that OD size
PM-18-25-12.00	Standard metric liner bushing (same as metric press-fit type)

STANDARD LINER ID TOLERANCES:

3/16 to 3/8"	+.0001/+.0004	8 to 10mm	+.005/+.014mm
7/16 to 5/8"	+.0002/+.0005	12 to 18mm	+.006/+.017mm
3/4"	+.0003/+.0006	22 to 30mm	+.007/+.020mm
7/8 to 1"	+.0004/+.0007	35 to 48mm	+.009/+.025mm
1-3/8"	+.0006/+.0010	55 to 78mm	+.010/+.029mm
1-3/4"	+.0008/+.0012	85 to 105mm	+.012/+.034mm
2-1/4"	+.0010/+.0015	(G6 tolerance)	

ID	OD	LENGTH	ANSI PART NO.
3/16	5/16 .3141-.3138 (.327-.322 UNG)	1/4	L-20-4
		5/16	L-20-5
		3/8	L-20-6
		1/2	L-20-8
		5/8	L-20-10
		3/4	L-20-12
1/4	7/16 .4392-.4389 (.453-.448 UNG)	1/4	L-28-4
		5/16	L-28-5
		3/8	L-28-6
		1/2	L-28-8
		5/8	L-28-10
		3/4	L-28-12
5/16	1/2 .5017-.5014 (.520-.515 UNG)	1/4	L-32-4
		5/16	L-32-5
		3/8	L-32-6
		1/2	L-32-8
		5/8	L-32-10
		3/4	L-32-12
		1	L-32-16
		1-3/8	L-32-22
	9/16 .5642-.5639 (.582-.577 UNG)	1/4	L-36-4
		5/16	L-36-5
		3/8	L-36-6
		1/2	L-36-8
		5/8	L-36-10
		3/4	L-36-12
		1	L-36-16
3/8	5/8 .6267-.6264 (.645-.640 UNG)	1/4	L-40-4-24
		5/16	L-40-5-24
		3/8	L-40-6-24
		1/2	L-40-8-24
		5/8	L-40-10-24
		3/4	L-40-12-24
		1	L-40-16-24
7/16		1/4	L-40-4-28
		5/16	L-40-5-28
		3/8	L-40-6-28
		1/2	L-40-8-28
		5/8	L-40-10-28
		3/4	L-40-12-28
		1	L-40-16-28
1/2	3/4 .7518-.7515 (.770-.765 UNG)	5/16	L-48-5
		3/8	L-48-6
		1/2	L-48-8
		3/4	L-48-12
		1	L-48-16
		1-3/8	L-48-22
		1-1/2	L-48-24
		1-3/4	L-48-28
		2-1/8	L-48-34
9/16	7/8 .8768-.8765 (.895-.890 UNG)	5/16	L-56-5-36
		3/8	L-56-6-36
		1/2	L-56-8-36
		5/8	L-56-10-36
		3/4	L-56-12-36
		1	L-56-16-36
		1-1/4	L-56-20-36
5/8		5/16	L-56-5-40
		3/8	L-56-6-40
		1/2	L-56-8-40
		5/8	L-56-10-40
		3/4	L-56-12-40
		1	L-56-16-40
		1-1/4	L-56-20-40

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LINER BUSHINGS

ID	OD	LENGTH	ANSI PART NO.
3/4	1 1.0018-1.0015 (1.020-1.015 UNG)	1/2	L-64-8
		3/4	L-64-12
		1	L-64-16
		1-3/8	L-64-22
		1-1/2	L-64-24
		1-3/4	L-64-28
		2-1/8	L-64-34
		2-1/2	L-64-40
		3	L-64-48
7/8	**1-1/4** 1.2520-1.2517 (1.270-1.265 UNG)	1/2	L-80-8
		5/8	L-80-10
		3/4	L-80-12
		1	L-80-16
		1-1/4	L-80-20
		1-1/2	L-80-24
1	**1-3/8** 1.3772-1.3768 (1.395-1.390 UNG)	1/2	L-88-8
		3/4	L-88-12
		1	L-88-16
		1-3/8	L-88-22
		1-1/2	L-88-24
		1-3/4	L-88-28
		2-1/8	L-88-34
		2-1/2	L-88-40
		3	L-88-48
1-3/8	**1-3/4** 1.7523-1.7519 (1.770-1.765 UNG)	3/4	L-112-12
		1	L-112-16
		1-3/8	L-112-22
		1-1/2	L-112-24
		1-3/4	L-112-28
		2-1/8	L-112-34
		2-1/2	L-112-40
		3	L-112-48
1-3/4	**2-1/4** 2.2525-2.2521 (2.270-2.265 UNG)	3/4	L-144-12
		1	L-144-16
		1-3/8	L-144-22
		1-1/2	L-144-24
		1-3/4	L-144-28
		2-1/8	L-144-34
		2-1/2	L-144-40
		3	L-144-48
2-1/4	**2-1/4** 2.2525-2.2521 (2.270-2.265 UNG)	3/4	L-176-12
		1	L-176-16
		1-3/8	L-176-22
		1-1/2	L-176-24
		1-3/4	L-176-28
		2-1/8	L-176-34
		2-1/2	L-176-40
		3	L-176-48

For extended-range bushings (larger sizes) please see our web catalog.

Hoist Rings

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- Lifting Eyes
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LINER BUSHINGS – METRIC



PM

ID (G6)	OD (s6)	LENGTH	ANSI PART NO.
8mm	12mm 12.039-12.028mm	10mm	PM-12-10-8.00
		16mm	PM-12-16-8.00
10mm	15mm 15.039-15.028mm	12mm	PM-15-12-10.00
		20mm	PM-15-20-10.00
		25mm	PM-15-25-10.00
12mm	18mm 18.039-18.028mm	12mm	PM-18-12-12.00
		20mm	PM-18-20-12.00
		25mm	PM-18-25-12.00
15mm	22mm 22.048-22.035mm	16mm	PM-22-16-15.00
		28mm	PM-22-28-15.00
		36mm	PM-22-36-15.00
18mm	26mm 26.048-26.035mm	16mm	PM-26-16-18.00
		28mm	PM-26-28-18.00
		36mm	PM-26-36-18.00
22mm	30mm 30.048-30.035mm	20mm	PM-30-20-22.00
		36mm	PM-30-36-22.00
		45mm	PM-30-45-22.00
26mm	35mm 35.059-35.043mm	20mm	PM-35-20-26.00
		36mm	PM-35-36-26.00
		45mm	PM-35-45-26.00
30mm	42mm 42.059-42.043mm	25mm	PM-42-25-30.00
		45mm	PM-42-45-30.00
		56mm	PM-42-56-30.00
35mm	48mm 48.059-48.043mm	25mm	PM-48-25-35.00
		45mm	PM-48-45-35.00
		56mm	PM-48-56-35.00
42mm	55mm 55.072-55.053mm	30mm	PM-55-30-42.00
		56mm	PM-55-56-42.00
		67mm	PM-55-67-42.00
48mm	62mm 62.072-62.053mm	30mm	PM-62-30-48.00
		56mm	PM-62-56-48.00
		67mm	PM-62-67-48.00
55mm	70mm 70.078-70.059mm	30mm	PM-70-30-55.00
		56mm	PM-70-56-55.00
		67mm	PM-70-67-55.00
62mm	78mm 78.078-78.059mm	35mm	PM-78-35-62.00
		67mm	PM-78-67-62.00
		78mm	PM-78-78-62.00
70mm	85mm 85.093-85.071mm	35mm	PM-85-35-70.00
		67mm	PM-85-67-70.00
		78mm	PM-85-78-70.00
78mm	95mm 95.093-95.071mm	40mm	PM-95-40-78.00
		78mm	PM-95-78-78.00
		105mm	PM-95-105-78.00
85mm	105mm 105.101-105.079mm	40mm	PM-105-40-85.00
		78mm	PM-105-78-85.00
		105mm	PM-105-105-85.00
95mm	115mm 115.101-115.079mm	45mm	PM-115-45-95.00
		89mm	PM-115-89-95.00
		112mm	PM-115-112-95.00
105mm	125mm 125.117-125.092mm	45mm	PM-125-45-105.00
		89mm	PM-125-89-105.00
		112mm	PM-125-112-105.00

Note: Metric liner bushings are the same as metric press-fit bushings.

Round & Diamond Locating Pins

Now Available With LIFE-EX® Coating

Nice shell.





Made from a proprietary PVD coating, **LIFE-EX® Locating Pins are very hard, abrasion resistant, and slippery.**

The result is a component that has a longer lifecycle for high-production applications.

LIFE-EX® Locating Pins from Carr Lane will have you saying, *"That's one shell of a coating!"*

See Pages 238-239

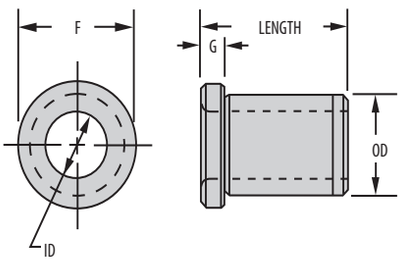
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HEAD LINER BUSHINGS



HL



INCH

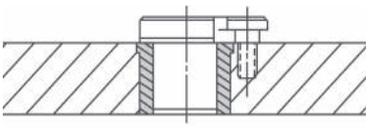
BODY OD	F DIA	G
1/2	5/8	3/32
3/4	7/8	3/32
1	1-1/8	1/8
1-3/8	1-1/2	1/8
1-3/4	1-7/8	3/16
2-1/4	2-3/8	3/16
2-3/4	2-7/8	3/16

METRIC

BODY OD	F DIA	G
12mm	15mm	3mm
15mm	18mm	3mm
18mm	22mm	4mm
22mm	26mm	4mm
26mm	30mm	4mm
30mm	34mm	5mm
35mm	39mm	5mm
42mm	46mm	5mm
48mm	52mm	5mm
55mm	59mm	5mm
62mm	66mm	6mm
70mm	74mm	6mm
78mm	82mm	6mm
85mm	90mm	6mm
95mm	100mm	6mm
105mm	110mm	6mm
115mm	120mm	6mm
125mm	130mm	6mm

APPLICATIONS:

Similar to an L bushing, but with a head to resist heavy axial loads. Head liners are permanent bushings used to hold renewable drill bushings. The head liner's ID has a precise sliding fit with the renewable bushing's OD. The hardened head liner accurately locates the renewable bushing and protects the jig plate from wear caused by frequent bushing replacement. Note: The "length" listed for a head liner refers to its overall length, not its length under the head. Metric head-liner bushings are the same as metric head-press-fit bushings.



ORDERING EXAMPLES:

HL-32-16	Standard inch liner bushing
HL-32-16U	Unground OD
HM-18-25-12.00	Standard metric liner bushing (same as metric press-fit type)

STANDARD LINER ID TOLERANCES:

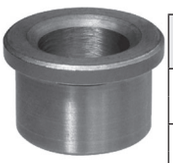
5/16"	+.0001/+.0004	8 to 10mm	+.005/+.014mm
1/2"	+.0002/+.0005	12 to 18mm	+.006/+.017mm
3/4"	+.0003/+.0006	22 to 30mm	+.007/+.020mm
1"	+.0004/+.0007	35 to 48mm	+.009/+.025mm
1-3/8"	+.0006/+.0010	55 to 78mm	+.010/+.029mm
1-3/4"	+.0008/+.0012	85 to 105mm	+.012/+.034mm
2-1/4"	+.0010/+.0015	(G6 tolerance)	

ID RANGE	OD	LENGTH	ANSI PART NO.
5/16	1/2 .5017-.5014 (.520-.515 UNG)	5/16	HL-32-5
		3/8	HL-32-6
		1/2	HL-32-8
		3/4	HL-32-12
		1	HL-32-16
		1-3/8	HL-32-22
1/2	3/4 .7518-.7515 (.770-.765 UNG)	5/16	HL-48-5
		3/8	HL-48-6
		1/2	HL-48-8
		3/4	HL-48-12
		1	HL-48-16
		1-3/8	HL-48-22
		1-1/2	HL-48-24
		1-3/4	HL-48-28
		2-1/8	HL-48-34
3/4	1 1.0018-1.0015 (1.020-1.015 UNG)	1/2	HL-64-8
		3/4	HL-64-12
		1	HL-64-16
		1-3/8	HL-64-22
		1-1/2	HL-64-24
		1-3/4	HL-64-28
		2-1/8	HL-64-34
		2-1/2	HL-64-40
		3	HL-64-48
1	1-3/8 1.3772-1.3768 (1.395-1.390 UNG)	1/2	HL-88-8
		3/4	HL-88-12
		1	HL-88-16
		1-3/8	HL-88-22
		1-1/2	HL-88-24
		1-3/4	HL-88-28
		2-1/8	HL-88-34
		2-1/2	HL-88-40
		3	HL-88-48
1-3/8	1-3/4 1.7523-1.7519 (1.770-1.765 UNG)	3/4	HL-112-12
		1	HL-112-16
		1-3/8	HL-112-22
		1-1/2	HL-112-24
		1-3/4	HL-112-28
		2-1/8	HL-112-34
		2-1/2	HL-112-40
		3	HL-112-48
1-3/4	2-1/4 2.2525-2.2521 (2.270-2.265 UNG)	3/4	HL-144-12
		1	HL-144-16
		1-3/8	HL-144-22
		1-1/2	HL-144-24
		1-3/4	HL-144-28
		2-1/8	HL-144-34
		2-1/2	HL-144-40
		3	HL-144-48
2-1/4	2-3/4 2.7526-2.7522 (2.770-2.765 UNG)	3/4	HL-176-12
		1	HL-176-16
		1-3/8	HL-176-22
		1-1/2	HL-176-24
		1-3/4	HL-176-28
		2-1/8	HL-176-34
		2-1/2	HL-176-40
		3	HL-176-48

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HEAD LINER BUSHINGS – METRIC



HM

ID (G6)	OD (s6)	LENGTH	ANSI PART NO.
8mm	12mm 12.039-12.028mm	10mm	HM-12-10-8.00
		16mm	HM-12-16-8.00
10mm	15mm 15.039-15.028mm	12mm	HM-15-12-10.00
		20mm	HM-15-20-10.00
		25mm	HM-15-25-10.00
12mm	18mm 18.039-18.028mm	12mm	HM-18-12-12.00
		20mm	HM-18-20-12.00
		25mm	HM-18-25-12.00
15mm	22mm 22.048-22.035mm	16mm	HM-22-16-15.00
		28mm	HM-22-28-15.00
		36mm	HM-22-36-15.00
18mm	26mm 26.048-26.035mm	16mm	HM-26-16-18.00
		28mm	HM-26-28-18.00
		36mm	HM-26-36-18.00
22mm	30mm 30.048-30.035mm	20mm	HM-30-20-22.00
		36mm	HM-30-36-22.00
		45mm	HM-30-45-22.00
26mm	35mm 35.059-35.043mm	20mm	HM-35-20-26.00
		36mm	HM-35-36-26.00
		45mm	HM-35-45-26.00
30mm	42mm 42.059-42.043mm	25mm	HM-42-25-30.00
		45mm	HM-42-45-30.00
		56mm	HM-42-56-30.00
35mm	48mm 48.059-48.043mm	25mm	HM-48-25-35.00
		45mm	HM-48-45-35.00
		56mm	HM-48-56-35.00
42mm	55mm 55.072-55.053mm	30mm	HM-55-30-42.00
		56mm	HM-55-56-42.00
		67mm	HM-55-67-42.00
48mm	62mm 62.072-62.053mm	30mm	HM-62-30-48.00
		56mm	HM-62-56-48.00
		67mm	HM-62-67-48.00
55mm	70mm 70.078-70.059mm	30mm	HM-70-30-55.00
		56mm	HM-70-56-55.00
		67mm	HM-70-67-55.00
62mm	78mm 78.078-78.059mm	35mm	HM-78-35-62.00
		67mm	HM-78-67-62.00
		78mm	HM-78-78-62.00
70mm	85mm 85.093-85.071mm	35mm	HM-85-35-70.00
		67mm	HM-85-67-70.00
		78mm	HM-85-78-70.00
78mm	95mm 95.093-95.071mm	40mm	HM-95-40-78.00
		78mm	HM-95-78-78.00
		105mm	HM-95-105-78.00
85mm	105mm 105.101-105.079mm	40mm	HM-105-40-85.00
		78mm	HM-105-78-85.00
		105mm	HM-105-105-85.00
95mm	115mm 115.101-115.079mm	45mm	HM-115-45-95.00
		89mm	HM-115-89-95.00
		112mm	HM-115-112-95.00
105mm	125mm 125.117-125.092mm	45mm	HM-125-45-105.00
		89mm	HM-125-89-105.00
		112mm	HM-125-112-105.00

Note: Metric head-liner bushings are the same as metric head-press-fit bushings.

Alignment Pins

Strength and Precision



Ball Lock Pins (L, T. button or Ring Handles)

Detent Pins

- Wide assortment of quality ball lock and detent pins for precision alignment
- In steel or stainless steel
- A wide selection of other alignment pins are available

See Pages 27-65

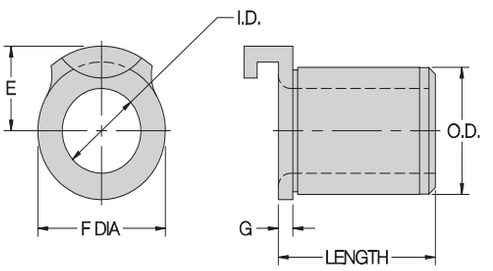
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UN-A-LOK™ LINER BUSHINGS



UL
ULM



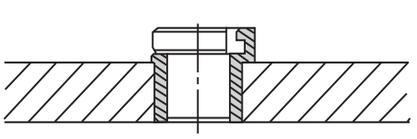
INCH

BODY OD	E	F DIA	G
5/16	1/4	.365	3/32
1/2	3/8	9/16	3/32
3/4	1/2	13/16	3/32
1	21/32	1-1/16	1/8
1-3/8	7/8	1-7/16	1/8

METRIC

BODY OD	E	F DIA	G
12mm	9.5mm	15mm	3mm
15mm	11mm	18mm	3mm
18mm	13mm	22mm	4mm
22mm	15.5mm	26mm	4mm
26mm	17.5mm	30mm	4mm

APPLICATIONS:
Similar to an HL head liner, but incorporating a special locking tab that eliminates the need for a lockscrew. Un-A-Lok™ liners are permanent bushings used to hold SF renewable drill bushings (on the "slip" side only, not the "fixed" side). Although slightly more expensive than a head liner plus a lockscrew, installation time is dramatically reduced. **Patent no. 3,015,242 and 3,099,079**.



ORDERING EXAMPLES:

UL-20-5	Standard inch liner bushing
UL-20-5U	Unground OD
ULM-12-10	Standard metric liner bushing

STANDARD LINER ID TOLERANCES:

3/16 to 5/16"	+.0001/+.0004	8 to 10mm	+.005/+.014mm
1/2"	+.0002/+.0005	12 to 18mm	+.006/+.017mm
3/4"	+.0003/+.0006	(G6 tolerance)	
1"	+.0004/+.0007		

INCH

ID	OD	LENGTH	ANSI PART NO.
3/16	5/16 .3141-.3138 (.327-.322 UNG)	5/16	UL-20-5
		3/8	UL-20-6
		1/2	UL-20-8
		3/4	UL-2012
5/16	1/2 .5017-.5014 (.520-.515 UNG)	3/8	UL-32-6
		1/2	UL-32-8
		3/4	UL-32-12
1/2	3/4 .7518-.7515 (.770-.765 UNG)	1/2	UL-48-8
		3/4	UL-48-12
		1	UL-48-16
3/4	1 1.0018-1.0015 (1.020-1.015 UNG)	1/2	UL-64-8
		3/4	UL-64-12
		1	UL-64-16
1	1-3/8 1.3772-1.3768 (1.395-1.390 UNG)	1/2	UL-88-8
		3/4	UL-88-12
		1	UL-88-16
		1-3/8	UL-88-22

METRIC

ID (G6)	OD (s6)	LENGTH	PART NO.
8mm	12mm 12.039-12.028mm	10mm	ULM-12-10-8.00
		16mm	ULM-12-16-8.00
10mm	15mm 15.039-15.028mm	12mm	ULM-15-12-10.00
		20mm	ULM-15-20-10.00
		25mm	ULM-15-25-10.00
12mm	18mm 18.039-18.028mm	12mm	ULM-18-12-12.00
		20mm	ULM-18-20-12.00
		25mm	ULM-18-25-12.00
15mm	22mm 22.048-22.035mm	16mm	ULM-22-16-15.00
		28mm	ULM-22-28-15.00
		36mm	ULM-22-36-15.00
18mm	26mm 26.048-26.035mm	16mm	ULM-26-16-18.00
		28mm	ULM-26-28-18.00
		36mm	ULM-26-36-18.00

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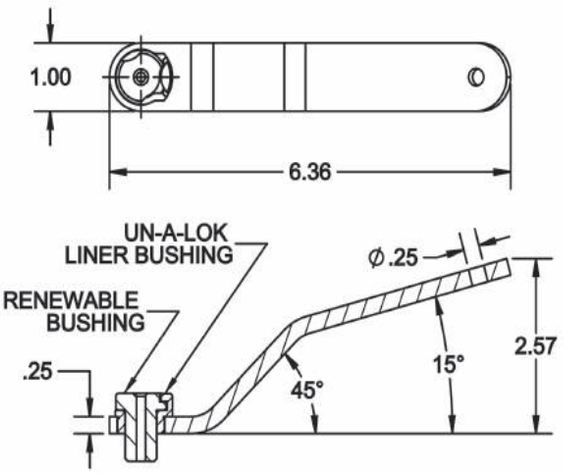
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BUSHING HANDLES

QUICK-CHANGE HANDLE: ALUMINUM WITH 1144 STEEL UN-A-LOK LINER
PERMANENT HANDLE: MILD STEEL

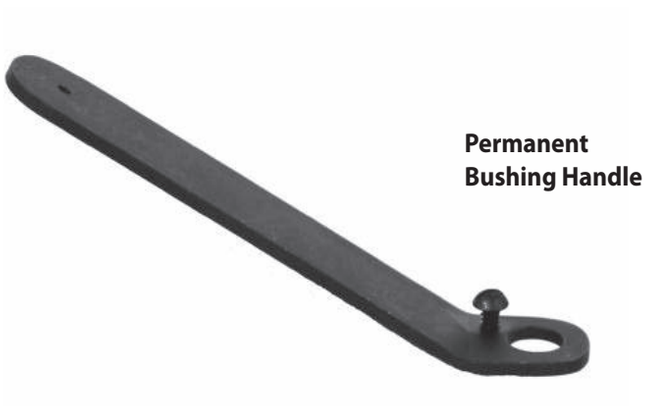


Quick-Change Bushing Handle

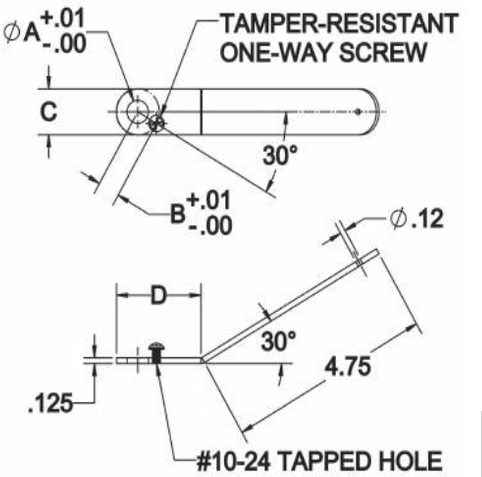


Quick-Change Bushing Handles are ready to hold any Slip/Fixed Renewable Drill Bushing in a choice of three OD sizes – 3/16, 5/16, or 1/2". These comfortable, high-quality handles provide convenient handling and extra support when using a portable drill motor. A Un-A-Lok liner bushing permanently installed in the handle provides excellent wear resistance and quick bushing changes. The handle is provided with a hole in the end for cable attachment.

PART NO.	SF BUSHING OD
CL-12-BHQC	3/16
CL-20-BHQC	5/16
CL-32-BHQC	1/2



Permanent Bushing Handle



Permanent Bushing Handles are designed for one-time installation of a Slip/Fixed Bushing directly into the steel handle, where it is fastened with a tamper-resistant one-way screw to create a permanent assembly. The handle is provided with a hole in the end for cable attachment.

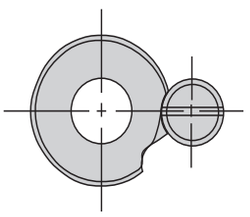
PART NO.	SF BUSHING OD	A DIA	B	C	D
CL-20-BH	5/16	.313	.383	1	1.12
CL-32-BH	1/2	.501	.508	1	1.12

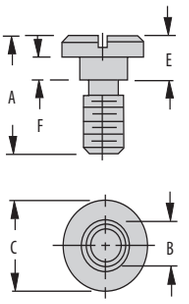
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LOCKSCREWS AND CLAMPS

LOCKSCREWS







The most popular locking device for renewable drill bushings. Use on either the "slip" or "fixed" side of a slip-fixed bushing. Simple, strong, compact, and economical.

STANDARD MOUNTING (INCH)

PART NO. (PACK OF 5)	A	B DIA	C DIA	E	F	THREAD
LS-0-PACKOF5	7/16	3/16	5/16	3/16	.105/.100	#8-32
LS-1-PACKOF5	5/8	3/8	5/8	1/4	.138/.132	5/16-18
LS-2-PACKOF5	7/8			3/8	.200/.194	
LS-3-PACKOF5	1	7/16	3/4	3/8	.200/.194	3/8-16
LS-4-PACKOF5*	1-1/16			7/16	.231/.225	
LS-5-PACKOF5*	1-1/8			1/2	.263/.257	

STANDARD MOUNTING – THINWALL (INCH)

TW-1-PACKOF5	7/16	3/16	5/16	3/16	.105/.100	#8-32
TW-2-PACKOF5	1/2	1/4	3/8	1/4	.138/.132	#10-32
TW-3-PACKOF5	11/16		7/16	3/8	.200/.194	
TW-4-PACKOF5	7/8	3/8	9/16	1/2	.263/.257	5/16-18
TW-5-PACKOF5	1	3/8	5/8	5/8	.325/.319	
TW-7-PACKOF5	3/4			3/8	.200/.194	

STANDARD MOUNTING (METRIC)

LSM-1-PACKOF5	15mm	7.5mm	13mm	6mm	3.3mm	M5
LSM-3-PACKOF5	18mm	9.5mm	16mm	8mm	4.3mm	M6
LSM-5-PACKOF5	22mm	12mm	20mm	10mm	5.8mm	M8
LSM-7-PACKOF5	32mm	15mm	24mm	12mm	7.3mm	M10

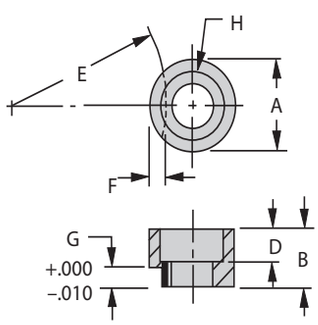
PROJECTED MOUNTING (METRIC)

LSM-2-PACKOF5	18mm	7.5mm	13mm	9mm	6.3mm	M5
LSM-4-PACKOF5	22mm	9.5mm	16mm	12mm	8.3mm	M6
LSM-6-PACKOF5	27mm	12mm	20mm	15mm	10.8mm	M8
LSM-8-PACKOF5	38mm	15mm	24mm	18mm	13.3mm	M10

* For extended-range bushings.

ROUND CLAMPS





Alternative to lockscrews when using the "fixed" side of a slip-fixed SF bushing. Round clamps have less clearance under their heads, to clamp bushings tighter (which is why you cannot use them on the bushing's "slip" side). Use them with a Socket-Head Cap Screw.

STANDARD MOUNTING (INCH)

PART NO.	A DIA	B	D	E	F	G	H SOCKET-HEAD CAP SCREW	REPLACES LOCK SCREW
RC-01	5/8	5/16	5/32	17/32	.109	.125	5/16-18	LS-1
RC-02		7/16	7/32	29/32	.125	.188		LS-2
RC-03	3/4	1/2	9/32	1-13/32	.156	.188	3/8-16	LS-3
RC-04*		17/32	1/4	2-1/2		.219		LS-4
RC-05*		9/16				.250		LS-5

STANDARD MOUNTING (METRIC)

RCM-1	13mm	8mm	4mm	9.5mm	2.8mm	3mm	M5	LSM-1
RCM-3	16mm	10mm	5mm	15mm	3.3mm	4mm	M6	LSM-3
RCM-5	20mm	12mm	5mm	30mm	3.8mm	5.5mm	M8	LSM-5
RCM-7	24mm	16mm	7mm	80mm	4.5mm	7mm	M10	LSM-7

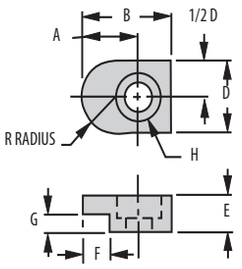
* For extended-range bushings.

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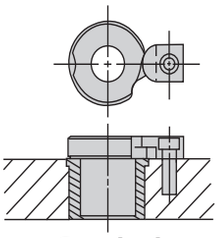
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ROUND END CLAMPS

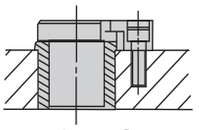




A heavy-duty alternative to lockscrews. Allows locating tapped hole farther away from bushing to avoid interference with a larger liner. Use on either the "slip" or "fixed" side of a slip-fixed renewable bushing. Available in two heights: standard for recessed liner mounting; tall for projected head-liner mounting. Use with a Socket-Head Cap Screw.



Standard Mounting



Projected Mounting

STANDARD MOUNTING (INCH)

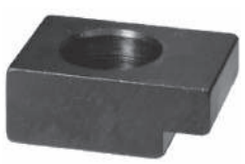
PART NO.	A	B	D	E	F	G	H SOCKET-HEAD CAP SCREW	R
RK-01	7/16	3/4	5/4	5/16	3/16	1/8	1/4-20	5/16
RK-02	1/2			3/8	1/4	3/16		
RK-03	5/8	1	3/4	3/8	5/16	3/16	5/16-18	3/8
RK-04*	11/16	1-1/8	3/4	7/16	5/16	7/32	3/8-16	3/8
RK-05*				1/2		1/4		

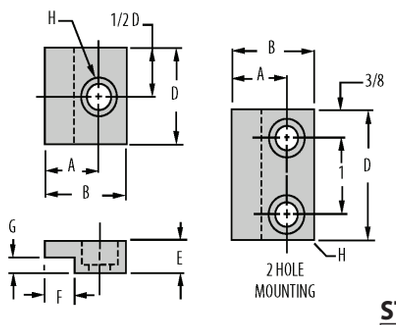
PROJECTED MOUNTING (INCH)

RK-10	7/16	3/4	5/8	3/8	3/16	7/32	1/4-20	5/16
RK-11						1/4		
RK-12	1/2			1/2	1/4	5/16		
RK-13						3/8		
RK-14	5/8	1	3/4	1/2	5/16	3/8	3/8-16	3/8

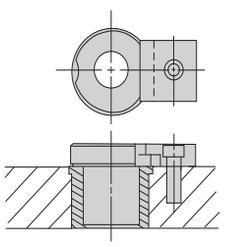
* For extended-range bushings.

FLAT CLAMPS

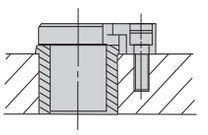




Use to lock FM-type fixed-renewable bushings which have a milled locking flat. Available in two heights: standard for recessed liner mounting; tall for projected head-liner mounting. Use with one or two Socket-Head Cap Screws.



Standard Mounting



Projected Mounting

STANDARD MOUNTING (INCH)

PART NO.	NO. OF HOLES	A	B	D	E	F	G	H SOCKET-HEAD CAP SCREW
FC-01	1	1/2	7/8	5/8	5/16	3/16	1/8	1/4-20
FC-02		5/8	1	1	3/8	1/4	3/16	5/16-18
FC-03			1-1/8			5/16		
FC-04*	1	51/64	1-11/64	1-1/4	3/8	27/64	7/32	3/8-16
FC-05*	2			1-3/4				
FC-06*	1			1-1/4	1/2		1/4	
FC-07*	2			1-3/4				

PROJECTED MOUNTING (INCH)

FC-10	1	1/2	7/8	5/8	3/8	3/16	7/32	1/4-20
FC-11							1/4	
FC-12	1	5/8	1	1	1/2	1/4	5/16	5/16-18
FC-13							3/8	

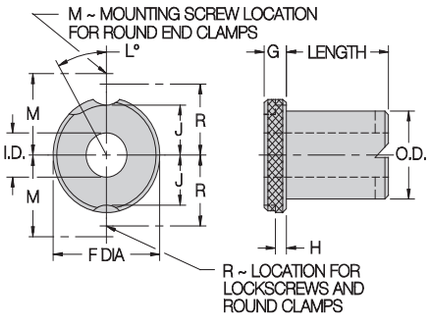
* For extended-range bushings.

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CHIP-BREAKER BUSHINGS



CH



INCH

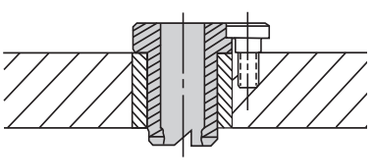
BODY OD	F	G	H	J	L	M	R	LOCK SCREW
5/16	35/64	1/4	1/8	11/64	65°	5/8	1/2	LS-1
1/2	51/64			19/64	65°	3/4	5/8	
3/4	1-3/64			27/64	50°	7/8	3/4	
1	1-27/64	3/8	3/16	19/32	35°	1-7/64	59/64	LS-2
1-3/8	1-51/64			25/32	30°	1-19/64	1-7/64	
1-3/4	2-19/64	3/8	3/16	1	30°	1-41/64	1-25/64	LS-3
2-1/4	2-51/64			1-1/4	25°	1-57/64	1-41/64	

METRIC

8mm	15mm	6mm	3mm	4.5mm	65°		11.5mm	LSM-1
10mm	18mm			6mm	65°		13mm	LSM-2
12mm	22mm	8mm	4mm	7.5mm	60°		16mm	LSM-3 LSM-4
15mm	26mm			9.5mm	50°		18mm	
18mm	30mm			11.5mm	50°		20mm	
22mm	34mm	10mm	5.5mm	13mm	35°		23.5mm	LSM-5 LSM-6
26mm	39mm			15.5mm	35°		26mm	
30mm	46mm			19mm	30°		29.5mm	
35mm	52mm			22mm	30°		32.5mm	
42mm	59mm			25.5mm	30°		36mm	
48mm	66mm	12mm	7mm	28.5mm	30°		41mm	LSM-7 LSM-8
55mm	74mm			32.5mm	25°		45mm	
62mm	82mm			36.5mm	25°		49mm	

APPLICATIONS:

Similar to an SF renewable bushing, but with specially designed chip-breaking notches on the drill-exit end. Use to break up chips from tough stringy materials, to reduce friction and heat buildup. Reduces bushing wear at the drill-exit end and reduces the chance of tool or workpiece damage. A chip-breaker bushing should extend beyond its liner to allow chips to escape. Chip breakers are also available on other bushing types such as P, H, and DC (directed coolant).



ORDERING EXAMPLES:

CH-20-16-.1250	Standard inch SF-type bushing with chip breaker, inch ID
CH-20-16-.1772	Standard inch SF-type bushing with chip breaker, mm ID (.1772 = 4.50mm)
CH-20-16-.1250 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
CHM-10-20-4.50	Standard metric SF-type bushing with chip breaker
PCH-20-16-.1250	P bushing with chip breaker
HCH-20-16-.1250	H bushing with chip breaker
DCCH-20-16-.1250	Directed coolant bushing with chip breaker

STANDARD ID TOLERANCES:

From #80 to 1/4"	+.0001/+.0004	From .35 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to 1-1/2"	+.0002/+.0006	Over 18 to 30mm	+.007/+.020mm
		Over 30 to 50mm	+.009/+.025mm
Over 1-1/2 to 2-3/4"	+.0003/+.0007	(G6 tolerance)	

ID RANGE	OD	LENGTH	ANSI PART NO.	LOCK SCREW
.0625-.0934 1/16-#43 1.60-2.35mm	**5/16** .3125-.3123	*3/4	CH-20-12	LS-1 RC-01 RK-01 RK-10
		*1	CH-20-16	
		*1-3/8	CH-20-22	
.0935-.1935 #42-#10 2.40-4.90mm		*3/4	CH-20-12	LS-1 RC-01 RK-01 RK-10
		*1	CH-20-16	
		*1-3/8	CH-20-22	
.1405-.3438 #28-11/32 3.60-8.70mm	**1/2** .5000-.4998	*3/4	CH-32-12	LS-1 RC-01 RK-01 RK-10
		*1	CH-32-16	
		*1-3/8	CH-32-22	
		*1-3/4	CH-32-28	
		*2-1/8	CH-32-34	
.2812-.5625 9/32-9/16 7.20-14.00mm	**3/4** .7500-.7498	1	CH-48-16	LS-1 RC-01 RK-01 RK-11
		1-3/8	CH-48-22	
		1-3/4	CH-48-28	
		2-1/8	CH-48-34	
		*2-1/2	CH-48-40	
.4688-.7812 15/32-25/32 11.50-19.50mm	**1** 1.0000-.9998	1	CH-64-16	LS-2 RC-02 RK-02 RK-12
		1-3/8	CH-64-22	
		1-3/4	CH-64-28	
		2-1/8	CH-64-34	
		2-1/2	CH-64-40	
		3	CH-64-48	
.7188-1.0625 23/32–1-1/16 18.50-27.00mm	**1-3/8** 1.3750-1.374	1	CH-88-16	LS-2 RC-02 RK-02 RK-12
		1-3/8	CH-88-22	
		1-3/4	CH-88-28	
		2-1/8	CH-88-34	
		2-1/2	CH-88-40	
		3	CH-88-48	
.9688-1.4062 31/32–1-13/32 25.00-35.00mm	**1-3/4** 1.7500-1.7497	1-3/8	CH-112-22	LS-3 RC-03 RK-03 RK-13
		1-3/4	CH-112-28	
		2-1/8	CH-112-34	
		2-1/2	CH-112-40	
		3	CH-112-48	
1.3438-1.8750 1-11/32–1-7/8 35.00-47.00mm	**2-1/4** 2.2500-2.2496	1-3/8	CH-144-22	LS-3 RC-03 RK-03 RK-13
		1-3/4	CH-144-28	
		2-1/8	CH-144-34	
		2-1/2	CH-144-40	
		3	CH-144-48	

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

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CHIP-BREAKER BUSHINGS – METRIC

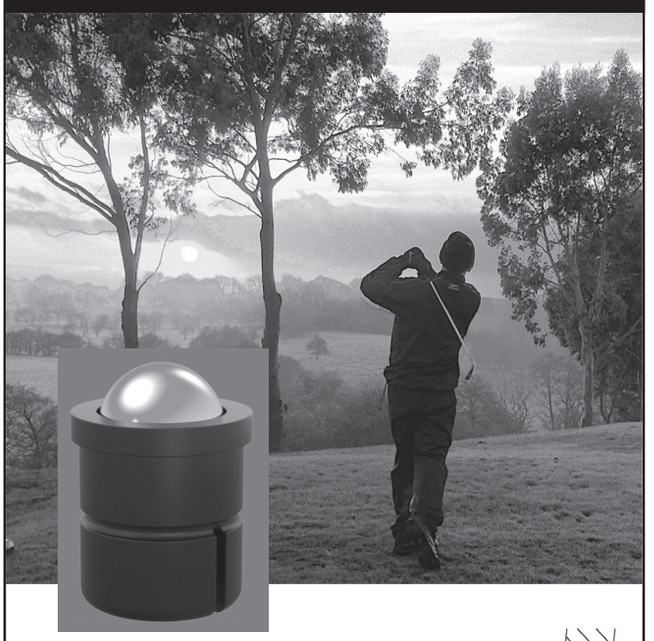


CHM

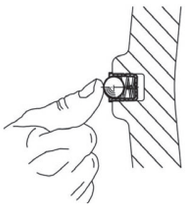
ID RANGE (G6)	OD (h5)	LENGTH	ANSI PART NO.	LOCK SCREW
1.00-4.00mm	**8mm** 8.000-7.994mm	*10mm	CHM-8-10	LSM-1 LSM-2 RCM-1 RCM-2
		*16mm	CHM-8-16	
4.01-6.00mm	**10mm** 10.000-9.994mm	12mm	CHM-10-12	
		20mm	CHM-10-20	
		25mm	CHM-10-25	
6.01-8.00mm	**12mm** 12.000-11.992mm	12mm	CHM-12-12	LSM-3 LSM-4 RCM-3 RCM-4
		20mm	CHM-12-20	
		25mm	CHM-12-25	
8.01-10.00mm	**15mm** 15.000-14.992mm	16mm	CHM-15-16	
		28mm	CHM-15-28	
		36mm	CHM-15-36	
10.01-12.00mm	**18mm** 18.000-17.992mm	16mm	CHM-18-16	
		28mm	CHM-18-28	
		36mm	CHM-18-36	
12.01-15.00mm	**22mm** 22.000-21.991mm	20mm	CHM-22-20	LSM-5 LSM-6 RCM-5 RCM-6
		36mm	CHM-22-36	
		45mm	CHM-22-45	
15.01-18.00mm	**26mm** 26.000-25.991mm	20mm	CHM-26-20	
		36mm	CHM-26-36	
		45mm	CHM-26-45	
18.01-22.00mm	**30mm** 30.000-29.991mm	25mm	CHM-30-25	
		45mm	CHM-30-45	
		56mm	CHM-30-56	
22.01-26.00mm	**35mm** 35.000-34.989mm	25mm	CHM-35-25	
		45mm	CHM-35-45	
		56mm	CHM-35-56	
26.01-30.00mm	**42mm** 42.000-41.989mm	30mm	CHM-42-30	
		56mm	CHM-42-56	
		67mm	CHM-42-67	
30.01-35.00mm	**48mm** 48.000-47.989mm	30mm	CHM-48-30	LSM-7 LSM-8 RCM-7 RCM-8
		56mm	CHM-48-56	
		67mm	CHM-48-67	
35.01-42.00mm	**55mm** 55.000-54.987mm	30mm	CHM-55-30	
		56mm	CHM-55-56	
		67mm	CHM-55-67	
42.01-48.00mm	**62mm** 62.000-61.987mm	35mm	CHM-62-35	
		67mm	CHM-62-67	
		78mm	CHM-62-78	

* Small metric drill sizes through .80mm are counterbored 1.00mm diameter, with 3mm drill-bearing length.

Precision All in One Shot.



Thanks to their flexible body design, Self-Retaining Ball Plungers from Carr Lane Mfg. can be securely installed in an ordinary drilled hole, very often simply by hand.



The slotted end of the thermoplastic body expands to compensate for hole tolerances up to .008".

Eliminate an extra machining step with Self-Retaining Ball Plungers.

Carr Lane MANUFACTURING CO.

See page 177

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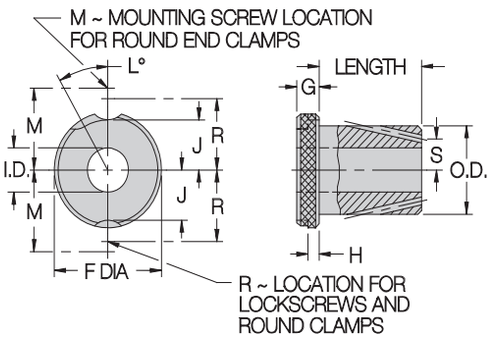
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DIRECTED-COOLANT BUSHINGS



DC



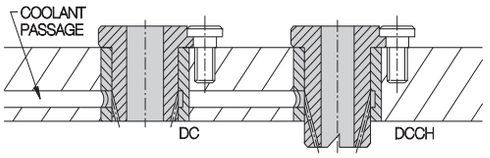
BODY OD	F DIA	G	H	J	L	M	N DIA
5/16	35/64	1/4	1/8	11/64	65°	5/8	5/8
1/2	51/64			19/64	65°	3/4	7/8
3/4	1-3/64			27/64	50°	7/8	1-1/8
1	1-27/64	3/8	3/16	19/32	35°	1-7/64	1-1/2
1-3/8	1-51/64			25/32	30°	1-19/64	1-7/8
1-3/4	2-19/64			1	30°	1-41/64	2-3/8
2-1/4	2-51/64			1-1/4	25°	1-57/64	2-7/8

BODY OD	P	Q	R	S	T DIA	U DIA	V
5/16	3/32	3/16	1/2	5/64	.067	25/64	5/32
1/2	3/32	5/16**	5/8	9/64	.093	19/32**	7/32**
3/4	1/8	5/16	3/4	17/64	.104	55/64	7/32
1	1/8	5/16	59/64	23/64	.125	1-5/32	7/32
1-3/8	3/16	7/16	1-7/64	17/32	.147	1-17/32	9/32
1-3/4	3/16		1-25/64	11/16	.173	1-31/32	
2-1/4	3/16		1-41/64	7/8	.173	2-15/32	

** Q = 3/16, U = 39/64, V = 5/32 on 1/2" long liner bushings.

APPLICATIONS:

Similar to an SF renewable bushing, but with passages to direct coolant to the cutting area. This design is particularly good for washing away chips, especially when ordered as the combination Directed Coolant Chip Breaker (DCCH). DC bushings require special liners, DCL or DCHL, to direct coolant from a drilled manifold passage to the holes in the bushing's OD wall. **INFO+**: Important note: Always order matching liner length (see page 571.)



ORDERING EXAMPLES:

DC-20-12-.1250	Standard inch directed-coolant bushing, inch ID
DCCH-20-16-.1250	Same as above, except with chip breakers (go to next length so that chip breakers extend beyond the liner)
DC-20-12-.1772	Standard inch directed-coolant bushing, mm ID (.1772 = 4.50 mm)
DC-20-12-.1250 REAMER	Reamer tolerance on ID
DC-20-12-.1250 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
DCL-32-12	Liner for renewable bushings above
DCHL-32-12	Head liner for renewable bushings above

STANDARD ID TOLERANCES:

From #80 to 1/4"	+.0001/+.0004	From .35 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to 1-1/2"	+.0002/+.0006	Over 18 to 30mm	+.007/+.020mm
		Over 30 to 50mm	+.009/+.025mm
Over 1-1/2 to 2-3/4"	+.0003/+.0007		

REAMER ID TOLERANCES:

From #60 to 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
Over 1 to 1-1/2"	+.0008/+.0012	Over 18 to 30mm	+.020/+.033mm

STANDARD LINER ID TOLERANCES:

5/16"	+.0001/+.0004	1-3/8"	+.0006/+.0010
1/2"	+.0002/+.0005	1-3/4"	+.0008/+.0012
3/4"	+.0003/+.0006	2-1/4"	+.0010/+.0015
1"	+.0004/+.0007		

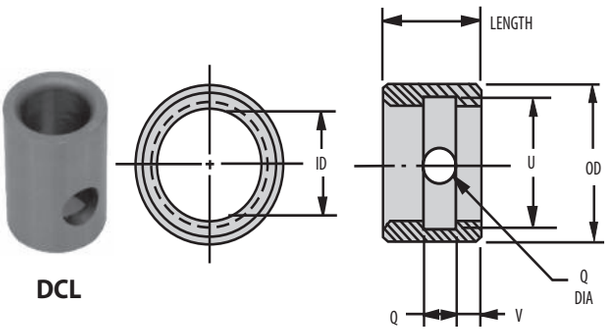
ID RANGE	OD	LENGTH	ANSI PART NO.	LOCK SCREW
.0625-.0934 1/16-#43 1.60-2.35mm	**5/16** .3125-.3123	*3/4	DC-20-12	LS-1 RC-01 RK-01 RK-11
		*1	DC-20-16	
		*1-3/8	DC-20-22	
.0935-.1935 #42-#10 2.40-4.90mm		*3/4	DC-20-12	LS-1 RC-01 RK-01 RK-11
		*1	DC-20-16	
		*1-3/8	DC-20-22	
1405-.3438 #28-11/32 3.60-8.70mm	**1/2** .5000-.4998	*3/4	DC-32-12	LS-1 RC-01 RK-01 RK-11
		*1	DC-32-16	
		*1-3/8	DC-32-22	
		*1-3/4	DC-32-28	
		*2-1/8	DC-32-34	
.2812-.5625 9/32-9/16 7.20-14.00mm	**3/4** .7500-.7498	1	DC-48-16	LS-1 RC-01 RK-01 RK-11
		1-3/8	DC-48-22	
		1-3/4	DC-48-28	
		2-1/8	DC-48-34	
		*2-1/2	DC-48-40	
.4688-.7812 15/32-25/32 11.50-19.50mm	**1** 1.0000-.9998	1	DC-64-16	LS-2 RC-02 RK-02 RK-12
		1-3/8	DC-64-22	
		1-3/4	DC-64-28	
		2-1/8	DC-64-34	
		2-1/2	DC-64-40	
		3	DC-64-48	
.7188-1.0625 23/32–1-1/16 18.50-27.00mm	**1-3/8** 1.3750-1.3747	1	DC-88-16	LS-2 RC-02 RK-02 RK-12
		1-3/8	DC-88-22	
		1-3/4	DC-88-28	
		2-1/8	DC-88-34	
		2-1/2	DC-88-40	
		3	DC-88-48	
.9688-1.4062 31/32–1-13/32 25.00-35.00mm	**1-3/4** 1.7500-1.7497	1-3/8	DC-112-22	LS-3 RC-03 RK-03 RK-13
		1-3/4	DC-112-28	
		2-1/8	DC-112-34	
		2-1/2	DC-112-40	
		3	DC-112-48	
1.3438-1.8750 1-11/32–1-7/8 35.00-47.00mm	**2-1/4** 2.2500-2.2496	1-3/8	DC-144-22	LS-3 RC-03 RK-03 RK-13
		1-3/4	DC-144-28	
		2-1/8	DC-144-34	
		2-1/2	DC-144-40	
		3	DC-144-48	

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

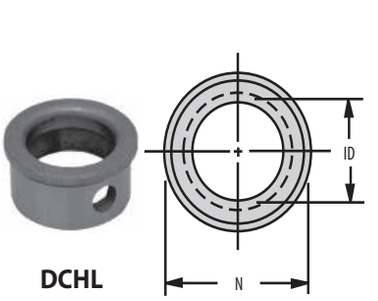
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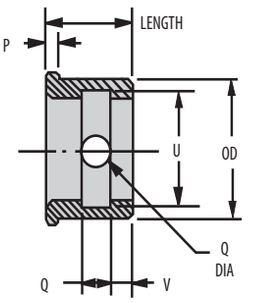
DIRECTED-COOLANT BUSHINGS



DCL



DCHL



INFO+: See below and page 570 for dimensions.

LINERS

ID	OD	LENGTH	PART NO.	MATCHING RENEWABLE BUSHING	
				STANDARD	CHIP BREAKER
5/16	**1/2** .5017-.5014 (.520-.515 UNG)	1/2	DCL-32-8	—	DCCH-20-12
		3/4	DCL-32-12	DC-20-12	DCCH-20-16
		1	DCL-32-16	DC-20-16	DCCH-20-22
		1-3/8	DCL-32-22	DC-20-22	—
1/2	**3/4** .7518-.7515 (.770-.765 UNG)	1/2	DCL-48-8	—	DCCH-32-12
		3/4	DCL-48-12	DC-32-12	DCCH-32-16
		1	DCL-48-16	DC-32-16	DCCH-32-22
		1-3/8	DCL-48-22	DC-32-22	DCCH-32-28
		1-3/4	DCL-48-28	DC-32-28	DCCH-32-34
		2-1/8	DCL-48-34	DC-32-34	—
3/4	**1** 1.0018-1.0015 (1.020-1.015 UNG)	3/4	DCL-64-12	—	DCCH-48-16
		1	DCL-64-16	DC-48-16	DCCH-48-22
		1-3/8	DCL-64-22	DC-48-22	DCCH-48-28
		1-3/4	DCL-64-28	DC-48-28	DCCH-48-34
		2-1/8	DCL-64-34	DC-48-34	DCCH-48-40
		2-1/2	DCL-64-40	DC-48-40	—
1	**1-3/8** 1.3772-1.3768 (1.395-1.390 UNG)	3/4	DCL-88-12	—	DCCH-64-16
		1	DCL-88-16	DC-64-16	DCCH-64-22
		1-3/8	DCL-88-22	DC-64-22	DCCH-64-28
		1-3/4	DCL-88-28	DC-64-28	DCCH-64-34
		2-1/8	DCL-88-34	DC-64-34	DCCH-64-40
		2-1/2	DCL-88-40	DC-64-40	DCCH-64-48
		3	DCL-88-48	DC-64-48	—
1-3/8	**1-3/4** 1.7523-1.7519 (1.770-1.765 UNG)	3/4	DCL-112-12	—	DCCH-88-16
		1	DCL-112-16	DC-88-16	DCCH-88-22
		1-3/8	DCL-112-22	DC-88-22	DCCH-88-28
		1-3/4	DCL-112-28	DC-88-28	DCCH-88-34
		2-1/8	DCL-112-34	DC-88-34	DCCH-88-40
		2-1/2	DCL-112-40	DC-88-40	DCCH-88-48
		3	DCL-112-48	DC-88-48	—
1-3/4	**2-1/4** 2.2525-2.2521 (2.270-2.265 UNG)	1	DCL-144-16	—	DCCH-112-22
		1-3/8	DCL-144-22	DC-112-22	DCCH-112-28
		1-3/4	DCL-144-28	DC-112-28	DCCH-112-34
		2-1/8	DCL-144-34	DC-112-34	DCCH-112-40
		2-1/2	DCL-144-40	DC-112-40	DCCH-112-48
		3	DCL-144-48	DC-112-48	—
2-1/4	**2-3/4** 2.7526-2.7522 (2.770-2.765 UNG)	1	DCL-176-16	—	DCCH-144-22
		1-3/8	DCL-176-22	DC-144-22	DCCH-144-28
		1-3/4	DCL-176-28	DC-144-28	DCCH-144-34
		2-1/8	DCL-176-34	DC-144-34	DCCH-144-40
		2-1/2	DCL-176-40	DC-144-40	DCCH-144-48
		3	DCL-176-48	DC-144-48	—

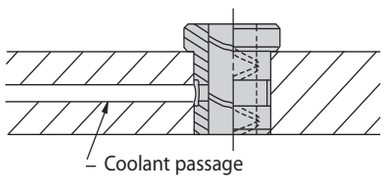
HEAD LINERS

HEAD LINER PART NO.	MATCHING RENEWABLE BUSHING	
	STANDARD	CHIP BREAKER
DCHL-32-8	—	DCCH-20-12
DCHL-32-12	DC-20-12	DCCH-20-16
DCHL-32-16	DC-20-16	DCCH-20-22
DCHL-32-22	DC-20-22	—
DCHL-48-8	—	DCCH-32-12
DCHL-48-12	DC-32-12	DCCH-32-16
DCHL-48-16	DC-32-16	DCCH-32-22
DCHL-48-22	DC-32-22	DCCH-32-28
DCHL-48-28	DC-32-28	DCCH-32-34
DCHL-48-34	DC-32-34	—
DCHL-64-12	—	DCCH-48-16
DCHL-64-16	DC-48-16	DCCH-48-22
DCHL-64-22	DC-48-22	DCCH-48-28
DCHL-64-28	DC-48-28	DCCH-48-34
DCHL-64-34	DC-48-34	DCCH-48-40
DCHL-64-40	DC-48-40	—
DCHL-88-12	—	DCCH-64-16
DCHL-88-16	DC-64-16	DCCH-64-22
DCHL-88-22	DC-64-22	DCCH-64-28
DCHL-88-28	DC-64-28	DCCH-64-34
DCHL-88-34	DC-64-34	DCCH-64-40
DCHL-88-40	DC-64-40	DCCH-64-48
DCHL-88-48	DC-64-48	—
DCHL-112-12	—	DCCH-88-16
DCHL-112-16	DC-88-16	DCCH-88-22
DCHL-112-22	DC-88-22	DCCH-88-28
DCHL-112-28	DC-88-28	DCCH-88-34
DCHL-112-34	DC-88-34	DCCH-88-40
DCHL-112-40	DC-88-40	DCCH-88-48
DCHL-112-48	DC-88-48	—
DCHL-144-16	—	DCCH-112-22
DCHL-144-22	DC-112-22	DCCH-112-28
DCHL-144-28	DC-112-28	DCCH-112-34
DCHL-144-34	DC-112-34	DCCH-112-40
DCHL-144-40	DC-112-40	DCCH-112-48
DCHL-144-48	DC-112-48	—
DCHL-176-16	—	DCCH-144-22
DCHL-176-22	DC-144-22	DCCH-144-28
DCHL-176-28	DC-144-28	DCCH-144-34
DCHL-176-34	DC-144-34	DCCH-144-40
DCHL-176-40	DC-144-40	DCCH-144-48
DCHL-176-48	DC-144-48	—

OIL-GROOVE BUSHINGS



APPLICATIONS:
Oil grooves are available on most drill-bushing types, including P, H, and SF. Use when you need complete drill lubrication and cooling, such as when drilling hardened steel. Oil grooves are specially designed coolant passageways in the bushing's ID wall. Choose from 25 different groove styles. End wipers are also available, to keep out dirt and chips.



ORDERING EXAMPLES:

P-48-16-.5000-AJ	P bushing with AJ oil groove, inch ID
P-48-16-.4724-AJ	P bushing with AJ oil groove, mm ID (.4724 = 12.00mm)
P-48-16-.5000-AJ-AAA	P bushing with AJ oil groove and AAA wiper
SF-48-16-.5000-AJ	SF bushing with AJ oil groove

THREE GENERAL TYPES:
1. With oil hole. A single radial hole in the bushing wall allows coolant to flow from a manifold passage to the internal oil grooves. Bushing must be installed to line up the radial hole with the manifold passage.

2. With oil hole and external groove. OD groove allows coolant to flow around the bushing, then through the radial hole in the bushing's wall to the internal oil grooves. Allows installing the bushing at any orientation, and mounting bushings in series using a single manifold passage. This type is our most popular.

3. Without oil feed. No external coolant feed through a manifold passage, so all coolant enters through the top. This type is also commonly used as a bearing bushing, packed with oil or grease.

OIL-GROOVE STYLES:
We offer a wide selection of oil-groove styles in each general type. This allows choosing a style to suit various operating conditions, lubrication requirements, and individual preferences.

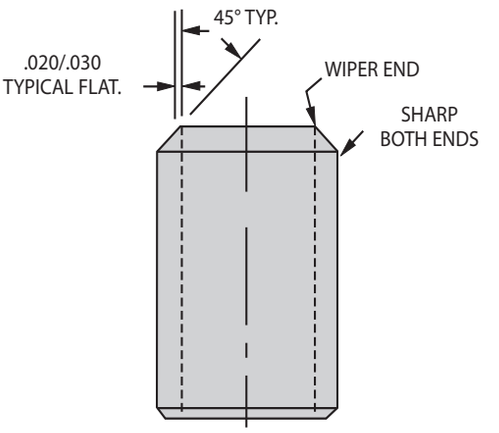
OPTIONAL WIPERS:
To guard against dirt and chips entering the bushing ID, order oil-groove bushings with a wiper end. Note: do not order an oil-groove style that breaks out at the wiper end (AA, AB, AG, AH, AD, or AE). Order style AAA for headless bushings (install wiper in either direction). Order style ABB or ACC for head-type bushings.

TECHNICAL DATA:
Oil-groove dimensions - 1/16" wide x 1/32" deep
Oil-hole dimensions - 1/4" diameter
External-groove dimensions - 5/16" wide x 3/64" deep

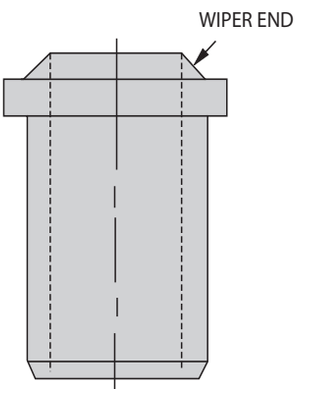
Allowable ID range - 1/2" to 8"
Allowable length range - 1/2" to 8"

Oil grooves stop 1/8" short of bushing end.

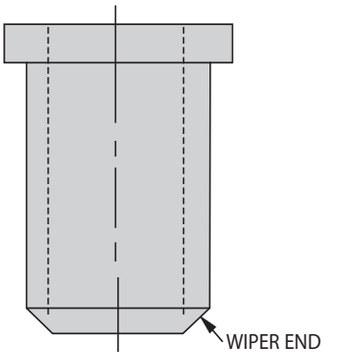
OPTIONAL WIPERS



STYLE AAA
HEADLESS BUSHINGS



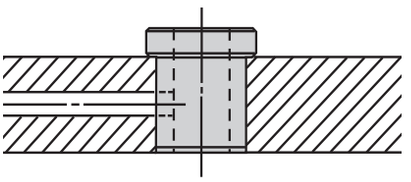
STYLE ABB
HEAD-TYPE BUSHINGS



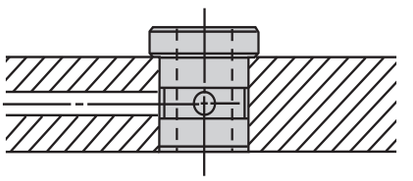
STYLE ACC
HEAD-TYPE BUSHINGS

13

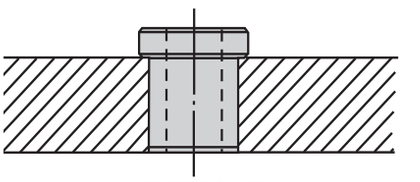
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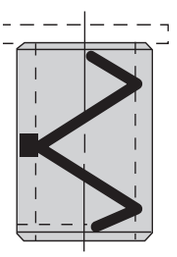
WITH OIL HOLE



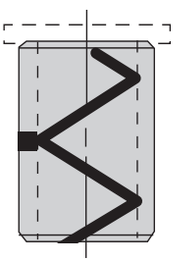
WITH OIL HOLE & EXTERNAL GROOVE



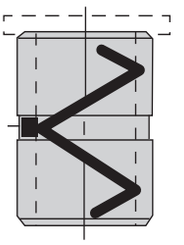
WITHOUT OIL FEED



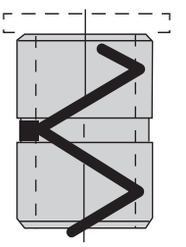
AC
Helix



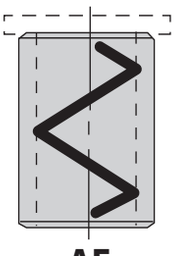
AA
Helix
Open Bottom



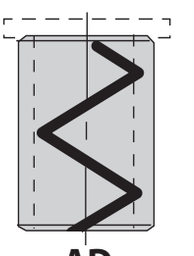
AJ
Helix



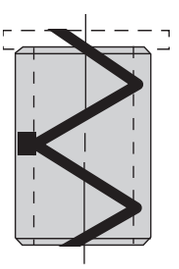
AG
Helix
Open Bottom



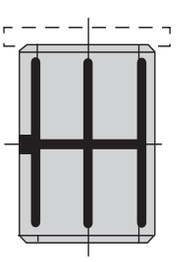
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Helix



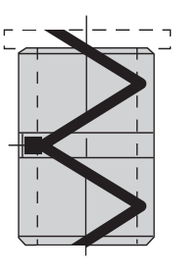
AD
Helix
Open Bottom



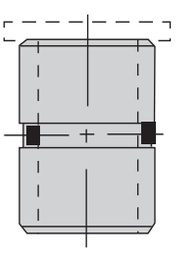
AB
Helix
Open both ends



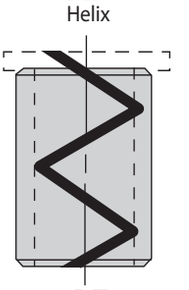
AL
Straight



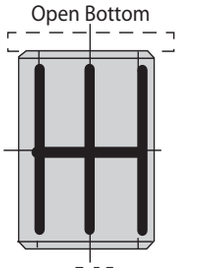
AH
Helix
Open both ends



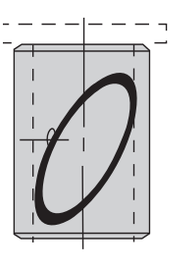
AO
Two Holes



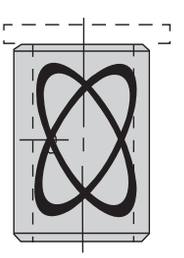
AE
Helix
Open both ends



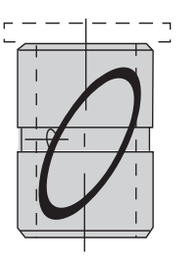
AK
Straight



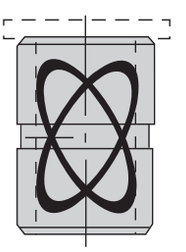
AR
Loop



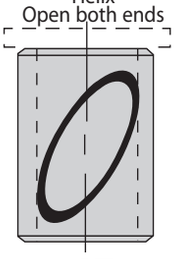
AU
Double Loop



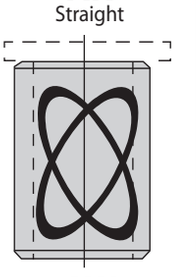
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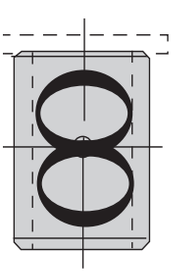
AV
Double Loop



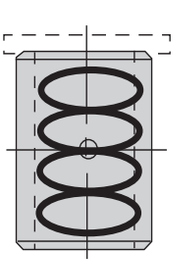
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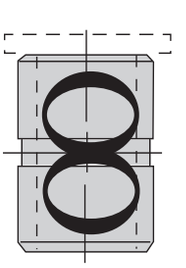
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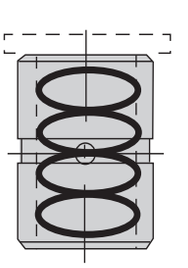
AN
Figure 8



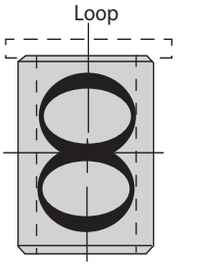
AX
Double Figure 8



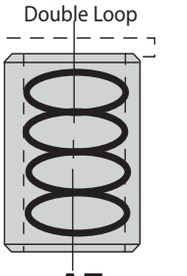
AP
Figure 8



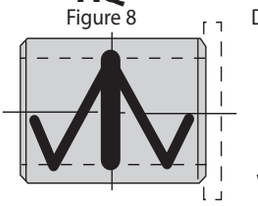
AY
Double Figure 8



AQ
Figure 8



AZ
Double Figure 8



AM
Helix
with ID groove

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OIL-GROOVE BUSHINGS

OIL-GROOVE CONVERSION CHART

Carr Lane Mfg.	Ace	Acme	American	Briney	Economy	United	Universal	Welch
Style AA	Type 1	Style 5	Style 1	Style A	Style A	Style 1A	Style A	Style A
Style AB	Type 2	Style 8	Style 2	Style B	Style B	Style 2A	Style B	Style B
Style AC	Type 3	Style 2	Style 3	Style C	Style C	Style 3A	Style C	Style C
Style AD	Type 4	Style 4	Style 4	Style D	Style D	Style 1	Style D	Style D
Style AE	Type 6	Style 7	Style 5	Style E	Style E	Style 2	Style E	Style E
Style AF	Type 5	Style 1	Style 6	Style F	Style F	Style 3	Style F	Style F
Style AG	Type 7	Style 6	Style 7	Style G	Style G	Style 1B	Style G	Style G
Style AH	Type 8	Style 9	Style 8	Style H	Style H	Style 2B	Style H	Style H
Style AJ	Type 9	Style 3	Style 9	Style J	Style J	Style 3B	Style J	Style J
Style AK	Type 10	Style 10	Style 10	Style K	Style K	Style 4	Style K	Style K
Style AL	Type 11	Style 11	Style 11	Style L	Style L	Style 4A	Style L	Style L
Style AM	Type 12	—	Style 12	Style M	Style M	Style 6	Style M	Style M
Style AN	Type 14	Style 20	Style 13	Style N	Style N	Style 7A	Style N	Style N
Style AO	Type 13	Style 12	Style 14	Style O	Style O	Style 12C	Style O	Style O
Style AP	Type 15	Style 21	Style 15	Style P	Style P	Style 7B	Style P	Style P
Style AQ	Type 16	Style 19	Style 16	Style Q	Style Q	Style 7	Style Q	Style Q
Style AR	Type 17	Style 14	Style 17	Style R	Style R	Style 9A	Style R	Style R
Style AS	Type 18	Style 15	Style 18	Style S	Style S	Style 9B	Style S	Style S
Style AJ	Type 19	Style 13	Style 19	Style T	Style T	Style 9	Style T	Style T
Style AU	Type 20	Style 17	Style 20	Style U	Style U	Style 10A	Style U	Style U
Style AV	Type 21	Style 18	Style 21	Style V	Style V	Style 10B	Style V	Style V
Style AW	Type 22	Style 16	Style 22	Style W	Style W	Style 10	Style W	Style W
Style AX	Type 23	Style 23	Style 23	Style X	Style X	Style 8A	Style X	Style X
Style AY	Type 24	Style 24	Style 24	Style Y	Style Y	Style 8B	Style Y	Style Y
Style AZ	Type 25	Style 22	Style 25	Style Z	Style Z	Style 8	Style Z	Style Z

WIPER CONVERSION CHART

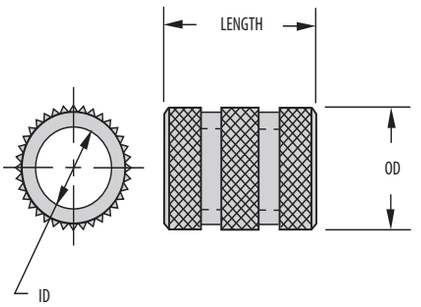
Carr Lane Mfg.	Ace	Acme	American	Briney	Economy	United	Universal	Welch
Style AAA	Type WEA	Style WA	Style A	Style AA	Style AA	Style PE	Style AA	Style AA
Style ABB	Type WEB	Style WB	Style B	Style BB	Style BB	Style HW	Style BB	Style BB
Style ACC	Type WEC	Style WC	Style C	Style CC	Style CC	Style HE	Style CC	Style CC

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DIAMOND-GROOVE BUSHINGS

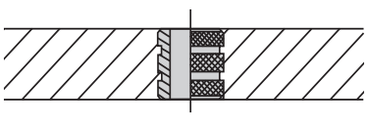


DG



APPLICATIONS:

A bushing for cast-in-place or potted installation. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.



ORDERING EXAMPLES:

DG-26-16-.1875	Standard inch bushing, inch ID
DG-26-16-.1772	Standard inch bushing, mm ID (.1772 = 4.50mm)
DG-26-16-.1875 REAMER	Reamer tolerance on ID
DG-26-16-.1875 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)
DGM-8-12-4.50	Standard metric bushing

Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:

From #55 to 1/4"	+.0001/+.0004	From 1 to 3mm	+.002/+.008mm
		Over 3 to 6mm	+.004/+.012mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
Over 3/4 to 1-1/2"	+.0002/+.0006	Over 18 to 19mm	+.007/+.020mm

(G6 tolerance)

REAMER ID TOLERANCES:

From #60 to 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
		Over 18 to 19mm	+.020/+.033mm

(F6 tolerance)

ID RANGE	OD	LENGTH	ANSI PART NO.
.0520-.0995 #55-#39 1.35-2.50mm	**13/64** .223-.213	1/4	DG-13-4
		5/16	DG-13-5
		3/8	DG-13-6
		1/2	DG-13-8
.0980-.1406 #40-9/64 2.50-3.50mm	**1/4** .275-.260	1/4	DG-16-4
		5/16	DG-16-5
		3/8	DG-16-6
		1/2	DG-16-8
		*3/4	DG-16-12
.1250-.1935 1/8-#10 3.20-4.90mm	**5/16** .337-.322	1/4	DG-20-4
		5/16	DG-20-5
		3/8	DG-20-6
		1/2	DG-20-8
		3/4	DG-20-12
		*1	DG-20-16
.1562-.2570 5/32-F 4.00-6.50mm	**13/32** .431-.416	1/4	DG-26-4
		5/16	DG-26-5
		3/8	DG-26-6
		1/2	DG-26-8
		3/4	DG-26-12
		*1	DG-26-16
.1562-.3160 5/32-O 4.00-8.00mm	**1/2** .525-.510	5/16	DG-32-5
		3/8	DG-32-6
		1/2	DG-32-8
		3/4	DG-32-12
		*1	DG-32-16
.3125-.4375 5/16-7/16 7.90-11.00mm	**5/8** .650-.635	3/8	DG-40-6
		1/2	DG-40-8
		3/4	DG-40-12
		1	DG-40-16
		1-3/8	DG-40-22
.3125-.5312 5/16-17/32 8.00-13.00mm	**3/4** .775-.760	3/8	DG-48-6
		1/2	DG-48-8
		3/4	DG-48-12
		1	DG-48-16
		1-3/8	DG-48-22
.5000-.6562 1/2-21/32 13.00-16.50mm	**7/8** .900-.885	3/8	DG-56-6
		1/2	DG-56-8
		3/4	DG-56-12
		1	DG-56-16
		1-3/8	DG-56-22
.5000-.7656 1/2-49/64 13.00-19.00mm	**1** 1.035-1.010	1/2	DG-64-8
		3/4	DG-64-12
		1	DG-64-16
		1-3/8	DG-64-22
		1-1/2	DG-64-24

* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

13

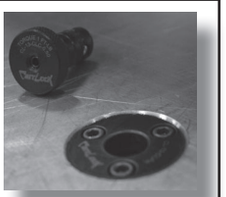
DIAMOND-GROOVE BUSHINGS – METRIC



DGM

ID RANGE (G6)	OD	LENGTH	ANSI PART NO.
1.00-1.80mm	5mm 5.50-5.25mm	6mm	DGM-5-6
		9mm	DGM-5-9
1.81-2.60mm		6mm	DGM-5-6
		9mm	DGM-5-9
2.61-3.30mm	6mm 6.65-6.25mm	8mm	DGM-6-8
		12mm	DGM-6-12
		16mm	DGM-6-16
3.31-4.00mm	7mm 7.65-7.25mm	8mm	DGM-7-8
		12mm	DGM-7-12
		16mm	DGM-7-16
4.01-5.00mm	8mm 8.65-8.25mm	8mm	DGM-8-8
		12mm	DGM-8-12
		16mm	DGM-8-16
5.01-6.00mm	10mm 10.65-10.25mm	10mm	DGM-10-10
		16mm	DGM-10-16
		20mm	DGM-10-20
6.01-8.00mm	12mm 12.65-12.25mm	10mm	DGM-12-10
		16mm	DGM-12-16
		20mm	DGM-12-20
8.01-10.00mm	15mm 15.65-15.25mm	12mm	DGM-15-12
		20mm	DGM-15-20
		25mm	DGM-15-25
10.01-12.00mm	18mm 18.65-18.25mm	12mm	DGM-18-12
		20mm	DGM-18-20
		25mm	DGM-18-25
12.01-15.00mm	22mm 22.65-22.25mm	16mm	DGM-22-16
		28mm	DGM-22-28
		36mm	DGM-22-36
15.01-18.00mm	26mm 26.90-26.25mm	16mm	DGM-26-16
		28mm	DGM-26-28
		36mm	DGM-26-36

CarrLock®
System for Fast Fixturing



PROBLEM:

"We are an aerospace prototype shop making the transition from prototype to production on an important UAV project. We've developed elaborate fixturing of all shapes and sizes. We found ourselves leaving our trim fixtures set up on a large gantry style table and then having to tear everything down when a large part came along to make way for it.

This tied up one of our most valuable spindles, and dust collection was nearly impossible. Change over and setup times were totally out of control."



Machine Operator Tyler Vaughn, of the Flying S, places a carbon trim fixture. The Carr Lock® receiver bushings allow for fixtures in various configurations.

SOLUTION:

"I discovered that I could combine 80% of our trim fixtures into just one fixture plate using just two Carr Lock pins, with excellent locating ability and much better clamping than before.

Our setup times have gone from an average of about 25 minutes to literally 30 seconds, thus saving us hundreds of hours."

Peter Bowman
Production Manager/Mfg Engineer
Flying S Inc.

Exclusively Made in the USA

www.carrlane.com/carrlock

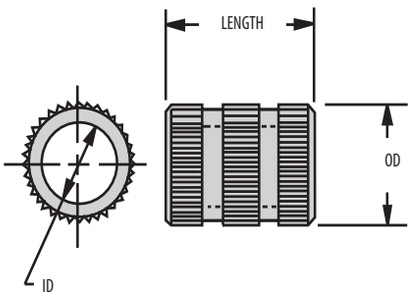
See Pages 358-372

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SERRATA-GROOVE BUSHINGS

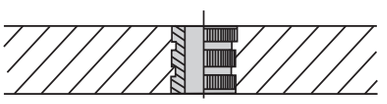


SG



APPLICATIONS:

Can be cast in place or potted, just as a diamond-groove bushing, or can also be pressed into an installation hole. Straight knurl provides less resistance to axial loads than the diamond knurl on a DG bushing. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.



ORDERING EXAMPLES:

SG-26-16-.1875	Standard inch bushing, inch ID
SG-26-16-.1772	Standard inch bushing, mm ID (.1772 = 4.50mm)
SG-26-16-.1875 REAMER	Reamer tolerance on ID
SG-26-16-.1875 NCB	No counterbore on long bushings marked with * (no counterbore is standard on all other bushings)

Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:

From #55 to 1/4"	+.0001/+.0004	From 1 to 3mm	+.002/+.008mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 3 to 6mm	+.004/+.012mm
Over 3/4 to 1-1/2"	+.0002/+.0006	Over 6 to 10mm	+.005/+.014mm
Over 10 to 18mm	+.006/+.017mm	Over 18 to 19mm	+.007/+.020mm

(G6 tolerance)

REAMER ID TOLERANCES:

From #60 to 1/4"	+.0005/+.0008	From 1 to 3mm	+.006/+.012mm
		Over 3 to 6mm	+.010/+.018mm
Over 1/4 to 1"	+.0006/+.0010	Over 6 to 10mm	+.013/+.022mm
		Over 10 to 18mm	+.016/+.027mm
		Over 18 to 19mm	+.020/+.033mm

(F6 tolerance)

ID RANGE	OD	LENGTH	ANSI PART NO.
.0520-.0995 #55-#39 1.35-2.50mm	**13/64** .223-.213	1/4	SG-13-4
		5/16	SG-13-5
		3/8	SG-13-6
		1/2	SG-13-8
.0980-.1406 #40-9/64 2.50-3.50mm	**1/4** .275-.260	1/4	SG-16-4
		5/16	SG-16-5
		3/8	SG-16-6
		1/2	SG-16-8
		*3/4	SG-16-12
.1250-.1935 1/8-#10 3.20-4.90mm	**5/16** .337-.322	1/4	SG-20-4
		5/16	SG-20-5
		3/8	SG-20-6
		1/2	SG-20-8
		3/4	SG-20-12
		*1	SG-20-16
.1562-.2570 5/32-F 4.00-6.50mm	**13/32** .431-.416	1/4	SG-26-4
		5/16	SG-26-5
		3/8	SG-26-6
		1/2	SG-26-8
		3/4	SG-26-12
		*1	SG-26-16
.1562-.3160 5/32-O 4.00-8.00mm	**1/2** .525-.510	5/16	SG-32-5
		3/8	SG-32-6
		1/2	SG-32-8
		3/4	SG-32-12
		*1	SG-32-16
.3125-.4375 5/16-7/16 7.90-11.00mm	**5/8** .650-.635	3/8	SG-40-6
		1/2	SG-40-8
		3/4	SG-40-12
		1	SG-40-16
		1-3/8	SG-40-22
.3125-.5312 5/16-17/32 8.00-13.00mm	**3/4** .775-.760	3/8	SG-48-6
		1/2	SG-48-8
		3/4	SG-48-12
		1	SG-48-16
		1-3/8	SG-48-22
.5000-.6562 1/2-21/32 13.00-16.50mm	**7/8** .900-.885	3/8	SG-56-6
		1/2	SG-56-8
		3/4	SG-56-12
		1	SG-56-16
		1-3/8	SG-56-22
.5000-.7656 1/2-49/64 13.00-19.00mm	**1** 1.035-1.010	1/2	SG-64-8
		3/4	SG-64-12
		1	SG-64-16
		1-3/8	SG-64-22
		1-1/2	SG-64-24

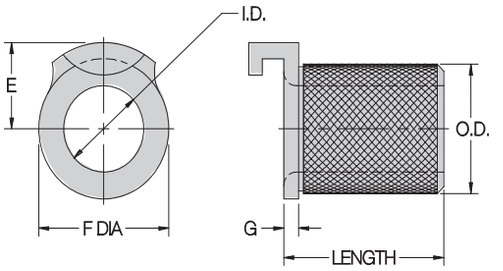
* **INFO+:** Counterbored, leaving correct drill-bearing length and clearance (see page 537 for bearing length).

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DIAMOND-KNURL UN-A-LOK™ LINER BUSHINGS



ULD
ULDM



INCH

BODY OD	E	F DIA	G
5/16	1/4	.365	3/32
1/2	3/8	9/16	3/32
3/4	1/2	13/16	3/32
1	21/32	1-1/16	1/8
1-3/8	7/8	1-7/16	1/8

METRIC

BODY OD	E	F DIA	G
12mm	9.5mm	15mm	3mm
15mm	11mm	18mm	3mm
18mm	13mm	22mm	4mm
22mm	15.5mm	26mm	4mm
26mm	17.5mm	30mm	4mm

INCH

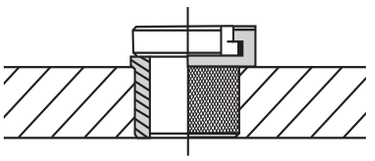
ID	OD	LENGTH	PART NO.
3/16	**5/16** .342-.332	5/16	ULD-20-5
		3/8	ULD-20-6
		1/2	ULD-20-8
		3/4	ULD-20-12
5/16	**1/2** .533-.523	3/8	ULD-32-6
		1/2	ULD-32-8
		3/4	ULD-32-12
1/2	**3/4** .785-.775	1/2	ULD-48-8
		3/4	ULD-48-12
		1	ULD-48-16
3/4	**1** 1.035-1.025	1/2	ULD-64-8
		3/4	ULD-64-12
		1	ULD-64-16
1	**1-3/8** 1.415-1.405	1/2	ULD-88-8
		3/4	ULD-88-12
		1	ULD-88-16
		1-3/8	ULD-88-22

METRIC

ID (G6)	OD	LENGTH	PART NO.
8mm	**12mm** 12.65-12.25mm	10mm	ULDM-12-10
		16mm	ULDM-12-16
10mm	**15mm** 15.65-15.25mm	12mm	ULDM-15-12
		20mm	ULDM-15-20
		25mm	ULDM-15-25
12mm	**18mm** 18.65-18.25mm	12mm	ULDM-18-12
		20mm	ULDM-18-20
		25mm	ULDM-18-25
15mm	**22mm** 22.65-22.25mm	16mm	ULDM-22-16
		28mm	ULDM-22-28
		36mm	ULDM-22-36
18mm	**26mm** 26.90-26.25mm	16mm	ULDM-26-16
		28mm	ULDM-26-28
		36mm	ULDM-26-36

APPLICATIONS:

A liner for cast-in-place or potted installation, used to hold SF renewable drill bushings. Un-A-Lok™ liners incorporate a special locking tab that eliminates the need for a lockscrew. Holds only the "slip" side of an SF bushing, not the "fixed" side. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.



ORDERING EXAMPLES:

ULD-20-5	Standard inch liner bushing
ULDM-12-10	Standard metric liner bushing

STANDARD LINER ID TOLERANCES:

3/16 to 5/16"	+.0001/+.0004	8 to 10mm	+.005/+.014mm
1/2"	+.0002/+.0005	12 to 18mm	+.006/+.017mm
3/4"	+.0003/+.0006	(G6 tolerance)	
1"	+.0004/+.0007		

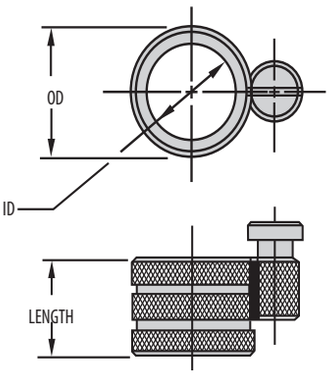
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EZ-CAST LINER BUSHINGS

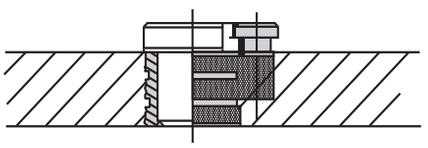


EZ



ID RANGE	OD	LENGTH	PART NO.
5/16 .3126-.3129	**1/2** .525-.510	1/2	EZ-32-8
		3/4	EZ-32-12
		1	EZ-32-16
1/2 .5002-.5005	**3/4** .775-.760	1/2	EZ-48-8
		3/4	EZ-48-12
		1	EZ-48-16
		1-3/8	EZ-48-22
3/4 .7503-.7506	**1** 1.035-1.010	1/2	EZ-64-8
		3/4	EZ-64-12
		1	EZ-64-16
		1-3/8	EZ-64-22
1 1.0004-1.0007	**1-3/8** 1.410-1.385	3/4	EZ-88-12
		1	EZ-88-16
		1-3/8	EZ-88-22

APPLICATIONS:
Another liner for cast-in-place or potted installation, used to hold SF renewable drill bushings. Unlike diamond-knurl unilock liners, EZ-cast liners hold either the "slip" or "fixed" side of an SF bushing, since they include an integral lockscrew holder. Diamond-knurled OD provides superior holding strength against both rotational and axial forces. Since the bushing's OD is not ground, keep the ID accurately located during casting or potting to ensure accuracy in the finished tool.



ORDERING EXAMPLE:
EZ-32-8 Standard inch liner bushing

STANDARD LINER ID TOLERANCES:
5/16" +.0001/+.0004
1/2" +.0002/+.0005
3/4" +.0003/+.0006
1" +.0004/+.0007

CarrLane® MANUFACTURING CO.
Hoist Rings

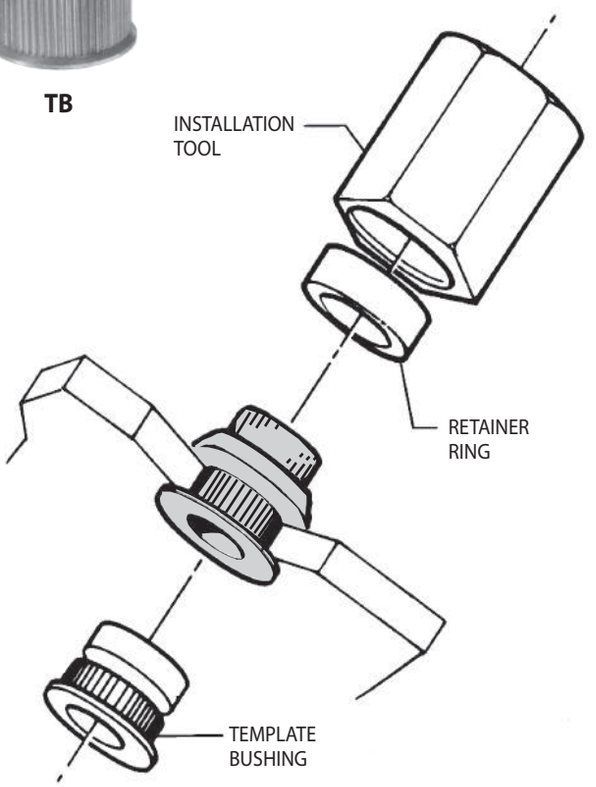
Many Varieties Of Hoist Rings
Trusted to Move Your Most Important Materials.
• Swivel Hoist Rings • Pivoting Hoist Rings • Side-Pull Hoist Rings
• Safety Hoist Rings • Lifting Eyes
See Pages 73-92

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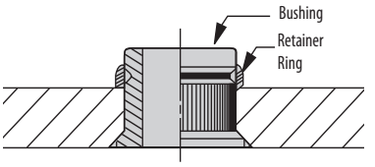
TEMPLATE BUSHINGS



TB



APPLICATIONS:
An economical bushing designed for thin template jig plates from 1/16 to 3/8" thick. Bushings are held in place by a Retainer Ring (order Retainer Ring and Installation Tool separately). The OD serrations prevent the bushing from spinning. Bushings can be removed and reused by breaking the aluminum Retainer Ring (extra rings available separately).



ORDERING EXAMPLES:

TB-24-6-4-.1250	Bushing with 1/8" ID
TR-10	Matching Retainer Ring for 1/16" thick template
TR-30	Matching Retainer Ring for 1/8" thick template

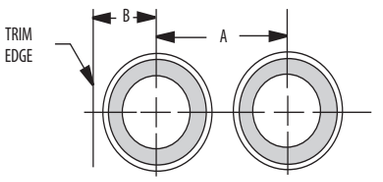
Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:
#55 to 1/2" +.0001/+.0011 | 1.30 to 12mm +.002/+.030mm

CONCENTRICITY:
ID concentric with OD to within .002 TIR

INSTALLATION STEPS

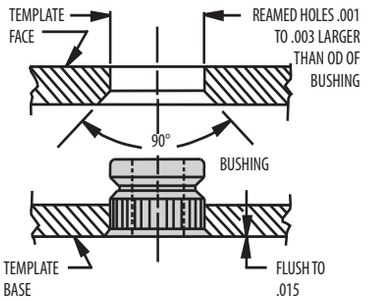
1. LAY OUT HOLES



When laying out holes, observe the minimum hole spacing and edge distance listed below:

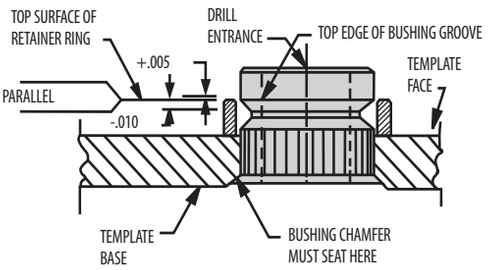
BUSHING OD	A MINIMUM	B MINIMUM
3/8	.60	.250
1/2	.73	.312
3/4	.98	.438

2. REAM AND COUNTERSINK



Ream hole .001 to .003 larger than bushing OD. Countersink reamed hole to allow the bushing to seat .015 below flush with surface. For best results, use a piloted countersink tool so that the countersink is concentric and free of chatter marks.

3. INSTALL



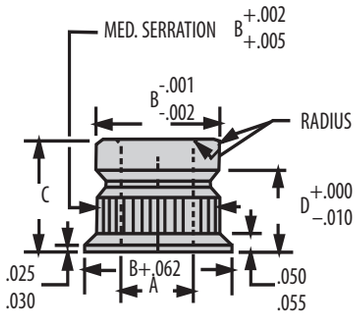
Install Retainer Ring with an arbor press whenever possible. The Installation Tool is also tapped for mounting on a rivet gun or other impact tool. Check that Retainer Ring top surface is within +.005 / -.010 of the bushing groove's top edge before installing.

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TEMPLATE BUSHINGS



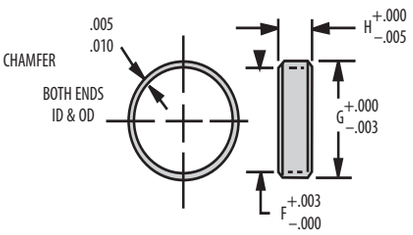




TEMPLATE BUSHINGS AND RETAINER RINGS

ID RANGE A	OD B	LENGTH C	GRIP D	BUSHING PART NO.	RETAINER RING PART NO.	TEMPLATE THICKNESS
.0520-.1960 #55-#9 1.30-5.00mm	3/8	3/8	1/4	TB-24-6-4	TR-10	1/16
					TR-20	3/32
					TR-30	1/8
			5/16	TB-24-6-5	TR-10	1/8
					TR-30	3/16
		1/2	5/16	TB-24-8-5	TR-10	1/8
					TR-30	3/16
			3/8	TB-24-8-6	TR-10	3/16
					TR-30	1/4
			7/16	TB-24-8-7	TR-10	1/4
					TR-30	5/16
.1960-.3160 #9-O 5.00-8.00mm	1/2	3/8	1/4	TB-32-6-4	TR-40	1/16
					TR-50	3/32
					TR-60	1/8
			5/16	TB-32-6-5	TR-40	1/8
					TR-60	3/16
		1/2	5/16	TB-32-8-5	TR-40	1/8
					TR-60	3/16
			3/8	TB-32-8-6	TR-40	3/16
					TR-60	1/4
			7/16	TB-32-8-7	TR-40	1/4
					TR-60	5/16
		5/8	1/2	TB-32-10-8	TR-40	5/16
					TR-60	3/8
.3125-.5000 5/16-1/2 8.00-12.00mm	3/4	3/8	1/4	TB-48-6-4	TR-70	1/16
					TR-80	3/32
					TR-90	1/8
			5/16	TB-48-6-5	TR-70	1/8
					TR-90	3/16
		1/2	5/16	TB-48-8-5	TR-70	1/8
					TR-90	3/16
			3/8	TB-48-8-6	TR-70	3/16
					TR-90	1/4
			7/16	TB-48-8-7	TR-70	1/4
					TR-90	5/16
		5/8	1/2	TB-48-10-8	TR-70	5/16
					TR-90	3/8

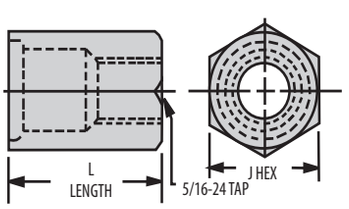




RETAINER RINGS

PART NO.	OD B	G OD	H
TR-10	.375	.468	.205
TR-20			.173
TR-30			.142
TR-40	.500	.593	.205
TR-50			.173
TR-60			.142
TR-70	.750	.843	.205
TR-80			.173
TR-90			.142





INSTALLATION TOOLS

PART NO.	FOR BUSHING SERIES	FOR RING SERIES	J	L	COMPLETE SET PART NO.
TBT-100	TB-24	TR-10,TR-20,TR-30	5/8	1	TBT-400
TBT-200	TB-32	TR-40,TR-50,TR-60	3/4	1	
TBT-300	TB-48	TR-70,TR-80,TR-90	1	1	

13

THREADED TEMPLATE BUSHINGS



Retainer Ring (TTR)



Threaded Template Bushing (TTB)

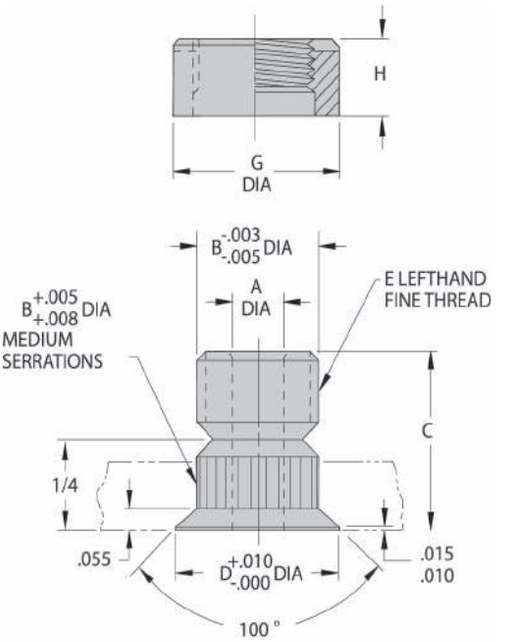
STANDARD ID TOLERANCE:
From #55 to 1/2" +.0001/+.0015
(ID concentric with OD to within .002" TIR)

INSTALLATION:
Drill hole in jig plate to nominal bushing OD (B diameter). Countersink 90° to allow bushing to seat flush to .015" below surface of plate (standard version only, not flanged version). Install and tighten Retainer Ring to secure. To make Retainer Ring installation easier, we offer a handy Socket-Type Installation Tool that fits 1/4" square drives.

APPLICATIONS:
This economical bushing is designed for thin template jig plates from 3/64 to 3/8" thick. Bushings are held in place by a threaded Retainer Ring (order separately). Left-hand thread is self tightening during drilling to prevent the Retainer Ring from loosening. Flush contact of the Retainer Ring against the jig plate ensures perpendicular drill alignment. OD serrations prevent the bushing from rotating during drilling. Choose standard countersunk type for flush mounting, or flanged type for installation without countersinking the jig plate. Threaded Template Bushings can be easily removed to replace or reuse.

ORDERING EXAMPLES:
Available in 3/8", 1/2", 5/8", 3/4", and 1" OD sizes. Standard prices apply to standard bushings only, with any standard inch or metric ID size within the stated range.

TTB-24-.1250	Bushing with 1/8" ID
TTR-24-3	Matching Retainer Ring for 1/4" thick template



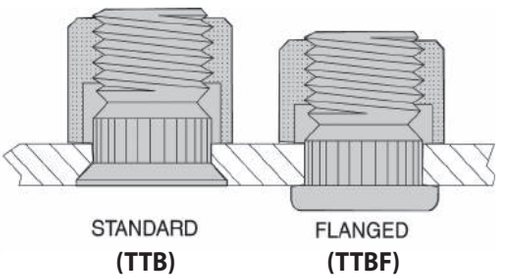
TTB

THREADED TEMPLATE BUSHINGS — STANDARD (ORDER BUSHING AND RETAINER RING SEPARATELY)

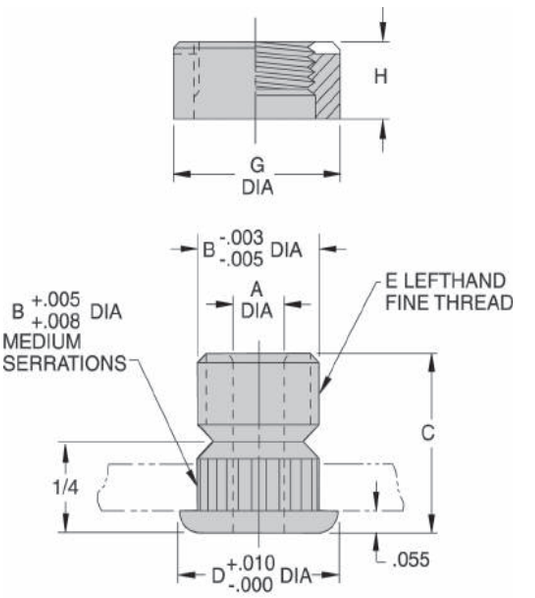
A ID RANGE	B OD	C LENGTH	D DIA	E	G DIA	H	BUSHING PART NO.	RETAINER RING PART NO.	TEMPLATE THICKNESS
.0520-.1960 #55-#9 1.30-5.00mm	3/8	1/2	.475	3/8-24 LH	1/2	3/8	TTB-24	TTR-24-6	3/64-1/8
						5/16		TTR-24-5	9/64-3/16
						3/16		TTR-24-3	13/64-3/8
.1960-.3160 #9-0 5.00-8.00mm	1/2	1/2	.600	1/2-20 LH	5/8	3/8	TTB-32	TTR-32-6	3/64-1/8
						5/16		TTR-32-5	9/64-3/16
						3/16		TTR-32-3	13/64-3/8
.3125-.4375 5/16-7/16 7.90-11.00mm	5/8	1/2	.725	5/8-18 LH	3/4	3/8	TTB-40	TTR-40-6	3/64-1/8
						5/16		TTR-40-5	9/64-3/16
						3/16		TTR-40-3	13/64-3/8
.3125-.5312 5/16-17/32 8.00-13.00mm	3/4	1/2	.850	3/4-16 LH	1	3/8	TTB-48	TTR-48-6	3/64-1/8
						5/16		TTR-48-5	9/64-3/16
						3/16		TTR-48-3	13/64-3/8
.5000-.7656 1/2-49/64 13.00-19.00mm	1	1/2	1.100	1"-14 LH	1-1/4	3/8	TTB-64	TTR-64-6	3/64-1/8
						5/16		TTR-64-5	9/64-3/16
						3/16		TTR-64-3	13/64-3/8

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THREADED TEMPLATE BUSHINGS



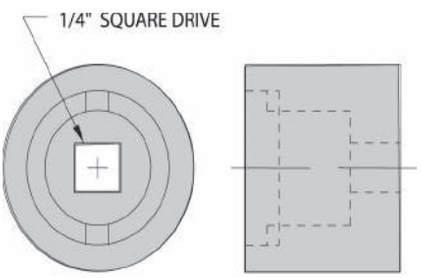
Choose standard countersunk type for flush mounting, or flanged type for installation without countersinking the jig plate.



TTBF

THREADED TEMPLATE BUSHINGS — FLANGED
(ORDER BUSHING AND RETAINER RING SEPARATELY)

A ID RANGE	B OD	C LENGTH	D DIA	E	G DIA	H	BUSHING PART NO.	RETAINER RING PART NO.	TEMPLATE THICKNESS
.0520-.1960 #55-#9 1.30-5.00mm	3/8	1/2	.475	3/8-24 LH	1/2	3/8	TTBF-24	TTR-24-6	3/64-1/8
						5/16		TTR-24-5	9/64-3/16
						3/16		TTR-24-3	13/64-3/8
.1960-.3160 #9-0 5.00-8.00mm	1/2	1/2	.600	1/2-20 LH	5/8	3/8	TTBF-32	TTR-32-6	3/64-1/8
						5/16		TTR-32-5	9/64-3/16
						3/16		TTR-32-3	13/64-3/8
.3125-.4375 5/16-7/16 7.90-11.00mm	5/8	1/2	.725	5/8-18 LH	3/4	3/8	TTBF-40	TTR-40-6	3/64-1/8
						5/16		TTR-40-5	9/64-3/16
						3/16		TTR-40-3	13/64-3/8
.3125-.5312 5/16-17/32 8.00-13.00mm	3/4	1/2	.850	3/4-16 LH	1	3/8	TTBF-48	TTR-48-6	3/64-1/8
						5/16		TTR-48-5	9/64-3/16
						3/16		TTR-48-3	13/64-3/8
.5000-.7656 1/2-49/64 13.00-19.00mm	1	5/8	1.100	1"-14 LH	1-1/4	3/8	TTBF-64	TTR-64-6	3/64-1/8
						5/16		TTR-64-5	9/64-3/16
						3/16		TTR-64-3	13/64-3/8



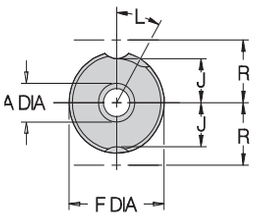
SOCKET-TYPE INSTALLATION TOOLS

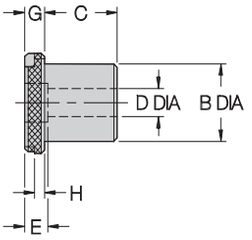
PART NO.	FOR INSTALLING RETAINER RINGS		
TTBT-24	TTR-24-3	TTR-24-5	TTR-24-6
TTBT-32	TTR-32-3	TTR-32-5	TTR-32-6
TTBT-40	TTR-40-3	TTR-40-5	TTR-40-6
TTBT-48	TTR-48-3	TTR-48-5	TTR-48-6
TTBT-64	TTR-64-3	TTR-64-5	TTR-64-6

GUN DRILL BUSHINGS

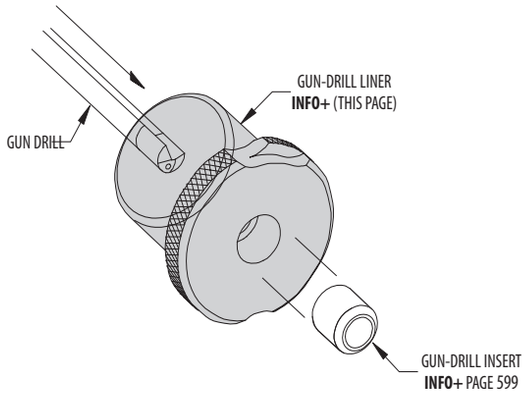


GDL





BODY OD	E	F DIA	G	H	J	L	R	LOCK SCREW
1	7/16	1-27/64	3/8	3/16	19/32	35°	59/64	LS-2
1-3/8	7/16	1-51/64	3/8	3/16	25/32	30°	1-7/64	LS-2
1-3/4	3/4	2-19/64	3/8	3/16	1	30°	1-25/64	LS-2

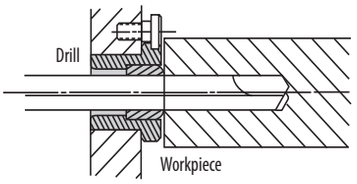


TYPE GDL
GUN-DRILL LINER

A ID	B OD	C LENGTH	D	PART NO.	LOCK SCREW
13/64	**1** 1.0000-.9998	1	1/8	GDL-64-16-13	LS-2
1/4			5/32	GDL-64-16-16	
5/16			7/32	GDL-64-16-20	
1/2			11/32	GDL-64-16-32	
3/4			9/16	GDL-64-16-48	
13/64	**1-3/8** 1.3750-1.3747	1-3/8	1/8	GDL-88-22-13	LS-2
1/4			5/32	GDL-88-22-16	
5/16			7/32	GDL-88-22-20	
1/2			11/32	GDL-88-22-32	
3/4			9/16	GDL-88-22-48	
1			51/64	GDL-88-22-64	
13/64	**1-3/4** 1.7500-1.7497	1-3/4	1/8	GDL-112-28-13	LS-2
1/4			5/32	GDL-112-28-16	
5/16			7/32	GDL-112-28-20	
1/2			11/32	GDL-112-28-32	
3/4			9/16	GDL-112-28-48	
1			51/64	GDL-112-28-64	
1-3/8			1-3/64	GDL-112-28-88	

APPLICATIONS:

These bushings are for gun-drilling machines, such as Eldorado, Drillmation, deHoff, and Lahr. Gun-drill bushings are similar to SF renewable bushings, but with the drill bearing at the bushing's head end. Depending on the gun-drilling machine, bushings are either one-piece or two-piece (a liner and an insert).



ORDERING EXAMPLE:

GDL-112-28-20 Liner for any insert with a 5/16 OD

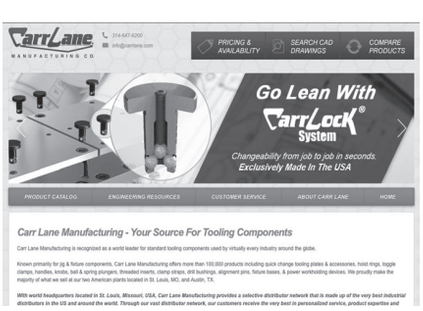
Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD LINER ID TOLERANCES:

13/64"	+.0014/+.0016
1/4 to 5/16"	+.0015/+.0017
1/2"	+.0016/+.0018
3/4 to 1"	+.0017/+.0019
1-3/8"	+.0021/+.0023

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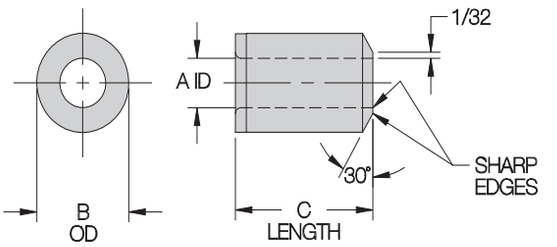
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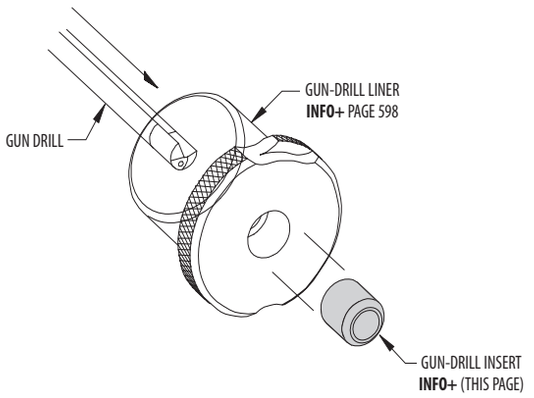
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GUN DRILL BUSHINGS



GDI





TYPE GDI
GUN-DRILL INSERTS

A ID	B OD	C LENGTH	PART NO.	MATCHING LINER
.0635-.0995 #52-#39 1.65-2.50mm	**13/64** .2046-.2043	1/2	GDI-13-8	GDL-64-16-13
		3/4	GDI-13-12	GDL-88-22-13
		1	GDI-13-16	GDL-112-28-13
.0980-.1406 #40-9/64 2.50-3.50mm	**1/4** .2516-.2513	1/2	GDI-16-8	GDL-64-16-16
		3/4	GDI-16-12	GDL-88-22-16
		1	GDI-16-16	GDL-112-28-16
.1250-.1935 1/8-#10 3.20-4.90mm	**5/16** .3141-.3138	1/2	GDI-20-8	GDL-64-16-20
		3/4	GDI-20-12	GDL-88-22-20
		1	GDI-20-16	GDL-112-28-20
.1875-.3160 3/16-0 4.80-8.00mm	**1/2** .5017-.5014	1/2	GDI-32-8	GDL-64-16-32
		3/4	GDI-32-12	GDL-88-22-32
		1	GDI-32-16	GDL-112-28-32
.3125-.5312 5/16-17/32 8.00-13.50mm	**3/4** .7518-.7515	1/2	GDI-48-8	GDL-64-16-48
		3/4	GDI-48-12	GDL-88-22-48
		1	GDI-48-16	GDL-112-28-48
.5000-.7656 1/2-49/64 13.00-19.00mm	**1** 1.0018-1.0015	3/4	GDI-64-12	GDL-88-22-64
		1	GDI-64-16	GDL-112-28-64
.6250-1.0312 5/8–1-1/32 16.00-26.00mm	**1-3/8** 1.3772-1.3768	1	GDI-88-16	GDL-112-28-88

ORDERING EXAMPLES:

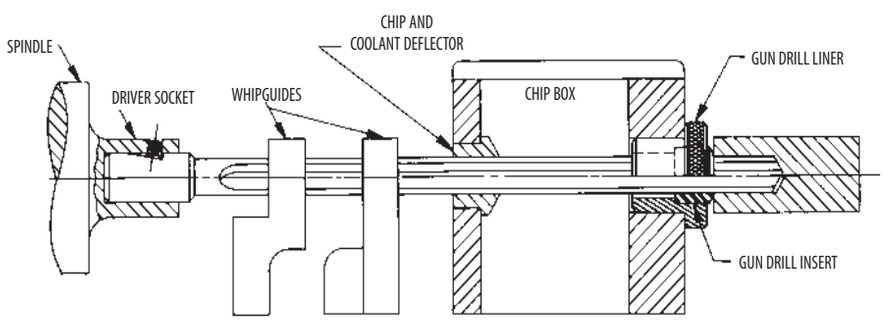
GDI-20-16-.1250 Gun-drill insert for 1-3/4" OD liner
GDL-112-28-20, inch ID

GDI-20-16-.1772 Gun-drill insert for 1-3/4" OD liner
GDL-112-28-20, mm ID (.1772 = 4.50mm)

Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:

#52 to 1-1/32" -.0000/+.0002 | 1.65 to 26mm -.000/+.005mm

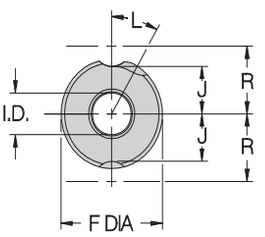


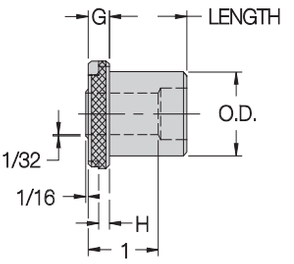
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GUN DRILL BUSHINGS



GDE





BODY OD	F DIA	G	H	J	L	R
1	1-27/64	3/8	3/16	19/32	35˚	59/64
1-3/8	1-51/64	3/8	3/16	25/32	30˚	1-7/64

ORDERING EXAMPLES:

GDE-64-12-.1250 Standard gun-drill bushing, inch ID
GDE-64-12-.1772 Standard gun-drill bushing, mm ID (.1772 = 4.50mm)

STANDARD ID TOLERANCES:

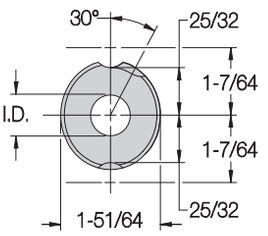
1/8 to 1-1/16" -.0000/+.0002 | 3 to 27mm -.000/+.005mm

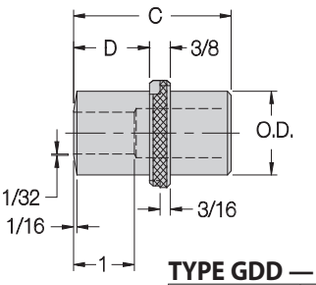
TYPE GDE — ONE-PIECE ELDORADO TYPE

ID RANGE	OD	LENGTH	PART NO.	LOCK SCREW
.1250-.7812 1/8-25/32 3.20-19.50mm	1 1.0000-.9998	3/4	GDE-64-12	LS-2
		1	GDE-64-16	
		1-3/8	GDE-64-22	
.1250-1.0625 1/8-1-1/16 3.20-27.00mm	1-3/8 1.3750-1.3747	1	GDE-88-16	LS-2
		1-3/8	GDE-88-22	



GDD





TYPE GDD — ONE-PIECE ELDORADO DEEP TYPE

ID RANGE	OD	C LENGTH	D EXT.	PART NO.	LOCK SCREW
.1250-1.0625 1/8-1-1/16 3.20-27.00mm	1-3/8 1.3750- 1.3747	1-7/8	1/2	GDD-88-30	LS-2
		2-3/8	1	GDD-88-38	
		2-7/8	1-1/2	GDD-88-46	
		3-3/8	2	GDD-88-54	

ORDERING EXAMPLES:

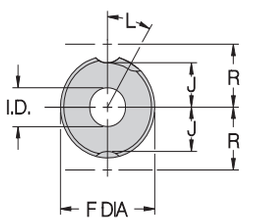
GDD-88-30-.1250 Standard gun-drill bushing, inch ID
GDD-88-30-.1772 Standard gun-drill bushing, mm ID (.1772 = 4.50mm)

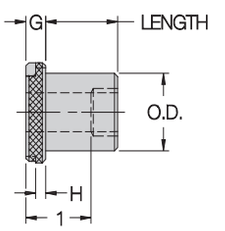
STANDARD ID TOLERANCES:

1/8 to 1-1/16" -.0000/+.0002 | 3 to 27mm -.000/+.005mm



GDH





BODY OD	F DIA	G	H	J	L	R
1	1-27/64	3/8	3/16	19/32	35˚	59/64
1-3/8	1-51/64	3/8	3/16	25/32	30˚	1-7/64

ORDERING EXAMPLES:

GDH-64-12-.1250 Standard gun-drill bushing, inch ID
GDH-64-12-.1772 Standard gun-drill bushing, mm ID (.1772 = 4.50mm)

STANDARD ID TOLERANCES:

1/8 to 1-1/16" -.0000/+.0002 | 3 to 27mm -.000/+.005mm

TYPE GDH — ONE-PIECE DEHOFF TYPE

ID RANGE	OD	LENGTH	PART NO.	LOCK SCREW
.1250-.7812 1/8-25/32 3.20-19.50mm	1 1.0000-.9998	3/4	GDH-64-12	LS-2
		1	GDH-64-16	
		1-3/8	GDH-64-22	
.1250-1.0625 1/8-1-1/16 3.20-27.00mm	1-3/8 1.3750-1.3747	1	GDH-88-16	LS-2
		1-3/8	GDH-88-22	

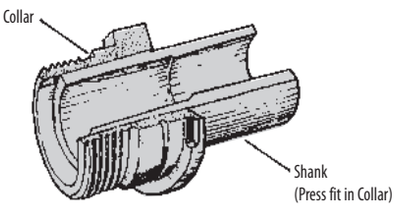
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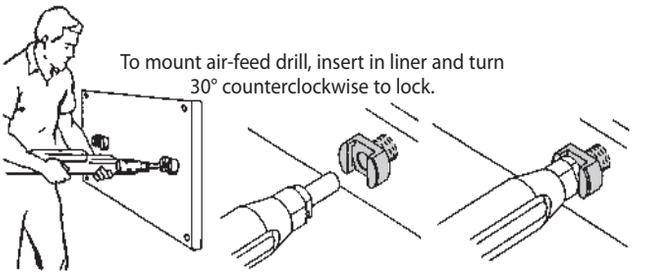
Angic Global Solutions 1-888-872-0690
https://www.AngicGlobal.com Sales@AngicGlobal.com

AIR FEED BUSHINGS

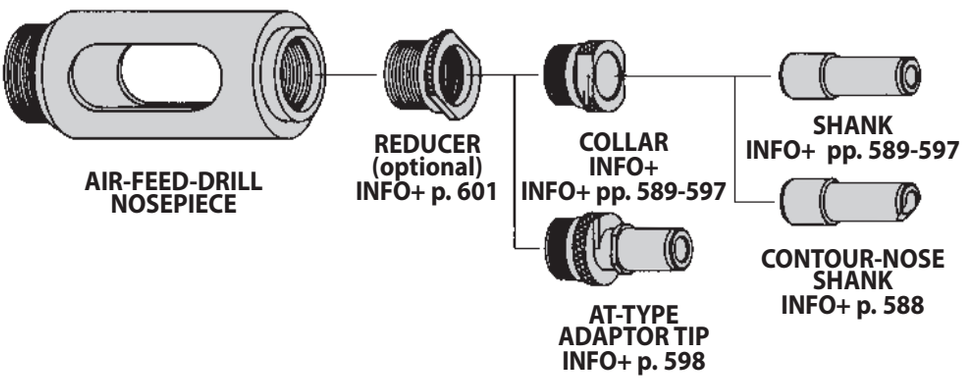


ADAPTOR TIP ASSEMBLY

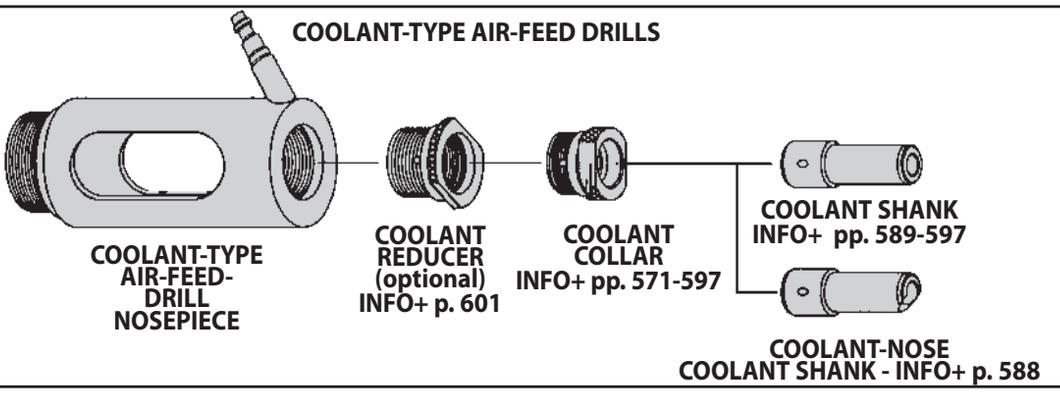




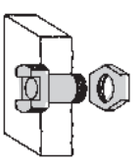
STANDARD AIR-FEED DRILLS



COOLANT-TYPE AIR-FEED DRILLS

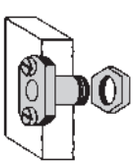


MOUNTING OPTIONS



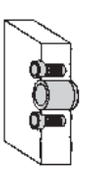
TAPER-LOK LINERS INFO+ p. 600

New-design one-piece lock liner has angular locking surfaces for superior strength. Allows very close hole spacing. Hold in place with a lock nut. Also available knurled for installing in plastic tooling.



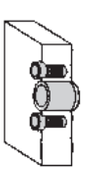
LOCK LINERS INFO+ p. 601

Conventional lock liner incorporating two lock screws. Hold in place with a lock nut.



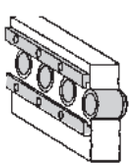
TAPER-LOK AIR-FEED LOCKSCREWS INFO+ p. 599

New-design lock screw especially for air-feed drills. Angular locking surface for superior strength. Install two lock screws and a liner directly in jig plate.



LOCKSCREWS INFO+ p. 599

Conventional-style lock screws. Install two lock screws and a liner bushing directly in jig plate.



LOCK STRIPS INFO+ p. 599

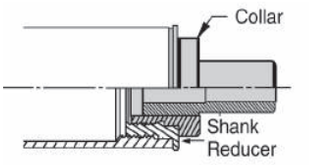
Allows the closest possible hole spacing. Use together with liner bushings.

13

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AIR FEED BUSHINGS

APPLICATIONS:
Drill-bush shanks, collars, adaptors, and locking accessories for air-feed drills, tappers, and back-spotfacers. Available for all standard drill motors, including Gardner-Denver, Keller, Aro, Buckeye, Quackenbush, Desoutter, and Ingersoll-Rand.



CONSTRUCTION:
Adaptor-tip assemblies consist of two pieces: a locking collar and a pressed-in shank. The collar screws into the air- feed-drill nosepiece, precisely aligns the shank, and locks the drill in place by rotating 30˚ counter-clockwise after mounting. Shanks and collars can be ordered separately for replacement purposes.

ORDERING EXAMPLES:

A-21101-.1250	Complete adaptor-tip assembly
21101-.1250	Shank only
21000	Collar only
A-21101-.1250-C	Complete assembly with contour nose
21101-.1250-C	Shank only, with contour nose
A-11101-.1250	Coolant-type assembly
A-11101-.1250-C	Coolant-type assembly with contour nose

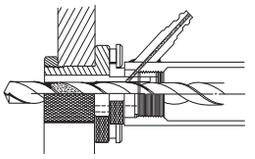
Standard prices apply only to bushings with a standard-drill-size ID within the stated ID range. See catalog back cover for standard drill sizes and their decimal equivalents. For prices on non-standard ID sizes, including reamer-tolerance and tap-guide bushings, please contact factory.

STANDARD ID TOLERANCES:

From #70 to 1/4"	+.0001/+.0004	From 1 to 3mm	+.002/+.008mm
Over 1/4 to 3/4"	+.0001/+.0005	Over 3 to 6mm	+.004/+.012mm
Over 3/4 to 1-1/2"	+.0002/+.0006	Over 6 to 10mm	+.005/+.014mm
		Over 10 to 18mm	+.006/+.017mm
AT-Type	+.0000/+.0003	Over 18 to 30mm	+.007/+.020mm

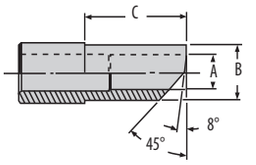
(**INFO+**: See page 540 for reamer ID tolerances.)

OPTIONAL COOLANT TYPE:



For coolant-inducing air-feed drills. Special shanks, collars, and reducers with internal coolant passages. Contact factory for pricing.

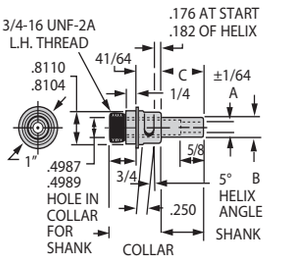
OPTIONAL CONTOUR NOSE:



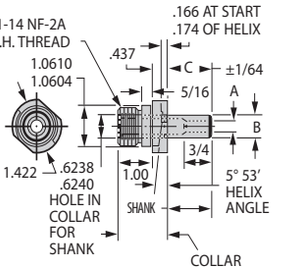
Angular-nose shank recommended for close drilling along sloped or curved surfaces. Available on standard and coolant-type shanks. To order, add "-C" suffix to part number. Contact factory for pricing.

ADAPTOR TIP ASSEMBLIES

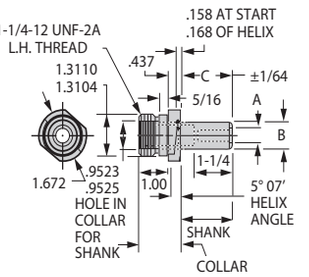
21000 SERIES



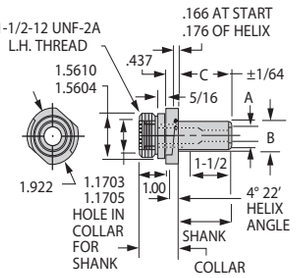
22000 SERIES



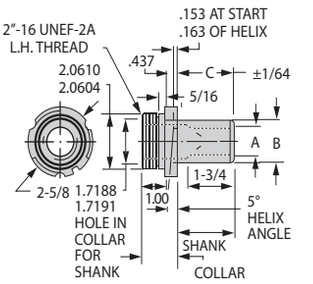
23000 SERIES



24000 SERIES



25000 SERIES



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21000 SERIES

A ID RANGE	B OD	C LENGTH	TIP ASSEMBLY STANDARD TYPE PART NO.	TIP ASSEMBLY COOLANT TYPE PART NO.	SHANK ONLY STANDARD TYPE PART NO.	SHANK ONLY COOLANT TYPE PART NO.	COLLAR ONLY STANDARD TYPE PART NO.	COLLAR ONLY COOLANT TYPE PART NO.	TAPER-LOK LINER PART NO. p. 600	LOCK LINER PART NO. p. 601	LOCK NUT PART NO. p. 601	TAPER-LOK LOCKSCREW PART NO. p. 599	LOCK SCREW PART NO. p. 599	LINER PART NO. p. 599
.0938-.2500 3/32-1/4 2.40-6.35mm	**3/8** .3748-.3745	3/8	A-21101	A-11101	21101	11101			TLL-16520 (Matches A-21106 tip)	A-16520 (Matches A-16500 tip)	14441			19936
		1/2	A-21102	A-11102	21102	11102								
		5/8	A-21103	A-11103	21103	11103								
		3/4	A-21104	A-11104	21104	11104								
		7/8	A-21105	A-11105	21105	11105								
		1	A-21106	A-11106	21106	11106								
		1-1/16	A-16500	A-11107	16500	11107								
		1-1/8	A-21108	A-11108	21108	11108								
		1-1/4	A-21110	A-11110	21110	11110								
		1-3/8	A-21111	A-11111	21111	11111								
		1-1/2	A-21113	A-11113	21113	11113								
		1-5/8	A-21114	A-11114	21114	11114								
		1-3/4	A-21115	A-11115	21115	11115								
		1-7/8	A-21116	A-11116	21116	11116								
		2	A-21118	A-11118	21118	11118								
		2-1/8	A-21119	A-11119	21119	11119								
		2-1/4	A-21120	A-11120	21120	11120								
		2-3/8	A-21121	A-11121	21121	11121								
		2-1/2	A-21122	A-11122	21122	11122								
		2-3/4	A-21124	A-11124	21124	11124								
		3	A-21125	A-11125	21125	11125								
		3-1/4	A-21126	A-11126	21126	11126								
		6	A-21131	A-11131	21131	11131								
.0938-.3125 3/32-5/16 2.40-7.90mm	**7/16** .4373-.4370	1/2	A-21202	A-11202	21202	11202	21000	11000				CL-11-AFL or CL-13-AFL or CL-14-AFL	16531	19937
		5/8	A-21203	A-11203	21203	11203								
		3/4	A-21204	A-11204	21204	11204								
		7/8	A-21205	A-11205	21205	11205								
		1	A-21206	A-11206	21206	11206								
		1-1/8	A-21208	A-11208	21208	11208								
		1-1/4	A-21210	A-11210	21210	11210								
		1-3/8	A-21211	A-11211	21211	11211								
		1-1/2	A-21213	A-11213	21213	11213								
		1-5/8	A-21214	A-11214	21214	11214								
		1-3/4	A-21215	A-11215	21215	11215								
		1-7/8	A-21216	A-11216	21216	11216								
		2	A-21218	A-11218	21218	11218								
		2-1/8	A-21219	A-11219	21219	11219								
		2-1/4	A-21220	A-11220	21220	11220								
		2-3/8	A-21221	A-11221	21221	11221								
		2-1/2	A-21222	A-11222	21222	11222								
		2-3/4	A-21224	A-11224	21224	11224								
		3	A-21225	A-11225	21225	11225								
		3-1/4	A-21226	A-11226	21226	11226								
.0938-.3750 3/32-3/8 2.40-9.50mm	**1/2** .4998-.4995	3/8	A-21301	A-11301	21301	11301			TLL-16521 (Matches A-21306 tip)	A-16521 (Matches A-16501 tip)	14442			19938
		1/2	A-21302	A-11302	21302	11302								
		5/8	A-21303	A-11303	21303	11303								
		3/4	A-21304	A-11304	21304	11304								
		7/8	A-21305	A-11305	21305	11305								
		1	A-21306	A-11306	21306	11306								
		1-1/16	A-16501	A-11307	16501	11307								
		1-1/8	A-21308	A-11308	21308	11308								
		1-1/4	A-21310	A-11310	21310	11310								
		1-3/8	A-21311	A-11311	21311	11311								
		1-1/2	A-21313	A-11313	21313	11313								
		1-5/8	A-21314	A-11314	21314	11314								
		1-3/4	A-21315	A-11315	21315	11315								
		1-7/8	A-21316	A-11316	21316	11316								
		2	A-21318	A-11318	21318	11318								
		2-1/8	A-21319	A-11319	21319	11319								
		2-1/4	A-21320	A-11320	21320	11320								
		2-3/8	A-21321	A-11321	21321	11321								
		2-1/2	A-21322	A-11322	21322	11322								
		2-3/4	A-21324	A-11324	21324	11324								
		3	A-21325	A-11325	21325	11325								
		3-1/4	A-21326	A-11326	21326	11326								
		5	A-21330	A-11330	21330	11330								

INFO++

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AIR FEED BUSHINGS



22000 SERIES

A ID RANGE	B OD	C LENGTH	TIP ASSEMBLY STANDARD TYPE PART NO.	TIP ASSEMBLY COOLANT TYPE PART NO.	SHANK ONLY STANDARD TYPE PART NO.	SHANK ONLY COOLANT TYPE PART NO.	COLLAR ONLY STANDARD TYPE PART NO.	COLLAR ONLY COOLANT TYPE PART NO.	TAPER-LOK LINER PART NO. p. 600	LOCK LINER PART NO. p. 601	LOCK NUT PART NO. p. 601	TAPER-LOK LOCKSCREW PART NO. p. 599	LOCK SCREW PART NO. p. 599	LINER PART NO. p. 599	INFO++
.1875-.2812 3/16-9/32 4.80-7.10mm	**7/16** .4373-.4370	3/8	A-22101	A-12101	22101	12101	22000	12000				CL-11-AFL or CL-13-AFL or CL-14-AFL	16532	19937	
		1/2	A-22102	A-12102	22102	12102									
		5/8	A-22103	A-12103	22103	12103									
		3/4	A-22104	A-12104	22104	12104									
		7/8	A-22105	A-12105	22105	12105									
		1	A-22106	A-12106	22106	12106									
		1-1/8	A-22108	A-12108	22108	12108									
		1-1/4	A-22110	A-12110	22110	12110									
		1-3/8	A-22111	A-12111	22111	12111									
		1-1/2	A-22113	A-12113	22113	12113									
		1-5/8	A-22114	A-12114	22114	12114									
		1-3/4	A-22115	A-12115	22115	12115									
		1-7/8	A-22116	A-12116	22116	12116									
		2	A-22118	A-12118	22118	12118									
		2-1/8	A-22119	A-12119	22119	12119									
		2-1/4	A-22120	A-12120	22120	12120									
		2-3/8	A-22121	A-12121	22121	12121									
		2-1/2	A-22122	A-12122	22122	12122									
		2-3/4	A-22124	A-12124	22124	12124									
		3	A-22125	A-12125	22125	12125									
		3-1/4	A-22126	A-12126	22126	12126									
		3-1/2	A-22127	A-12127	22127	12127									
		3-3/4	A-22128	A-12128	22128	12128									
		4	A-22129	A-12129	22129	12129									
		5	A-22130	A-12130	22130	12130									
		6	A-22131	A-12131	22131	12131									
.1875-.3438 3/16-11/32 4.80-8.70mm	**1/2** .4998-.4995	1/2	A-22202	A-12202	22202	12202								19938	
		5/8	A-22203	A-12203	22203	12203									
		3/4	A-22204	A-12204	22204	12204									
		7/8	A-22205	A-12205	22205	12205									
		1	A-22206	A-12206	22206	12206									
		1-1/8	A-22208	A-12208	22208	12208									
		1-1/4	A-22210	A-12210	22210	12210									
		1-3/8	A-22211	A-12211	22211	12211									
		1-1/2	A-22213	A-12213	22213	12213									
		1-5/8	A-22214	A-12214	22214	12214									
		1-3/4	A-22215	A-12215	22215	12215									
		1-7/8	A-22216	A-12216	22216	12216									
		2	A-22218	A-12218	22218	12218									
		2-1/8	A-22219	A-12219	22219	12219									
		2-1/4	A-22220	A-12220	22220	12220									
		2-3/8	A-22221	A-12221	22221	12221									
		2-1/2	A-22222	A-12222	22222	12222									
		2-3/4	A-22224	A-12224	22224	12224									
		3	A-22225	A-12225	22225	12225									
		3-1/4	A-22226	A-12226	22226	12226									
		3-1/2	A-22227	A-12227	22227	12227									
		3-3/4	A-22228	A-12228	22228	12228									
		4	A-22229	A-12229	22229	12229									
		5	A-22230	A-12230	22230	12230									
		6	A-22231	A-12231	22231	12231									
.1875-.4062 3/16-13/32 4.80-10.20mm	**9/16** .5623-.5620	5/8	A-22303	A-12303	22303	12303								19939	
		3/4	A-22304	A-12304	22304	12304									
		7/8	A-22305	A-12305	22305	12305									
		1	A-22306	A-12306	22306	12306									
		1-1/8	A-22308	A-12308	22308	12308									
		1-1/4	A-22310	A-12310	22310	12310									
		1-3/8	A-22311	A-12311	22311	12311									
		1-1/2	A-22313	A-12313	22313	12313									
		1-5/8	A-22314	A-12314	22314	12314									
		1-3/4	A-22315	A-12315	22315	12315									
		1-7/8	A-22316	A-12316	22316	12316									

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22000 SERIES (CONT.)

A ID RANGE	B OD	C LENGTH	TIP ASSEMBLY STANDARD TYPE PART NO.	TIP ASSEMBLY COOLANT TYPE PART NO.	SHANK ONLY STANDARD TYPE PART NO.	SHANK ONLY COOLANT TYPE PART NO.	COLLAR ONLY STANDARD TYPE PART NO.	COLLAR ONLY COOLANT TYPE PART NO.	TAPER-LOK LINER PART NO. p. 600	LOCK LINER PART NO. p. 601	LOCK NUT PART NO. p. 601	TAPER-LOK LOCKSCREW PART NO. p. 599	LOCK SCREW PART NO. p. 599	LINER PART NO. p. 599
		CONTINUED FROM PRECEDING PAGE.												
.1875-.4062 3/16-13/32 4.80-10.20mm	**9/16** .5623-.5620	2	A-22318	A-12318	22318	12318								
		2-1/8	A-22319	A-12319	22319	12319								
		2-1/4	A-22320	A-12320	22320	12320								
		2-3/8	A-22321	A-12321	22321	12321								
		2-1/2	A-22322	A-12322	22322	12322								
		2-3/4	A-22324	A-12324	22324	12324								
		3	A-22325	A-12325	22325	12325								
		3-1/4	A-22326	A-12326	22326	12326								19939
		3-1/2	A-22327	A-12327	22327	12327								
		3-3/4	A-22328	A-12328	22328	12328								
		4	A-22329	A-12329	22329	12329								
		5	A-22330	A-12330	22330	12330								
		6	A-22331	A-12331	22331	12331								
.1875-.4688 3/16-15/32 4.80-11.80mm	**5/8** .6248-.6245	3/8	A-22401	A-12401	22401	12401								
		1/2	A-22402	A-12402	22402	12402								
		5/8	A-22403	A-12403	22403	12403								
		3/4	A-22404	A-12404	22404	12404								
		7/8	A-22405	A-12405	22405	12405								
		1	A-22406	A-12406	22406	12406								
		1-1/8	A-22408	A-12408	22408	12408								
		1-3/16	A-16502	A-12409	16502	12409								
		1-1/4	A-22410	A-12410	22410	12410								
		1-3/8	A-22411	A-12411	22411	12411								
		1-1/2	A-22413	A-12413	22413	12413								
		1-5/8	A-22414	A-12414	22414	12414								
		1-3/4	A-22415	A-12415	22415	12415			TLL-16522 (Matches A-22406 Tip)	A-16522 (Matches A-16502 Tip)	14443			19940
		1-7/8	A-22416	A-12416	22416	12416								
		2	A-22418	A-12418	22418	12418								
		2-1/8	A-22419	A-12419	22419	12419								
		2-1/4	A-22420	A-12420	22420	12420								
		2-3/8	A-22421	A-12421	22421	12421	22000					CL-11-AFL or CL-13-AFL or CL-14-AFL	16532	
		2-1/2	A-22422	A-12422	22422	12422		12000						
		2-3/4	A-22424	A-12424	22424	12424								
		3	A-22425	A-12425	22425	12425								
		3-1/4	A-22426	A-12426	22426	12426								
		3-1/2	A-22427	A-12427	22427	12427								
		3-3/4	A-22428	A-12428	22428	12428								
		4	A-22429	A-12429	22429	12429								
		5	A-22430	A-12430	22430	12430								
		6	A-22431	A-12431	22431	12431								
.1875-.4688 3/16-15/32 4.80-11.80mm	**3/4** .7498-.7495	3/4	A-22504	A-12504	22504	12504								
		7/8	A-22505	A-12505	22505	12505								
		1	A-22506	A-12506	22506	12506								
		1-1/8	A-22508	A-12508	22508	12508								
		1-1/4	A-22510	A-12510	22510	12510								
		1-3/8	A-22511	A-12511	22511	12511								
		1-1/2	A-22513	A-12513	22513	12513								
		1-5/8	A-22514	A-12514	22514	12514								
		1-3/4	A-22515	A-12515	22515	12515								
		1-7/8	A-22516	A-12516	22516	12516								
		2	A-22518	A-12518	22518	12518								19941
		2-1/8	A-22519	A-12519	22519	12519								
		2-1/4	A-22520	A-12520	22520	12520								
		2-3/8	A-22521	A-12521	22521	12521								
		2-1/2	A-22522	A-12522	22522	12522								
		2-3/4	A-22524	A-12524	22524	12524								
		3	A-22525	A-12525	22525	12525								
		3-1/4	A-22526	A-12526	22526	12526								
		3-1/2	A-22527	A-12527	22527	12527								
		3-3/4	A-22528	A-12528	22528	12528								
		4	A-22529	A-12529	22529	12529								
		5	A-22530	A-12530	22530	12530								
		6	A-22531	A-12531	22531	12531								

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AIR FEED BUSHINGS



23000 SERIES

A ID RANGE	B OD	C LENGTH	TIP ASSEMBLY		SHANK ONLY		COLLAR ONLY		TAPER-LOK LINER PART NO. p. 600	LOCK LINER PART NO. p. 601	LOCK NUT PART NO. p. 601	TAPER-LOK LOCKSCREW PART NO. p. 599	LOCK SCREW PART NO. p. 599	LINER PART NO. p. 599
			STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.						
.2500-.5312 1/4-17/32 6.30-13.50mm	**3/4** .7498-.7495	3/4	A-23104	A-13104	23104	13104	23000	13000				CL-11-AFL or CL-13-AFL or CL-14-AFL	16532	19942
		7/8	A-23105	A-13105	23105	13105								
		1	A-23106	A-13106	23106	13106								
		1-1/8	A-23108	A-13108	23108	13108								
		1-1/4	A-23110	A-13110	23110	13110								
		1-3/8	A-23111	A-13111	23111	13111								
		1-1/2	A-23113	A-13113	23113	13113								
		1-5/8	A-23114	A-13114	23114	13114								
		1-3/4	A-23115	A-13115	23115	13115								
		1-7/8	A-23116	A-13116	23116	13116								
		2	A-23118	A-13118	23118	13118								
		2-1/8	A-23119	A-13119	23119	13119								
		2-1/4	A-23120	A-13120	23120	13120								
		2-3/8	A-23121	A-13121	23121	13121								
		2-1/2	A-23122	A-13122	23122	13122								
		2-3/4	A-23124	A-13124	23124	13124								
		3	A-23125	A-13125	23125	13125								
		3-1/4	A-23126	A-13126	23126	13126								
		3-1/2	A-23127	A-13127	23127	13127								
		3-3/4	A-23128	A-13128	23128	13128								
		4	A-23129	A-13129	23129	13129								
		5	A-23130	A-13130	23130	13130								
		6	A-23131	A-13131	23131	13131								
.2500-.5938 1/4-19/32 6.30-15.00mm	**13/16** .8123-.8120	3/4	A-23204	A-13204	23204	13204								19943
		7/8	A-23205	A-13205	23205	13205								
		1	A-23206	A-13206	23206	13206								
		1-1/8	A-23208	A-13208	23208	13208								
		1-1/4	A-23210	A-13210	23210	13210								
		1-3/8	A-23211	A-13211	23211	13211								
		1-1/2	A-23213	A-13213	23213	13213								
		1-5/8	A-23214	A-13214	23214	13214								
		1-3/4	A-23215	A-13215	23215	13215								
		1-7/8	A-23216	A-13216	23216	13216								
		2	A-23218	A-13218	23218	13218								
		2-1/8	A-23219	A-13219	23219	13219								
		2-1/4	A-23220	A-13220	23220	13220								
		2-3/8	A-23221	A-13221	23221	13221								
		2-1/2	A-23222	A-13222	23222	13222								
		2-3/4	A-23224	A-13224	23224	13224								
		3	A-23225	A-13225	23225	13225								
		3-1/4	A-23226	A-13226	23226	13226								
		3-1/2	A-23227	A-13227	23227	13227								
		3-3/4	A-23228	A-13228	23228	13228								
		4	A-23229	A-13229	23229	13229								
		5	A-23230	A-13230	23230	13230								
		6	A-23231	A-13231	23231	13231								

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23000 SERIES (CONT.)

A ID RANGE	B OD	C LENGTH	TIP ASSEMBLY		SHANK ONLY		COLLAR ONLY		TAPER-LOK LINER PART NO. p. 600	LOCK LINER PART NO. p. 601	LOCK NUT PART NO. p. 601	TAPER-LOK LOCKSCREW PART NO. p. 599	LOCK SCREW PART NO. p. 599	LINER PART NO. p. 599
			STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.						
.2500-.6562 1/4-21/32 6.30-16.50mm	**7/8** .8748-.8745	3/4	A-23304	A-13304	23304	13304	23000	13000	TLL-16523 (Matches A-23310 Tip)	A-16523 (Matches A-16504 Tip)	14445	CL-11-AFL or CL-13-AFL or CL-14-AFL	16532	19944
		7/8	A-23305	A-13305	23305	13305								
		1	A-23306	A-13306	23306	13306								
		1-1/8	A-23308	A-13308	23308	13308								
		1-1/4	A-23310	A-13310	23310	13310								
		1-3/8	A-23311	A-13311	23311	13311								
		1-7/16	A-16503	A-13312	16503	13312								
		1-1/2	A-23313	A-13313	23313	13313								
		1-5/8	A-23314	A-13314	23314	13314								
		1-3/4	A-23315	A-13315	23315	13315								
		1-7/8	A-23316	A-13316	23316	13316								
		2	A-23318	A-13318	23318	13318								
		2-1/8	A-23319	A-13319	23319	13319								
		2-1/4	A-23320	A-13320	23320	13320								
		2-3/8	A-23321	A-13321	23321	13321								
		2-1/2	A-23322	A-13322	23322	13322								
		2-3/4	A-23324	A-13324	23324	13324								
		3	A-23325	A-13325	23325	13325								
		3-1/4	A-23326	A-13326	23326	13326								
		3-1/2	A-23327	A-13327	23327	13327								
		3-3/4	A-23328	A-13328	23328	13328								
		4	A-23329	A-13329	23329	13329								
		5	A-23330	A-13330	23330	13330								
		6	A-23331	A-13331	23331	13331								
.2500-.7188 1/4-23/32 6.30-18.00mm	**1** .9998-.9995	1	A-23406	A-13406	23406	13406								19945
		1-1/8	A-23408	A-13408	23408	13408								
		1-1/4	A-23410	A-13410	23410	13410								
		1-3/8	A-23411	A-13411	23411	13411								
		1-1/2	A-23413	A-13413	23413	13413								
		1-5/8	A-23414	A-13414	23414	13414								
		1-3/4	A-23415	A-13415	23415	13415								
		1-7/8	A-23416	A-13416	23416	13416								
		2	A-23418	A-13418	23418	13418								
		2-1/8	A-23419	A-13419	23419	13419								
		2-1/4	A-23420	A-13420	23420	13420								
		2-3/8	A-23421	A-13421	23421	13421								
		2-1/2	A-23422	A-13422	23422	13422								
		2-3/4	A-23424	A-13424	23424	13424								
		3	A-23425	A-13425	23425	13425								
		3-1/4	A-23426	A-13426	23426	13426								
		3-1/2	A-23427	A-13427	23427	13427								
		3-3/4	A-23428	A-13428	23428	13428								
		4	A-23429	A-13429	23429	13429								
		5	A-23430	A-13430	23430	13430								
		6	A-23431	A-13431	23431	13431								
.2500-.7188 5/16-23/32 6.30-18.00mm	**1-1/8** 1.1248-1.1245	1	A-23506	A-13506	23506	13506			TTL-16524 (Matches A-23515 Tip)	A-16524 (Matches A-16504 Tip)	14446			19946
		1-1/8	A-23508	A-13508	23508	13508								
		1-1/4	A-23510	A-13510	23510	13510								
		1-3/8	A-23511	A-13511	23511	13511								
		1-1/2	A-23513	A-13513	23513	13513								
		1-5/8	A-23514	A-13514	23514	13514								
		1-3/4	A-23515	A-13515	23515	13515								
		1-7/8	A-23516	A-13516	23516	13516								
		1-15/16	A-16504	A-13517	16504	13517								
		2	A-23518	A-13518	23518	13518								
		2-1/8	A-23519	A-13519	23519	13519								
		2-1/4	A-23520	A-13520	23520	13520								
		2-3/8	A-23521	A-13521	23521	13521								
		2-1/2	A-23522	A-13522	23522	13522								
		2-3/4	A-23524	A-13524	23524	13524								
		3	A-23525	A-13525	23525	13525								
		3-1/4	A-23526	A-13526	23526	13526								
		3-1/2	A-23527	A-13527	23527	13527								
		3-3/4	A-23528	A-13528	23528	13528								
		4	A-23529	A-13529	23529	13529								
		5	A-23530	A-13530	23530	13530								
		6	A-23531	A-13531	23531	13531								

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24000 SERIES

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			STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.							
.3125-.4062 5/16-13/32 8.00-10.20mm	**5/8** .6248-.6245	5/8	A-24103	A-14103	24103	14103	24000	14000				CL-11-AFL or CL-13-AFL or CL-14-AFL	16532	19947	
		3/4	A-24104	A-14104	24104	14104									
		7/8	A-24105	A-14105	24105	14105									
		1	A-24106	A-14106	24106	14106									
		1-1/8	A-24108	A-14108	24108	14108									
		1-1/4	A-24110	A-14110	24110	14110									
		1-3/8	A-24111	A-14111	24111	14111									
		1-1/2	A-24113	A-14113	24113	14113									
		1-5/8	A-24114	A-14114	24114	14114									
		1-3/4	A-24115	A-14115	24115	14115									
		1-7/8	A-24116	A-14116	24116	14116									
		2	A-24118	A-14118	24118	14118									
		2-1/8	A-24119	A-14119	24119	14119									
		2-1/4	A-24120	A-14120	24120	14120									
		2-3/8	A-24121	A-14121	24121	14121									
		2-1/2	A-24122	A-14122	24122	14122									
		2-3/4	A-24124	A-14124	24124	14124									
		3	A-24125	A-14125	24125	14125									
		3-1/4	A-24126	A-14126	24126	14126									
		3-1/2	A-24127	A-14127	24127	14127									
		3-3/4	A-24128	A-14128	24128	14128									
		4	A-24129	A-14129	24129	14129									
		5	A-24130	A-14130	24130	14130									
		6	A-24131	A-14131	24131	14131									
.3125-.5312 5/16-17/32 8.00-13.50mm	**3/4** .7498-.7495	3/4	A-24304	A-14304	24304	14304									
		7/8	A-24305	A-14305	24305	14305									
		1	A-24306	A-14306	24306	14306									
		1-1/8	A-24308	A-14308	24308	14308									
		1-1/4	A-24310	A-14310	24310	14310									
		1-3/8	A-24311	A-14311	24311	14311									
		1-1/2	A-24313	A-14313	24313	14313									
		1-5/8	A-24314	A-14314	24314	14314									
		1-3/4	A-24315	A-14315	24315	14315									
		1-7/8	A-24316	A-14316	24316	14316									
		2	A-24318	A-14318	24318	14318									
		2-1/8	A-24319	A-14319	24319	14319									
		2-1/4	A-24320	A-14320	24320	14320									
		2-3/8	A-24321	A-14321	24321	14321									
		2-1/2	A-24322	A-14322	24322	14322									
		2-3/4	A-24324	A-14324	24324	14324									
		3	A-24325	A-14325	24325	14325									
		3-1/4	A-24326	A-14326	24326	14326									
		3-1/2	A-24327	A-14327	24327	14327									
		3-3/4	A-24328	A-14328	24328	14328									
		4	A-24329	A-14329	24329	14329									
		5	A-24330	A-14330	24330	14330									
		6	A-24331	A-14331	24331	14331									

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24000 SERIES (CONT.)

A ID RANGE	B OD	C LENGTH	TIP ASSEMBLY STANDARD TYPE PART NO.	TIP ASSEMBLY COOLANT TYPE PART NO.	SHANK ONLY STANDARD TYPE PART NO.	SHANK ONLY COOLANT TYPE PART NO.	COLLAR ONLY STANDARD TYPE PART NO.	COLLAR ONLY COOLANT TYPE PART NO.	TAPER-LOK LINER PART NO. p. 600	LOCK LINER PART NO. p. 601	LOCK NUT PART NO. p. 601	TAPER-LOK LOCKSCREW PART NO. p. 599	LOCK SCREW PART NO. p. 599	LINER PART NO. p. 599
.3125-.6562 5/16-21/32 8.00-16.50mm	**7/8** .8745-.8748	7/8	A-24405	A-14405	24405	14405								
		1	A-24406	A-14406	24406	14406								
		1-1/8	A-24408	A-14408	24408	14408								
		1-1/4	A-24410	A-14410	24410	14410								
		1-3/8	A-24411	A-14411	24411	14411								
		1-1/2	A-24413	A-14413	24413	14413								
		1-5/8	A-24414	A-14414	24414	14414								
		1-3/4	A-24415	A-14415	24415	14415								
		1-7/8	A-24416	A-14416	24416	14416								
		2	A-24418	A-14418	24418	14418								
		2-1/8	A-24419	A-14419	24419	14419								
		2-1/4	A-24420	A-14420	24420	14420								19950
		2-3/8	A-24421	A-14421	24421	14421								
		2-1/2	A-24422	A-14422	24422	14422								
		2-3/4	A-24424	A-14424	24424	14424								
		3	A-24425	A-14425	24425	14425								
		3-1/4	A-24426	A-14426	24426	14426								
		3-1/2	A-24427	A-14427	24427	14427								
		3-3/4	A-24428	A-14428	24428	14428								
		4	A-24429	A-14429	24429	14429								
		5	A-24430	A-14430	24430	14430								
		6	A-24431	A-14431	24431	14431								
.3125-.7812 5/16-25/32 8.00-19.50mm	**1** .9998-.9995	1	A-24506	A-14506	24506	14506								
		1-1/8	A-24508	A-14508	24508	14508								
		1-1/4	A-24510	A-14510	24510	14510								
		1-3/8	A-24511	A-14511	24511	14511								
		1-1/2	A-24513	A-14513	24513	14513								
		1-5/8	A-24514	A-14514	24514	14514								
		1-3/4	A-24515	A-14515	24515	14515								
		1-7/8	A-24516	A-14516	24516	14516								
		2	A-24518	A-14518	24518	14518						CL-11-AFL or CL-13-AFL or CL-14-AFL	16532	
		2-1/8	A-24519	A-14519	24519	14519	24000							
		2-1/4	A-24520	A-14520	24520	14520		14000						19951
		2-3/8	A-24521	A-14521	24521	14521								
		2-1/2	A-24522	A-14522	24522	14522								
		2-3/4	A-24524	A-14524	24524	14524								
		3	A-24525	A-14525	24525	14525								
		3-1/4	A-24526	A-14526	24526	14526								
		3-1/2	A-24527	A-14527	24527	14527								
		3-3/4	A-24528	A-14528	24528	14528								
		4	A-24529	A-14529	24529	14529								
		5	A-24530	A-14530	24530	14530								
		6	A-24531	A-14531	24531	14531								
.3125-.9062 5/16-29/32 8.00-23.00mm	**1-1/8** 1.1248-1.1245	1	A-24606	A-14606	24606	14606								
		1-1/8	A-24608	A-14608	24608	14608								
		1-1/4	A-24610	A-14610	24610	14610								
		1-3/8	A-24611	A-14611	24611	14611								
		1-1/2	A-24613	A-14613	24613	14613								
		1-5/8	A-24614	A-14614	24614	14614								
		1-3/4	A-24615	A-14615	24615	14615								
		1-7/8	A-24616	A-14616	24616	14616								
		1-15/16	A-16505	A-14617	16505	14617			TLL-16525 (Matches A-24615 Tip)	A-16525 (Matches A-16505 Tip)				
		2	A-24618	A-14618	24618	14618								
		2-1/8	A-24619	A-14619	24619	14619								
		2-1/4	A-24620	A-14620	24620	14620								
		2-3/8	A-24621	A-14621	24621	14621								
		2-1/2	A-24622	A-14622	24622	14622								
		2-3/4	A-24624	A-14624	24624	14624								
		3	A-24625	A-14625	24625	14625								
		3-1/4	A-24626	A-14626	24626	14626								
		3-1/2	A-24627	A-14627	24627	14627								
		3-3/4	A-24628	A-14628	24628	14628								
		4	A-24629	A-14629	24629	14629								
		5	A-24630	A-14630	24630	14630								
		6	A-24631	A-14631	24631	14631					14446			19946

INFO++

CONTINUED ON NEXT PAGE

AIR FEED BUSHINGS

24000 SERIES (CONT.)

A ID RANGE	B OD	C LENGTH	TIP ASSEMBLY		SHANK ONLY		COLLAR ONLY		TAPER-LOK LINER PART NO. p. 600	LOCK LINER PART NO. p. 601	LOCK NUT PART NO. p. 601	TAPER-LOK LOCKSCREW PART NO. p. 599	LOCK SCREW PART NO. p. 599	LINER PART NO. p. 599
			STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.						
.3125-.9375 5/16-15/16 8.00-23.50mm	**1-1/4** 1.2498-1.2495	1-1/4	A-24710	A-14710	24710	14710	24000	14000				CL-11-AFL or CL-13-AFL or CL-14-AFL	16532	19952
		1-3/8	A-24711	A-14711	24711	14711								
		1-1/2	A-24713	A-14713	24713	14713								
		1-5/8	A-24714	A-14714	24714	14714								
		1-3/4	A-24715	A-14715	24715	14715								
		1-7/8	A-24716	A-14716	24716	14716								
		2	A-24718	A-14718	24718	14718								
		2-1/8	A-24719	A-14719	24719	14719								
		2-1/4	A-24720	A-14720	24720	14720								
		2-3/8	A-24721	A-14721	24721	14721								
		2-1/2	A-24722	A-14722	24722	14722								
		2-3/4	A-24724	A-14724	24724	14724								
		3	A-24725	A-14725	24725	14725								
		3-1/4	A-24726	A-14726	24726	14726								
		3-1/2	A-24727	A-14727	24727	14727								
		3-3/4	A-24728	A-14728	24728	14728								
		4	A-24729	A-14729	24729	14729								
		5	A-24730	A-14730	24730	14730								
		6	A-24731	A-14731	24731	14731								
.3125-.9375 5/16-15/16 8.00-23.50mm	**1-1/2** 1.4998-1.4995	1	A-24806	A-14806	24806	14806			TLL-16526 (Matches A-24815 Tip)	A-16526 (Matches A-16506 Tip)	14447			
		1-3/8	A-24811	A-14811	24811	14811								
		1-1/2	A-24813	A-14813	24813	14813								
		1-5/8	A-24814	A-14814	24814	14814								
		1-3/4	A-24815	A-14815	24815	14815								
		1-7/8	A-24816	A-14816	24816	14816								
		1-15/16	A-16506	A-14817	16506	14817								
		2	A-24818	A-14818	24818	14818								
		2-1/8	A-24819	A-14819	24819	14819								
		2-1/4	A-24820	A-14820	24820	14820								
		2-3/8	A-24821	A-14821	24821	14821								
		2-1/2	A-24822	A-14822	24822	14822								
		2-3/4	A-24824	A-14824	24824	14824								
		3	A-24825	A-14825	24825	14825								
		3-1/4	A-24826	A-14826	24826	14826								
		3-1/2	A-24827	A-14827	24827	14827								
		3-3/4	A-24828	A-14828	24828	14828								
		4	A-24829	A-14829	24829	14829								
		5	A-24830	A-14830	24830	14830								
		6	A-24831	A-14831	24831	14831								

INFO++



25000 SERIES

.3750-1.0312 3/8-1-1/32 9.50-26.00mm	**1-1/4** 1.2498-1.2495	1-1/4	A-25110	A-15110	25110	15110	25000	15000				CL-12-AFL	16530	19953
		1-3/8	A-25111	A-15111	25111	15111								
		1-1/2	A-25113	A-15113	25113	15113								
		1-5/8	A-25114	A-15114	25114	15114								
		1-3/4	A-25115	A-15115	25115	15115								
		1-7/8	A-25116	A-15116	25116	15116								
		2	A-25118	A-15118	25118	15118								
		2-1/8	A-25119	A-15119	25119	15119								
		2-1/4	A-25120	A-15120	25120	15120								
		2-3/8	A-25121	A-15121	25121	15121								
		2-1/2	A-25122	A-15122	25122	15122								
		2-3/4	A-25124	A-15124	25124	15124								
		3	A-25125	A-15125	25125	15125								
		3-1/4	A-25126	A-15126	25126	15126								
		3-1/2	A-25127	A-15127	25127	15127								
		3-3/4	A-25128	A-15128	25128	15128								
		4	A-25129	A-15129	25129	15129								
		5	A-25130	A-15130	25130	15130								
		6	A-25131	A-15131	25211	15131								

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25000 SERIES (CONT.)

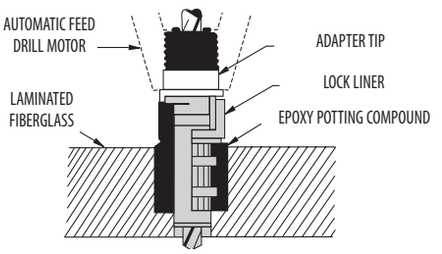
A ID RANGE	B OD	C LENGTH	TIP ASSEMBLY		SHANK ONLY		COLLAR ONLY		TAPER-LOK LINER PART NO. p. 600	LOCK LINER PART NO. p. 601	LOCK NUT PART NO. p. 601	TAPER-LOK LOCKSCREW PART NO. p. 599	LOCK SCREW PART NO. p. 599	LINER PART NO. p. 599
			STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.	STANDARD TYPE PART NO.	COOLANT TYPE PART NO.						
.3750-1.1562 3/8-1-5/32 9.50-29.00mm	**1-3/8** 1.3748-1.3745	1-3/8	A-25211	A-15211	25213	15211								
		1-1/2	A-25213	A-15213	25214	15213								
		1-5/8	A-25214	A-15214	25215	15214								
		1-3/4	A-25215	A-15215	25216	15215								
		1-7/8	A-25216	A-15216	25218	15216								
		2	A-25218	A-15218	25219	15218								
		2-1/8	A-25219	A-15219	25220	15219								
		2-1/4	A-25220	A-15220	25221	15220								19954
		2-3/8	A-25221	A-15221	25222	15221								
		2-1/2	A-25222	A-15222	25224	15222								
		2-3/4	A-25224	A-15224	25225	15224								
		3	A-25225	A-15225	25226	15225								
		3-1/4	A-25226	A-15226	25227	15226								
		3-1/2	A-25227	A-15227	25228	15227								
		3-3/4	A-25228	A-15228	25229	15228								
		4	A-25229	A-15229	25230	15229								
		5	A-25230	A-15230	25231	15230								
		6	A-25231	A-15231	25313	15231								
.3750-1.2812 3/8-1-9/32 9.50-32.00mm	**1-1/2** 1.4998-1.4995	1-1/2	A-25313	A-15313	25314	15313								
		1-5/8	A-25314	A-15314	25315	15314								
		1-3/4	A-25315	A-15315	25316	15315								
		1-7/8	A-25316	A-15316	25318	15316								
		2	A-25318	A-15318	25319	15318								
		2-1/8	A-25319	A-15319	25320	15319								
		2-1/4	A-25320	A-15320	25321	15320								
		2-3/8	A-25321	A-15321	25322	15321								
		2-1/2	A-25322	A-15322	25324	15322		15000					16530	19955
		2-3/4	A-25324	A-15324	25325	15324								
		3	A-25325	A-15325	25326	15325						CL-12-AFL		
		3-1/4	A-25326	A-15326	25327	15326								
		3-1/2	A-25327	A-15327	25328	15327								
		3-3/4	A-25328	A-15328	25329	15328								
		4	A-25329	A-15329	25330	15329								
		5	A-25330	A-15330	25331	15330								
		6	A-25331	A-15331	25415	15331								
.3750-1.4688 3/8-1-15/32 9.50-37.00mm	**1-3/4** 1.7498-1.7495	1-3/4	A-25415	A-15415	25416	15415								
		1-7/8	A-25416	A-15416	25418	15416								
		2	A-25418	A-15418	25419	15418								
		2-1/8	A-25419	A-15419	25420	15419								
		2-1/4	A-25420	A-15420	25421	15420								
		2-3/8	A-25421	A-15421	25422	15421								
		2-1/2	A-25422	A-15422	25424	15422								19956
		2-3/4	A-25424	A-15424	25425	15424								
		3	A-25425	A-15425	25426	15425								
		3-1/4	A-25426	A-15426	25427	15426								
		3-1/2	A-25427	A-15427	25428	15427								
		3-3/4	A-25428	A-15428	25429	15428								
		4	A-25429	A-15429	25430	15429								
		5	A-25430	A-15430	25431	15430								
		6	A-25431	A-15431	25518	15431								
.3750-1.4688 3/8-1-15/32 9.50-37.00mm	**2** 1.9998-1.9995	2	A-25518	A-15518	16513	15518								
		2-5/8	A-16513	A-15523	25524	15523								
		2-3/4	A-25524	A-15524	25525	15524								
		3	A-25525	A-15525	25526	15525								
		3-1/4	A-25526	A-15526	25527	15526				A-16533 (Matches A-16513 Tip)	14448			
		3-1/2	A-25527	A-15527	25528	15527								
		3-3/4	A-25528	A-15528	25529	15528								
		4	A-25529	A-15529	25530	15529								
		5	A-25530	A-15530	25531	15530								
		6	A-25531	A-15531		15531								

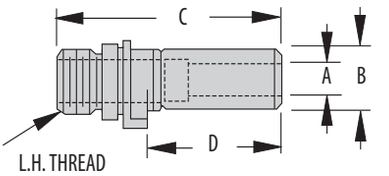
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AIR FEED BUSHINGS

AT-TYPE ONE-PIECE ADAPTER TIPS





ADAPTER TIP

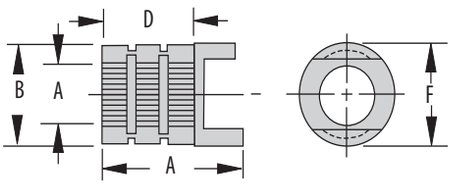
AT-series adapter tips are one-piece adapters primarily for fiberglass and plastic tooling. They are used with AT-series knurled liners, and are not compatible with any other liners or air-feed accessories. AT-series bushings are available in 3/4-16 and 1"-14 mounting-thread sizes, in a total of four OD sizes, to fit drill diameters from .1910" to .6250".

AT-TYPE ADAPTER TIPS

PART NO.	A ID RANGE	B OD	C	D	L.H. THREAD
AT-1	.1910-.2055 #11-#5	11/32 .3437-.3435	2-7/16	1-9/16	3/4-16
AT-2	.1910-.2850 #11-9/32	7/16 .4375-.4373			
AT-3	.2810-.4130 K-Z	9/16 .5625-.5623			
AT-4	.2810-.6250 K-5/8	3/4 .7500-.7498			1-14



LOCK LINER



13

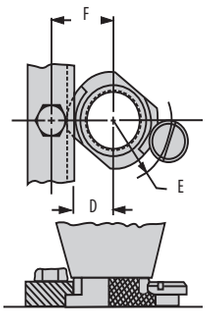
Precision knurled liner bushing for mounting air-feed drills in fiberglass or plastic tooling. AT-series knurled lock liners are designed especially for AT-series one-piece adapter tips, and are not compatible with any other liners or air-feed accessories. Press-fit AT-series liners are available as specials. Available in four sizes.

AT-TYPE LOCK LINERS

PART NO.	A ID RANGE	B OD	C	D	F DIA
LL-1	11/32 .3440-.3443	9/16	1-3/8	7/8	11/16
LL-2	7/16 .4377-.4380	11/16			13/16
LL-3	9/16 .5627-.5630	13/16			15/16
LL-4	3/4 .7503-.7506	1			1-1/8

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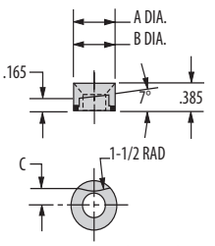
MOUNTING DIMENSIONS FOR LOCKSCREWS AND LOCK STRIPS

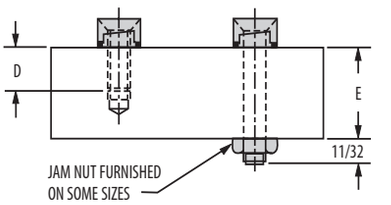


DIMENSION	21000 SERIES	22000 SERIES	23000 SERIES	24000 SERIES	25000 SERIES
D	.312	.609	.734	.859	—
E	.625	.922	1.047	1.172	1.562
F	.687	.984	1.109	1.234	—

TAPER-LOK AIR-FEED LOCKSCREWS





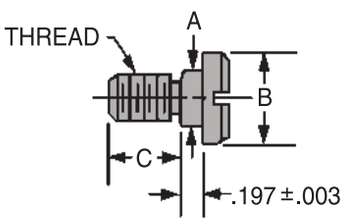


Angular locking surface mates perfectly with air-feed collars. Use instead of standard lockscrews for greater strength . . . eliminates worn, bent, or broken lockscrews caused by point contact. Serrations at bottom bite into the fixture plate to positively prevent rotation under heavy torque loads. Alloy steel mounting screws furnished. **Patent no. 3,336,822.**

PART NO.	MOUNTING SCREW DIA.	MOUNTING SCREW	A DIA	B DIA	C	D	E	REPLACES STANDARD LOCKSCREW
CL-9-AFL	5/16	Not Furnished	5/8	19/32	3/16	—	—	—
CL-11-AFL		5/16-18x1.00				19/32		16531 & 16532
CL-13-AFL		5/16-18x1.50 w/Jam Nut				1-3/32	3/4	—
CL-14-AFL		5/16-18x2.00 w/Jam Nut				1-19/32	1-1/4	
CL-10-AFL	3/8	Not Furnished	3/4	23/32	7/32	—	—	—
CL-12-AFL		3/8-16x1.00				19/32		16530

LOCKSCREWS

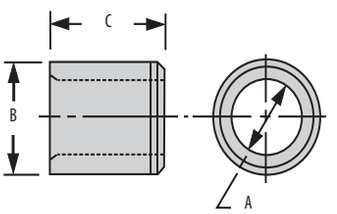




PART NO. (PACK OF 5)	A DIA	B DIA	C	B THREAD
16531-PACKOF5	3/8	5/8	5/16	5/16-18
16532-PACKOF5			7/16	
16530-PACKOF5	7/16	3/4	5/8	3/8-16

LINERS

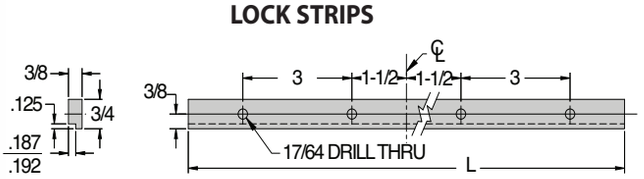




PART NO.	A ID	B OD	C LENGTH
19936	3/8	5/8	1
19937	7/16	3/4	1
19938	1/2		
19939	9/16	7/8	1
19940	5/8		
19947			1-3/4
19941	3/4	1	1
19942			1-3/8
19949			1-3/4
19943	13/16	1-3/8	1-3/8
19944	7/8		
19950			1-3/4
19945	1		1-3/8
19951			1-3/4
19946	1-1/8	1-3/4	1-3/4
19952	1-1/4		
19953			2-1/2
19954	1-3/8		
19955	1-1/2	2-1/4	2-1/2
19956	1-3/4		

LOCK STRIPS





PART NO.	L OVERALL LENGTH	NO. OF HOLES
LSM-12	12	4
LSM-24	24	8
LSM-36	36	12

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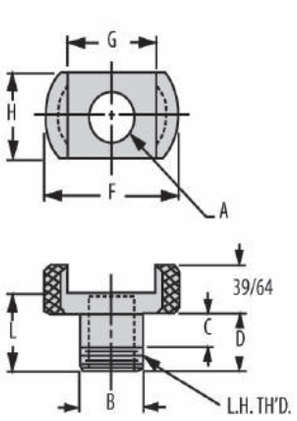
AIR FEED BUSHINGS

TAPER-LOK LINERS



PRESS FIT

Precision liner bushing for mounting air-feed drills through a jig plate. One-piece design has two angled locking surfaces to lock the drill motor in place, for superior strength. Milled flats allow close hole spacing. Press fit into jig plate, then fasten from behind with a Lock Nut (order separately). Optional heavy-duty type has precisely machined helical locking surfaces that mate exactly with the air-feed collar for added impact resistance. **Patent no. 3,015,242**. Available for 21000 through 24000 series air-feed drills (not 25000 series).



PRESS FIT – STANDARD

PART NO.	A DIA	B DIA	C	D	F DIA	G	H	L	L.H. THREAD	MATCHING LOCK NUT	MATCHING ADAPTOR TIP
TLL-16520	.3750 .3755	.4995 .4990	7/16	3/4	1-1/8	.625	3/4	1	1/2-20	14441	A-21106
TLL-16521	.5000 .5005	.7495 .7490	7/16	3/4	1-3/16	.625	7/8	1	3/4-16	14442	A-21306
TLL-16522	.6250 .6255	.8745 .8740	7/16	3/4	1-13/16	1.218	1-1/8	1	7/8-14	14443	A-22406
TLL-16523	.8750 .8756	1.2495 1.2490	9/16	1	2-1/8	1.468	1-3/8	1-1/4	1-1/4-12	14445	A-23310
TLL-16524	1.1252 1.1258	1.4990 1.4985	27/32	1-1/2	2-1/8	1.468	1-5/8	1-3/4	1-1/2-12	14446	A-23515
TLL-16525	1.1252 1.1258	1.4990 1.4985			2-7/16	1.718					A-24615
TLL-16526	1.5002 1.5008	1.9990 1.9985	27/32	1-1/2	2-7/16	1.718	2-1/2	1-3/4	2″-16	14447	A-24815

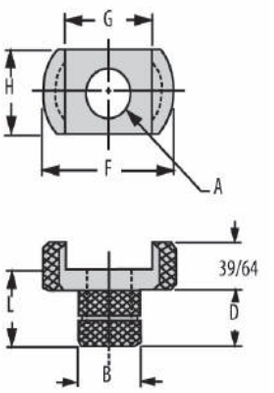
PRESS FIT – HEAVY DUTY

HLL-16520	.3750 .3755	.4995 .4990	7/16	3/4	1-1/8	.625	3/4	1	1/2-20	14441	A-21106
HLL-16521	.5000 .5005	.7495 .7490	7/16	3/4	1-3/16	.625	7/8	1	3/4-16	14442	A-21306
HLL-16522	.6250 .6255	.8745 .8740	7/16	3/4	1-13/16	1.218	1-1/8	1	7/8-14	14443	A-22406
HLL-16523	.8750 .8756	1.2495 1.2490	9/16	1	2-1/8	1.468	1-3/8	1-1/4	1-1/4-12	14445	A-23310
HLL-16524	1.1252 1.1258	1.4990 1.4985	27/32	1-1/2	2-1/8	1.468	1-5/8	1-3/4	1-1/2-12	14446	A-23515
HLL-16525	1.1252 1.1258	1.4990 1.4985			2-7/16	1.718					A-24615
HLL-16526	1.5002 1.5008	1.9990 1.9985	27/32	1-1/2	2-7/16	1.718	2-1/2	1-3/4	2″-16	14447	A-24815



KNURLED

Precision knurled liner bushing for mounting air-feed drills in fiberglass or plastic tooling. One-piece design has two angled locking surfaces to lock the drill motor in place, for superior strength. Optional heavy-duty type has precisely machined helical locking surfaces that mate exactly with the air-feed colla for added impact resistance. Milled flats allow close hole spacing. Available for 21000 and 22000 series air-feed drills. **Patent no. 3,015,242.**



KNURLED – STANDARD

PART NO.	A DIA	B DIA	D	F DIA	G	H	L	MATCHING ADAPTOR TIP
TLD-375	.3750 .3755	3/4	7/8	1-3/16	.625	7/8	1-1/8	A-21108
TLD-500	.5000 .5005	3/4	7/8	1-3/16	.625	7/8	1-1/8	A-21308
TLD-750	.7500 .7505	1-1/8	7/8	1-13/16	1.218	1-1/8	1-1/8	A-22508

KNURLED – HEAVY DUTY

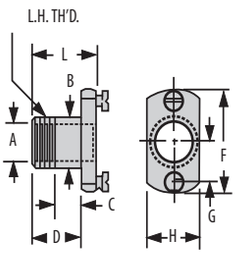
HLD-375	.3750 .3755	3/4	7/8	1-3/16	.625	7/8	1-1/8	A-21108
HLD-500	.5000 .5005	3/4	7/8	1-3/16	.625	7/8	1-1/8	A-21308
HLD-750	.7500 .7505	1-1/8	7/8	1-13/16	1.218	1-1/8	1-1/8	A-22508

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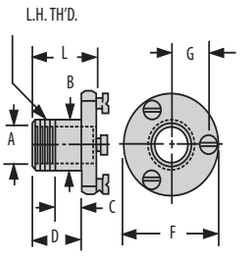
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LOCK LINERS





STANDARD

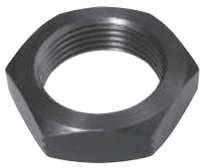


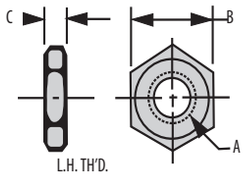
A-16533 ONLY

Precision liner bushing for mounting air-feed drills through a jig plate. The large head holds two standard Lockscrews, to lock the drill motor in place. Milled flats allow close hole spacing. Press fit into jig plate, then fasten from behind with a Lock Nut (order separately). Available for 21000 through 25000 series air-feed drills.

PART NO.	A DIA	B DIA	C	D	F DIA	G	H	L	L.H. THREAD	MATCHING LOCK NUT	MATCHING ADAPTOR TIP
.3750	.3750	.4995	7/16	3/4	1-3/4	5/8	3/4	1-1/16	1/2-20	14441	A-16500
	.3756	.4989									
.5000	.5000	.7495	7/16	3/4	1-3/4	5/8	1	1-1/16	3/4-16	14442	A-16501
	.5006	.7489									
.6250	.6250	.8745	7/16	3/4	2-7/16	59/64	1-1/8	1-3/16	7/8-14	14443	A-16502
	.6256	.8739									
.8750	.8750	1.2495	9/16	1	2-11/16	1-3/64	1-1/2	1-7/16	1-1/4-12	14445	A-16503
	.8756	1.2485									
1.1250	1.1250	1.4990	27/32	1-1/2	2-11/16	1-3/64	1-3/4	1-15/16	1-1/2-12	14446	A-16504
	1.1260	1.4980									
1.1250	1.1250	1.4990	27/32	1-1/2	3	1-11/64	1-3/4	1-15/16	1-1/2-12	14446	A-16505
	1.1260	1.4980									
1.5000	1.5000	1.9990	27/32	1-1/2	3	1-11/64	2-1/2	1-15/16	2"-16	14447	A-16506
	1.5010	1.9980									
2.0000	2.0000	2.4990	1-3/8	2	3-3/4	1-9/16	—	2-5/8	2-1/2-16	14448	A-16513
	2.0015	2.4980									

LOCK NUTS

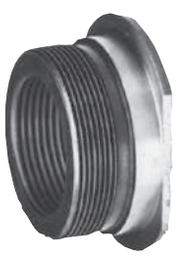


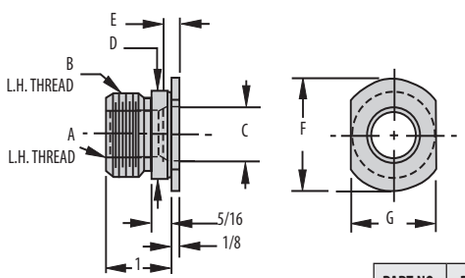


These fine-thread Lock Nuts fit the entire range of standard lock liners. Lock Liners press fit into the jig plate, then fasten from behind with a Lock Nut.

LOCK NUT PART NO.	A (THREAD SIZE)	B	C
14441	1/2-20	3/4	1/4
14442	3/4-16	1	1/4
14443	7/8-14	1-1/4	1/4
14445	1-1/4-12	1-3/4	3/8
14446	1-1/2-12	2	1/2
14447	2-16	2-1/2	1/2
14448	2-1/2-16	3	1/2

REDUCERS





These Reducers allow mounting a smaller-series air-feed adaptor tip on a larger-series drill motor. Available for either standard or coolant-type air-feed drills. Available for 22000 through 25000 series air-feed drill motors. Two Reducers can be used together to step down several sizes.

PART NO. STANDARD TYPE	PART NO. COOLANT TYPE	A INSIDE THREAD	B OUTSIDE THREAD	C DIA	D DIA	E	F DIA	G*
17952	A-17952	3/4-16	1-14	.8125	1.0610-1.0604	9/32	1-3/8	1-1/16
25018	A-25018		1-1/4-12		1.3110-1.3104		1-5/8	1-5/16
25582	A-25582		1-1/2-12		1.5610-1.5604		1-15/16	1-9/16
25583	A-25583	1-1/4	1-1/4-12	1.0625	1.3110-1.3104	11/32	1-5/8	1-5/16
20132	A-20132		1-1/2-12		1.5610-1.5604		1-15/16	1-9/16
20017	A-20017	1-1/4-12	1-1/2-12	1.3125	1.5610-1.5604	11/32	1-15/16	1-9/16
27910	A-27910	1-1/2-12	2-16	1.5625	2.0610-2.0604	11/32	2-1/2	2-1/16

* Coolant type does not have wrench flats.

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INCH DRILL SIZES

Drill/Decimal		Drill/Decimal		Drill/Decimal	
80	.0135	9/64	.1406	23/64	.3594
79	.0145	27	.1440	U	.3680
1/64	.0156	26	.1470	**3/8**	**.3750**
78	.0160	25	.1495	V	.3770
77	.0180	24	.1520	W	.3860
76	.0200	23	.1540	25/64	.3906
75	.0210	5/32	.1562	X	.3970
74	.0225	22	.1570	Y	.4040
73	.0240	21	.1590	13/32	.4062
72	.0250	20	.1610	Z	.4130
71	.0260	19	.1660	27/64	.4219
70	.0280	18	.1695	**7/16**	**.4375**
69	.0292	11/64	.1719	29/64	.4531
68	.0310	17	.1730	15/32	.4688
1/32	.0312	16	.1770	31/64	.4844
67	.0320	15	.1800	**1/2**	**.5000**
66	.0330	14	.1820	33/64	.5156
65	.0350	13	.1850	17/32	.5312
64	.0360	**3/16**	**.1875**	35/64	.5469
63	.0370	12	.1890	**9/16**	**.5625**
62	.0380	11	.1910	37/64	.5781
61	.0390	10	.1935	19/32	.5938
60	.0400	9	.1960	39/64	.6094
59	.0410	8	.1990	**5/8**	**.6250**
58	.0420	7	.2010	41/64	.6406
57	.0430	13/64	.2031	21/32	.6562
56	.0465	6	.2040	43/64	.6719
3/64	.0469	5	.2055	**11/16**	**.6875**
55	.0520	4	.2090	45/64	.7031
54	.0550	3	.2130	23/32	.7188
53	.0595	7/32	.2188	47/64	.7344
1/16	**.0625**	2	.2210	**3/4**	**.7500**
52	.0635	1	.2280	49/64	.7656
51	.0670	A	.2340	25/32	.7812
50	.0700	15/64	.2344	51/64	.7969
49	.0730	B	.2380	**13/16**	**.8125**
48	.0760	C	.2420	53/64	.8281
5/64	.0781	D	.2460	27/32	.8438
47	.0785	E	.2500	55/64	.8594
46	.0810	**1/4**	**.2500**	**7/8**	**.8750**
45	.0820	F	.2570	57/64	.8906
44	.0860	G	.2610	29/32	.9062
43	.0890	17/64	.2656	59/64	.9219
42	.0935	H	.2660	**15/16**	**.9375**
3/32	.0938	I	.2720	61/64	.9531
41	.0960	J	.2770	31/32	.9688
40	.0980	K	.2810	63/64	.9844
39	.0995	9/32	.2812	**1**	**1.0000**
38	.1015	L	.2900		
37	.1040	M	.2950	+64th	
36	.1065	19/64	.2969	increments up to	
7/64	.1094	N	.3020	1-7/8"	
35	.1100	**5/16**	**.3125**		
34	.1110	O	.3160	+32nd	
33	.1130	P	.3230	increments up to	
32	.1160	21/64	.3281	2-1/4"	
31	.1200	Q	.3320		
1/8	**.1250**	R	.3390	+16th	
30	.1285	11/32	.3438	increments up to	
29	.1360	S	.3480	4-1/4"	
28	.1405	T	.3580		

METRIC DRILL SIZES

Drill/Decimal		Drill/Decimal		Drill/Decimal	
.35mm	.0138	3.60mm	.1417	8.70mm	.3425
.38mm	.0150	3.70mm	.1457	8.75mm	.3445
.40mm	.0157	3.75mm	.1476	8.80mm	.3465
.42mm	.0165	3.80mm	.1496	8.90mm	.3504
.45mm	.0177	3.90mm	.1535	**9.00mm**	**.3543**
.48mm	.0189	**4.00mm**	**.1575**	9.10mm	.3583
.50mm	.0197	4.10mm	.1614	9.20mm	.3622
.55mm	.0217	4.20mm	.1654	9.25mm	.3642
.60mm	.0236	4.25mm	.1673	9.30mm	.3661
.65mm	.0256	4.30mm	.1693	9.40mm	.3701
.70mm	.0276	4.40mm	.1732	9.50mm	.3740
.75mm	.0295	4.50mm	.1772	9.60mm	.3780
.80mm	.0315	4.60mm	.1811	9.70mm	.3819
.85mm	.0335	4.70mm	.1850	9.75mm	.3839
.90mm	.0354	4.75mm	.1870	9.80mm	.3858
.95mm	.0374	4.80mm	.1890	9.90mm	.3898
1.00mm	**.0394**	4.90mm	.1929	**10.00mm**	**.3937**
1.05mm	.0413	**5.00mm**	**.1969**	10.20mm	.4016
1.10mm	.0433	5.10mm	.2008	10.50mm	.4134
1.15mm	.0453	5.20mm	.2047	10.80mm	.4252
1.20mm	.0472	5.25mm	.2067	**11.00mm.4331**	
1.25mm	.0492	5.30mm	.2087	11.20mm	.4409
1.30mm	.0512	5.40mm	.2126	11.50mm	.4528
1.35mm	.0531	5.50mm	.2165	11.80mm	.4646
1.40mm	.0551	5.60mm	.2205	**12.00mm**	**.4724**
1.45mm	.0571	5.70mm	.2244	12.20mm	.4803
1.50mm	.0591	5.75mm	.2264	12.50mm	.4921
1.55mm	.0610	5.80mm	.2283	**13.00mm**	**.5118**
1.60mm	.0630	5.90mm	.2323	13.50mm	.5315
1.65mm	.0650	**6.00mm**	**.2362**	**14.00mm**	**.5512**
1.70mm	.0669	6.10mm	.2402	14.50mm	.5709
1.75mm	.0689	6.20mm	.2441	**15.00mm**	**.5906**
1.80mm	.0709	6.25mm	.2461	15.50mm	.6102
1.85mm	.0728	6.30mm	.2480	**16.00mm**	**.6299**
1.90mm	.0748	6.40mm	.2520	16.50mm	.6496
1.95mm	.0768	6.50mm	.2559	**17.00mm**	**.6693**
2.00mm	**.0787**	6.60mm	.2598	17.50mm	.6890
2.05mm	.0807	6.70mm	.2638	**18.00mm**	**.7087**
2.10mm	.0827	6.75mm	.2657	18.50mm	.7283
2.15mm	.0846	6.80mm	.2677	**19.00mm**	**.7480**
2.20mm	.0866	6.90mm	.2717	19.50mm	.7677
2.25mm	.0886	**7.00mm**	**.2756**	**20.00mm**	**.7874**
2.30mm	.0906	7.10mm	.2795	20.50mm	.8071
2.35mm	.0925	7.20mm	.2835	**21.00mm**	**.8268**
2.40mm	.0945	7.25mm	.2854	21.50mm	.8465
2.45mm	.0965	7.30mm	.2874	**22.00mm**	**.8661**
2.50mm	.0984	7.40mm	.2913	22.50mm	.8858
2.55mm	.1004	7.50mm	.2953	**23.00mm**	**.9055**
2.60mm	.1024	7.60mm	.2992	23.50mm	.9252
2.65mm	.1043	7.70mm	.3031	**24.00mm**	**.9449**
2.70mm	.1063	7.75mm	.3051	24.50mm	.9646
2.75mm	.1083	7.80mm	.3071	**25.00mm.9843**	
2.80mm	.1102	7.90mm	.3110		
2.90mm	.1142	**8.00mm**	**.3150**	+1.00mm	
3.00mm	**.1181**	8.10mm	.3189	increments	
3.10mm	.1220	8.20mm	.3228	up to 48mm	
3.20mm	.1260	8.25mm	.3248		
3.25mm	.1280	8.30mm	.3268	+5.00mm	
3.30mm	.1299	8.40mm	.3307	increments	
3.40mm	.1339	8.50mm	.3346	from 50mm	
3.50mm	.1378	8.60mm	.3386	up to 105mm	

TAP GUIDE SIZES
(Priced as specials)

Tap Size*	Tap Guide Nominal ID Size	Tap Drill Size**
#0-80	.0616	3/64
#2-56	.0883	#50
#2-64	.0880	#50
#4-40	.1152	#43
#4-48	.1147	#42
#5-40	.1282	#38
#5-44	.1280(3.25mm)	#37
#6-32	.1421	#36
#6-40	.1412	#33
#8-32	.1681	#29
#8-36	.1676	#29
#10-24	.1954	#25
#10-32	.1941	#21
1/4-20	.2565	#7
1/4-28	.2546	#3
5/16-18	.3197	F
5/16-24	.3179	I
3/8-16	.3831	5/16
3/8-24	.3804	Q
7/16-14	.4468	U
7/16-20	.4440	25/64
1/2-13	.5100	27/64
1/2-20	.5065	29/64
9/16-12	.5733	31/64
9/16-18	.5697	33/64
5/8-11	.6368	17/32
5/8-18	.6322	37/64
3/4-10	.7630	21/32
3/4-16	.7581	11/16
7/8-9	.8894	49/64
7/8-14	.8843	13/16
1-8	1.0162	7/8
1-14	1.0093	15/16
METRIC		
M1.6x0.35	.0651	1.25mm or #55
M2x0.4	.0810 (#46)	1.60mm or #52
M2.5x0.45	.1008	2.05mm or #46
M3x0.5	.1207	2.50mm or #39
M3.5x0.6	.1407	2.90mm or #32
M4x0.7	.1613	3.30mm or #30
M5x0.8	.2010 (#7)	4.20mm or #19
M6x1	.2410	5.00mm or #8
M8x1.25	.3214	6.80mm or H
M8x1	.3197	7.00mm or J
M10x1.5	.4009	8.50mm or R
M10x1.25	.4002	8.80mm or 11/32
M12x1.75	.4805	10.20mm or 13/32
M12x1.25	.4789	10.80mm or 27/64
M14x2	.5600	12.00mm or 15/32
M14x1.5	.5584	12.50mm or 1/2
M16x2	.6387	14.00mm or 35/64
M16x1.5	.6372	14.50mm or 37/64
M18x2.5	.7191	15.50mm or 39/64
M18x1.5	.7159	16.50mm or 21/32
M20x2.5	.7978	17.50mm or 11/16
M20x1.5	.7946	18.50mm or 47/64
M22x2.5	.8765	19.50mm or 49/64
M22x1.5	.8734	20.50mm or 13/16
M24x3	.9583	21.00mm or 53/64
M24x2	.9537	22.00mm or 7/8

* Coarse series shown in bold. Pitch callout not required on metric coarse series.
** Closest size for 75% theoretical thread.

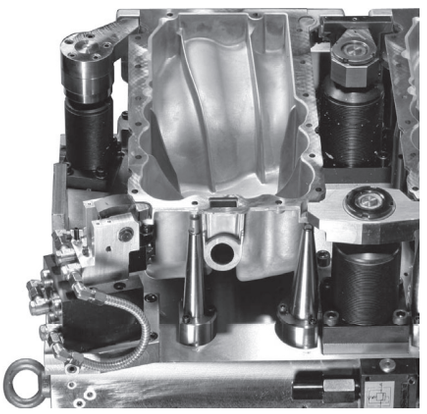
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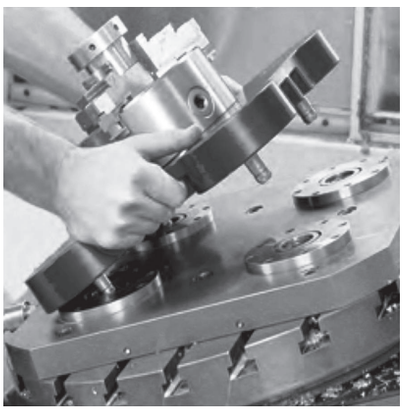
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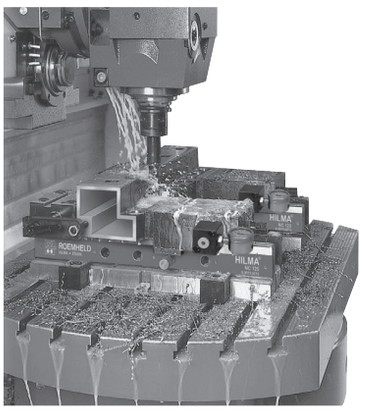
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Power Workholding For CNC Machining







Power Workholding
Precision Vises
Zero Point Mounting
Assembly and Handling

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About Us

In 1982 an independent joint venture was established to marry the proven product expertise of Roemheld with the tooling industry know-how and distribution network of Carr Lane Manufacturing. This partnership now offers to the American manufacturer the finest in international power workholding, combined with the best in local service and support.



Carr Lane Roemheld supplies North America with engineered hydraulic clamping and quick tool change systems, backed by responsive service and technical support. Used in the automotive, aerospace, appliance and other markets, these high-quality machine tool accessories and workholders greatly increase manufacturing productivity.



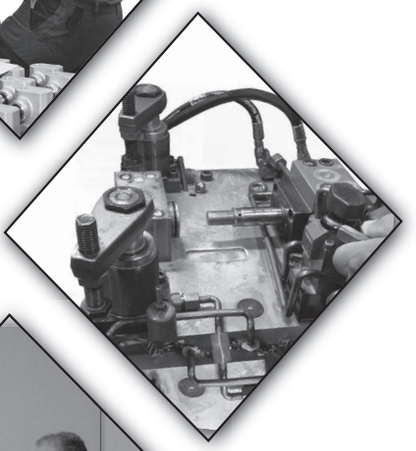
Founded in 1952 in St. Louis, Missouri by Earl E. Walker and family to make standardized tooling components, Carr Lane Manufacturing has grown, through constant innovation, to become the foremost manufacturer and supplier to the American machine tool industry. Now the most complete line available, Carr Lane Manufacturing offers jig and fixture components, toggle clamps, hoist rings, alignment pins, drill bushings, spring plungers, and modular fixturing. Setting the standard for American tool engineers, Carr Lane Manufacturing's catalog is recognized as the manufacturing engineer's tooling reference.



Drawing upon a centuries-old tradition of German craftsmanship, metalworking was already well established in Laubach, Germany when the Roemheld family began to manage operations in 1870. Development of the hydraulic workholding components began in the early 1960's and soon grew to dominate the European market. Today, Roemheld GmbH is by far the world leader in this productivity-enhancing technology, offering a tremendous range of power workholding components of superior design and the highest quality.

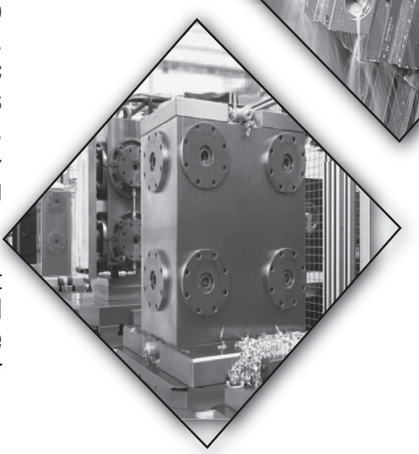
We invite you to review this section of the catalog in depth and to visit roemheld-usa.com for more information. We at Carr Lane Roemheld welcome the opportunity to assist you in your manufacturing process in the most productive way possible — with the world's most dependable power workholding equipment.











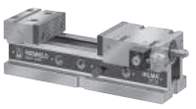
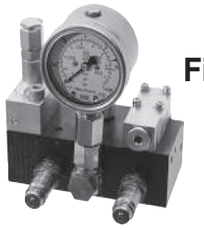
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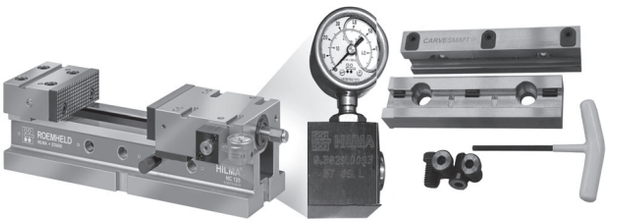
Featured Power Workholding Items

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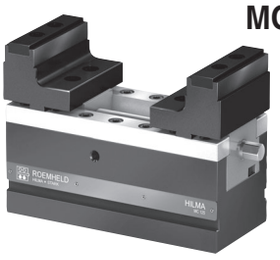
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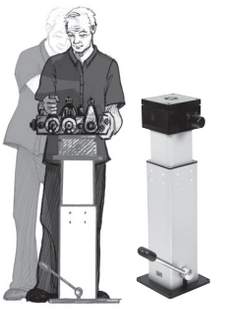
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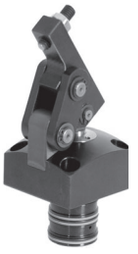
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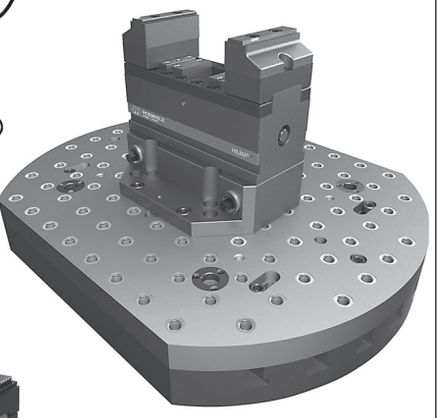
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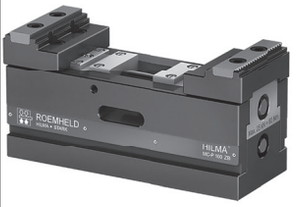


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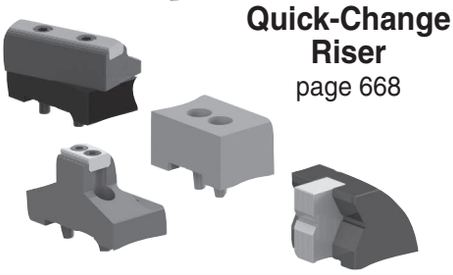




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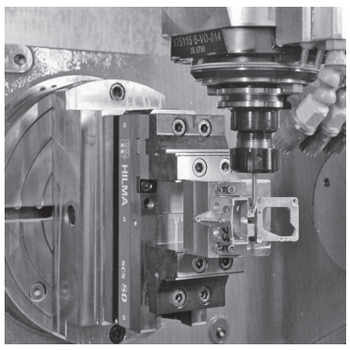
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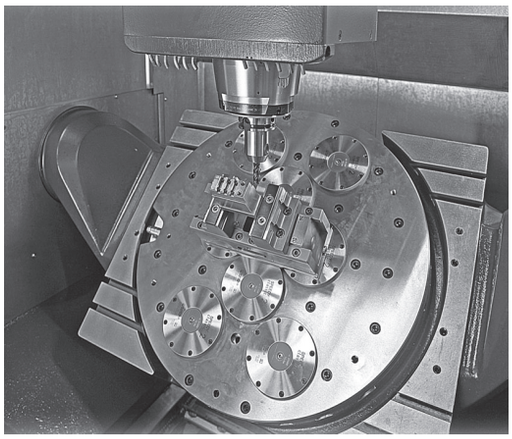
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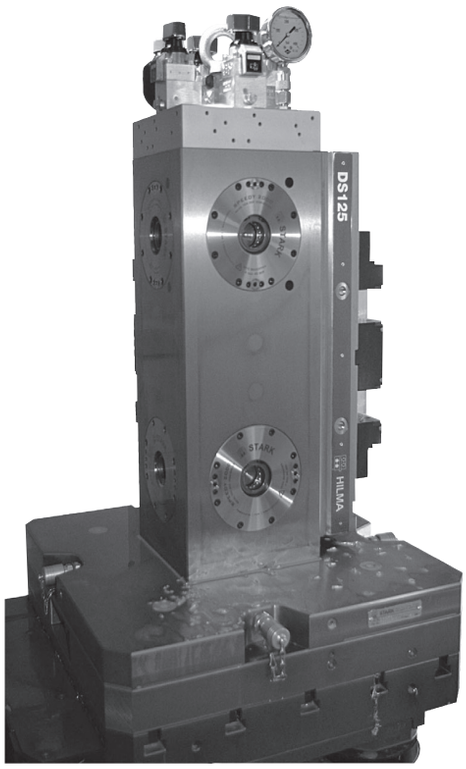
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PRECISION MACHINE VISES INCREASE PRODUCTIVITY

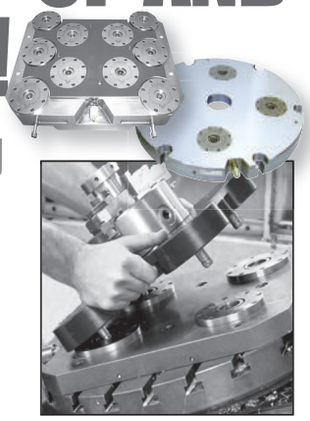
Use in Conjunction with the Zero Point Mounting System for Faster, More Accurate Fixture Set Ups





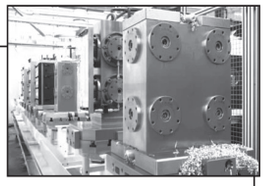


REDUCE SET-UP AND DOWNTIME!



Zero Point Mounting System for Quick Change Fixturing

This comprehensive system utilizes clamping components and insertion nipples, which provide an immediate zero point orientation.



- Reduce set up time by as much as 90% with zero point mounting
- Existing fixtures can be easily adapted
- Highly accurate positioning and repeatability
- Increased productivity
- Fast payback
- Set-up times slashed
- Fixture life extended

View Stark Zero Point Mounting Products at:

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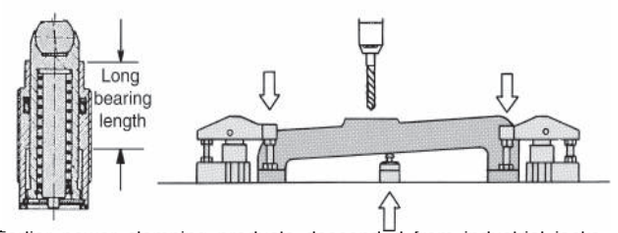
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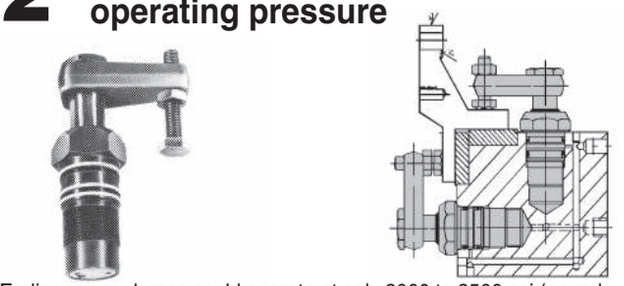
What makes Roemheld Power Workholding better than earlier hydraulic clamps?

1 Designs specifically and purely for workholding



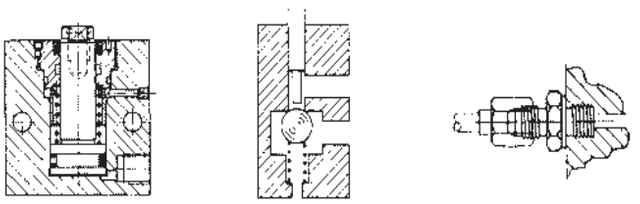
Earlier power clamping products descended from industrial jacks, pipe benders, and rams. Although these early devices (many still on the market) are fine for their original uses, they do not meet the special demands of modern workholding. For example, in a machining application, components are often subject to side loading due to cutting forces, not simply axial loads. This condition requires totally different engineering to provide sufficient bearing lengths for durability. As another example, workholding components are frequently exposed to coolant, chips, dirt, and grit, so clamps must include effective wipers and vent filters. Also, industrial cylinders converted to clamps are usually too bulky to fit easily on fixtures.

2 Compactness, with 7250-psi operating pressure



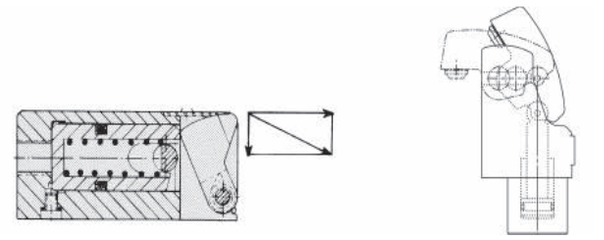
Earlier power clamps could operate at only 2000 to 3500 psi (pounds per square inch) fluid pressure. You needed large, bulky clamps with large internal cylinders to provide enough clamping force. Roemheld components are designed differently, inside and out, to fit easily on fixtures. They work comfortably even at 7250 psi, letting you use much smaller clamps to get the same clamping force. Compact Roemheld clamps open up new fixturing possibilities: you can now place clamps in tighter spots than before, and with the extra space, you can put more workpieces on a fixture (for example, six parts per cycle instead of only 4).

3 Zero-leakage sealing technology



Another feature unique to Roemheld power workholding is leak-free hydraulic sealing. Zero leakage is always important for safe clamping, and is absolutely vital on portable palletized fixtures. Maintaining pressure in a closed, disconnected system requires that *all* components – clamps, valves, and fittings – be leak-free. This calls for drastic changes in sealing techniques: cylinder seals are different, poppet valves (not leaky spool valves) are used whenever possible, and all fittings use metal-to-metal sealing (straight BSPP pipe threads with knife-edge sealing, instead of leak-prone tapered pipe threads).

4 State-of-the-art product development



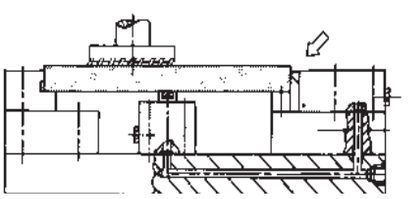
The Edge Clamps and Extending Clamps shown above are just two examples of advanced clamp designs in the Roemheld line. Both set new standards for good engineering and compact size. Our many new products and product improvements result from constant, extensive research and development. New products are field tested and proven, often for years, before they are ever offered for sale.

5 Extensive clamp sizes that follow a logical progression



Roemheld offers a vast selection of clamp sizes and varieties, to match your requirements exactly. In fact, we offer *several times* as many catalog models as our closest competitor (with much better stock too)! Just as important, our clamp sizes follow a logical progression of clamping forces, so you can usually find a clamp that is just the right size.

6 Manifold mounting



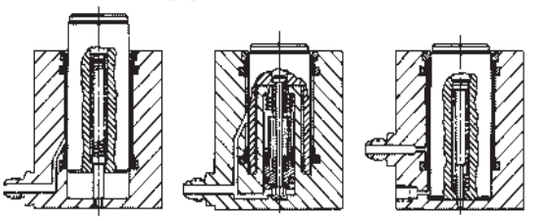
Our Roemheld line pioneered the ever-increasing use of manifold mounting: supplying fluid to clamps through passages drilled in the fixture, rather than through tubing or hoses. Manifold mounting, which requires specially designed clamps, allows designing totally "clean" fixtures without chip traps. Also, manifold mounting lets you put clamps closer together and in tighter spots, often letting you put more workpieces on a fixture.

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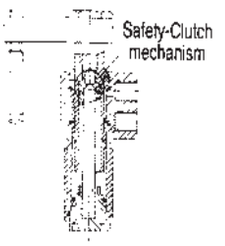
7 Work Supports



One of the most important improvements in power workholding is the work support. These components do not exert clamping force; instead, they lock off to restrain a workpiece during machining to prevent deflection and vibration. Roemheld work supports offer two major improvements: (1) drastically improved accuracy, with +/-.0002 inches repeatability, and (2) fluid-advanced and air-advanced supports. Fluid- and air-advanced versions offer significant advantages over conventional spring-loaded work supports. A spring-loaded support relies on a workpiece's weight to depress its support plunger to the proper height. While fluid pressure is off, the plunger remains in a raised position on the machine and can hamper loading and unloading. A fluid-advanced work support's plunger, on the other hand, is retracted when fluid pressure is off. Applying pressure first raises the plunger gently to the workpiece, then automatically locks it at the correct height. When pressure is released, the plunger retracts again for clear loading.

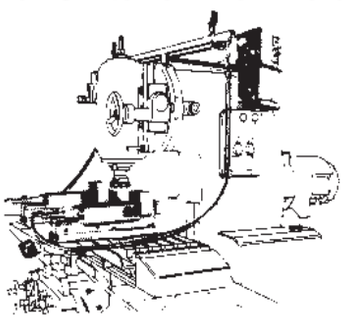
8 Swing Clamps





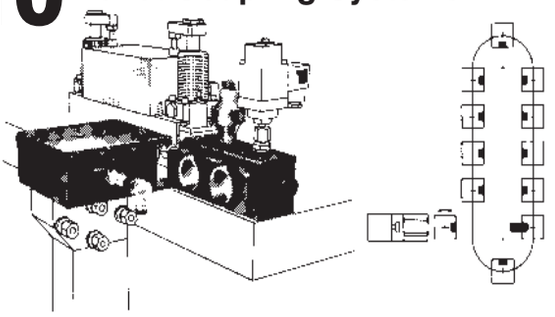
In all modesty, Roemheld Swing Clamps are by far the finest available anywhere, both in features and durability. Our proprietary safety-clutch mechanism prevents damage if the clamping arm strikes an unexpected object, such as an incorrectly loaded workpiece. The arm clutch disengages to avoid damaging the object or the clamp's helical-cam mechanism. In addition, our swing clamps incorporate a fast, totally dependable spring return, unlike our competitors'. We offer many varieties and sizes of swing clamps, including super-miniature and manifold-mounted versions.

9 Power Units for Workholding



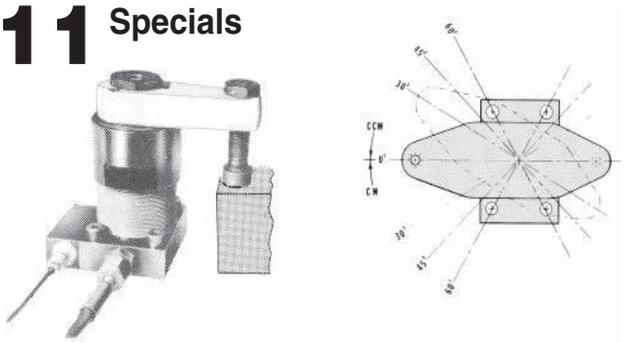
Early power-clamping systems relied either on limited-capacity air/oil intensifiers or on massive, noisy pumps for hydraulic power. Roemheld Electric and Air Power Units are totally different: they are compact, quiet power units designed especially for workholding. These turnkey units include an extremely durable pump, large fluid reservoir, clamping valves, switches, gauges, and numerous safety devices. Workholding power units are becoming a standard accessory on milling machines and machining centers.

10 Pallet Coupling Systems



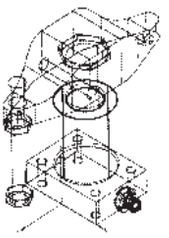
Power clamping on portable palletized fixtures is becoming quite common, yet presents some special challenges, such as maintaining full clamping pressure while the fixture is separated from its power source. We offer a wide choice of solutions, from rotary couplings, to manual pallet decouplers, to automatic coupling systems with programmable controllers.

11 Specials



Because many tough clamping problems require modified or totally special components, we offer full specials-engineering capabilities. Our research and development staff can quickly design products to meet your special requirements. And unlike our competitors, we are a full-capability manufacturer, from start to finish, so lead times are always reasonable.

12 Engineering and Service Support



Drawing Files Available at www.carrlane.com

The combined resources of Carr Lane Roemheld Mfg. Co., Carr Lane Mfg. Co, and Roemheld GmbH bring you the world's finest technical support. Our capabilities include:
(1) Field engineers and regional managers helping our fine authorized distributors give you on-site assistance nationwide.
(2) Extensive CAD/CAM capabilities, both inhouse and for customer use, including a complete CAD library of catalog items available for users.
(3) A large stock of catalog items, plus quick-response manufacturing capabilities.
(4) Quality products that rarely need service, unlike those of our competitors, who regularly sell replacement parts and need repair stations throughout the country.

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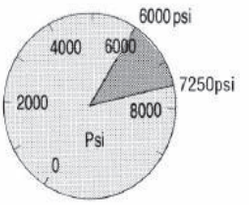
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Design Information

1. Operating Pressure

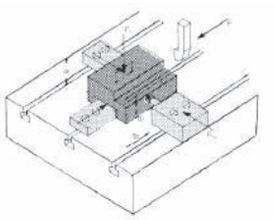
Although most Roemheld components operate comfortably and safely at up to 7250 psi, we recommend selecting a standard "design pressure" of 6000-psi for workholding fixtures. The table on each clamp's catalog page shows 6000-psi forces in bold for quick reference.



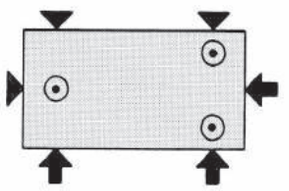
Designing at 6000 psi gives you most of the compactness benefits of high pressures, yet leaves a 25% reserve in case you find that you need additional holding force after building the fixture. Adjust up or down if necessary after checking the fixture. We recommend permanently labeling or stamping the fixture with the chosen operating pressure, for future reference. Operating at low pressures is somewhat a waste of our components' capabilities, but may occasionally be desirable with delicate workpieces. Whenever possible, stay with high pressures and use smaller clamps for better economy and minimum size. Minimum operating pressure is generally 1500 psi using an Electric Power Unit, or 2200 psi using an Air Power Unit. Work supports require at least 1500 psi. Please note, a few products in this catalog are limited to pressures lower than 7250 psi. To use these components in full-pressure systems, see Pressure Reducing Valves.

2. Machining Operations and Fixture Layout

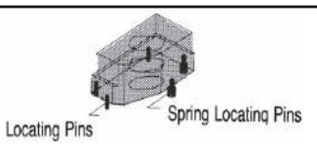
While developing your fixture concept, consider the following factors wherever possible:



Use positive stops to resist machining forces, rather than relying just on clamp forces. With well-placed locators, you can use smaller clamps.



Choose clamping points that are backed up by solid stops or rests to resist clamping forces. Clamping forces can distort a workpiece unless counteracted by firm supports.



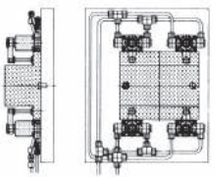
Evaluate workpiece-loading procedure and clamping sequence. Loading and clamping can be completely automatic, or involve some manual steps. To position the workpiece against locators, spring-loaded positioners (above) are often helpful. Sequence Valves are extremely useful to position hydraulically with push clamps before clamping. Total positioning force should be 30-50% of the workpiece's weight to overcome friction.



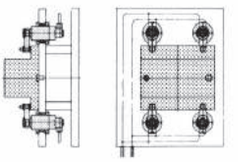
Decide how many parts you want to place on the fixture. For example, to place three workpieces on the above fixture, super-miniature Swing Clamps are necessary. With only one workpiece, just about any clamp would do.

3. Plumbing Options

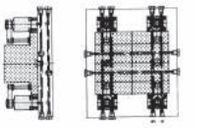
Supplying fluid to hydraulic fixtures is not merely an afterthought. Fluid supply is an integral part of fixture design. The following Swing Clamp fixtures illustrate four distinct plumbing concepts.



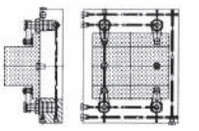
1. Tubing lines on top of fixture plate.
This is the oldest, most traditional method of supplying fluid to hydraulic clamps. Before manifold mounting, using tubing was about the only option available. Advantages; less baseplate machining is required; quick build time. Disadvantages: chips are easily trapped in tubing lines; a large base-plate area is required; exposed tubing is subject to damage.



2. Tubing lines underneath fixture plate.
Running tubing lines below the working area is an improvement on option 1. Advantages: no chip traps in working area; more freedom to position clamps with tubing out of the way. Disadvantages: a large base-plate area is still required; more complicated fixture construction.



3. Manifold mounting, with O-ring ports.
This option uses passages drilled in the fixture to feed fluid directly to O-ring ports underneath the clamps. Advantages: more compact fixture size; no chip traps in working area; most economical construction. Disadvantages; gundrilling is sometimes required; less freedom to mount clamps in odd positions.

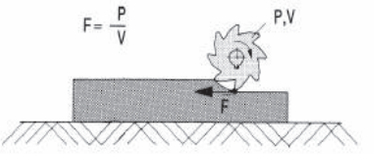


4. Cartridge-type manifold mounting.
Similar to option 3, except clamps are embedded in specially prepared, tapped mounting holes. Advantages: most compact fixture size; great freedom to position clamps in tight places; no chip traps in working area. Disadvantages: gundrilling is sometimes required; a thicker base plate is usually required (this is also an advantage because it makes the fixture more rigid).

4. Cutting Forces

An important step in most fixture designs is looking at the planned machining operations to estimate cutting forces on the workpiece, both magnitude and direction. Your "estimate" can be a rough guess based on experience, or a calculation based on machining data. One simple formula for force magnitude is based on the physical relationship:

$$Force = \frac{Power}{Velocity}$$



$$\text{Cutting force (lbs)} = \frac{\text{Heaviest-cut horsepower} \times \frac{\text{Machine efficiency}}{\%} \times 33{,}000}{\text{Cutting speed (sfpm)}}$$

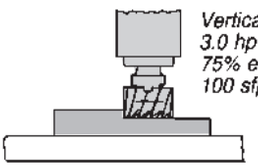
Please note: heaviest-cut horsepower is not total machine horsepower, rather it is the maximum horsepower actually used during the machining cycle. Typical machine efficiency is roughly 75%. (.75). The number 33,000 is a units-conversion factor.
The above formula only calculates force magnitude, not direction. Cutting force can have X, Y, and/or Z components. Force direction (and magnitude) can vary drastically from the beginning, to the middle, to end of the cut.

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Example



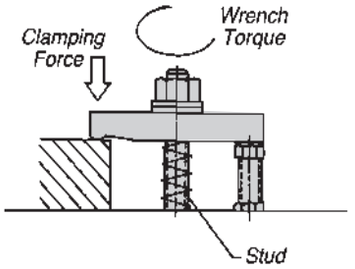
Vertical mill
3.0 hp heaviest cut
75% efficiency
100 sfpm cutting speed

$$\text{Cutting force} = \frac{3.0 \text{ hp} \times .75 \times 33{,}000}{100 \text{ sfpm}} = 743 \text{ lbs}$$

Intuitively, force direction is virtually all horizontal. In this example (negligible z-axis component). Direction varies between the x and y axes as the cut progresses.

5. Clamp Forces / Sizes

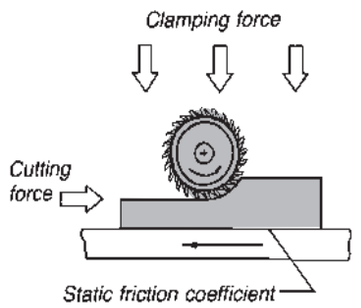
Clamping-force calculations can be quite complicated. Sometimes an approximate method is good enough. See table below for how much clamping force is available from manual clamp straps of various sizes (with a 2-to-1 clamping-force ratio) to compare with power-clamp forces.



Stud Size	Recommended Torque* (ft-lbs)	Clamping Force (lbs)
1/4-20	4	500
5/16-18	9	900
3/8-16	16	1300
1/2-13	38	2300
5/8-11	77	3700
3/4-10	138	5500

* Clean, dry clamping stud torqued to approximately 33% of its 100,000 psi yield strength (2:1 lever ratio).

You can also calculate required clamping forces based on calculated cutting force. A simplified example appears below, with cutting force entirely horizontal, and no workpiece stops

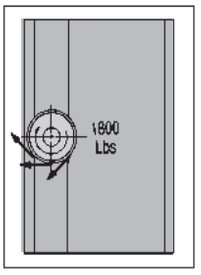


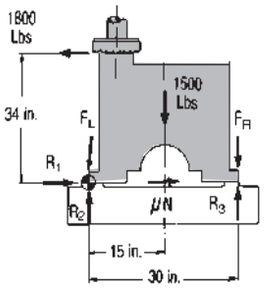
$$\text{Clamping force (lbs)} = \frac{\text{Cutting force (lbs)}}{\text{Static friction coefficient}} \times \text{Safety factor (usually 2)}$$

Contact surfaces	Friction coefficent (Dry)	Friction coefficent (Lubricated)
Steel on steel	.15	.12
Steel on cast iron	.19	.10
Cast iron on cast iron	.30	.19

(frictional force resists the entire cutting force). With workpiece stops and multi-direction forces, calculations become much more complicated. To simplify somewhat, determine the worst-case force situation intuitively, then treat the calculation as a two-dimensional static-mechanics problem (using a free-body diagram). In the example below, cutting force is already known to be 1800 lbs from previous calculations. The workpiece weighs 1500 lbs. Unknown forces are:

F_R = Total force from all clamps on right side
F_L = Total force from all clamps on left side
R_1 = Horizontal reaction force from fixed stop
R_2 = Vertical reaction force from fixed stop
R_3 = Vertical reaction force on right side
N = Normal force = $F_L + F_R + 1500$
μ = Coefficient of friction = .19





The equations below solve for unknown forces assuming that for a static condition:

1. The sum of forces in the x direction must equal zero
2. The sum of forces in the y direction must equal zero
3. The sum of moments about any point must equal zero

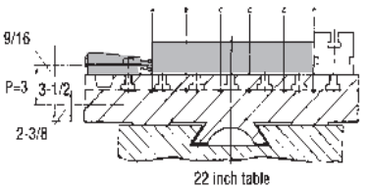
At first glance, the example above looks "statically indeterminate," i.e. there are 5 variables and only 3 equations. But for the minimum required clamping force, R_3 would be zero (workpiece barely touching) and F_L would be zero (there is no tendency to lift on the left side). Now with only 3 variables, we can solve:

$$\sum F_x = 0 = -1800 + R_1 + (.19)(1500 + F_R)$$
$$\sum F_y = 0 = R_2 - 1500 - F_R$$
$$\sum M = 0 = (34)(1800) - (15)(1500) - (30)(F_R)$$

Solving for the variables,

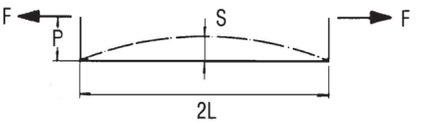
F_R = 1290 lbs
R_1 = 1270 lbs
R_2 = 2790 lbs

In other words, the combined force from all clamps on the right side must be greater than 1290 lbs. We recommend a 2-to-1 safety factor (2580 lbs). Even though F_L (the combined force from all clamps on the left side) equals zero, a small clamping force may be desirable to prevent vibration. Too much



clamping force can be as bad as too little. Excess force can cause fixture and machine-table distortion or even damage. Even a small hydraulic clamp can generate tremendous

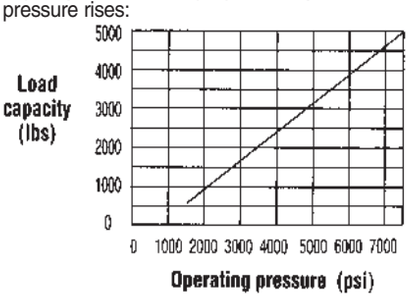
$$S = P \times \left(1 - \frac{1}{1 + \frac{FL^2}{2EI}}\right)$$



stresses (S). In the example above, three 4560-lb Edge Clamps cause some machine-table bending. Using static beam-binding calculations, maximum distortion, at point D, is about .0006 inches (probably acceptable). However, if the clamping point were higher off the machine table (P dimension), distortion would be much greater. Higher clamps would require adding an intermediate fixture plate to increase table rigidity.

6. Work Supporting

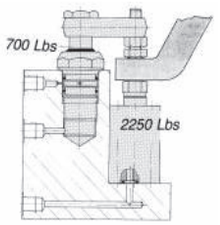
Unlike clamps, work supports do not actually exert force on a workpiece. After adjusting to the part, work supports essentially become fixed supports or rests. A work support's load capacity increases proportionally as fluid pressure rises:



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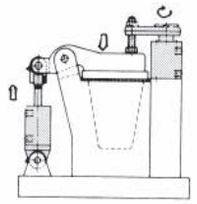
Choose enough load capacity to resist: (1) machining forces; (2) workpiece weight; (3) clamping forces not resisted by fixed stops.



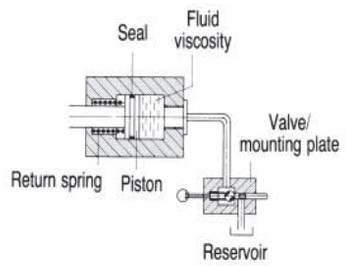
When supporting underneath a clamp, as in the example above, load capacity should be substantially greater than clamping force. Not only must the support resist static clamping force, it must resist dynamic load too (the "hammering" due to clamping-arm momentum). We recommend a load capacity of at least 2 times the clamping force. Another factor when clamping over a work support is that the clamp may build up force faster than the support builds up load capacity. To avoid this, use a sequence valve to delay clamping until load capacity builds up.

7. Single Acting vs. Double Acting

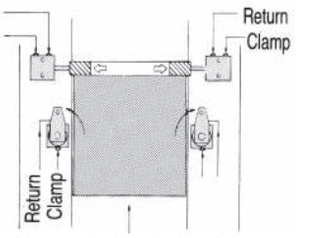
The return side of single acting elements, with a few exceptions (small work supports), require breather ports on the return side, and when used in systems with high flow or pressurized cutting fluids/coolants, great care must be taken to ensure that these fluids do not enter the return side of the clamps. It is highly recommended that double acting elements be used in such systems, thus eliminating the problem, and resultant machine down time. Double acting clamps should also be used in systems having an automatic load/unload, so that all functions can easily be coordinated.



1. Moving linkages or retracting heavy loads. For a quick, positive return when weight is too heavy for spring return.



2. Large fixtures with long tubing runs or flow restrictions. Return speed is adversely affected by: (1) pressure drop in tubing and hoses; (2) pressure drop in valves; (3) high fluid viscosity, especially at lower temperatures; (4) frictional force at piston seals, especially when clamped for an extended time, which displaces the fluid film on cylinder walls.

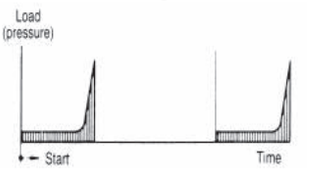


3. Machine-tool interlock. In automated systems where timing and synchronization are important, double-acting clamps are the best choice. By installing pressure switches in both clamping and return lines, a machine controller knows exact clamp status at all times.

8. Clamping Time

Hydraulic clamping is usually fast, but not instantaneous. To estimate clamping time, consider the two phases of clamping:

1. Extending time, under low-pressure free flow
2. Pressure-building time



Extending time is fairly easy to calculate, knowing fluid required by each clamp and the power units flow rate, using the formula below. One obvious way to reduce clamping time is to set clamps as close to the workpiece at possible, to use as little stroke as possible.

$$\text{Extend time (sec)} = \frac{\text{Maximum fluid req'd for all clamps (cu.in.)} \times \text{Portion of stroke used (usually 1/2)} \times 60}{\text{Power Unit flow rate (cu. in./min.)}}$$

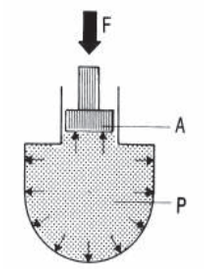
After extending, an additional volume of fluid must be pumped into the system to build pressure. This is due mainly to:

1. Compressibility of the hydraulic fluid (add about 4% of total system volume to build to 7250 psi)
2. Volume expansion of hydraulic hoses (.066 cu.in. per foot)
3. Charging an accumulator, if used

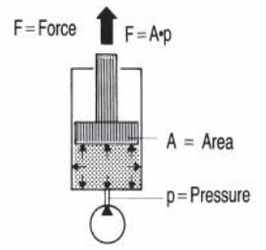
By calculating fluid required for each of the above factors, you can estimate pressure-building time. Using Sequence Valves lengthens clamping time, because each sequence step requires extending time and pressure-building time. To reduce clamping time, set Sequence-Valve trigger pressure as low as possible. With multiple Sequence Valves, set trigger-pressure differences at their minimum allowables value.

9. Other Hydraulic Considerations

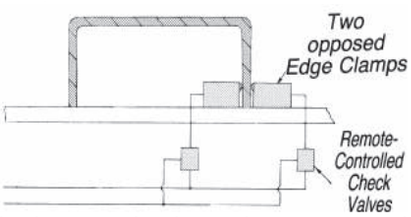
The basis of hydraulic clamping systems is "Pascal's Law", which says that if pressure is applied to a static fluid that is completely enclosed, that pressure is transmitted equally in all directions: This principle is used to transmit force to remote locations,



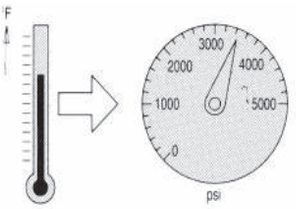
via hose, tubing, or drilled passages. When hydraulic pressure acts on a clamp's piston area, it generates external force according to the physical relationship F=P x A:



Clamping with hydraulics causes some strange effects not occurring with manual clamps. One such phenomenon is fluid shifting between equal-force opposing clamps.



In the example above, the two opposed clamps allow the workpiece to float between them. Pushing on one clamp encounters no resistance because fluid just shifts to the opposing clamp (if the check valves were not present). Do not let equal-force clamps oppose each other without Remote-Controlled Check Valves.



Another strange effect is pressure change due to temperature change of a closed system. In fact, pressure changes about 80 psi per 1° F! Be careful of excessive temperature changes, especially increases. Use a Pressure-Relief Valve for safety.

10. Hydraulic Symbols and Circuit Diagrams

Hydraulic symbols and diagrams area a useful "shorthand" method of describing how a clamping circuit works without detailed drawings. The following pages show two circuit examples, and a summary listing of hydraulic symbols.

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Bleeding of the Spring Area ■ A0.110

Introduction
Due to increased use of coolants and cutting fluids in machining, there is an increased possibility that these fluids may penetrate into the spring areas of single acting cylinders and work supports. Many fluids can cause corrosion, which can lead to malfunction and possible failure.

Why bleeding is necessary
If not vented, excess pressure or vacuum in the spring area changes the spring forces which may lead to malfunctions.

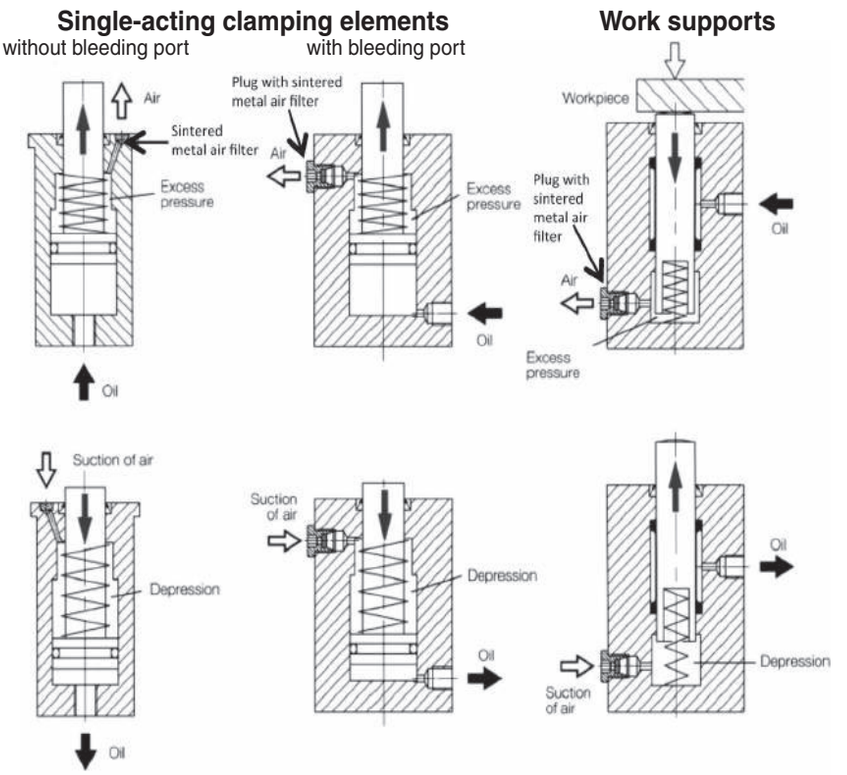
Condensation from coolants can lead to corrosion on the piston, spring or housing.

Leakage of hydraulic seals must drain properly to avoid malfunctions.

Using sintered metal filters minimizes dust and chips.

Liquids are the real problem because they can be drawn through the air filter. This can cause the spring area to be reduced. Malfunctions can occur due to this excess pressure or vacuum.

Catalog elements with bleeding of the spring area



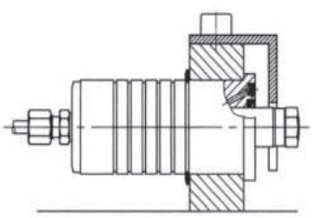
• Venting of Spring Air ■ A0.110

Cover
Clamping elements without bleeding port can be covered, but due to today's normal quantities of coolants this does not seem to be successful. In such applications you should use other clamping elements, preferably double-acting elements.

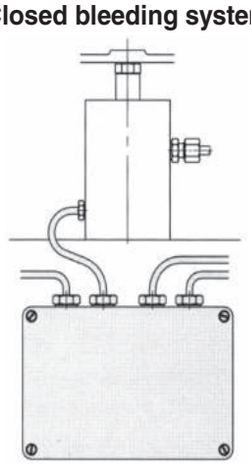
Bleeding hose
Connection of a bleeding hose is preferred and the opening is to be displaced to a point where no liquid can penetrate.

Closed bleeding system
Connecting the breather port to an external area can increase the spring area volume. By doing this, the amount of additional pressure or vacuum generated is minimal. This serves a dual purpose in allowing the spring area to be vented as well as protection from agressive coolants. A good solution is to use sealed electrical wiring boxes with connecting threads. **The volume of this additional area should be ten times the stroke volume of all connected elements.**

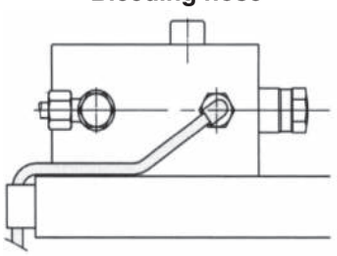
Cover



Closed bleeding system



Bleeding hose



Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

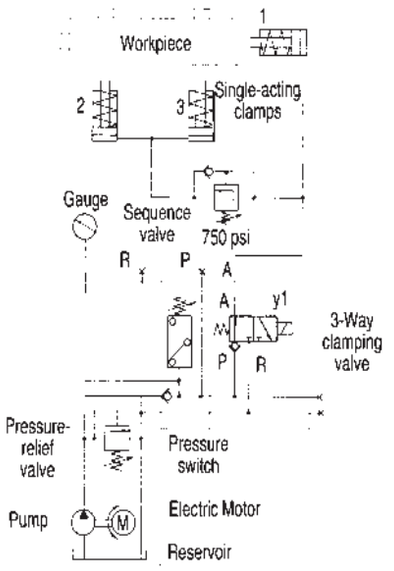
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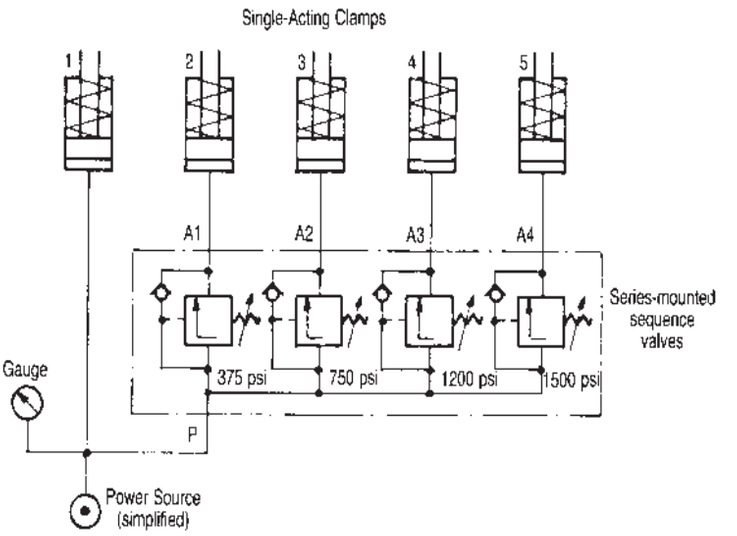
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Design Information

Example Hydraulic Circuit Diagrams





Clamp & Cylinder Symbols

	Push clamp or cylinder, single acting
	Push clamp or cylinder, double acting
	Pull clamp, single acting
	Swing clamp, single acting
	Swing clamp, double acting
	Extending clamp, single acting
	Extending clamp, double acting
	Work support, spring extended
	Work support, fluid advanced
	Work support, air advanced

Power Source Symbols

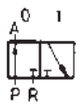
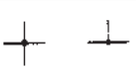
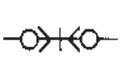
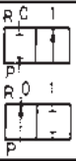
	Power source (simplified)
	Electric Power unit, consisting of a fluid reservoir, pump, electric motor, pressure-relief valve, pressure switch, clamping valve, and gauge.
M	Electric motor, showing direction of rotation
	Constant displacement pump
	Variable displacement pump
	Fluid reservoir
	Fluid filter

Valve Symbols

A 0 1 P R	3/2 directional-control valve (3-way, 2-position), complete symbol with solenoid operator and spring return (normally open)
0 1	Boxes showing valve positions (two). For valves with spring return, the neutral position is shown at left (0).
0 1 A P R	Inlet and outlet connections are drawn at the neutral-position box, and are designed by capital letters: P = Inlet pressure from pump A,B,C… = Operating connections R,S,T = Outlet return (tank) L = Leakage line Z,Y,Z = Control Lines

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Design Information

	Flow lines and directions are shown in each valve-position box. Lines show flow path, arrows show flow direction. Shutoffs are designated by capped-off lines inside the box.		Check valve
			Remote-controlled check valve (pilot operated)
 	Valves can be normally open, as shown on top (clamped in neutral position), or normally closed, as shown on bottom (unclamped in neutral position)		Shutoff valve
			Pressure-relief valve
			Flow control valve, with unrestricted return line
	Valve operators are shown outside the boxes	**Accessory Symbols**	
	Solenoid operated		Operating line, pressure or return
	Spring operated (or returned)		Control line, for transmitting control/pilot signals
	Manually operated		Leakage line, for carrying away fluid leakage
	Detent position		Flexible line, such as hydraulic hose
	Lever operated		Line connection
	Foot-pedal operated		Line crossing, without connection
	Push-button operated		Pressure-connection point, such as a port
	Cam-roller operated		Bleeding point
	Plunger operated		Quick disconnect, coupled
	Air-pilot operated		Quick disconnect, decoupled
	2/2 directional-control valve, normally closed on top, normally open below.		Rotary coupling (2 passage shown)
			Accumulator
	4/2 directional-control valve, for double-acting clamps		Gage
	Sequence valve, with unrestricted return line		Pressure switch
	Pressure-reducing valve, with unrestricted return line		Air filter/regulator/lubricator

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Recommended Precautions For The Designer, Builder & Operator

IMPORTANT: READ THIS SHEET CAREFULLY BEFORE OPERATING.

Roemheld power workholding components are high quality products, engineered and manufactured to give you long, dependable and safe performance. For proper and safe operation, please follow all instructions on this sheet. Save these instructions for future reference.

SERVICE NOTE: Most Roemheld components are 100% individually tested for proper operation before leaving the factory. Please recheck these instructions if your new unit does not work properly. Should any component ever need service, please contact the factory. Do not disassemble the unit yourself — many are not user serviceable. Roemheld components incorporate advanced sealing technologies that eliminate the need for routine seal replacement.

TUBING: Use only *steel* tubing as specified in the Roemheld catalog: Seamless steel tubing, C1010, cold drawn, fully annealed, 5/16 OD, .065 wall thickness (Certified to 37,500 psi burst). Follow all tubing installation guidelines. We highly recommend the CLR-300-TL flaring tool to effectively flare this heavy-walled tubing.

HOSES: Use only hydraulic hoses as specified in the Roemheld catalog: 1/4 ID hydraulic hose, 25,520 psi min. burst pressure, (2) female swivel-nut ends, 5/16 JIC 37° flare.

FLUID CONNECTIONS: Connect fluid lines to the 5/16 JIC 37° flare male connection on each clamp (two for double-acting clamps). This fitting accepts either 5/16 OD 37° flared tubing, or a hydraulic hose with 5/16 JIC 37° swivel nuts (female) at each end. **Do not screw NPT pipe fittings into Roemheld components, or use NPT fittings anywhere in a workholding system.** Roemheld fittings are 5/16 JIC 37°. These fittings offer a positive metal-to-metal seal. **Do not use teflon tape or sealant.** Do not use fitting sizes other than 5/16. This size is ideal for workholding fixtures. Smaller tube sizes have poor flow rates. Larger tube sizes are not readily available with sufficient wall thickness for high pressure operation, and are difficult to flare. Never use brass fittings.

OPERATING PRESSURE: Do not operate components above their maximum allowable fluid pressure stated in the Roemheld catalog (7250 psi for most components). Always use a gauge to monitor fluid pressure. Locate pressure gauge where the machine operator can easily read it. Often, placing it directly on the machining fixture is best. All Roemheld Electric and Air Power units include a fluid-pressure gauge.

ADDITIONAL SAFETY PRECAUTIONS: If losing fluid pressure (due to a cut hose, etc.) would pose any danger to the operator, install a pressure switch, or other pressure-monitoring device, to monitor system pressure. This switch electrically signals the machine tool to shut down if fluid pressure is inadequate.

COMPONENT COMPATIBILITY: Do not mix non-Roemheld components into a Roemheld power-workholding circuit. Other brands are not leakfree, and their performance may be unpredictable.

HYDRAULIC FLUID: Always use absolutely clean, fresh hydraulic fluid. Fill the fluid under absolutely clean conditions. **Almost all service problems are caused by dirty, contaminated fluid. Fluid must be clean to 10 micron or better nominal filtration.** Use only the following DIN 51524, HLP, ISO Grade fluids to preserve your warranty:

Oil Temp. [°C]	Designation [as per DIN 51524]	Application
10-40	HLP 22	Power units with poppet valves or single acting circuits
15-50	HLP 32	Mechanical pumps or double acting circuits

See also CLR-000-V, high pressure in-line filter.

BLEEDING AIR: Usually components will bleed trapped air automatically when you clamp and unclamp them several times. If manual bleeding is still necessary, bleed at an elevated tube or hose connection, farthest from the power source. With the clamps actuated (system pressurized) slightly loosen the connection. After fluid seeps out for a few seconds, retighten. Repeat at other connections if necessary. After bleeding, unclamp (depressurize system) and refill the power sources fluid reservoir.

CAUTION: ALWAYS KEEP HANDS CLEAR OF POWER CLAMPS DURING OPERATION. THESE COMPONENTS EXERT VERY HIGH FORCES AND CAN CAUSE SERIOUS INJURY. DISCONNECT POWER SOURCE BEFORE CONNECTING, DISCONNECTING, ADJUSTING, OR OTHERWISE HANDLING COMPONENTS.

FLOW CONTROL: When using Swing Clamps, Extending Clamps, or Fluid-Advanced Work Supports with a high-flow-rate power source, make sure the fluid flow rate to each component is under the maximum stated in the catalog. Otherwise the components may not activate properly. See the Roemheld catalog for flow control valves.

FLOOD COOLANT: Work Supports and Swing Clamps have air vents protected by sintered-metal filters. These vents could draw in coolant if the components are submerged. To prevent this, attach an air vent tube via the tapped hole provided (see each component's catalog page for air-vent-fitting part numbers).

PRESS-TOOL CLAMPING: Clamping die sets on presses require different components and safety devices than found in our Roemheld Power Workholding catalog. Contact factory for press-tool clamping systems.

MOUNTING: Carefully follow mounting instructions as shown in the Roemheld catalog for each component.

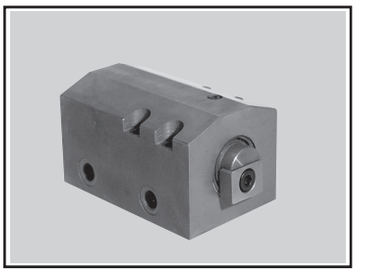
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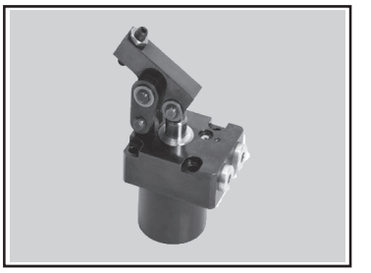
Advantages

- Low pressure high clamping force.
- Can be ran off machine hydraulic, so an additional power unit is unnecessary.
- Improved production rate and quality over manual clamping.
- See website or contact engineering for more information.



B1.8233 Block Clamps 70 / 100 bar

Hydraulic block clamps are particularly suitable for clamping of workpieces, that require a large free space for machining, and for applications where conventional clamps and swing clamps are too big. Clamping direction adjustable and in small recesses and bores. Clamping force of 540-2920 lbf.



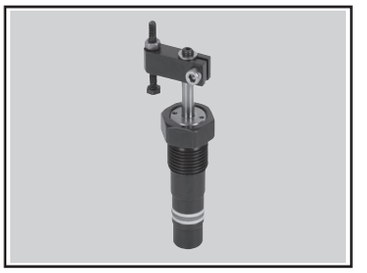
B1.8268 Hinge Clamps with Throttle Valve 70 bar

Hydraulic Hinge Clamps are designed for the direct connection to the lowpressure hydraulics of machine tools. Special kinematics allow clamping without side loads of workpieces which are very sensitive against deformation. Clamping force of 515-3865 lbf.



B1.8271 Mini Compact Clamp 200 bar

Mini compact clamps are designed for application in hydraulic clamping fixtures where oil supply is effected through drilled channels in the fixture body. Clamping force of 20-290 lbf.



B1.848 Mini Swing Clamps with Sturdy Swing Mechanism 150 bar

This double-acting mini swing clamp works as pull-type cylinder where a part of the total stroke is used to swing the piston. Mini swing clamps are particularly suitable for machining of thin-walled workpieces, which require only little clamping forces. Clamping force of 20-135 lbf.



B1.8500 Swing Clamps with Sturdy Swing Mechanism 70 bar

The hydraulic swing clamp with sturdy swing mechanism can be directly connected to the low-pressure hydraulics of the machine tool. Clamping force of 135-2990 lbf.



B1.8802 Swing Clamps with Reinforced Swing Mechanism 160 bar

The Swing Clamps with Reinforced Swing Mechanisms are designed with a double clamping arm which gives the ability to clamp 2 work pieces at the same time. Forked head for simple clamping arms. Clamping force of 315-785 lbf.



B1.947 Threaded-Body Work Supports 70 bar

Hydraulic work supports are used to provide a self-adjusting rest for the workpiece during the machining operations. They compensate the workpiece surface irregularities, also vibration and deflection under machining loads. Support force up to 900 lbf.



B1.9472 Threaded-Body Work Supports 70 bar

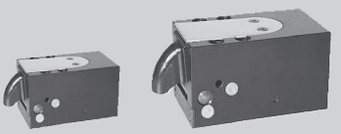
This series of Threaded-Body Work Supports can be directly connected to the low-pressure hydraulics of the machine tool. The extension, a shaft diameter of 16 mm, enables the support of surfaces in recesses and cavities that otherwise would be inaccessible. Support force up to 675 lbf.

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

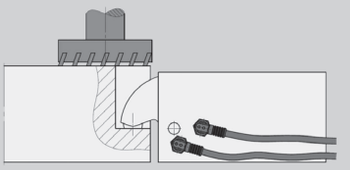
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Down-Holding Clamps

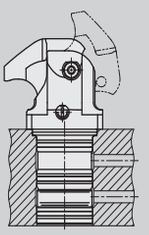


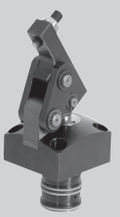
Flat Profile
pages 620-621



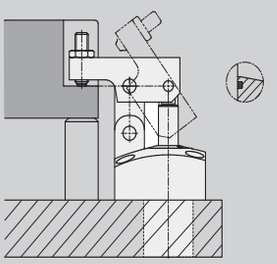


Compact Clamps
page 623





Hinge/Link Clamps
pages 624-626



Extending Clamps

Arm extends forward to clamp, then retracts again for clear loading when unclamped. Ideal for clamping in narrow recesses.

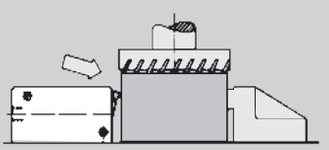
Flat Profile Clamps extend in a smooth, continuous radial motion. The arm retracts fully for loading. Choice of swivel-pad arm or spherical-nose arm. **Compact** Clamps have a sturdy lever mechanism that pivots into clamping position. These clamps are extremely compact both in footprint and overall height. The clamping lever pivots a full 90° for clear loading even when using custom long clamping levers. Ideal for clamping in narrow recesses.

Compact Clamps have a metallic wiper edge, and are especially suited for applications where space is limited. Two different clamping levers are available, which can be machined to adapt to your workpiece, then swiveled into small recesses for unimpeded loading and unloading. Four different sizes of the clamp are available, each with a short or long clamping arm.

Hinge or Link Clamps are ideal in narrow recesses, and have a fully retractable arm for clear loading from above. Hinge clamps are ideal for manifold mounting, and are available in more than 100 variations.



Low Profile
page 622



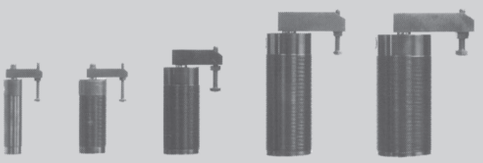
Edge Clamps

Nose advances to grip side of workpiece. Clamping thrust is both forward and down. Ideal when clamping from above would interfere with machining.

Low profile edge clamp sits below cutter path yet still clamps high on workpiece...important for solid, vibration-free clamping.

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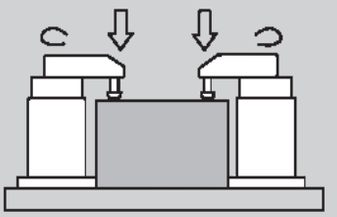
Down-Holding Clamps



pages 628-629

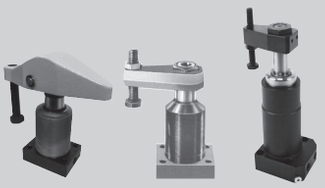
Air-Powered Swing Clamps

Ideal when only light clamping force is required. Powered by low-pressure shop air.



Swing Clamps

Arm swings 90 degrees then clamps down. Ideal when you need maximum reach and clearance for loading/unloading. Proprietary safety-clutch mechanism prevents damage if the clamping arm strikes an unexpected object during its swing.



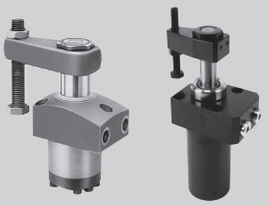
Flange Base
pages 630-631, 638

Flange base swing clamp is good for taller workpieces. Very popular because it takes up little area on the fixture. Mount either on top of fixture or through fixture plate.



All Threaded
pages 630-631

All threaded swing clamp is well-suited for through-hole mounting. Fittings are underneath clamp to keep plumbing away from workpiece area.



Top Flange
pages 632-633, 637

Top Flange swing clamp has high-level fittings. Mounts in a tapped or bored hole, with plumbing running above the fixture plate or using manifold mounting.

Swing Clamp Arms pages 634-635

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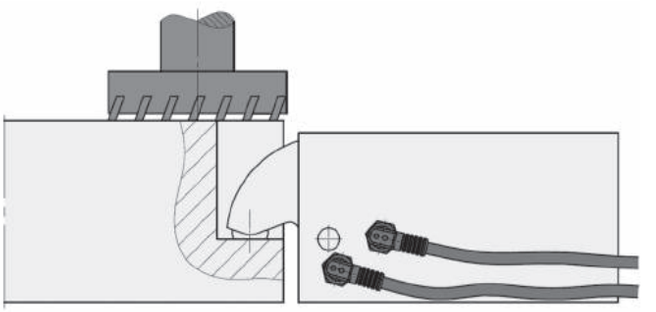
Flat Clamp ■ with optional position monitoring ■ Double Acting Max. Operating Pressure ■ 7250 psi (500 bar)



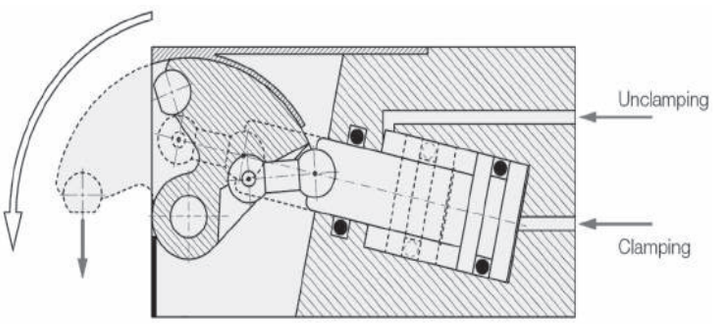
- **Flat, compact design**
- **High protection against chips and spatter**
- **Large clamping stroke**
- **Clamping lever completely retracts**
- **Optional position monitoring**
- **Designed to resist side forces at the clamping point**

The flat clamp is a double-acting hydraulic clamping element available in two sizes with two lever options. Oil can be supplied via fitting connection or manifold mounted. The clamping lever is connected to the piston by a connecting rod and retracts completely within the body of the clamp allowing for vertical part loading.

IMPORTANT NOTES: When mounted vertically, it is recommended to remove the cover plate to allow for coolant and chip drainage. Other notes can be found in A 0.100.



These extending clamps have an extremely low profile for excellent machining clearance.



Cutaway view of Swivel Nose Model

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

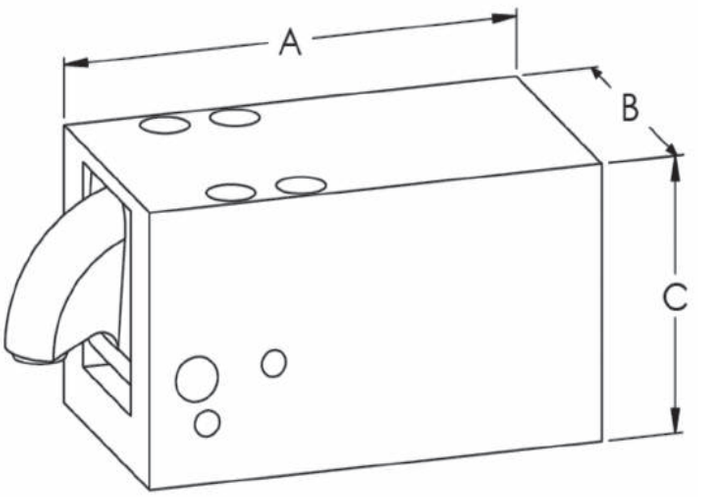
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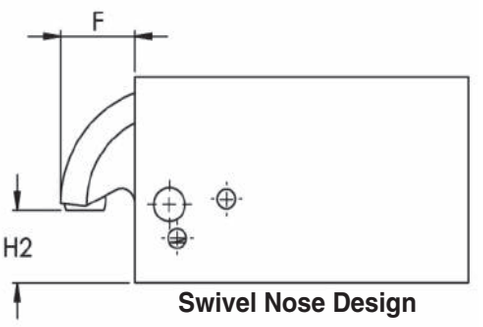
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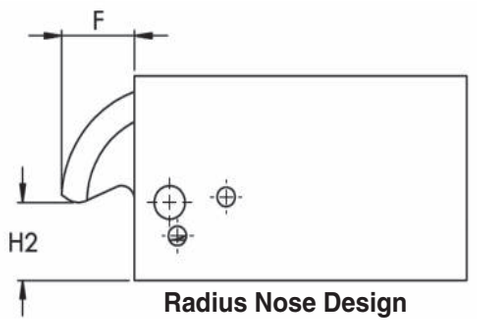
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Flat Clamp ■ with optional position monitoring ■ Double Acting
Max. Operating Pressure ■ 7250 psi (500 bar)





Swivel Nose Design



Radius Nose Design

Swivel Pad Contact Bolt

		Size 1	Size 2
Clamp Force (lbs)	7250 psi	3050	4940
	4000 psi	1680	2720
	2000 psi	840	1360
A		4.27	5.08
B		2.36	2.95
C		2.30	2.89
F		0.94	1.12
H2 (min.)		0.75	0.96
Weight (lbs)		5.0	9.5
Part No., Clamp		**CLR-1824-202**	**CLR-1824-262**

Radius Nose Contact Bolt

Clamp Force (lbs)	7250 psi	2760	4780
	4000 psi	1520	2640
	2000 psi	760	1320
H2 (min.)		0.71	0.87
Part No., Clamp		**CLR-1824-201**	**CLR-1824-261**

Accessories

Part No., Screw Plug G 1/4	**CLR-810-F**
Part No., Plug Connection NW5	**CLR-9210-132**
Part No., Inductive Prox Switch	**CLR-3829-263**
Part No., Rt Angle Plug for Switch	**CLR-3829-099**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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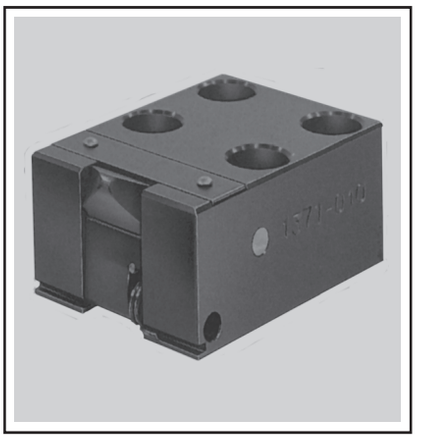
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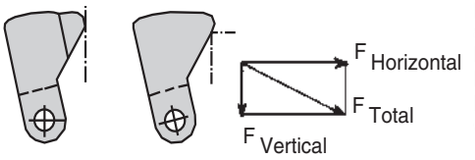
Edge Clamps

7250 psi max
Single acting



Low Profile

- **Grips side of workpiece . . . pushes forward and down**
- **Ideal when clamping from above is difficult**
- **Down-holding force is 1/3 of total clamping force**
- **Sits low yet clamps high . . . just below the cutter path to reduce vibration**
- **Choice of three sizes**

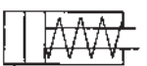


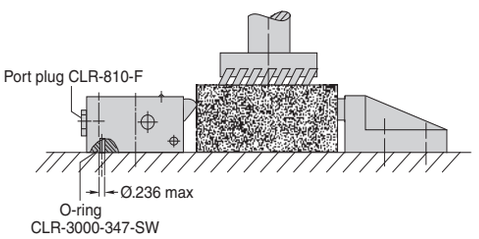
CLAMPING ACTION: Fluid pressure advances the cylinder, which in turn pivots the nose forward and down to grip side of workpiece. Spring return.

MOUNTING: Fasten with four socket-head cap screws. 1/4 BSPP connection. Same unit may be mounted without external plumbing lines. To manifold mount, order CLR-3000-347-SW O-ring and CLR-810-F port plug.

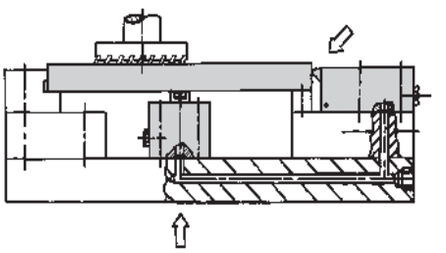
CONSTRUCTION: Internal cylinder pushes pivoting nose. Nose cover keeps out chips and debris. Body made from carbon steel, black oxide finish. Forged, alloy steel nose, hardened to RC 56-58. Nose is through-hardened so that it can be ground to suit the workpiece if desired.

Low-profile edge clamps can be used to grip the side of a workpiece for machining clearance, or to clamp over the top edge.

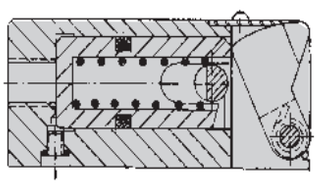


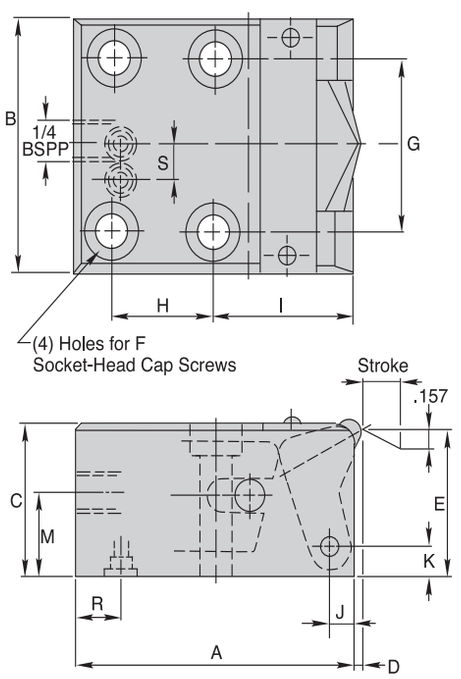


Low-profile edge clamps can be mounted low, yet clamp up high, just below the cutter path to reduce vibration. Edge clamps can be manifold mounted on a flat surface by unplugging the bottom port and installing o-ring CLR-3000-347-SW, then plugging the 1/4 BSPP port with a CL-810-F port plug.



Edge clamp used with a block-type work support, both components manifold mounted for easy chip removal.





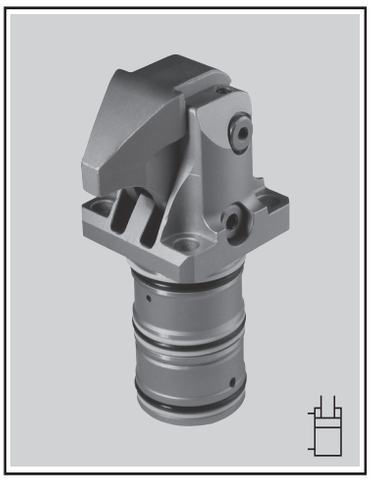
Clamping force (lbs)	7250 psi	1910	4495	8990
	6000 psi	1600	3700	7400
	5000 psi	1300	3100	6200
	4000 psi	1100	2500	5000
	3000 psi	790	1900	3700
Clamping stroke		.31	.39	.39
Fluid required (in.³)		.10	.30	.62
Piston Ø		16mm	25mm	36mm
Force per 1000 psi (lbs)		260	612	1223
Max. operating pressure (psi)		7500	7500	7500
A		2.677	3.543	3.780
B		1.97	2.36	3.15
C		1.26	1.57	1.97
D		.079	0	.079
E		1.220	1.535	1.929
F		5/16 or M8	5/16 or M8	3/8 or M10
G		1.260	1.575	2.205
H		1.063	1.496	1.496
I		1.260	1.654	1.811
J		.217	.236	.315
K		.236	.354	.433
M		.75	.91	1.06
R		.512	.551	.630
S		0	0	.551
Weight (lbs)		2.0	2.5	4.6
Part No.		**CLR-110-EC**	**CLR-310-EC**	**CLR-410-EC**

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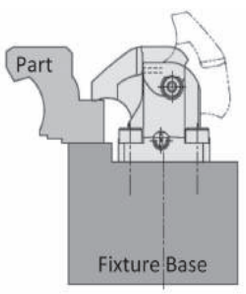
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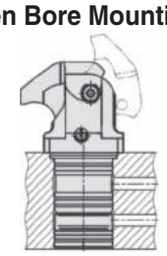
Compact Clamp ■ Cartridge type with pneumatic clamping monitoring Double Acting ■ Max. Operating Pressure ■ 3625 psi (250 bar)



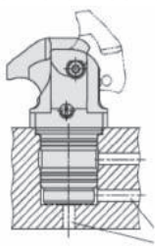
The compact clamp pivots over the workpiece, then clamps in a downward stroke without applying any side load to the part like similar clamps. When retracted, the arm is behind the front plane of the clamp allowing for unobstructed top loading. It has a small footprint with large clamping force. Metal wiper on piston rod and nitrated finish helps protect this clamp from chips and coolant for a long life cycle. Four Sizes, three mounting options and two arm options help the designer choose the optimal clamp for their application. The long arm can be machined to fit into pockets. The clamp for closed bore mounting does not include the lower protective cap which makes the overall height shorter.

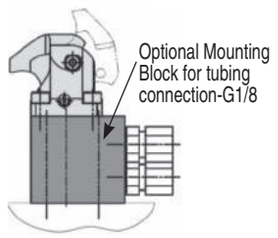


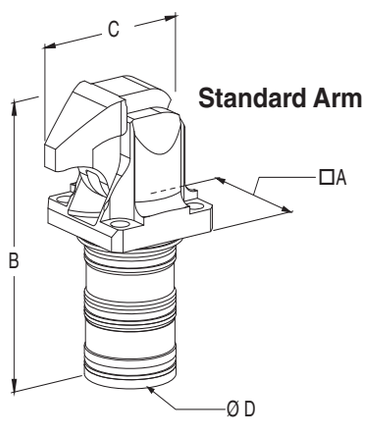
Open Bore Mounting

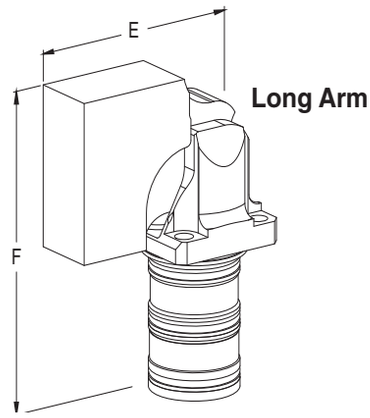


Closed Bore Mounting









		Size 1	Size 2	Size 3	Size 4
Clamp Force (lbs)	3625 psi	560	900	1680	2360
	2000 psi	310	495	930	1300
	1000 psi	150	245	465	650

Open Bore Mounting

A	1.34	1.65	1.89	2.17
B	3.03	3.33	3.90	4.15
C	1.73	1.93	2.38	2.52
Ø D	0.98	1.26	1.57	1.77
E	2.19	3.19	3.60	3.74
F	3.38	3.60	3.90	4.15
Weight standard version	0.60	1.06	1.87	2.31
Part No., Clamp - Standard Arm	**CLR-1801-110**	**CLR-1802-110**	**CLR-1803-110**	**CLR-1804-110**
Part No., Clamp - Long Arm	**CLR-1801-130**	**CLR-1802-130**	**CLR-1803-130**	**CLR-1804-130**

Closed Bore Mounting

B	2.73	2.97	3.58	3.77
F	3.09	3.24	3.59	3.77
Weight standard version	0.53	0.93	1.68	2.03
Part No., Clamp - Standard Arm	**CLR-1801-111**	**CLR-1802-111**	**CLR-1803-111**	**CLR-1804-111**
Part No., Clamp - Long Arm	**CLR-1801-131**	**CLR-1802-131**	**CLR-1803-131**	**CLR-1804-131**

Accessories

Part No., Spare Standard Arm	**CLR-3548-1121**	**CLR-3548-1122**	**CLR-3548-1123**	**CLR-3548-1124**
Part No., Spare Long Arm	**CLR-3548-1071**	**CLR-3548-1072**	**CLR-3548-1073**	**CLR-3548-1074**
Part No., Mounting Block	**CLR-3468-381**	**CLR-3468-382**	**CLR-3468-383**	**CLR-3468-384**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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Hinge Clamp with Flat Clamping Lever ■ with pneumatic position monitoring*
Single and Double Acting ■ Max. Operating Pressure ■ 3625 psi (250 bar)

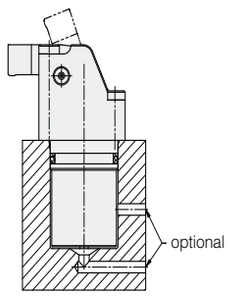


The cartridge style compact hinge clamp with flat clamping lever is especially suitable for fixtures with minimal space. It allows for machining of surfaces that are only a few millimeters above the clamping point. When clamping, the piston moves upwards against the rear edge of the lever and pivots it to the clamped position. The piston force is diverted 180° onto the workpiece. The force is dependent on the operating pressure and length of lever.

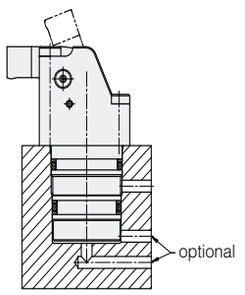
When unclamping the lever is pivots back to the unclamp position by means of a hook-shaped carrier on the piston. Double acting is required for time and cycle dependent installations, since the return stroke is precisely defined. Typical applications for double acting are multiple clamping fixtures with many workpieces that are closely arranged, rotary indexing fixtures in horizontal and vertical machining centers, assembly lines. These clamps are intended to be used with hydraulic fluid only.

Installation and connecting possibilities

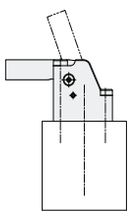
Single acting

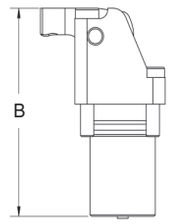


Double acting

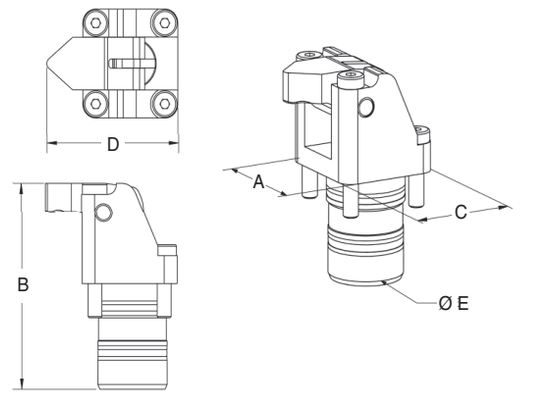


Long clamping lever (blank)





Single acting with standard arm



Double acting with standard arm

			Size 1	Size 2	Size 3	Size 4
Clamping Force (lbs)	3625 psi	Single acting	560	740	1300	2200
		Double acting	720	1125	1955	2920
	2000 psi	Single acting	310	410	720	1215
		Double acting	395	620	1080	1610
	1000 psi	Single acting	155	205	360	610
		Double acting	200	310	540	805

Single Acting - Without Position Monitoring

A (in.)	1.38	1.65	2.09	2.60
B (in.)	2.77	3.45	3.91	5.02
C (in.)	1.30	1.65	2.13	2.48
D (in)	1.83	2.28	2.95	3.48
Ø E (in.)	0.98	1.30	1.57	1.81
Weight (lbs) standard version	0.67	1.39	2.70	4.81
Part No., without standard arm	**CLR-1829-610E00**	**CLR-1829-620E00**	**CLR-1829-630E00**	**CLR-1829-640E00**
Part No., with standard arm	**CLR-1829-610E18**	**CLR-1829-620E24**	**CLR-1829-630E28**	**CLR-1829-640E33**

Double Acting - With Position Monitoring*

B (in.)	2.62	3.21	3.94	4.41
Weight (lbs) standard version	0.63	1.27	2.53	4.18
Part No., without standard arm	**CLR-1829-613D00**	**CLR-1829-623D00**	**CLR-1829-633D00**	**CLR-1829-643D00**
Part No., with standard arm	**CLR-1829-613D18**	**CLR-1829-623D24**	**CLR-1829-633D28**	**CLR-1829-643D33**

Accessories

Part No., standard arm	**CLR-0354-974**	**CLR-0354-975**	**CLR-0354-976**	**CLR-0354-977**
Part No., long blank arm	**CLR-0354-978**	**CLR-0354-979**	**CLR-0354-980**	**CLR-0354-981**

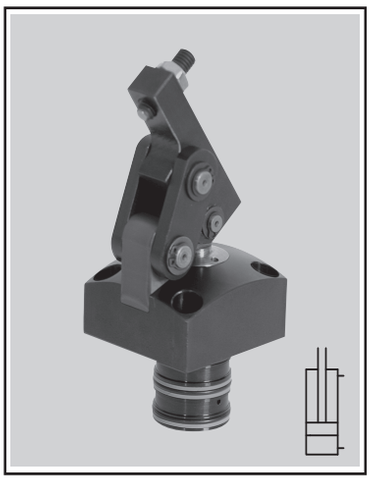
Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

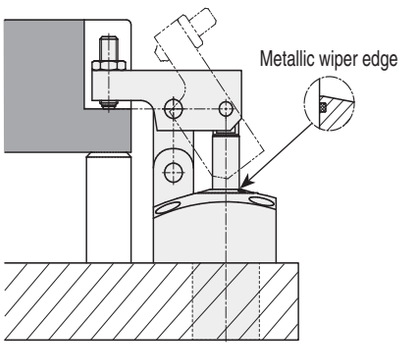
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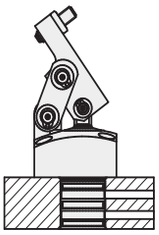
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Hinge Clamp ■ with metal wiper and optional position monitoring
Double Acting ■ Max. Operating Pressure ■ 3625 psi (250 bar)

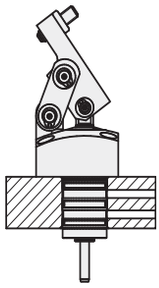




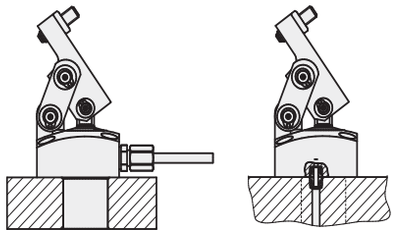
The hinge clamp family of workholding clamps offer many different variations in order to satisfy your fixturing goal. As the hydraulic piston moves upward, the hinge mechanism swivels the arm over your workpiece. The optimized design location of the pins and linkage can reduce or eliminate the transmission of side loading into your part. When retracted, the standard arm is behind the front plane of the clamp allowing for unobstructed top loading. It has a small footprint with large clamping force and FKM seals are standard. Metal wiper on piston rod and contoured top surface provides excellent protection from chips and coolant drainage for a long life cycle. Three sizes, three mounting options, and two arm options help the designer choose the optimal clamp for their application. The long arm can be machined to fit into pockets.



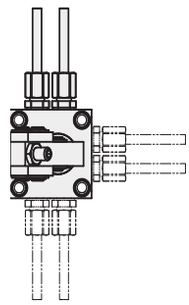
Cartridge Type



Cartridge type with extended piston for position monitoring



Solid body type shown with actuation via fitting connection (left) or connecting insert (right)



Fitting connections on three sides

Part Number Coding: CLR-1825-X X X X

Size	Body Type	Arm Type	Monitoring
1 = Size 1	**1** = Cartridge body type	**0** = Without clamping arm	**E** = Electrical position monitoring
2 = Size 2	**2** = Cartridge body with extended piston for position monitoring	**1** = Standard arm with contact bolt	**P** = Pneumatic position monitoring
3 = Size 3	**3** = Rear fitting connection	**2** = Long clamping arm	**(BLANK)** = No position monitoring
4 = Size 4	**4** = Rear fitting connection with extended piston for position monitoring		
	5 = Fitting connection on 3 sides		
	6 = Fitting connection on 3 sides with extended piston for position monitoring		

Example: CLR-1825-231 = Size 2 clamp with rear fitting connection, standard arm and no monitoring.

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

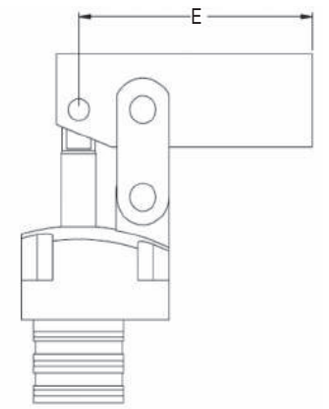
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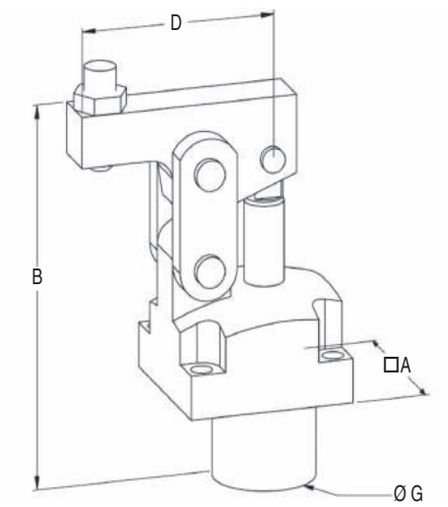
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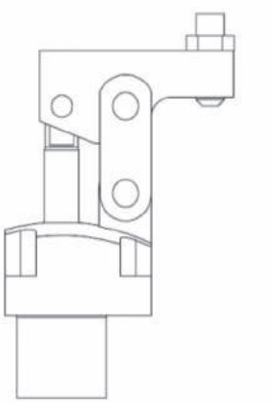
Hinge Clamp ■ with metal wiper and optional position monitoring
Double Acting ■ Max. Operating Pressure ■ 3625 psi (250 bar)

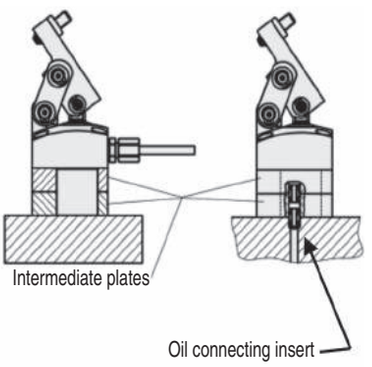
Cartridge Body Style With Long Arm





Solid Body Type With Standard Arm





		Size 1	Size 2	Size 3
Clamping Force (lbs)	3625 psi	890	2240	3190
	2000 psi	490	1240	1760
	1000 psi	240	620	880

Cartridge type

A	2.17	2.76	3.35
B	4.41	6.26	7.38
D	2.07	2.85	3.39
E	3.27	4.51	5.32
G	1.18	1.65	2.05
Weight standard version (lbs)	2.4	6.0	10.2
Part No., Clamp - Standard Arm	**CLR-1825-111**	**CLR-1825-211**	**CLR-1825-311**
Part No., Clamp - Long Arm	**CLR-1825-112**	**CLR-1825-212**	**CLR-1825-312**

Fitting connection type

Part No., Clamp - Standard Arm	**CLR-1825-131**	**CLR-1825-231**	**CLR-1825-331**
Part No., Clamp - Long Arm	**CLR-1825-132**	**CLR-1825-232**	**CLR-1825-332**

Accessories

Part No., Intermediate Plate	**CLR-3456-449**	**CLR-3456-468**	**CLR-3456-489**
Part No., Oil Connecting Insert	**CLR-9210-145**	**CLR-9210-145**	**CLR-9210-145**

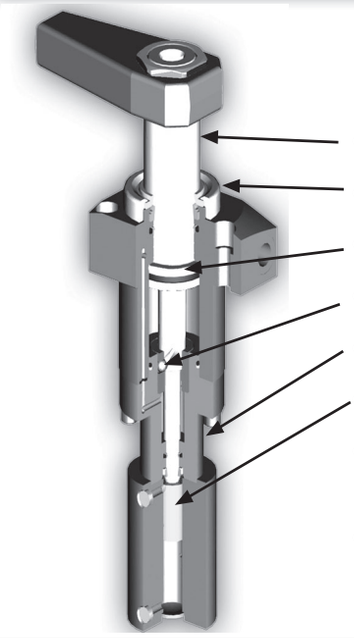
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Why Carr Lane Roemheld Swing Clamps?



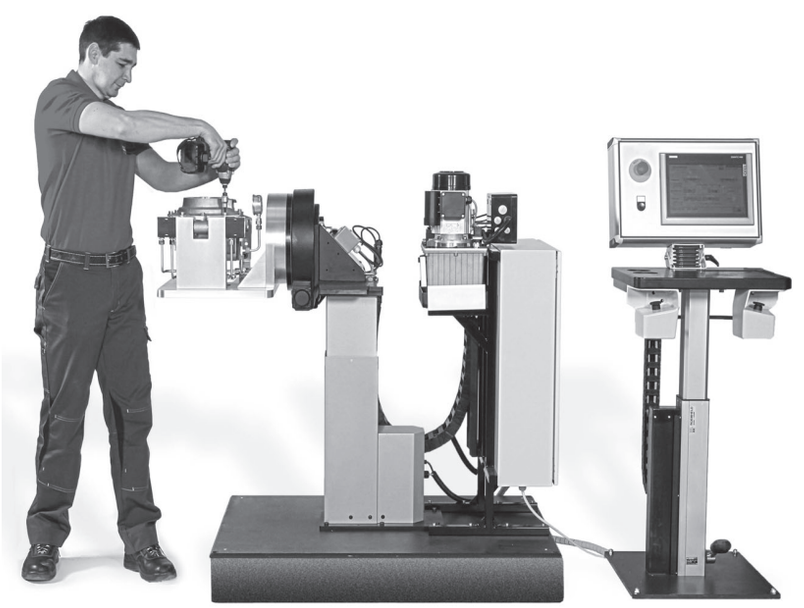
Designed for 1,000,000 cycles

2,000,000+ cycles tested at full load

- Rod diameter 30% larger to eliminate part deflection
- Viton wiper is standard (metal wiper optional)
- Exclusive safety clutch design available to prevent damage to part, fixture, or operator
- Reinforced swivel mechanism with 2 or 3 helix paths depending on size for longer life
- Up to 7500 psi maximum pressure for more compact clamp design
- Position monitoring available, either inductive or pneumatic via movable sensing bolt
- Over 1000 different standard sizes and styles available with clamping forces from 130 lb. to 8265 lb. stroke up to 2”
- Special stroke and clamping forces available upon request.

See Page 628-638

Versatile Modular Units For Assembly and Handling



- Combine our modular units to Lift, Tilt, Rotate or Move your assembly
- Easily move your assembly to optimal position to increase productivity and reduce fatigue
- Preset positions for long runs or adjustable locations for flexibility

See Pages 734-735

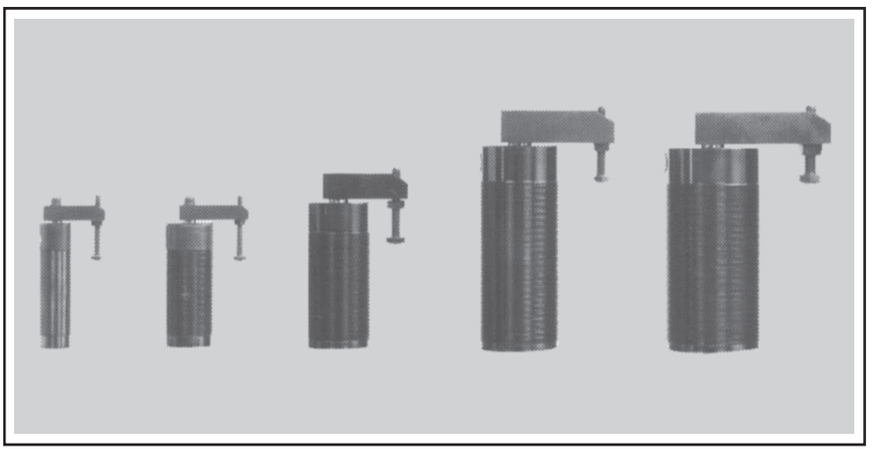
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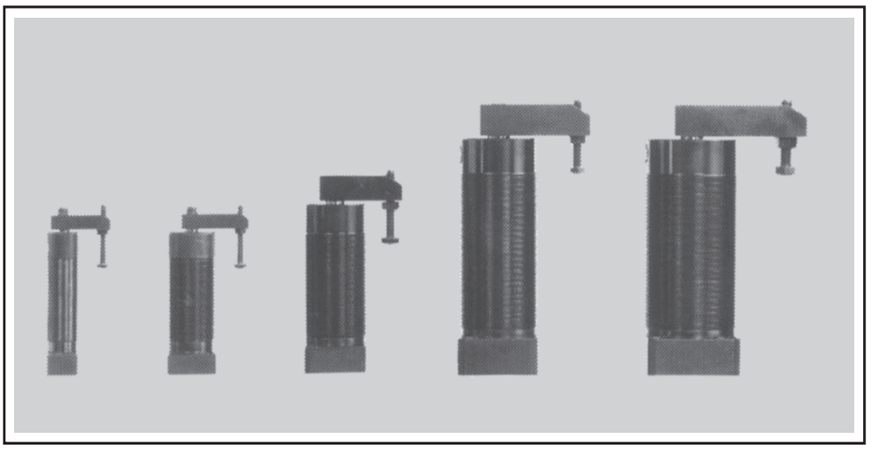
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Air-Powered Swing Clamps

100 psi air max
Double acting only



All Threaded



Flange Base

- **Use when light clamping force is desired**
- **Operates by air…no hydraulic power source needed**
- **Available with standard or long arm**
- **Double acting…clamp and return by air pressure**
- **Choice of five sizes**

CLAMPING ACTION: Applying air pressure to upper port swings clamping arm 90° over the workpiece, then clamps down.

Note: Arm also moves down while swinging (see chart for stroke during swing). To unclamp, switch air pressure to the lower port. Choose part number for clockwise or counterclockwise rotation into clamping position.

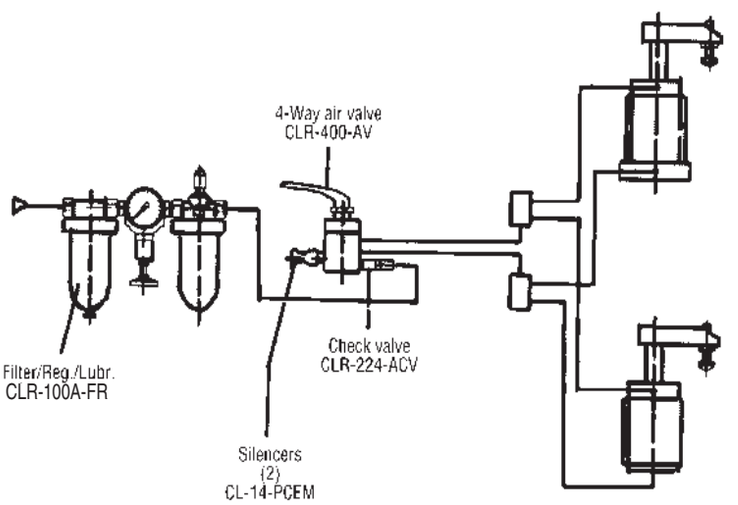
MOUNTING FLANGE BASE: Fasten base to fixture with four cap screws. Mount in any position horizontal or vertical.

MOUNTING, ALL THREADED: Mount in a bored hole, using the two locknuts furnished.

DESIGN CONSIDERATIONS: Do not use with hydraulic fluid, or above 100 psi (87 psi with long arm). Use an air check valve between the air supply and the 4-way air valve and clamps, and periodically check for leaks. Any leaks there would cause clamping pressure loss if the shop air supply fails. To ensure long clamp life, we recommend installing an Air Extractor/ Dryer before the Filter/Regulator/Lubricator.

CLAMP ARM: Flange-base type can be mounted to start its 90° swing from any of four positions, 90° apart. All threaded type can be mounted to start its 90° swing from any position. Standard-length arm is furnished with clamp. Order long arm separately. Adjustable contact bolt furnished.

NOTE: These air clamps do not have safety clutch like hydraulic swing clamps.



Connection Example

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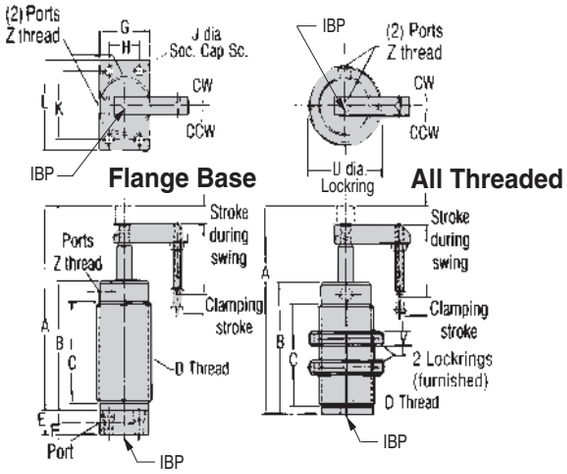
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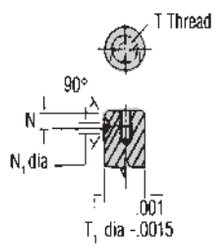
Air-Powered Swing Clamps

100 psi air max
Double acting only

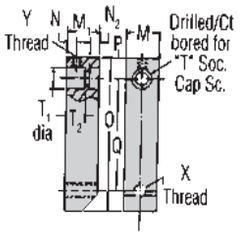


New miniature size for light-force applications where space is at a premium.

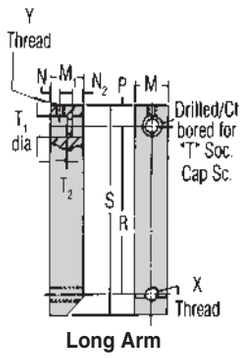




Rod Dimensions



Standard Arm



Long Arm

Maximum clamping force std. arm, at 100 psi (air)	20 Lbs	41 Lbs	107 Lbs	167 Lbs	277 Lbs
Max. air pressure, std. arm (psi)	100	100	100	100	100
Max. air pressure, long arm (psi)	87	87	87	87	87
Minimum air pressure (psi)	58	58	58	58	58
Clamping stroke	9/32	9/32	13/32	19/32	19/32
Stroke during swing	9/32	9/32	5/16	21/32	21/32
A, flanged/all threaded	3-27/32 3-25/32	3-27/32 3-25/32	4-1/2	6-9/16	6-9/16
B, flanged/all threaded	2-23/32 2-5/8	2-23/32 2-5/8	3-3/16	4-1/2	4-1/2
C	1-7/8	1-7/8	2-3/8	3-17/32	3-17/32
D	M20x1.0	M30x1.5	M40x1.5	M50x1.5	M60x1.5
E	15/32	15/32	5/8	7/8	7/8
F	3/16	3/16	3/8	1/2	1/2
G	3/4	1-3/16	1-1/2	1-31/32	2-1/4
H	—	.669	.906	1.181	1.575
J dia	1/4	1/4	1/4	5/16	5/16
K	1.378	1.693	1.969	2.362	2.598
L	1-31/32	2-3/8	2-9/16	3-5/32	3-11/32
M	15/32	15/32	19/32	3/4	3/4
M1	11/32	11/32	19/32	3/4	3/4
N	.138	.138	.138	.157	.157
N1	.138	.138	.138	.157	.157
N2	—	—	.236	.275	.275
O	1-15/32	1-21/32	2-1/16	2-3/4	3-5/16
P	9/32	9/32	13/32	15/32	15/32
Q	1	1-3/16	1-3/8	2	2-3/8
R	1-9/16	1-31/32	2-5/32	2-15/16	3-9/16
S	2-1/16	2-7/16	2-27/32	3-3/4	4-1/2
T	M4x10*	M4x10*	M5x10	M6x14	M6x14
T1 dia	.315	.315	.472	.591	.591
T2	.276	.276	.276	.315	.315
U dia	1-3/8	1-3/4	2-3/8	2-3/4	3-5/32
V	3/8	3/8	3/8	15/32	19/32
X	M4x0.7	M4x0.7	M6	M6	M8
Y	M3x0.5	M3x0.5	M4x0.7	M4x0.7	M4x0.7
Z	#10-32	#10-32	#10-32	1/8 NPT	1/8 NPT
Wt., flanged/all threaded (lbs)	1.0/0.8	1.2/0.9	1.8/1.1	4.0/2.8	5.3/3.7
Part no., flanged base CW	**CLR-1872-104-ASC**	**CLR-1873-104-ASC**	**CLR-1874-104-ASC**	**CLR-1875-104-ASC**	**CLR-1876-104-ASC**
Part no., flanged base CCW	**CLR-1872-204-ASC**	**CLR-1873-204-ASC**	**CLR-1874-204-ASC**	**CLR-1875-204-ASC**	**CLR-1876-204-ASC**
Part no., all threaded CW	**CLR-1872-304-ASC**	**CLR-1873-304-ASC**	**CLR-1874-304-ASC**	**CLR-1875-304-ASC**	**CLR-1876-304-ASC**
Part no., all threaded CCW	**CLR-1872-404-ASC**	**CLR-1873-404-ASC**	**CLR-1874-404-ASC**	**CLR-1875-404-ASC**	**CLR-1876-404-ASC**
Spare clamping arm, STD	**CLR-0187-201-ASCA**	**CLR-0187-301-ASCA**	**CLR-0187-401-ASCA**	**CLR-0187-501-ASCA**	**CLR-0187-601-ASCA**
Spare clamping arm, long	**CLR-0187-202-ASCA**	**CLR-0187-302-ASCA**	**CLR-0187-402-ASCA**	**CLR-0187-502-ASCA**	**CLR-0187-602-ASCA**
Spare lockring	**CLR-200-ASCA**	**CLR-300-ASCA**	**CLR-400-ASCA**	**CLR-500-ASCA**	**CLR-600-ASCA**

**Arm not counterbored (for capscrew). To avoid damage, clamps must take at least one full second to clamp.*

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Swing Clamps

7250/3000 psi max
Single and double acting

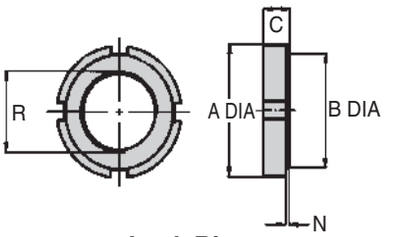


Flange Base

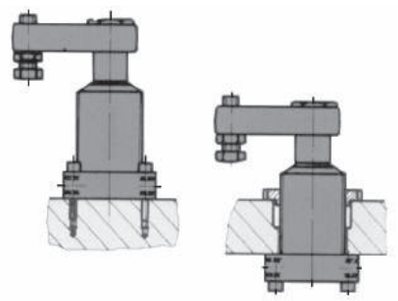


All Threaded

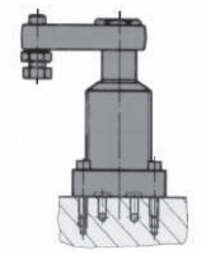
- **Popular series of swing clamps that provides many plumbing options**
- **Unique safety clutch prevents damage if arm strikes an object during swing**
- **Double-acting clamps are also available with longer clamping strokes (25mm or 50mm). Please contact factory.**
- **Choice of four sizes (3, 5, 6, and 7 series)**



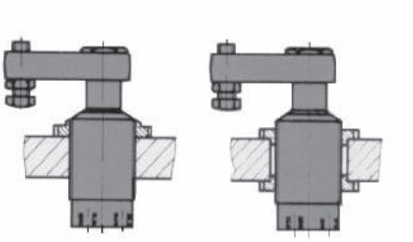
Lock Ring



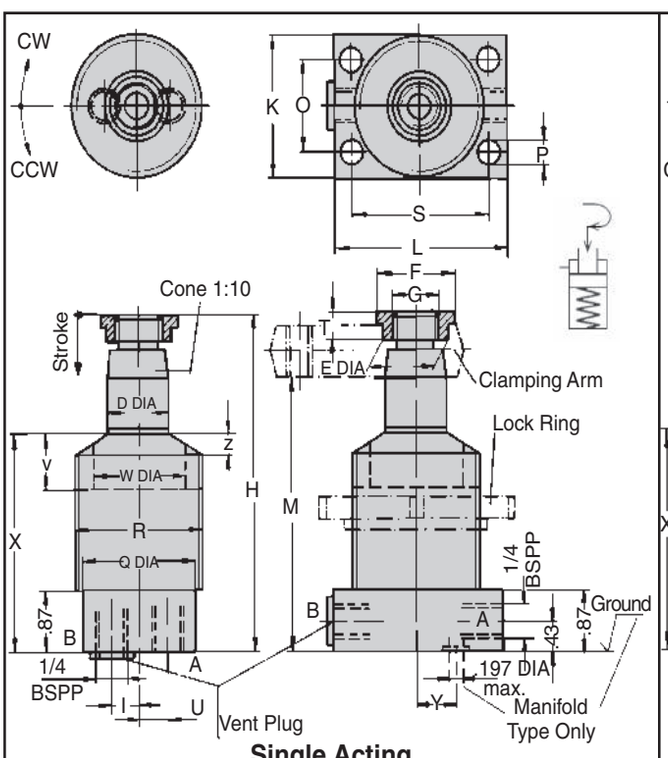
Version 1
Flange Base
Standard Fittings



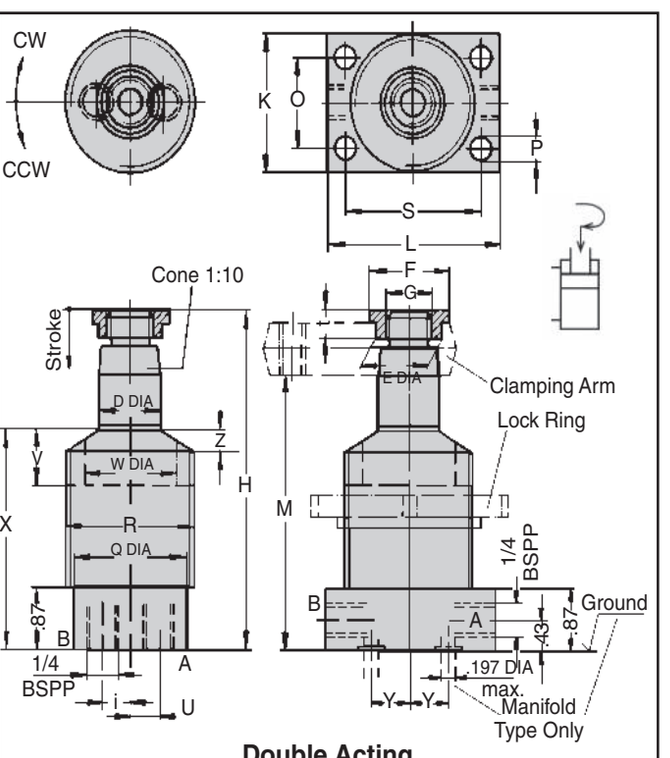
Version 2
Flange Base
Manifold Mounted



Version 3
All Threaded
Standard Fittings



Single Acting



Double Acting

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Swing Clamps

7250/3000 psi max
Single and double acting

CLAMPING ACTION: Fluid pressure swings arm 90° over workpiece then clamps down. Spring return lifts arm then swings in back 90° for loading/unloading. Optional fluid return version (double-acting). Choose either clockwise or counterclockwise rotation to clamping position.

MOUNTING: Choose from many possible mounting methods: (1) Fasten to top of fixture plate with four capscrews inserted through flange base from above; (2) Mount through a hole in the fixture plate, fastening with four capscrews inserted through flange base from below; (3) Mount through a bored hole and secure with two lockrings. Mount in any position, horizontal or vertical. Standard clamping arm requires a rear support.

DESIGN CONSIDERATIONS: The clamping arm must go through its full swing to operate properly. Stopping the arm short by obstructing it could possibly cause damage. Use low operating pressure during initial setting. May require a simple flow-control valve if fixture contains only a few clamps and is powered by a high-flow-rate power source. See power source pages to check. Cycle time must be at least one second.

STANDARD CLAMPING ARM: Rugged nodular iron arm pivots on a forged steel carrier. Arm can be mounted to start its 90° swing from any position within 360°. Contact bolt furnished.

OPTIONAL HALF ARM: Forged steel, furnished with contact bolt. Whenever possible, use standard clamping arms, with rear supports, for best mechanical leverage and full clamping force. Half arms are more compact and useful when there is no room for a rear support, but the maximum clamping force is greatly reduced. Half arms cause bending in the piston rods. This bending lowers the allowable maximum fluid pressure to 3000 psi. Exceeding 3000 psi can cause internal damage and decrease service life considerably. Arm extensions will furthur reduce the allowable operating pressure (inversely proportional to arm length.) To order Swing Clamps with half arms instead of standard arms, add an "H" to the part no.

FLUID CONNECTION: Male 37° tubing/hose connection (two with double-acting clamps). Do not use NPT fittings.

CONSTRUCTION: Sturdy helical-cam mechanism first rotates arm, then clamps. Integral safety clutch. Unit sealed to keep out dirt and chips.



3000 psi maximum

Optional Half Arm

To order a Swing Clamp with a half arm instead of a standard pivoting arm, add on "H" to the part no. Example:

CLR-314-SC Standard Arm
CLR-314-SCH Half Arm

Clamping force (lbs) standard pivoting arm SA/DA (lbs)	7250 psi	1065/1080	2810/2845	4120/4495	7305/7490
	6000 psi	860/920	2200/2300	3400/3700	6000/6500
	5000 psi	710/770	1800/2000	2800/3100	4900/5500
	4000 psi	580/620	1480/1560	2340/2480	4030/4340
	3000 psi	400/450	960/1200	1600/1900	2800/3300
Clamping force half arm SA/DA (lbs) See pgs. 646-648 for special arm lengths	3000 psi	540/630	1320/1560	1700/2360	3360/3810
Clamping stroke		.43	.55	59	.59
Stroke during swing		.28	.32	.43	.35
Fluid required to clamp (cu. in.)		.20	.61	1.12	1.69
Fluid required to unclamp, DA (cu. in.)		.54	1.69	3.11	4.60
Max. fluid flow rate (cu. in./min.)		11	36	67	101
Min. operating pressure (psi)		450	450	450	450
A Dia		2.68	3.54	4.53	5.12
B Dia		2.047/2.039	2.677/2.669	3.543/3.535	3.937/3.929
C		.47	.51	.63	.63
D Dia		.787	1.260	1.575	1.969
E Dia		.925	1.319	1.772	2.185
F Dia		1.18	1.57	2.17	2.68
G		M18 x 1.5	M28 x 1.5	M35 x 1.5	M45 x 1.5
H		4.98	5.81	6.77	7.17
I		.47	.49	.75	1.00
K		1.77	2.48	3.15	3.54
L		2.56	3.35	3.94	4.53
M (standard arm/half arm)		4.13/4.13	4.69/4.69	5.43/5.43	5.69/5.57
N		.12	.16	.20	.20
O		1.181	1.732	2.362	2.677
P Dia		.256	.335	.531	.630
Q Dia		1.69	2.28	3.03	3.46
R		M45 x 1.5	M60 x 1.5	M80 x 2	M90 x 2
S		1.969	2.559	3.150	3.543
T		.354	.394	.433	.472
U		.47	.77	1.04	1.34
V		.79	.79	1.18	1.57
W Dia		1.26	1.97	2.36	2.76
X		3.33	3.72	4.33	4.57
Y		.591	1.102	1.220	1.476
Z		.20	.24	.24	.35
Part No., Lock Ring		**CLR-300-SCA**	**CLR-500-SCA**	**CLR-600-SCA**	**CLR-700-SCA**
Part No., Standard Pivoting Arm		**CLR-302-SCA**	**CLR-502-SCA**	**CLR-602-SCA**	**CLR-702-SCA**
Part No., Half Arm		**CLR-301-SCA**	**CLR-501-SCA**	**CLR-601-SCA**	**CLR-701-SCA**

Flange Base – Standard Fittings

Part No., Clamp without Arm	Single-Acting, CW	**CLR-1883-104-SC**	**CLR-1885-104-SC**	**CLR-1886-104-SC**	**CLR-1887-104-SC**
	Single-Acting, CCW	**CLR-1883-204-SC**	**CLR-1885-204-SC**	**CLR-1886-204-SC**	**CLR-1887-204-SC**
	Double-Acting, CW	**CLR-1893-104-SCD**	**CLR-1895-104-SCD**	**CLR-1896-104-SCD**	**CLR-1897-104-SCD**
	Double-Acting, CCW	**CLR-1893-204-SCD**	**CLR-1895-204-SCD**	**CLR-1896-204-SCD**	**CLR-1897-204-SCD**
Part No., Clamp with Standard Arm	Single-Acting, CW	**CLR-314-SC**	**CLR-514-SC**	**CLR-614-SC**	**CLR-714-SC**
	Single-Acting, CCW	**CLR-324-SC**	**CLR-524-SC**	**CLR-624-SC**	**CLR-724-SC**
	Double-Acting, CW	**CLR-314-SCD**	**CLR-514-SCD**	**CLR-614-SCD**	**CLR-714-SCD**
	Double-Acting, CCW	**CLR-324-SCD**	**CLR-524-SCD**	**CLR-624-SCD**	**CLR-724-SCD**

Flange Base – Manifold Mounted

Part No., Clamp without Arm	Single-Acting, CW	**CLR-1883-504-SC**	**CLR-1885-504-SC**	**CLR-1886-504-SC**	**CLR-1887-504-SC**
	Single-Acting, CCW	**CLR-1883-604-SC**	**CLR-1885-604-SC**	**CLR-1886-604-SC**	**CLR-1887-604-SC**
	Double-Acting, CW	**CLR-1893-504-SCD**	**CLR-1895-504-SCD**	**CLR-1896-504-SCD**	**CLR-1897-504-SCD**
	Double-Acting, CCW	**CLR-1893-604-SCD**	**CLR-1895-604-SCD**	**CLR-1896-604-SCD**	**CLR-1897-604-SCD**
Part No., Clamp with Standard Arm	Single-Acting, CW	**CLR-354-SC**	**CLR-554-SC**	**CLR-654-SC**	**CLR-754-SC**
	Single-Acting, CCW	**CLR-364-SC**	**CLR-564-SC**	**CLR-664-SC**	**CLR-764-SC**
	Double-Acting, CW	**CLR-354-SCD**	**CLR-554-SCD**	**CLR-654-SCD**	**CLR-754-SCD**
	Double-Acting, CCW	**CLR-364-SCD**	**CLR-564-SCD**	**CLR-664-SCD**	**CLR-764-SCD**

All Threaded – Standard Fittings

Part No., Clamp without Arm	Single-Acting, CW	**CLR-1883-304-SC**	**CLR-1885-304-SC**	**CLR-1886-304-SC**	**CLR-1887-304-SC**
	Single-Acting, CCW	**CLR-1883-404-SC**	**CLR-1885-404-SC**	**CLR-1886-404-SC**	**CLR-1887-404-SC**
	Double-Acting, CW	**CLR-1893-304-SCD**	**CLR-1895-304-SCD**	**CLR-1896-304-SCD**	**CLR-1897-304-SCD**
	Double-Acting, CCW	**CLR-1893-404-SCD**	**CLR-1895-404-SCD**	**CLR-1896-404-SCD**	**CLR-1897-404-SCD**
Part No., Clamp with Standard Arm	Single-Acting, CW	**CLR-334-SC**	**CLR-534-SC**	**CLR-634-SC**	**CLR-734-SC**
	Single-Acting, CCW	**CLR-344-SC**	**CLR-544-SC**	**CLR-644-SC**	**CLR-744-SC**
	Double-Acting, CW	**CLR-334-SCD**	**CLR-534-SCD**	**CLR-634-SCD**	**CLR-734-SCD**
	Double-Acting, CCW	**CLR-344-SCD**	**CLR-544-SCD**	**CLR-644-SCD**	**CLR-744-SCD**

* Single-acting clamp with standard pivoting arm.

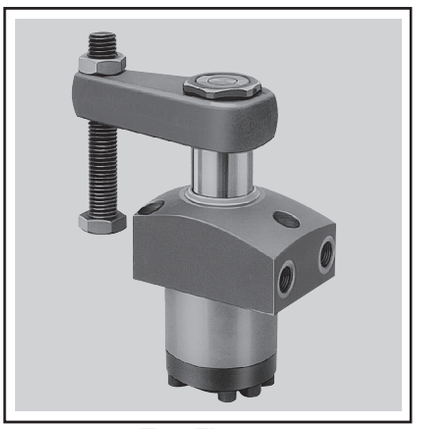
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Swing Clamps

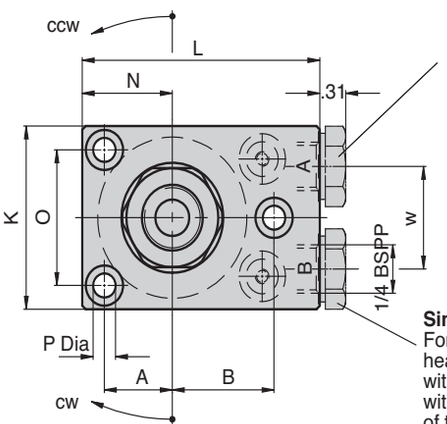
7250 psi max
Single and double acting



Top Flange

CLAMPING ACTION: Fluid pressure swings arm 90° over workpiece then clamps down. Spring return lifts arm then swings it back 90° for loading/unloading. Optional fluid return version (double-acting). Choose either clockwise or counterclockwise rotation to clamping position.

DESIGN CONSIDERATIONS: The clamping arm must go through its full swing to operate properly. Stopping the arm short by obstructing it could possibly cause damage. Use low operating pressure during initial setting. May require a simple flow-control valve if fixture contains only a few clamps and is powered by a high-flow-rate power source. See power source pages to check. Swing cycle time must be at least one second.

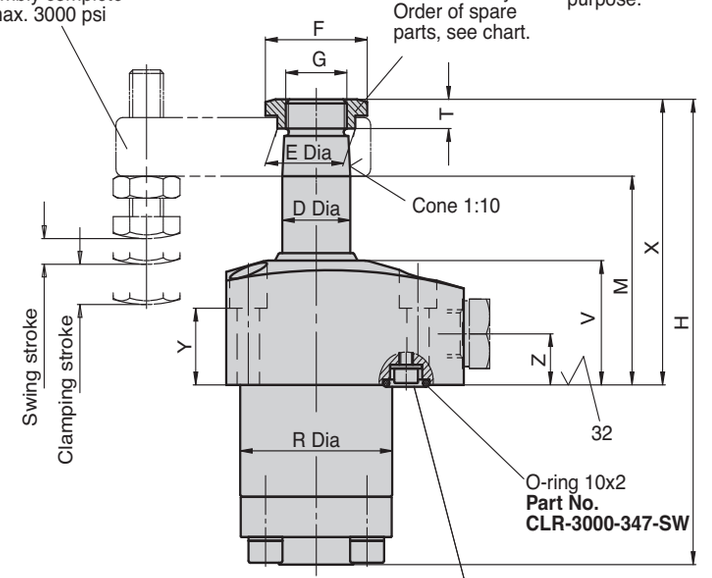


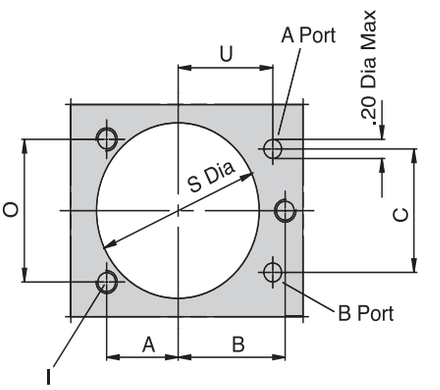
Double-acting elements:
For manifold mounting remove socket head cap screws and USIT-rings. Screw in two plugs CLR-810-F. (Not included).

Single-acting elements:
For manifold mounting at port A, remove socket head cap screw and USIT-ring, close port 1/4 BSPP with plug CLR-810-F. Port B is normally closed with a plug with sintered metal air filter. Bleeding of the spring area by drilled channels at port B is possible, plug CLR-810-F is required for this purpose.

Accessory:
Clamping arm assembly complete for max. 3000 psi

Nut is included in our delivery. Order of spare parts, see chart.





A Port = Clamping
B Port = Venting (single acting)
B Port = Unclamping (double acting)

Double-acting elements:
For manifold mounting remove socket head cap screws and USIT-rings. Screw in two plugs CLR-810-F. (Not included).

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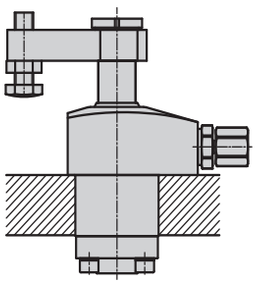
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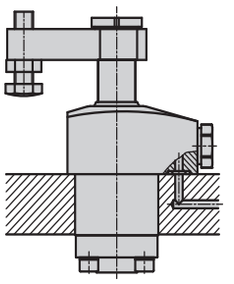
Swing Clamps

7250 psi max
Single and double acting

Connecting possibilities



Tube connection



Top Flange with O-ring sealing for manifold mounting

FLUID CONNECTION: 1/4 BSPP Port fittings with optional manifold mounting.

CONSTRUCTION: Sturdy helical-cam mechanism first rotates arm, then clamps. Integral safety clutch. Unit sealed to keep out dirt and chips.

INFO+: See pages 634-635 for arm options. Also available in 60º and 45º swing.

Clamping force (lbs) standard pivoting arm SA/DA (lbs)	7250 psi	**1130/1125**	**2755/2845**	**4420/4495**	**7680/7865**
	6000 psi	860/920	2200/2300	3400/3700	6000/6500
	5000 psi	710/770	1800/2000	2800/3100	4900/5500
	4000 psi	580/620	1480/1560	2340/2480	4030/4340
	3000 psi	400/450	960/1200	1600/1900	2800/3300
Clamping force half arm SA/DA (lbs) See pgs. 622-623 for special arm lengths	3000 psi	540/630	1320/1560	1700/2360	3360/3810
Clamping stroke		.43	.55	.59	.59
Swing stroke		.28	.31	.43	.35
Total stroke		.71	.86	1.02	.94
Operating pressure to swing min. (psi)		450	450	450	450
Max. oil flow rate (cu.in)		11	36	67	101
Oil to clamp (cu.in.)		.20	.61	1.12	1.69
Oil to return (cu.in.)		.54	1.69	3.11	4.58
D Dia		.787	1.260	1.575	1.969
A		.787	1.063	1.457	1.654
B		1.181	1.496	1.969	2.165
C		1.260	1.811	2.441	2.953
E Dia		.93	1.32	1.77	2.19
F		1.18	1.57	2.17	2.68
G		M18 x 1.5	M28 x 1.5	M35 x 1.5	M45 x 1.5
H		4.98	5.81	6.77	7.17
I		M6	M8	M10	M12
K		1.97	2.48	3.35	3.74
L		2.76	3.35	4.33	4.92
M		2.22	2.60	2.76	2.72
N		1.04	1.36	1.85	2.17
O		1.457	1.890	2.559	2.835
P Dia		.26	.35	.43	.55
R Dia		1.76	2.35	3.14	3.54
S Dia		1.79	2.38	3.17	3.56
T		.35	.39	.43	.47
U		1.043	1.220	1.575	1.772
V		1.34	1.57	1.57	1.57
W		1.10	1.61	2.17	2.76
X		3.07	3.70	4.09	4.29
Y		.83	.87	.59	.55
Z		.55	.55	.47	.47

Single Acting

Part No., Clockwise rotation	**CLR-1883-103-SC**	**CLR-1885-103-SC**	**CLR-1886-103-SC**	**CLR-1887-103-SC**
Part No., Counterclockwise rotation	**CLR-1883-203-SC**	**CLR-1885-203-SC**	**CLR-1886-203-SC**	**CLR-1887-203-SC**
Part No., 0 degree	**CLR-1883-243-SC**	**CLR-1885-243-SC**	**CLR-1886-243-SC**	**CLR-1887-243-SC**

Double Acting **

Part No., Clockwise rotation	**CLR-1893-103-SCD**	**CLR-1895-103-SCD**	**CLR-1896-103-SCD**	**CLR-1897-103-SCD**
Part No., Counterclockwise rotation	**CLR-1893-203-SCD**	**CLR-1895-203-SCD**	**CLR-1896-203-SCD**	**CLR-1897-203-SCD**
Part No., 0 degree	**CLR-1893-243-SCD**	**CLR-1895-243-SCD**	**CLR-1896-243-SCD**	**CLR-1897-243-SCD**

*** Longer stroke versions available - Consult Engineering.*

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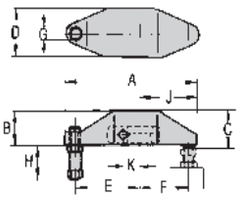
Swing Clamp Arms

7250 psi max
Single and double acting

Swing Clamp Part Number	Arm Size
CLR-3XX-SC(D)	Small
CLR-5XX-SC(D)	Medium
CLR-6XX-SC(D)	Large
CLR-7XX-SC(D)	Extra Large

Swing Clamp Part Number	Arm Size
CLR-18X3-XXX-SC(D)	Small
CLR-18X5-XXX-SC(D)	Medium
CLR-18X6-XXX-SC(D)	Large
CLR-18X7-XXX-SC(D)	Extra Large

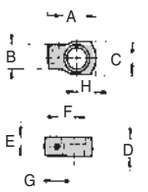




Standard Arm (Includes Carrier & Contact Bolt)

Size	Part No.	A	B	C	D	E	F	G	H	J	K
Small	CLR-0354-000-SCA	4.8	1.18	1.24	1.73	2.36	1.77	M10	.16-2.5	2.09	.57
Medium	CLR-0354-002-SCA	7.28	1.77	1.85	2.3	3.27	2.95	M16	.35-3.13	3.43	.88
Large	CLR-0354-041-SCA	8	2.13	2.22	3.23	3.62	3.23	M16	.35-3.75	3.74	1.1
Extra Large	CLR-0354-004-SCA	8.78	2.32	2.42	3.86	3.94	3.54	M20	.47-4.13	4.33	1.3





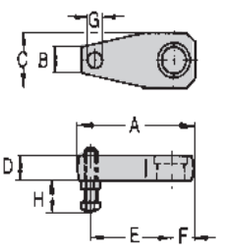
Carrier Only

Size	Part No.	A	B	C	D	E	F	G Dia.	H
Small	CLR-3542-093-SCA	1.81	1.02	1.26	0.63	0.33	0.57	.3150	0.63
Medium	CLR-3542-094-SCA	2.32	1.26	1.57	0.91	0.39	0.83	.3937	0.87
Large	CLR-3542-132-SCA	3.23	1.75	2.28	1.1	0.43	1.1	.4724	1.34
Extra Large	CLR-3542-096-SCA	3.54	2.2	2.68	1.34	0.51	1.3	.5512	1.42



Untapped Half Arm

Size	Part No.	A	B	C	D	F
Small	CLR-3921-016-SCA	2.95	.63	1.26	.63	.63
Medium	CLR-3921-017-SCA	4.53	0.87	1.89	0.91	0.98
Large	CLR-3921-021-SCA	5.51	1.1	2.36	1.1	1.18
Extra Large	CLR-3921-018-SCA	7.01	1.57	3.07	1.34	1.57





Tapped Half Arm (Includes Contact Bolt)

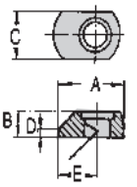
Size	Part No.	A	B	C	D	E	F	G	H
Small	CLR-0354-001-SCA	2.95	0.63	1.26	0.63	1.97	0.63	M10	.24-2.52
Medium	CLR-0354-003-SCA	4.53	0.87	1.89	0.91	2.95	0.98	M16	.36-3.11
Large	CLR-0354-042-SCA	5.51	1.1	2.36	1.1	3.74	1.18	M16	.36-3.11
Extra Large	CLR-0354-005-SCA	7.01	1.57	3.07	1.34	4.72	1.57	M20	.48-3.86

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Swing Clamp Arms

7250 psi max
Single and double acting

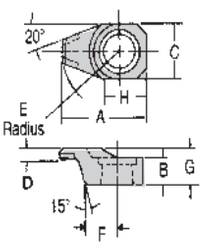




Short Arm

Size	Part no.	A	B	C	D	E
Small	**CLR-3548-159-SCA**	1.61	0.63	1.26	0.24	0.98
Medium	**CLR-3548-165-SCA**	2.4	0.91	1.89	0.24	1.46
Large	**CLR-3548-304-SCA**	2.99	1.1	2.36	0.43	1.77
Extra Large	**CLR-3548-163-SCA**	3.54	1.34	3.07	0.55	2.05

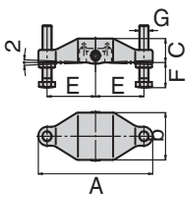




Thin Nose Arm

Size	Part no.	A	B	C	D	E	F	G	H
Small	**CLR-3548-238-SCA**	2.03	0.61	1.26	0.26	1.32	0.78	0.83	1.03
Medium	**CLR-3548-236-SCA**	2.99	0.89	1.81	0.35	1.97	0.88	1.1	1.31
Large	**CLR-3548-301-SCA**	3.94	1.1	2.6	0.43	2.52	1.72	1.34	1.94
Extra Large	**CLR-3548-302-SCA**	4.84	1.34	2.95	0.51	3.25	1.84	1.57	2.13

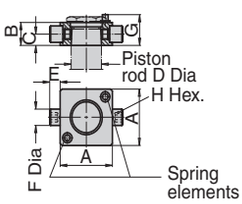




Double Arm (Includes Carrier & Contact Bolts)

Size	Part no.	A	B	C	D	E	F Max.
Small	**CLR-0354-131-SCA**	5.43	2.32	1.12	M10	2.36	2.52
Medium	**CLR-0354-132-SCA**	7.72	2.95	1.5	M16	3.27	3.11
Large	**CLR-0354-133-SCA**	8.5	3.35	1.85	M16	3.62	3.11
Extra Large	**CLR-0354-134-SCA**	9.29	4.13	2.2	M20	3.94	3.86



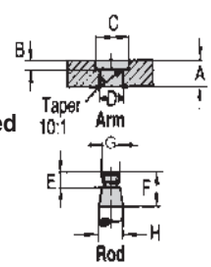


Carrier Only For Double-Arm

Size	Part no.	A	B	C	D Dia	E	F Dia	G*	H Hex
Small	**CLR-0354-141-SCA**	1.69	0.63	0.3	.79	0.35	0.39	0.85	M5
Medium	**CLR-0354-142-SCA**	2.17	0.91	0.43	1.26	0.43	0.63	1.14	M8
Large	**CLR-0354-143-SCA**	2.48	1.1	0.59	1.57	0.47	0.71	1.38	M8
Extra Large	**CLR-0354-144-SCA**	3.03	1.34	0.67	1.97	0.59	0.79	1.61	M8

*Stop for spring elements

Dimensions for Customer Manufactured Arms



Customer Manufactured Arm

Clamp Size	A	B	C Dia.	D Dia (10:1 taper)	E	F	G	H Dia.
Small	0.63	0.16	0.94	.7815/.7835	0.39	0.83	M18x1.5	0.79
Medium	0.91	0.2	1.34	1.2539/1.2559	0.47	1.1	M28x1.5	1.26
Large	1.1	0.2	1.81	1.5689/1.5709	0.47	1.34	M35x1.5	1.57
Extra Large	1.34	0.24	2.2	1.9626/1.9646	0.51	1.57	M45x1.5	1.97

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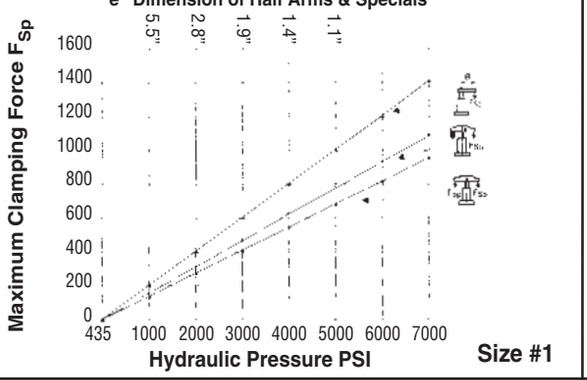
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Swing Clamp Arm Options

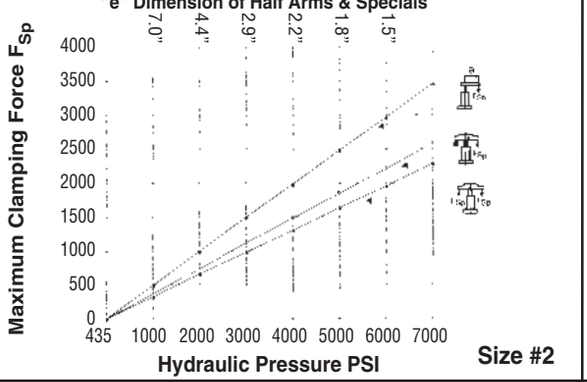
Single Acting

INCLUDES: CLR-3XX-SCX, CLR-18X3-XXX-SCX
"e" Dimension of Half Arms & Specials



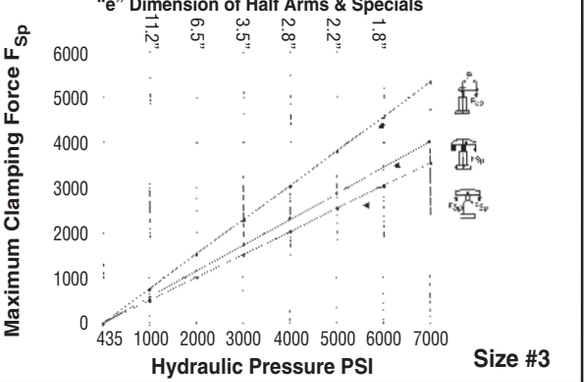
Size #1

INCLUDES: CLR-5XX-SCX, CLR-18X5-XXX-SCX
"e" Dimension of Half Arms & Specials



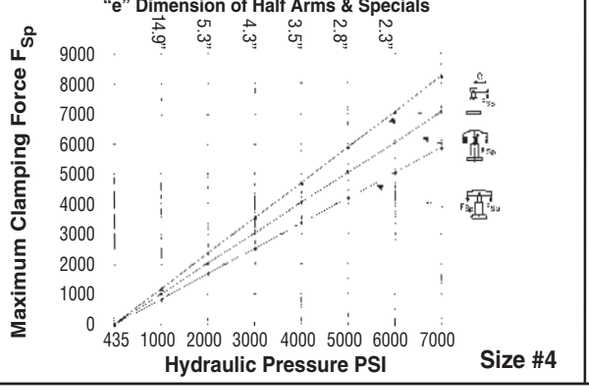
Size #2

INCLUDES: CLR-6XX-SCX, CLR-18X6-XXX-SCX
"e" Dimension of Half Arms & Specials



Size #3

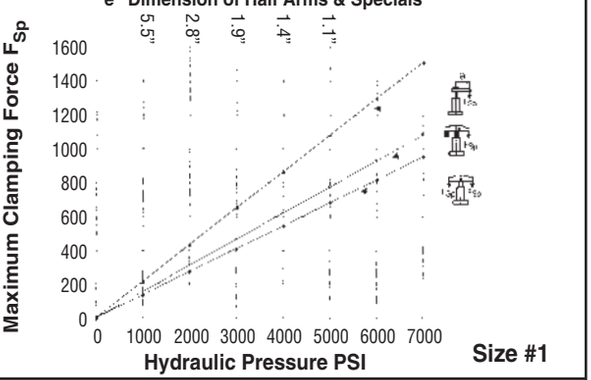
INCLUDES: CLR-7XX-SCX, CLR-18X7-XXX-SCX
"e" Dimension of Half Arms & Specials



Size #4

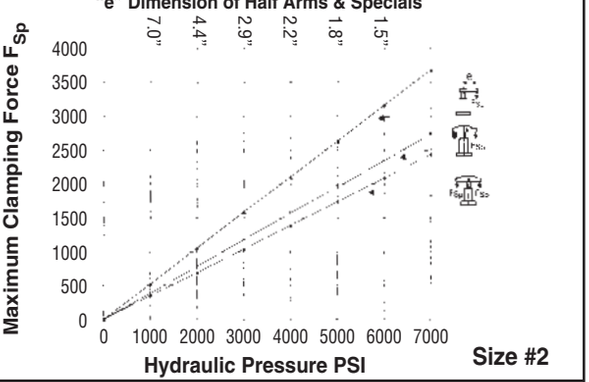
Double Acting

INCLUDES: CLR-3XX-SCXX, CLR-18X3-XXX-SCX
"e" Dimension of Half Arms & Specials



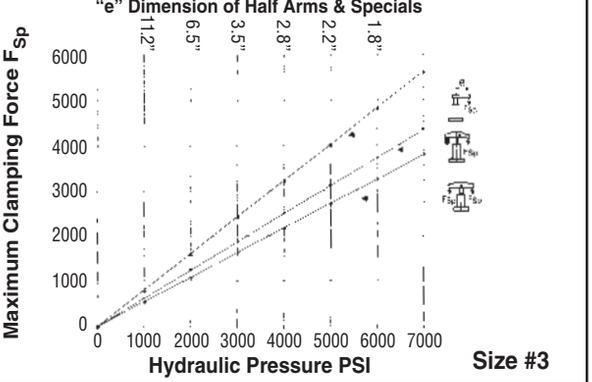
Size #1

INCLUDES: CLR-5XX-SCXX, CLR-18X5-XXX-SCX
"e" Dimension of Half Arms & Specials



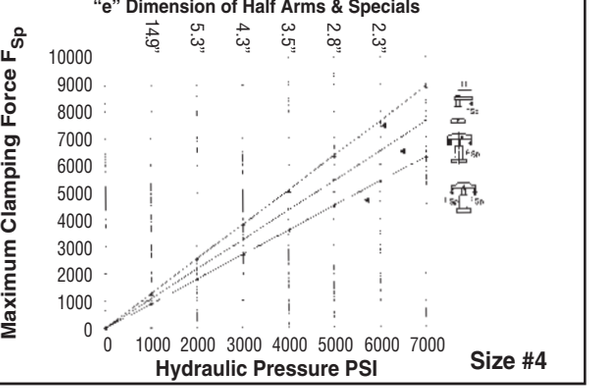
Size #2

INCLUDES: CLR-6XX-SCXX, CLR-18X6-XXX-SCX
"e" Dimension of Half Arms & Specials



Size #3

INCLUDES: CLR-7XX-SCXX, CLR-18X7-XXX-SCX
"e" Dimension of Half Arms & Specials



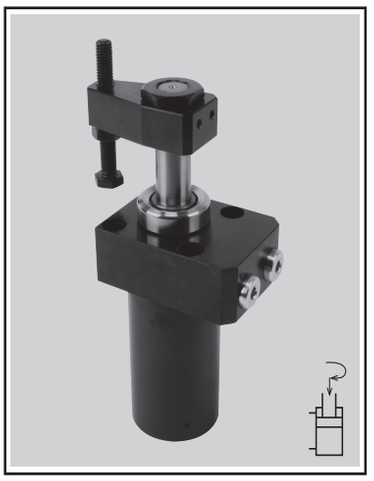
Size #4

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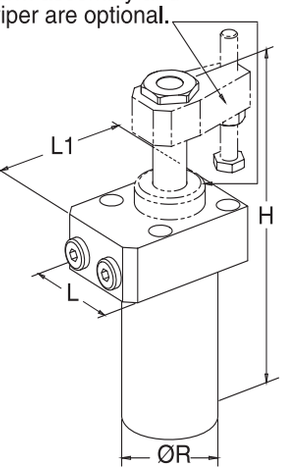
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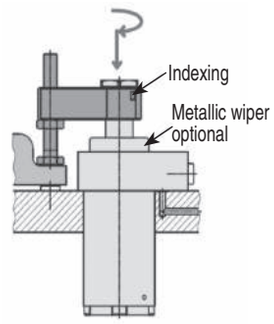
Swing Clamps ■ Top flange type with multiple position monitoring options
Double Acting ■ Max. Operating Pressure ■ 5075 psi (350 bar)



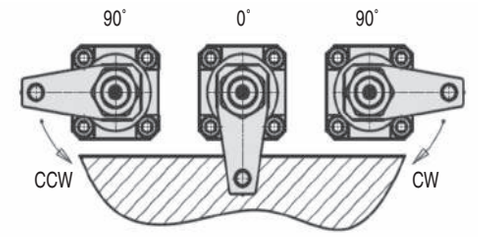
The hydraulic swing clamp is a pull type cylinder where a part of the total stroke is used to swing the piston, for when it is essential to keep the clamping area free for unrestricted workpiece loading/unloading. High clamping force at low pressures. The sturdy swing mechanism in combination with restricted flow rate, allows larger custom arms. Special swing angle and indexing of clamp arm available. Special swing angle and indexing of clamp arm available. Multiple pneumatic and electric position monitoring available. Metallic wiper option. Four sizes allow the designer to choose the optimal clamp for their application.

Clamp arm assembly and metal wiper are optional.





Pneumatic versions available to monitor clamp position and clamp/unclamp positions.



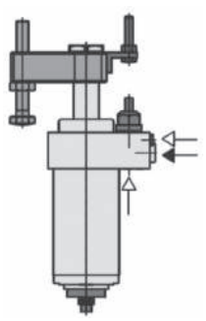
Special swing angle easily available

Clamping Force With Accessory Arm		Size 1	Size 2	Size 3	Size 4
Clamp Force (lbs)	5075 psi	1350	1890	3370	4945
	2000 psi	630	1010	1845	2700
	1000 psi	270	340	630	900

General Dimension specifications (in inches)

L	1.97	2.44	2.95	3.46
L1	2.76	3.19	3.74	4.13
H	6.39	6.92	8.06	9.20
R Diameter	1.77	2.05	2.36	2.99
Clamping Stroke	0.47	0.47	0.59	0.59
Approx. Weight (Lbs)	3.75	5.07	8.60	13.23
Part No., Swing Direction 90 Degree CW	**CLR-1843-X090-R23**	**CLR-1844-X090-R24**	**CLR-1845-X090-R30**	**CLR-1846-X090-R36**
Part No., Swing Direction 90 Degree CCW	**CLR-1843-X090-L23**	**CLR-1844-X090-L24**	**CLR-1845-X090-L30**	**CLR-1846-X090-L36**
Part No., Swing Direction 90 Degree CCW	**CLR-1843-X000-023**	**CLR-1844-X000-024**	**CLR-1845-X000-030**	**CLR-1846-X000-036**

X= Needs Letter Designation For Position Monitoring Style Desired (See Roemheld Data Sheet B1.853)



Switch rod version available for electric and pneumatic position monitoring.

Accessories

Part No., Clamp Arm With Contact Bolt	**CLR-0354-152**	**CLR-0354-153**	**CLR-0354-154**	**CLR-0354-155**
Part No., Complete Arm With Angle Bracket	**CLR-0354-156**	**CLR-0354-157**	**CLR-0354-158**	**CLR-0354-159**
Part No., Untapped Clamp Arm	**CLR-3548-660**	**CLR-3548-661**	**CLR-3548-803**	**CLR-3548-804**
Part No., Angle Bracket Complete	**CLR-0184-003**	**CLR-0184-004**	**CLR-0184-005**	**CLR-0184-005**
Part No., Metallic Wiper	**CLR-0341-104**	**CLR-0341-107**	**CLR-0341-105**	**CLR-0341-100**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

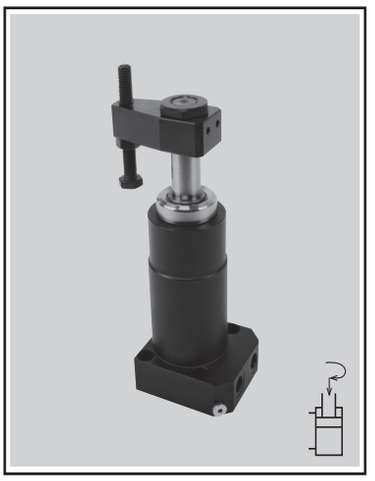
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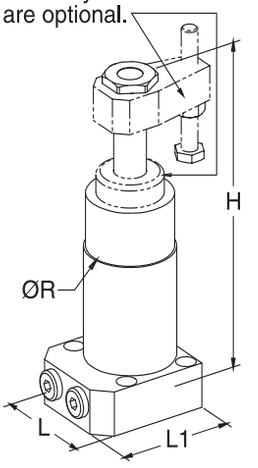
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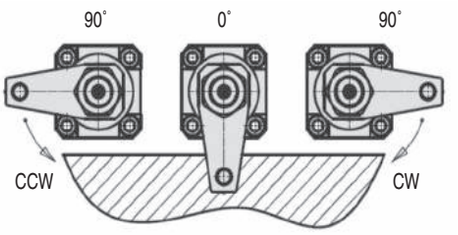
Swing Clamps ■ Flange base type with multiple position monitoring options
Double Acting ■ Max. Operating Pressure ■ 5075 psi (350 bar)



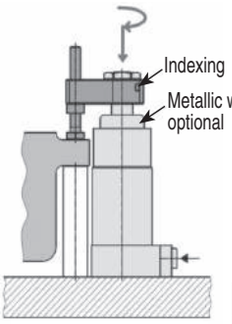
The hydraulic swing clamp is a pull type cylinder where a part of the total stroke is used to swing the piston, for when it is essential to keep the clamping area free for unrestricted workpiece loading/unloading. High clamping force at low pressures. The sturdy swing mechanism in combination with restricted flow rate, allows larger custom arms. Special swing angle and indexing of clamp arm available. Multiple pneumatic and electric position monitoring available. Metallic wiper option. Four sizes allow the designer to choose the optimal clamp for their application.

Clamp arm assembly and metal wiper are optional.





Special swing angle easily available



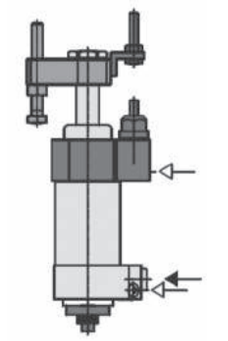
Pneumatic versions available to monitor clamp position and clamp/ unclamp positions.

Clamping Force - Accessory Arm		Size 1	Size 2	Size 3	Size 4
Clamp Force (lbs)	5075 psi	1350	1890	3370	4945
	2000 psi	630	1010	1845	2700
	1000 psi	270	340	630	900

General Dimension Specifications (in inches)

L	2.17	2.48	3.03	3.35
L1	2.36	2.60	2.95	3.54
H	6.39	6.92	8.06	9.20
R Diameter	1.77	2.05	2.36	2.99
Clamping Stroke	0.47	0.47	0.59	0.59
Approx. Weight (lbs.)	3.75	5.07	7.50	12.57
Part No., Swing Direction 90 Degree CW	**CLR-1843-X090-R23**	**CLR-1844-X090-R24**	**CLR-1845-X090-R30**	**CLR-1846-X090-R36**
Part No., Swing Direction 90 Degree CCW	**CLR-1843-X090-L23**	**CLR-1844-X090-L24**	**CLR-1845-X090-L30**	**CLR-1846-X090-L36**
Part No., Swing Direction 90 Degree CCW	**CLR-1843-X000-023**	**CLR-1844-X000-024**	**CLR-1845-X000-030**	**CLR-1846-X000-036**

X= Needs Letter Designation For Position Monitoring Style Desired (See Roemheld Data Sheet B1.854)



Switch rod version available for electric and pneumatic position monitoring.

Accessories

Part No., Clamp Arm With Contact Bolt	**CLR-0354-152**	**CLR-0354-153**	**CLR-0354-154**	**CLR-0354-155**
Part No., Complete Arm With Angle Bracket	**CLR-0354-156**	**CLR-0354-157**	**CLR-0354-158**	**CLR-0354-159**
Part No., Untapped Clamp Arm	**CLR-3548-660**	**CLR-3548-661**	**CLR-3548-803**	**CLR-3548-804**
Part No., Angle Bracket Complete	**CLR-0184-003**	**CLR-0184-004**	**CLR-0184-005**	**CLR-0184-005**
Part No., Metallic Wiper	**CLR-0341-104**	**CLR-0341-107**	**CLR-0341-105**	**CLR-0341-100**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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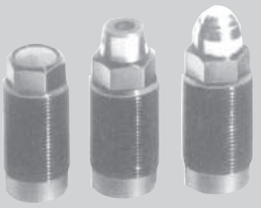
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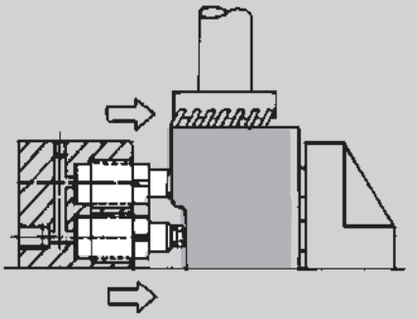
Push Clamps/Cylinders



Mini
page 640



Single Acting
page 641



Threaded-Body Push Clamps

Achieve high force in a compact size. Wide variety of types and sizes. Various models offer different mounting options, such as using accessory brackets, screwing directly into fixture, or manifold mounting.

Accessories, page 643



Block Clamps
pages 644-645

Block Clamps

Block Clamps are easy to mount horizontally or vertically on flat surfaces.

Available single and double acting, are excellent for punching and assembly operations, with high forces available. Wide range of sizes. Large sizes are often used for presswork applications (up to 180 tons).



Threaded-Body Universal Cylinder
pages 646-647

Threaded-Body Universal Cylinder

Achieve space-saving mounting in fixture walls with this universal cylinder, in a wide range of sizes. Alternatively single acting with spring return or double acting.

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Threaded-Body Push Clamps - Mini

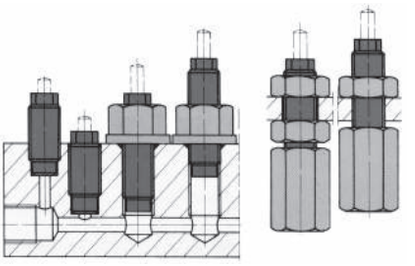
7250/2300 psi max
Single acting



Tube Mount (Metric Only) **Manifold Mount**

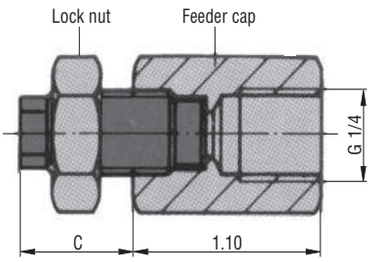
- **Can be mounted very close together**
- **High force in a small size**
- **Mount using accessory brackets or screw directly into fixture**
- **Positive stroke stop and long plunger guide for superior reliability**
- **Choice of five sizes**

****Do not use NPT fittings**

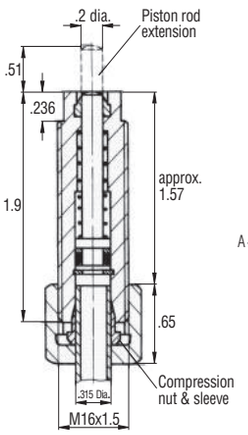


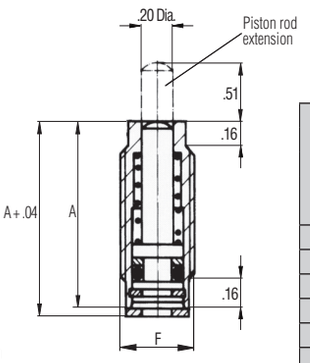
DESCRIPTION: These threaded body cylinders are particularly suitable for clamping of smaller workpieces in multiple clamping fixtures. Sealing is made by connecting directly to compression nut or by the included sealing washer. Multiple mounting options allow versatility when designing your fixture. Offered as flush mount piston or extended piston. High-speed cylinders are offered at a lower max. pressure.

IMPORTANT NOTES: These cylinders may not be subjected to load in the retracted position. The tube connection model has no stop for the tube, so it cannot be used for pre-mount of the compression sleeve. Please protect cylinders from chips and coolant.

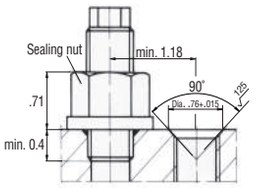


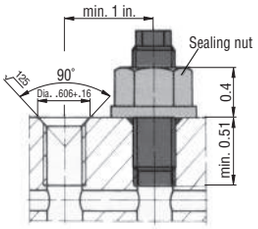






Clamping Force (lbs)				
	7250 psi	560		
	6000 psi	470		
	5000 psi	390		
	4000 psi	310		
	3000 psi	230		
Mounting Type		**Tube Mount**	**Manifold Mount**	
Stroke		0.39	0.197	0.39
Piston dia in.		0.315	0.315	0.315
Min psi		75	75	75
Spring return force (lbs)		3.4	3.4	3.4
A		—	1.06	1.57
B min/max		—	.43 / .95	.43 / 1.46
C		—	0.67	1.18
Seating torque (lbs)		8	8	8
Weight (lbs)		0.12	0.04	0.05



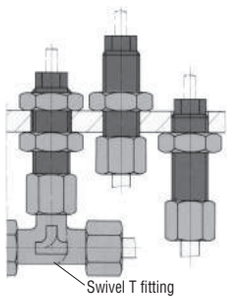


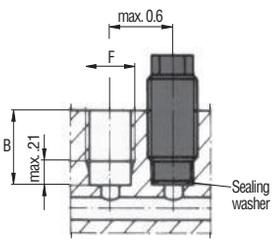
Inch

F Thread	—	1/2 - 20	1/2 - 20
Part No.	—	**CLR-801-TB**	**CLR-802-TB**
Part No., Lock Nut	—	**CLR-408-TBA**	
Part No., Sealing Washer	—	**CLR-3000-183-SW**	
Part No., Sealing Nut	—	**CLR-508-TBA**	
Part No., Feeder Cap	—	**CLR-308-TBA**	
Part No., Mounting Block	—	**CLR-108-TBA**	

Metric

F Thread	—	M12 X 1.5	M12 X 1.5
Part No.	**CLR-1459-001-TB**	**CLR-1458-001-TB**	**CLR-1458-002-TB**
Part No. with ext rod	**CLR-1459-011-TB**	**CLR-1458-011-TB**	**CLR-1458-012-TB**
Part No., High Speed 2300 psi max	**CLR-1459-101-TB**	**CLR-1458-101-TB**	**CLR-1458-102-TB**
Part No., High Speed w/ ext rod 2300 psi max	**CLR-1459-111-TB**	**CLR-1458-111-TB**	**CLR-1458-112-TB**
Part No., Lock Nut	**CLR-3300-409-TBA**	**CLR-3300-408-TBA**	
Part No., Sealing Washer	—	**CLR-3000-036-SW**	
Part No., Sealing Nut	**CLR-3300-407-TBA**	**CLR-3300-406-TBA**	
Part No., Swivel T Fitting	**CLR-9208-035-F**	—	
Part No., Swivel Elbow	**CLR-9208-036-F**	—	
Part No., Compression Nut	**CLR-9208-100-F**	—	
Part No., Compression Sleeve	**CLR-9208-101-F**	—	
Part No., Feeder Cap	—	**CLR-3467-064-TBA**	





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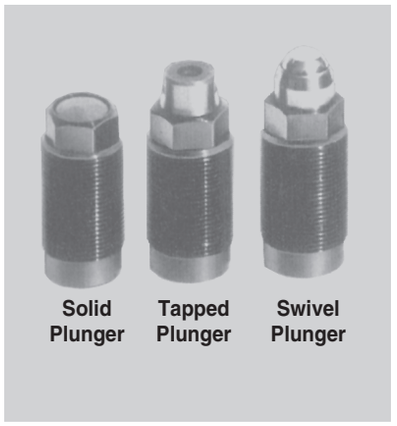
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Threaded-Body Push Clamps - Standard Wiper

7250 psi max
Single acting



Solid Plunger | Tapped Plunger | Swivel Plunger

- **Can be mounted very close together**
- **High force in a small size**
- **Mount using accessory brackets or screw directly into fixture**
- **Positive stroke stop and long plunger guide for superior reliability**
- **Choice of five sizes**

****Do not use NPT fittings**

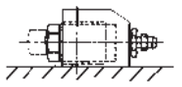


Figure 1

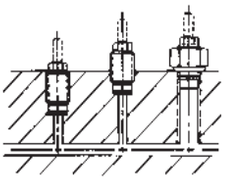


Figure 2

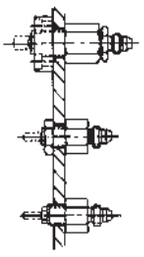


Figure 3

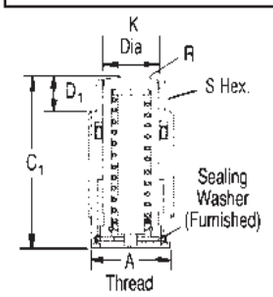
MOUNTING ON FIXTURE BASE: (Figure 1) Fasten mounting block to fixture. Screw clamp into block. (See table below for recommended seating torque. Sealing washer provided). Block has male 37° fluid connection.

MANIFOLD MOUNTING: (Figure 2) Screw clamp into tapped hole prepared as shown below. Supply fluid through passages drilled in fixture. Smallest size may be mounted with optional sealing nut. (Part no. CLR-508-TBA, 7/8 Hex. x. 46 thick).

MOUNTING THROUGH FIXTURE WALL: (Figure 3) (Through a tapped or bored hole). Secure clamp using optional locknut or mounting flange (two required for bored holes). Feeder cap required for fluid connection.

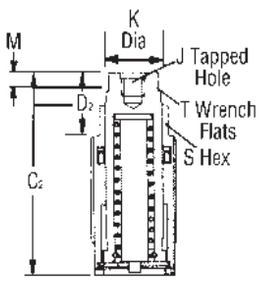
CONSTRUCTION: Steel plunger, case-hardened and ground. Positive stroke stop prevents over-extending the plunger. Long plunger guide provides support against side loads. Do not load plunger in its retracted position. Carbon steel body, black oxide finish.

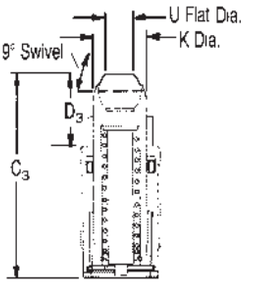
PLUNGERS: Choose solid, tapped, or swivel plunger. Tapped plunger accepts contact bolts. Swivel plunger distributes force to prevent marring. Plunger extensions available by special order.





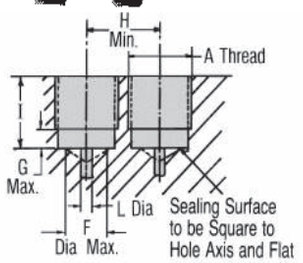
Symbol







See F&A section for contact bolts



Manifold
Hole Preparations

Mounting Options

See Threaded-Body Push Clamp accessories section

Clamping force (lbs)	7250 psi	1280	2270	3530	5530	8990
	6000 psi	1100	1900	2900	4500	7400
	5000 psi	900	1600	2400	3800	6200
	4000 psi	700	1200	1900	3000	5000
	3000 psi	500	900	1400	2300	3700
Max. clamping force (lbs)		1310	2340	3650	5700	9350
Stroke		.38	.47	.59	.63	.78
Fluid req'd (cu. in.)		.069	.147	.228	.479	.981
Piston area (sq. in.)		.175	.312	.487	.760	1.247
Force per 1000 psi (lbs)		175	312	487	760	1247
Max. oper. pressure (psi)		7500	7500	7500	7500	7500
A		7/8-14	1-1/8-12	1-1/4-16	1-1/2-16	1-7/8-16
C_1		1.50	1.81	2.19	2.34	3.44
C_2		1.78	2.06	2.59	2.69	3.88
C_3		1.80	2.09	2.73	2.86	—
D_1		.28	.38	.44	.53	.66
D_2		.56	.66	.81	.88	1.09
D_3		.56	.69	. 97	1.05	—
F dia		.47	.63	.78	1.00	1.25
G		.31	.34	.34	.44	.50
H		1.00	1.19	1.38	1.69	2.16
I	min.	.63	.78	.97	1.13	1.66
	max	1.53	1.41	1.75	1.81	2.75
J		1/4-20x1/4	1/4-20x1/4	5/16-18x5/16	5/16-18x5/16	1/2-13x1/2
K dia		.47	.63	.78	1.00	1.25
L dia		.19	.19	.19	.19	.19
M		.22	.22	.25	.28	.34
R		.75	1.00	1.25	1.56	2.00
S		.69	.94	1.69	1.25	1.69
T		.38	.50	.63	.75	.94
U		.28	.28	.41	.41	—
Seating torque (ft.-lbs)		29	36	43	58	163
Weight (lbs)		.18	.33	.48	.48	2.13
Part No., solid plunger		**CLR-000-TB**	**CLR-100-TB**	**CLR-200-TB**	**CLR-300-TB**	**CLR-400-TB**
Part No., tapped plunger		**CLR-001-TB**	**CLR-101-TB**	**CLR-201-TB**	**CLR-301-TB**	**CLR-401-TB**
Part No., swivel plunger		**CLR-010-TB**	**CLR-110-TB**	**CLR-210-TB**	**CLR-310-TB**	**—**
Spare sealing washer		**CLR-3000-840-SW**	**CLR-3000-179-SW**	**CLR-3000-180-SW**	**CLR-3000-843-SW**	**CLR-3000-181-SW**

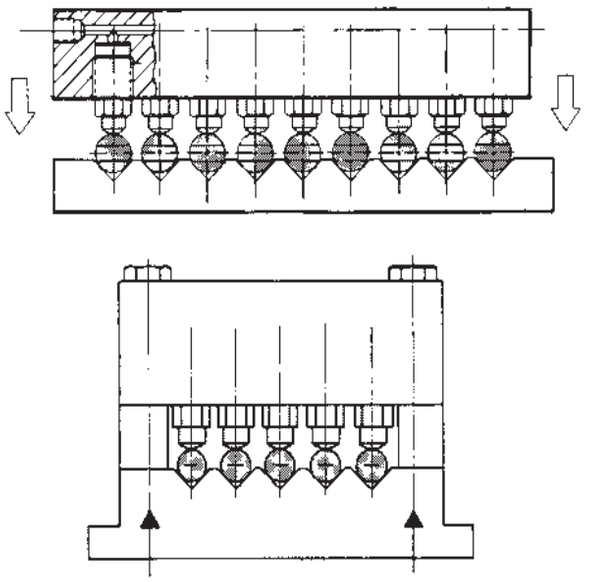
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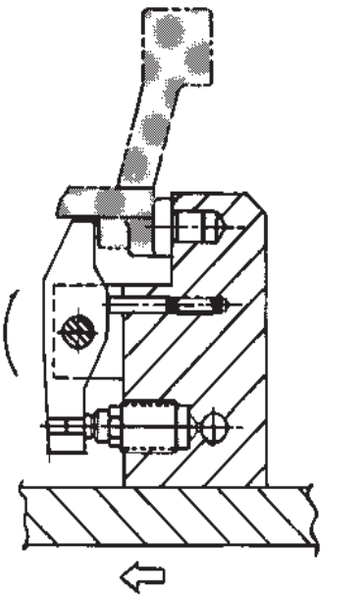
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Threaded-Body Push Clamps

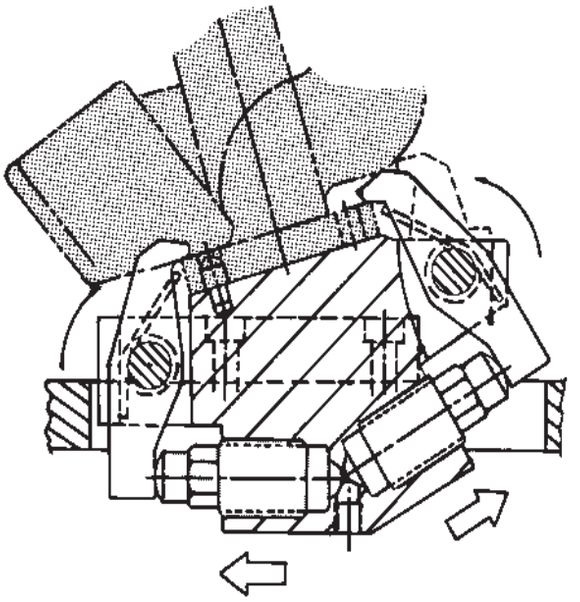
Application Examples



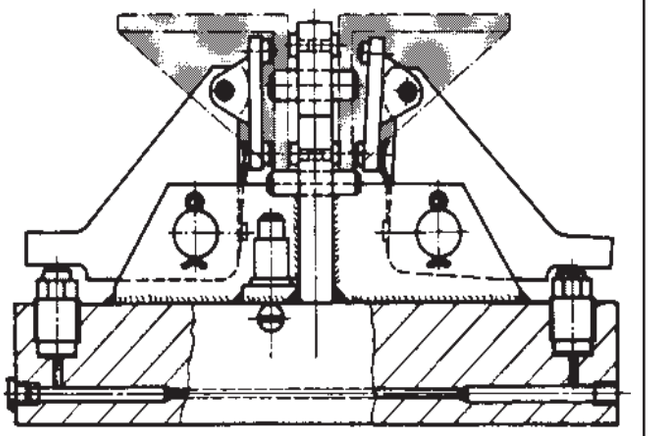
V-block fixtures allow very close workpiece spacing. Bottom example shows bridging bolt parallel to, and in the same plane as, the push clamps. This eliminates bending moments in the fixture.



Custom clamping unit made using a pivoting lever with a return spring. By altering the lever ratio, you can make workpiece contact greater or less than clamp force.



Twin clamping levers hold an exhaust manifold under extreme space limitations. Clamps are almost totally clear of workpiece area.



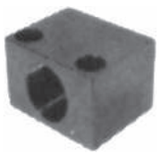
Pivoting levers clamp two angle brackets against a central locator. Each lever also has a pivoting contact pad to distribute clamping force evenly.

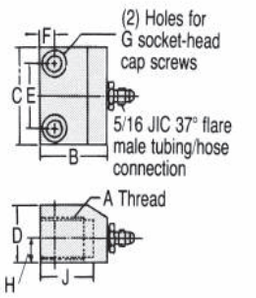
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Threaded-Body Push Clamp Accessories

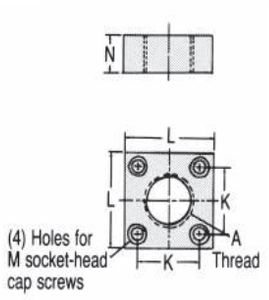




Mounting Blocks — Inch

A	1/2-20	7/8-14	1-1/8-12	1-1/4-16	1-1/2-16	1-7/8-16
B	1.63	1.75	2.00	2.25	2.38	3.25
C	1.50	2.25	2.75	3.00	3.50	4.00
D	1.00	1.25	1.50	1.75	2.00	2.50
E	1.00	1.50	1.88	2.00	2.38	2.75
F	.25	.38	.44	.50	.56	.63
G Dia.	1/4-20	5/16-18	3/8-16	1/2-13	1/2-13	5/8-11
H	.50	.56	.75	.75	1.00	1.25
J	.94	1.22	1.41	1.75	1.81	2.75
Part No.	**CLR-108-TBA**	**CLR-100-TBA**	**CLR-101-TBA**	**CLR-102-TBA**	**CLR-103-TBA**	**CLR-104-TBA**

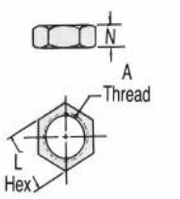




Mounting Flanges — Inch

A	1-1/4 - 16	1-1/2 - 16	1-7/8 - 16
K	1.56	1.75	2.13
L	2.25	2.5	3.00
M	5/16 - 18	5/16 - 18	3/8 - 16
N	.88	1.00	1.25
Part No.	**CLR-202-TBA**	**CLR-203-TBA**	**CLR-204-TBA**





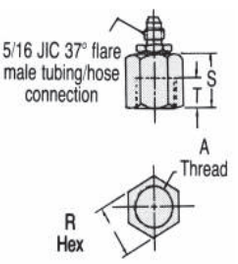
Jam Nuts — Inch

A	1/2 - 20	7/8 - 14	1-1/8 - 12
L	.75	1.94	1.69
N	.31	.50	.63
Part No.	**CLR-408-TBA**	**CLR-400-TBA**	**CLR-401-TBA**

Jam Nuts — Metric

A	M 28 X 1.5	M 32 X 1.5	M 38 X 1.5	M 45 X 1.5	M 60 X 1.5
L	50	62	58	68	90
N	10	11	11	12	13
Part No.	**CLR-3301-423-TBA**	**CLR-3301-019-TBA**	**CLR-3300-088-TBA**	**CLR-3300-326-TBA**	**CLR-3300-411-TBA**

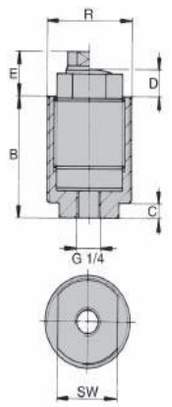




Feeder Caps — Inch

A	1/2-20	7/8-14	1-1/8-12	1-1/4-16	1-1/2-16	1-7/8-16
R	.75	1.13	1.38	1.50	1.75	2.13
S	.63	1.13	1.25	1.44	1.63	2.25
T	.44	.63	.78	.97	1.13	1.66
Part No.	**CLR-308-TBA**	**CLR-300-TBA**	**CLR-301-TBA**	**CLR-302-TBA**	**CLR-303-TBA**	**CLR-304-TBA**





Feeder Caps — Metric

Fits	CLR-1460-0XX-TB	CLR-1461-0XX-TB	CLR-1462-0XX-TB	CLR-1463-0XX-TB	CLR-1464-0XX-TB
A	M 22 X 1.5	M 26 X 1.5	M 30 X 1.5	M 38 X 1.5	M 48 X 1.5
B	44	49	58	59	85
C	7	7	7	7	8
D	7	10	11	13.5	17
E	14	16.5	20.5	22.5	28
R	M 28 X 1.5	M 32 X 1.5	M 38 X 1.5	M 45 X 1.5	M 60 X 1.5
SW	22	24	27	32	41
Part No.	**CLR-3467-084-TBA**	**CLR-3467-085-TBA**	**CLR-3467-086-TBA**	**CLR-3467-087-TBA**	**CLR-3467-093-TBA**

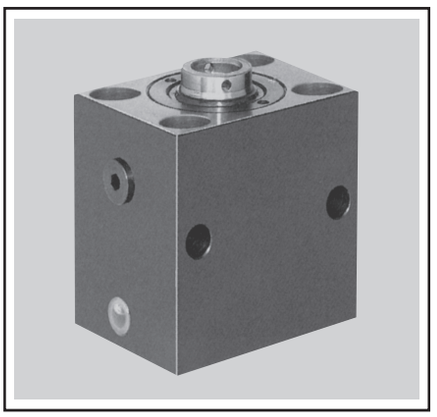
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Block Clamps

7250 psi max
Single and double acting



- **Easy to mount on flat surfaces**
- **Excellent for punching and assembly operations (very high forces available)**
- **Mount either horizontally or vertically**
- **Available with short or long stoke**
- **Choice of eight sizes**
- **Do not use NPT fittings**


Symbol


Symbol

CLAMPING ACTION: Fluid pressure advances plunger. Spring return. Optional fluid-return version (double-acting).

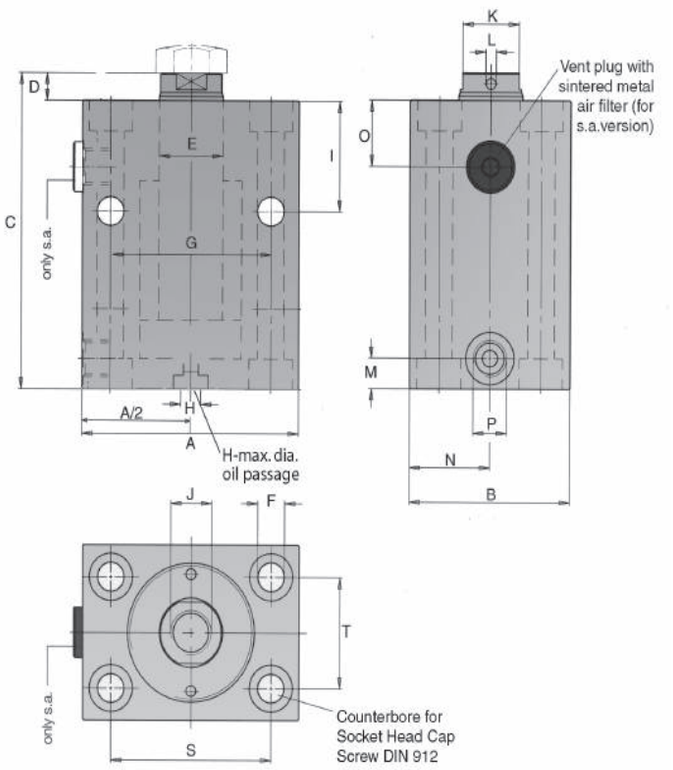
STROKE LENGTH: Short-stroke version is more compact. Choose it whenever possible. Longer strokes than listed below are available in all sizes…please contact factory.

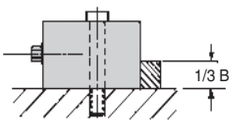
MOUNTING: Either fasten with long cap screws through the block and threaded into fixture, or tap holes in block to accept screws. See below for locations to drill additional holes if desired. If clamping thrust is not backed up by the fixture, a support should be provided to prevent slight screw shifting in the mounting holes…see example below. Support may be a rectangular strip or dowel pins (height should be at least 1/3 of B dimension). Male 37° fluid connection (two with double-acting clamps).

CONSTRUCTION: Steel plunger, case hardened and ground. Body made from carbon steel, or nodular iron in larger sizes. Spring-return versions have a sintered-metal vent filter to keep out dirt. If flood coolant could enter through the vent, replace vent filter with a CLR-815-AF air-vent fitting.

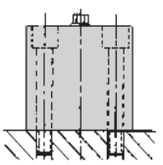
ACCESSORIES: Contact bolts for plunger recommended…see F&A section.

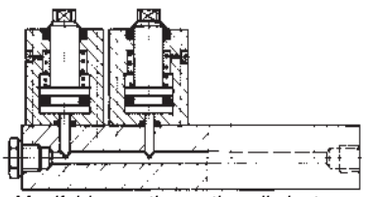
OPTIONAL VITON SEALS: For high-temperature applications (up to 300°F maximum) we offer viton seals as an option in all sizes. Please contact factory for more information.



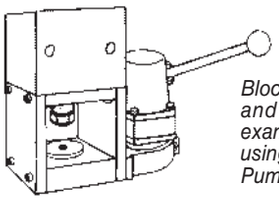


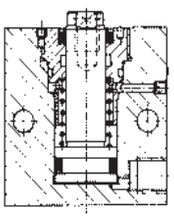
Horizontal mounting


Vertical mounting


Manifold mounting option eliminates external plumbing.


For radius pointed, or swivel contact bolts, see F&A section.


Block Clamps are ideal for punching and assembly operations. In this example, a small press is made using a Block Clamp and Hand Pump.



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Block Clamps

7250 psi max
Single and double acting

Clamping force (lbs)		2250	5505	9035	14120	22145	35070	56650	88125
	7250 psi								
	6000 psi	1900	4600	7500	11700	18300	29000	46900	72900
	5000 psi	1600	3800	6200	9700	15300	24200	39100	60800
	4000 psi	1200	3000	5000	7800	12200	19300	31300	48600
	3000 psi	900	2300	3700	5800	9200	14500	23400	36500
Piston Area (sq. in.)		.312	.760	1.247	1.950	3.050	4.833	7.791	12.150
Max. Oper. Pressure (psi)		7500	7500	7500	7500	7500	7500	7500	7500
A		2.38	2.56	2.97	3.34	3.94	4.94	6.31	7.88
B		1.38	1.75	2.19	2.50	2.94	3.75	4.75	5.94
C short stroke		2.44	2.81	3.34	3.50	3.94	4.56	5.19	5.69
C long stroke		3.81	4.00	4.34	4.50	4.94	5.88	7.06	8.06
D		.22	.28	.38	.38	.38	.56	.56	.59
E dia.		.39	.63	.79	.98	1.26	1.57	1.97	2.48
F dia. screw		1/4	5/16	3/8	3/8	7/16	5/8	3/4	7/8
G		1.181	1.969	2.165	2.480	2.992	3.740	4.724	6.220
H dia.		.19	.19	.19	.19	.19	.31	.31	.31
I		1.19	1.31	1.50	1.56	1.75	1.97	2.38	2.50
J		1/4-20 x15/32	3/8-16 x19/32	1/2-13 x19/32	5/8-11 x31/32	3/4-10 x1-3/16	1-8 x1-9/16	M30x40	M42x60
K		.31	.50	.63	—	—	—	—	—
L dia.		—	—	—	.16	.16	.16	.19	.22
M		.44	.44	.44	.44	.50	.66	.81	1.00
N		.69	.88	1.09	1.25	1.47	1.88	2.38	2.94
O		.66	.72	.88	.94	1.06	1.03	1.31	1.38
P-Port size		G1/4	G1/4	G1/4	G1/4	G1/4	G1/2	G1/2	G1/2
S		1.575	1.969	2.165	2.480	2.992	3.740	4.724	6.220
T		.866	1.181	1.378	1.575	1.772	2.559	3.150	4.252
Weight, short stroke (lbs.)		1.8	2.6	4.0	5.7	8.4	14.7	28.2	52.8
Weight, long stroke (lbs.)		1.9	4.2	5.9	7.9	11.6	21.5	43.6	81.4

Single Acting — Inch

Stroke, short	.31	.31	.38	.38	.47	.47	.47	.47
Stroke, long	.78	.78	.78	.78	.78	1.0	1.25	1.25
Fluid reqd., short (cu. in.)	.10	.24	.48	.73	1.37	2.26	3.68	5.75
Fluid reqd., long (cu. in.)	.23	.57	.94	1.46	2.29	4.83	9.81	15.34
Spring return force (lbs)	11	31	44	61	92	97	170	270
Part No. short stroke	**CLR-1511-705**	**CLR-1513-705**	**CLR-1514-705**	**CLR-1515-705**	**CLR-1516-705**	**CLR-1517-705**	—	—
Part No. long stroke	**CLR-1511-725**	**CLR-1513-725**	**CLR-1514-725**	**CLR-1515-725**	**CLR-1516-725**	**CLR-1517-735**	—	—
Part No, short stroke, manifold mount	**CLR-1511-705B**	**CLR-1513-705B**	**CLR-1514-705B**	**CLR-1515-705B**	**CLR-1516-705B**	**CLR-1517-705B**	—	—

Single Acting — Metric

J X Depth of thread	M6 X 12	M10 X 15	M12 X 15	M16 X 25	M20 X 30	M27 X 40	M30 X 40	M42 X 60
Part No. short stroke	**CLR-1511-005**	**CLR-1513-005**	**CLR-1514-105**	**CLR-1515-005**	**CLR-1516-005**	**CLR-1517-005**	**CLR-1518-005**	**CLR-1519-005**
Part No. long stroke	**CLR-1511-025**	**CLR-1513-025**	**CLR-1514-125**	**CLR-1515-025**	**CLR-1516-025**	**CLR-1517-035**	**CLR-1518-045**	**CLR-1519-045**
Part No, short stroke, manifold mount	**CLR-1511-005B**	**CLR-1513-005B**	**CLR-1514-105B**	**CLR-1515-005B**	**CLR-1516-005B**	**CLR-1517-005B**	**CLR-1518-005B**	**CLR-1519-005B**

Double Acting — Inch

Stroke, short	0.63	.78	1.00	1.00	1.00	1.19	1.25	1.56
Stroke, long	2.0	2.00	2.00	2.00	2.00	2.50	3.13	3.94
Fluid reqd., short (cu. in.)	.20	.57	1.25	1.95	3.05	5.74	9.81	19.17
Fluid reqd., long (cu. in.)	.62	1.52	2.50	3.90	6.10	12.08	24.54	47.93
Return piston area	.190	.448	.759	1.187	1.796	2.882	4.748	7.342
Part No. short stroke	**CLR-1541-705**	**CLR-1543-705**	**CLR-1544-705**	**CLR-1545-705**	**CLR-1546-705**	**CLR-1547-705**	—	—
Part No. long stroke	**CLR-1541-765**	**CLR-1543-765**	**CLR-1544-765**	**CLR-1545-765**	**CLR-1546-765**	**CLR-1547-775**	—	—

Double Acting — Metric

J x Depth of Thread	M6 x 12	M10 x 15	M12 x 15	M16 x 25	M20 x 30	M27 x 40	M30 x 40	M42 x 60
Part No. short stroke	**CLR-1541-105**	**CLR-1543-105**	**CLR-1544-105**	**CLR-1545-105**	**CLR-1546-105**	**CLR-1547-105**	**CLR-1548-105**	**CLR-1549-105**
Part No. long stroke	**CLR-1541-165**	**CLR-1543-165**	**CLR-1544-165**	**CLR-1545-165**	**CLR-1546-165**	**CLR-1547-175**	**CLR-1548-185**	**CLR-1549-195**

Larger sizes and strokes available (metric only).

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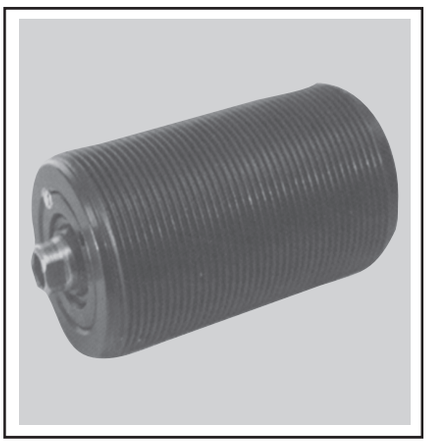
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Threaded-Body Universal Cylinder

7250 psi max
Single and double acting



- **6 piston diameters from 16 up to 63mm**
- **3 different strokes per size**
- **Sealing with very little leakage**
- **Alternatively single acting with spring return or double acting**
- **Ports 1/4 BSPP at the cylinder bottom**
- **Axial regulation due to external thread**
- **Lock nuts as per DIN 1804 can be used**
- **Space-saving mounting in fixture walls**
- **Piston rod with internal thread for fixing of different contact bolts**

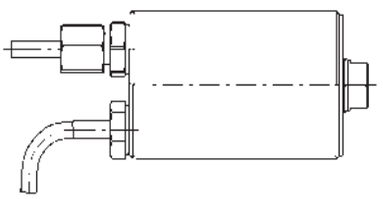
DESCRIPTION: The threaded-body universal cylinders are delivered with the same piston diameters and strokes as the well-proven block cylinders. Hydraulic connection is exclusively effected at the cylinder bottom by hydraulic tubes or hoses.

Sealing of the case-hardened piston rod is made by a tandem sealing with minimum leakage and a wiper.

APPLICATION: The threaded-body universal cylinders can be used as clamping cylinders for workpiece clamping as well as for general motion tasks.

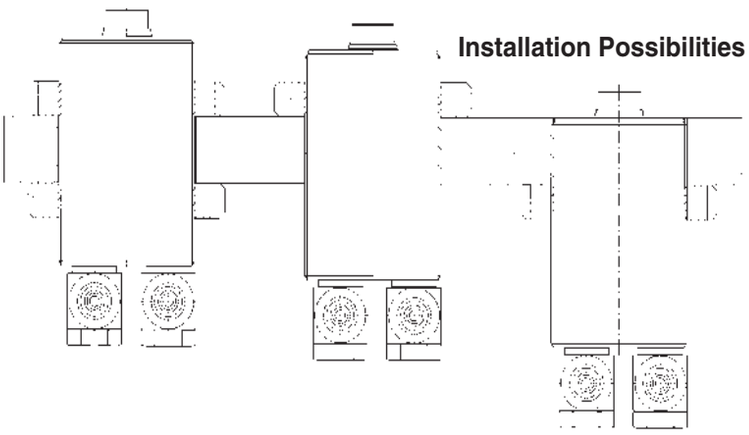
For temperatures exceeding 100°C a version with VITON® seals is available. Fixing is made in cross holes with 2 lock nuts or in threaded holes with 1 lock nut. The lock nuts allow exact positioning of the cylinder in axial direction.

BLEEDING OF THE SPRING AREA FOR SINGLE-ACTING VERSIONS: If there is a possibility that aggressive cutting lubricants and coolants penetrate through the sintered metal air filter into the cylinder's interior, a vent hose has to be connected and be placed in a protected position, see accessories.

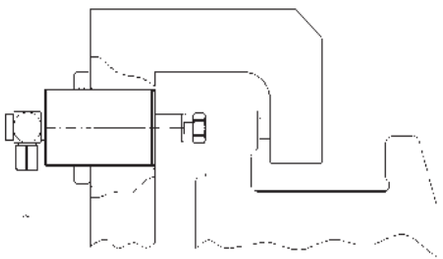


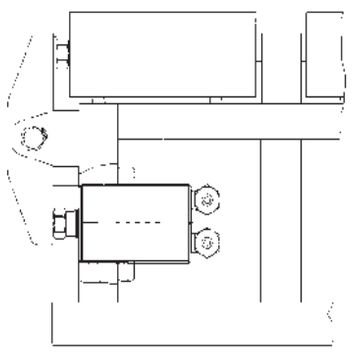
For this purpose the sintered metal air filter has to be exchanged by an insertion nipple fitting, or a corresponding male connector, see accessories.

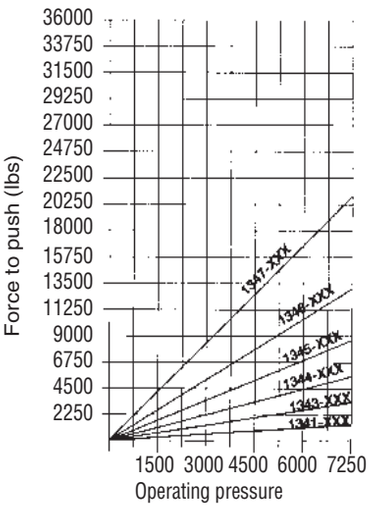
Installation Possibilities

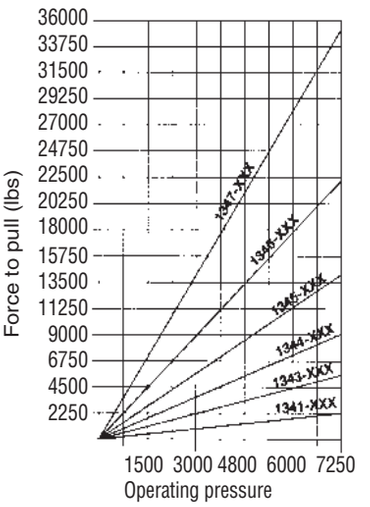


Application examples









14

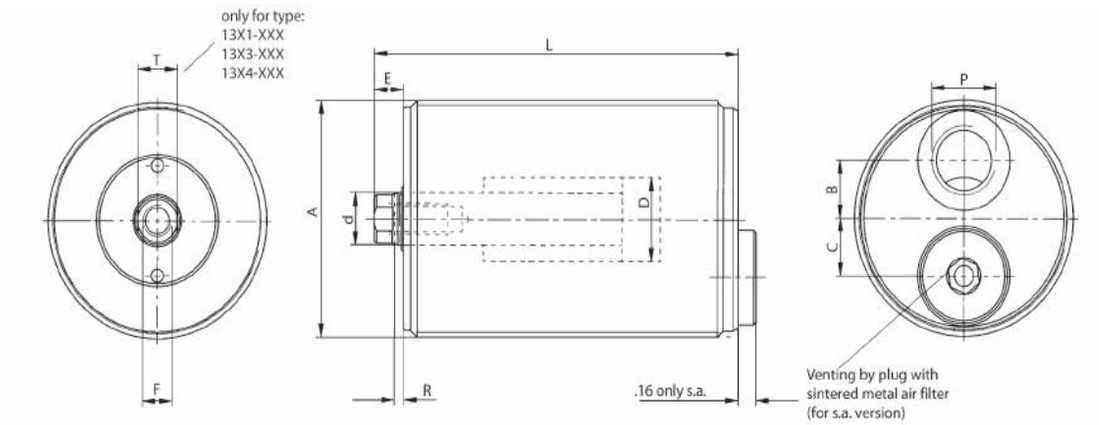
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Threaded-Body Universal Cylinder

7250 psi max
Single and double acting



Clamping force (lbs)	7250 psi	**2250**	**5510**	**9035**	**14120**	**22145**	**35070**
	6000 psi	1900	4600	7500	11700	18400	29100
	5000 psi	1600	3800	6300	9800	15300	24200
	4000 psi	1300	3100	5000	7800	12300	19400
	3000 psi	1000	2300	3800	5900	9200	14600
Piston Dia. D		.630	.984	1.260	1.575	1.969	2.480
Rod Dia. d		.394	.630	.787	.984	1.260	1.575
Spring return force, min. (lbs)		11	32	44	61	92	97
Oil Volume in Cubic Inches for each .39 inch of stroke	Stroke to Extend	.12	.3	.5	.8	1.21	2
	Stroke to Retract	.07	.18	.30	.5	.71	1.1
A		M45X1.5	M48x1.5	M55x1.5	M65x1.5	M75x1.5	M90x2
B		.43	.53	.51	.65	.83	1.10
C		.43	.53	.67	.85	1.06	1.32
F		M6X12	M10x15	M12x15	M16x25	M20x30	M27x40
E		.24 (.28)*	.28	.39	.39	.39	.55
P		1/4 BSPP	1/4 BSPP	1/4 BSPP	1/4 BSPP	1/4 BSPP	1/4 BSPP
R		—	—	—	.16	.16	.16
T		8mm	13mm	17mm	—	—	—

Single Acting, with Spring Return

Stroke, short	.31	.31	.39	.39	.47	.47
Total length l	2.95	3.31	3.78	3.90	4.29	4.80
Weight (lbs)	1.5	2	3	4.3	6.3	10
Part No.	**CLR-1311-005-TB**	**CLR-1313-005-TB**	**CLR-1314-105-TB**	**CLR-1315-005-TB**	**CLR-1316-005-TB**	**CLR-1317-005-TB**

Stroke, long	.79	.79	.79	.79	.79	.98
Total length l	4.33	4.49	4.76	4.88	5.28	6.10
Weight (lbs)	2.5	2.8	4	5.6	8	13
Part No.	**CLR-1311-025-TB**	**CLR-1313-025-TB**	**CLR-1314-125-TB**	**CLR-1315-025-TB**	**CLR-1316-025-TB**	**CLR-1317-035-TB**

Double Acting

Stroke, short	.63	.79	.98	.98	.98	1.18
Total length l	2.95	3.31	3.78	3.90	4.29	4.80
Weight (lbs)	1.5	2	3	4	6	9.4
Part No.	**CLR-1341-105-TBD**	**CLR-1343-105-TBD**	**CLR-1344-105-TBD**	**CLR-1345-105-TBD**	**CLR-1346-105-TBD**	**CLR-1347-105-TBD**

Stroke, medium	1.97	1.97	1.97	1.97	1.97	2.48
Total length l	4.33	4.49	4.76	4.88	5.28	6.10
Weight (lbs)	2.4	2.7	3.6	5.2	7.5	12
Part No.	**CLR-1341-165-TBD**	**CLR-1343-165-TBD**	**CLR-1344-165-TBD**	**CLR-1345-165-TBD**	**CLR-1346-165-TBD**	**CLR-1347-175-TBD**

Stroke, long	3.94	3.94	3.94	3.94	3.94	3.94
Total length l	6.42	6.46	6.73	6.85	7.24	7.56
Weight (lbs)	3.7	4	5.2	7.4	10.3	14.8
Part No.	**CLR-1341-195-TBD**	**CLR-1343-195-TBD**	**CLR-1344-195-TBD**	**CLR-1345-195-TBD**	**CLR-1346-195-TBD**	**CLR-1347-195-TBD**

Accessories

Part No. lock nut	**CLR-3300-326-TBA**	**CLR-24-HCA**	**CLR-3300-992-TBA**	**CLR-3301-661-TBA**	**CLR-73-HCA**	**CLR-3300-412-TBA**

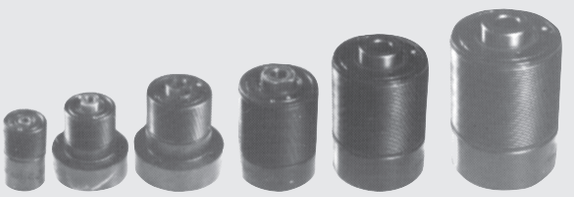
** Only for CLR-1311-025-TB and CLR-1341-165-TBD, -195-TBD*

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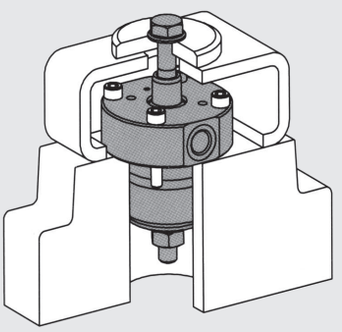
Pull Clamps



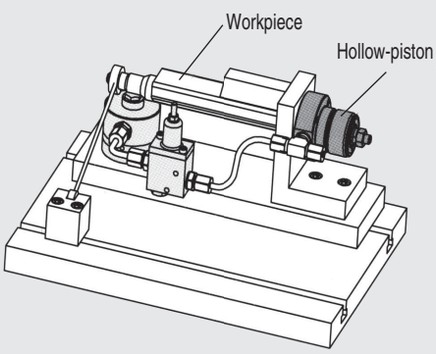
Page 649-650

Hollow-Plunger Clamps

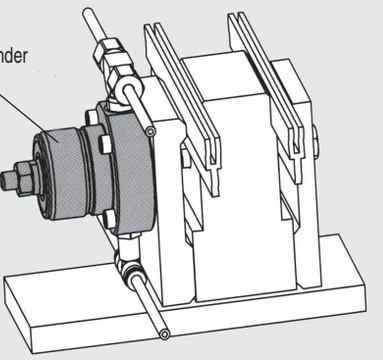
Insert stud through center hole. Quickly converts clamps straps from manual to power operation. Ideal for pulling or pushing a draw bar, and many other applications.



Use in combination with push-pull bolt and "C"-washer to clamp workpieces with center holes.



In a machine table, the workpiece can be supported by a work support after clamping with a hollow-piston cylinder in combination with a sequence valve.



Use for a milling fixture, in conjunction with hollow piston cylinders.

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Hollow-Plunger Clamps

7250 psi max
Single and double acting



- **Quickly converts clamp straps from manual to power operation**
- **Accepts stud through hollow plunger**
- **May be used either to pull or to push**
- **Useful for transmitting force to a remote location via a rod**
- **Choice of six sizes**

****Do not use NPT fittings**

DESCRIPTION: The piston of this cylinder is provided with a through hole or internal thread. In connection with a standard tie rod and C-washer combination, a variety of applications are possible.

The thread in the piston can be drilled out, if required. If the hollow-piston cylinder is mounted onto movable parts, e.g. clamps, the oil has to be supplied through a high-pressure hose.

CLAMPING ACTION: Fluid pressure pushes up plunger, pulling up a clamping stud inserted through center hole. Spring or fluid return.

CENTER HOLE: Choose either threaded or unthreaded center hole. Threaded version is ideal for pulling/pushing a drawbar or replacing a nut on a clamp strap. Unthreaded version is useful when clamp is removed for workpiece loading.

IMPORTANT NOTES: For operating pressures exceeding 5000 psi, use a grade 8 stud or equivalent.

It is important to torque the lock nut used sufficiently to prevent damaging the piston threads.

Penetration of aggressive cutting lubricants and coolants through the sintered metal air filter into the cylinder's interior should be avoided by appropriate arrangement or covering.

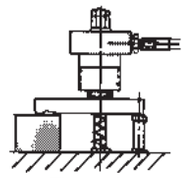
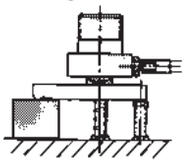
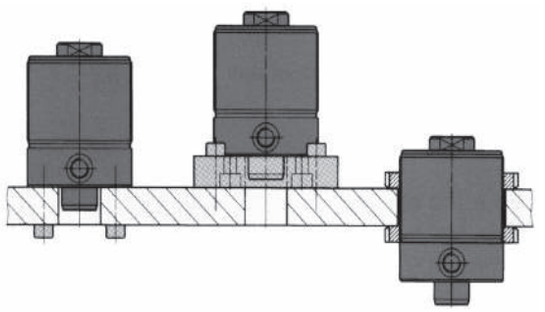
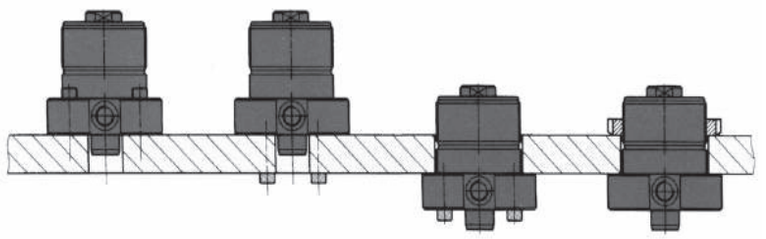


Figure 1

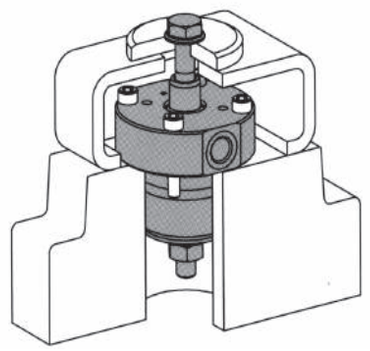


Installation Possibilities

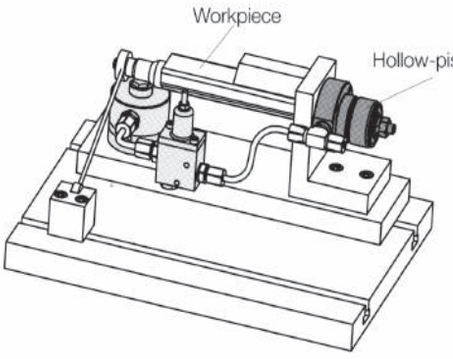




Application Examples

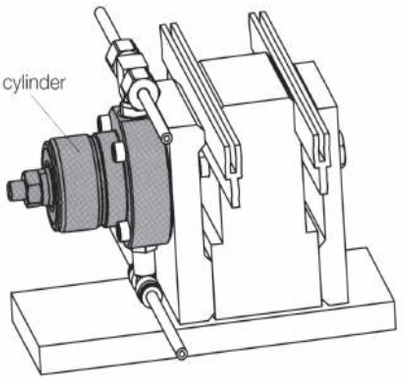


Hollow-piston cylinders in combination with push-pull bolt and "C"-washer can be used efficiently in many cases to clamp workpieces with center holes.



In the shown machine table, the workpiece is supported by means of a work support after clamping with a hollow-piston cylinder in combination with a sequence valve.

The savings in workpiece exchange time, compared to a mechanical clamping system amounts to 58%.



This clamping fixture is for milling operation on a light extruded rail. Workholding by means of hollow-piston cylinders in individual clamping stations mounted on a base plate. Positioning and support of the rail is effected with two longitudinal members matching the cross section of the rail.

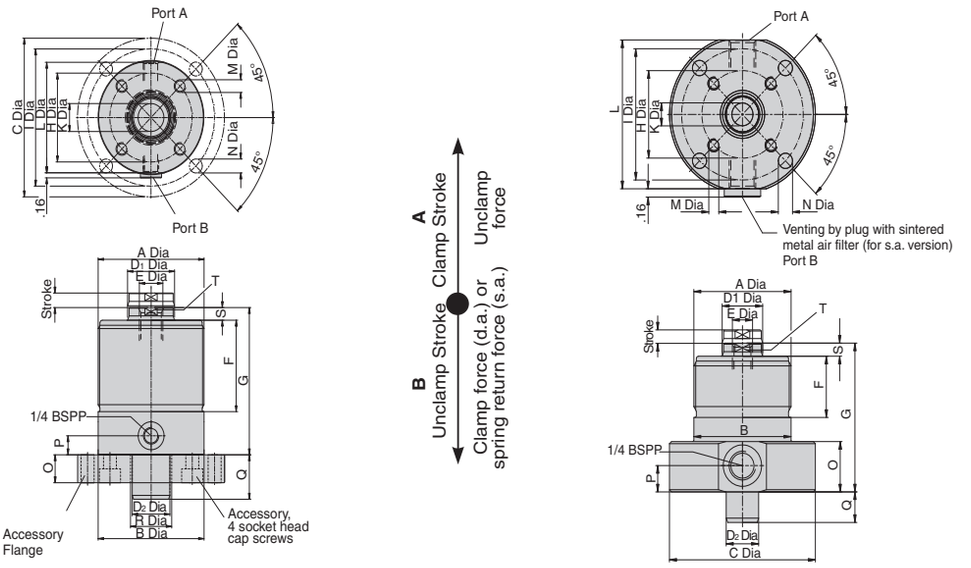
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Hollow Plunger Clamps

7250 psi max
Single and double acting



		2250	6745	10565	16545	25990	42375
Clamping Force/ Unclamping Force	7250 psi						
	6000 psi	1900/1900	5600/4500	8800/7100	13700/10800	21600/17400	35100/28500
	5000 psi	1600/1600	4700/3800	7300/5900	11500/9000	18000/14500	29300/23800
	4000 psi	1300/1300	3800/3000	5900/4800	9200/7200	14400/11600	23400/19000
	3000 psi	1000/1000	2800/2300	4400/3600	6900/5400	10800/8700	17600/14300
Spring return force (s.a.)		20	45	61	86	106	214
Piston area-clamp (sq.in.)		.3	.93	1.46	2.28	3.56	5.84
Piston area-unclamp (sq.in.)		.3	.76	1.19	1.80	2.88	4.74
Oil volume clamp		.25	1.17	2.30	4.50	8.83	18.4
Oil volume unclamp		.25	.96	1.87	3.54	7.14	15.93
A Dia		M40x1.5	M48x1.5	M60x1.5	M75x1.5	M90x2	M120x2
B Dia		1.57	1.89	2.36	2.95	3.54	4.72
C Dia		2.56	2.83	3.35	4.13	4.92	6.30
D_1 Dia		.472	.787	.984	1.256	1.575	1.969
D_2 Dia		.472	.623	.787	.984	1.256	1.575
E Dia x depth of thread		M6x8	M10x12	M12x15	M16x20	M20x25	M24x30
F		1.18	1.10	1.34	2.36	2.83	3.94
G		2.28	2.68	3.15	3.70	4.57	5.39
H Dia		1.181	1.575	1.969	2.362	2.756	3.858
I Dia		2.05	2.36	2.83	3.54	4.25	5.51
K Dia		.26	.41	.49	.65	.83	.98
L		2.36	2.68	3.23	2.83	3.43	4.61
M Dia x depth of thread		M6x8	M6x8	M6x10	M8x10	M10x14	M12x15
N Dia		.27	.27	.27	.35	.43	.53
O		.91	.91	.91	.79	.87	.98
P		.47	.47	.47	.47	.59	.59
Q		.47	.55	.75	.91	1.38	1.69
R Dia		—	—	—	1.102	1.378	1.693
S		.20	.24	.28	.35	.39	.39
T A/Flats		10mm	17mm	22mm	27mm	36mm	46mm
Weight (lbs)		1.8	2.6	4	4.9	9.7	2.14

Single Acting With Spring Return

Stroke	.24	.31	.39	.47	.63	.79
Part No.	**CLR-1752-004-HC**	**CLR-1754-004-HC**	**CLR-1755-004-HC**	**CLR-1756-004-HC**	**CLR-1757-004-HC**	**CLR-1758-004-HC**

Double Acting

Stroke	.39	.47	.63	.79	1.26	1.57
Part No.	**CLR-1752-023-HCD**	**CLR-1754-023-HCD**	**CLR-1755-023-HCD**	**CLR-1756-023-HCD**	**CLR-1757-023-HCD**	**CLR-1758-023-HCD**

Flange Base

Part No.	—	—	—	**CLR-3456-310-HCA**	**CLR-3456-313-HCA**	**CLR-3456-312-HCA**
Part No., cap screw	—	—	—	**CLR-3300-237-HCA**	**CLR-3300-277-HCA**	**CLR-3300-054-HCA**
Part No., lock ring	**CLR-99-HCA**	**CLR-24-HCA**	**CLR-11-HCA**	**CLR-73-HCA**	**CLR-12-HCA**	**CLR-34-HCA**

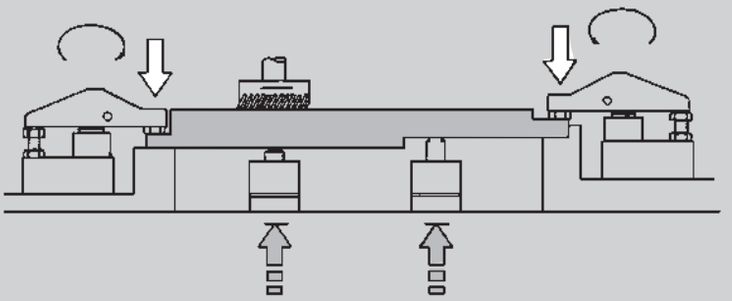
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Work Supports

7250 psi max
Single and double acting

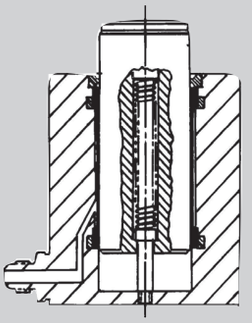


Automatically adjusts to proper height for supporting workpiece. Prevents deflection and vibration due to machining forces. May also be used underneath clamps to back up clamping force. More accurate, more consistent, and much faster than screw jacks.

Precision sleeve around support plunger holds it absolutely vertical while unlocked, then locks it securely when fluid pressure is applied. Plunger remains perfectly stationary during locking. Far better accuracy and repeatability than earlier segmented-collet or sandwiched-plate work supports. Choice of three actions:



Threaded Body
pages 652-654

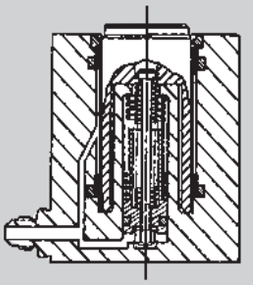


Spring Extended
(Plunger floats then locks)

Plunger is normally extended by light spring force. Workpiece's weight depresses plunger to proper height. Applying fluid pressure locks plunger securely.



Threaded Body
pages 652-655

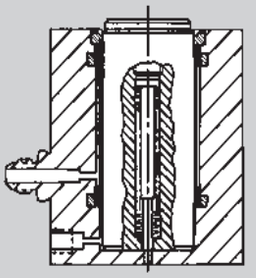


Fluid Advanced
(Plunger advances then locks)

Plunger is normally retracted for clear loading/unloading. Applying fluid pressure gently advances plunger to the workpiece, then automatically locks it. Note: do not use advancing plunger to lift loads.



Threaded Body
pages 652-654



Air Advanced/Extended
(Plunger floats or advances by air pressure)

Plunger is normally retracted for clear loading/unloading. Applying air pressure advances plunger to the workpiece. This allows fine tuning contact pressure using a simple air regulator. Contact force may be as light as a few ounces. Applying fluid pressure locks plunger securely.

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Threaded-Body Work Supports

7250 psi max
Single Acting



Spring Extended

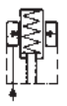


Fluid Advanced

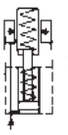


Air Advanced

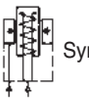
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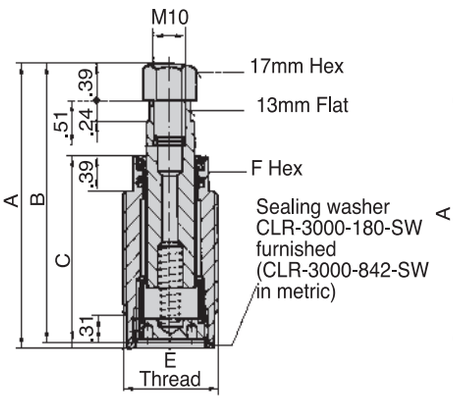


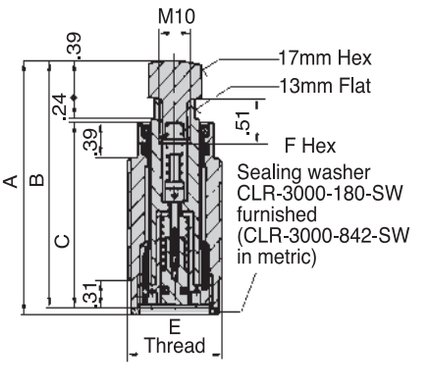
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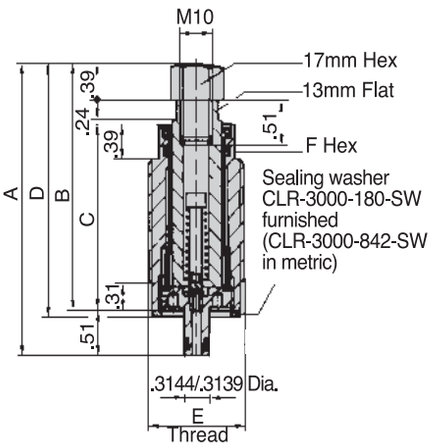


Symbol









Load Capacity at 7250 psi	1460 Lbs				2135 Lbs			
Plunger action	Spring Extended	Fluid Advanced		Air Advanced	Spring Extended	Fluid Advanced		Air Advanced
Stroke	.31	.31	.59	.31	.31	.31	.59	.31
Max. load capacity (lbs)	1460	1460	1460	1460	2135	2135	2135	2135
Fluid required (cu.in)	.01	.10	.10	.01	.01	.10	.18	.01
Max. fluid flow rate (cu.in./min.)	—	100	100	—	—	100	100	—
Contact force, min/max (lbs)	1.8 to 3.0	2.2 to 5.2	2.2 to 5.2	See text	1.8 to 3.0	2.2 to 5.2	2.2 to 5.2	See text
Max. operating pressure (psi)	7250	7250	7250	7250	7250	7250	7250	7250
Min. operating pressure (psi)	1460	1460	1460	1460	1460	1460	1460	1460
A	3.17	2.85	3.13	3.31	3.56	3.25	3.52	3.70
B	3.11	2.80	3.07	2.80	3.50	3.19	3.46	3.19
C	2.13	2.13	2.40	2.13	2.52	2.52	2.80	2.52
D	—	—	—	2.85	—	—	—	3.25
Weight (lbs)	.6	.6	.6	.6	.6	.6	.6	.6

INCH

E Thread	1-1/4-16	1-1/4-16	—	1-1/4-16	—	—	—	—
F Hex	1.06	1.06	—	1.06	—	—	—	—
Part. No., Work Support only	**CLR-001-WS**	**CLR-201-WS**		**CLR-101-WS**	—	—	—	—
Part No., Base only	**CLR-712-WSA**	**CLR-712-WSA**		**CLR-711-WSA**	—	—	—	—
Part No., Work Support with Base	**CLR-000-WS**	**CLR-200-WS**		**CLR-100-WS**	—	—	—	—

METRIC

E Thread	M30x1.5	M30x1.5	M30x1.5	M30x1.5	M30x1.5	M30x1.5	M30x1.5	M30x1.5
F Hex	24mm	24mm	24mm	24mm	24mm	24mm	24mm	24mm
Part. No., Work Support only	**CLR-1940-000-WS**	**CLR-1942-000-WS**	**CLR-1942-005-WS**	**CLR-1941-000-WS**	**CLR-1940-010-WS**	**CLR-1942-010-WS**	**CLR-1942-015-WS**	**CLR-1941-010-WS**

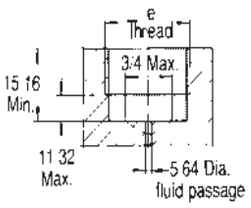
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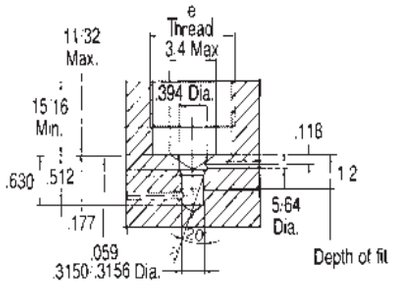
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Threaded-Body Work Supports

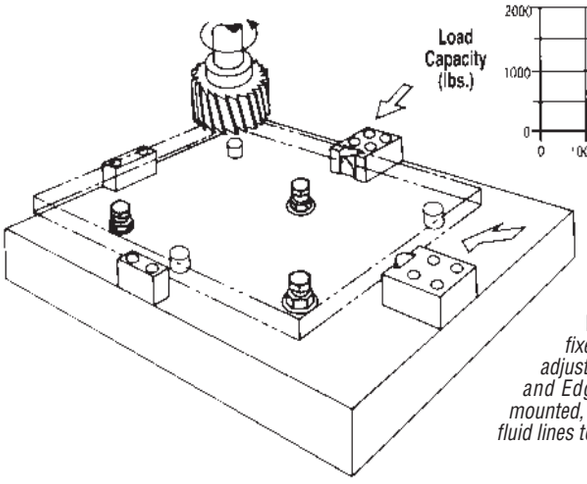
7250 psi max
Single acting

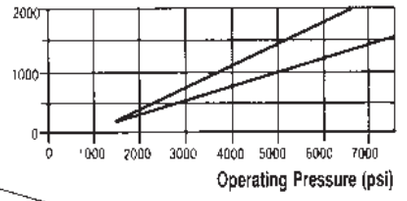


Hole Preparation (Spring Extended and Fluid Advanced)



Hole Preparation (Air Advanced)





Example:
Workpiece supported by three fixed rest buttons and three self-adjusting Work Supports. Supports and Edge Clamps are all manifold mounted, so the fixture has no exposed fluid lines to trap chips.

OPTIONAL BASE



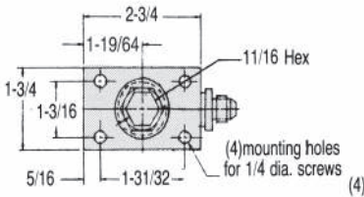
Spring-Extended Work Support with Base CLR-000-WS

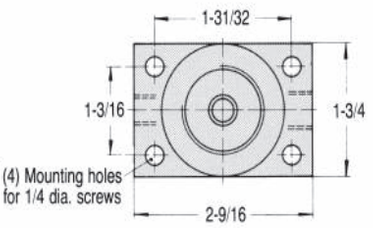


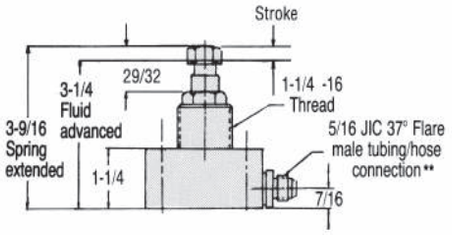
Fluid-Advanced Work Support with Base CLR-200-WS



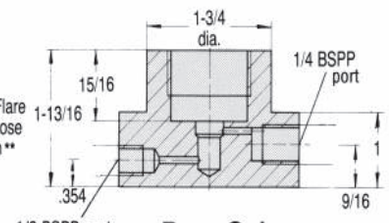
Air-Advanced Work Support with Base CLR-100-WS







Base Only CLR-712-WSA



Base Only CLR-711-WSA

- **Amazingly compact threaded body work support, only 1-1/4 inches in diameter!**
- **Height adjusts automatically with repeatability with ± .0002 inches**
- **Choice of two sizes in each of three-action types, plus a long-stroke fluid-advanced model (1700 lbs)**
- **Support plunger held by an advanced design, sliding-fit pressure sleeve (holds plunger absolutely vertical, locked or unlocked)**

SUPPORT ACTION (SPRING EXTENDED): Plunger is normally extended by light spring force. Workpiece's weight depresses plunger to proper height. When fluid pressure is applied, precision sleeve grips plunger, locking it securely.

SUPPORT ACTION (FLUID ADVANCED): Plunger is normally retracted for clear workpiece loading/unloading. Applying fluid pressure gently advances plunger to workpiece, where it contacts with light spring force. When fluid pressure is applied, precision sleeve grips plunger, locking it securely. Plunger retracts again when pressure is released.

SUPPORT ACTION (AIR ADVANCED): Plunger is normally retracted for clear workpiece loading/unloading. Applying air pressure gently advances plunger to workpiece. A simple 3-way air valve, fine pressure regulator, and air dryer are required. Fine tune contact pressure using regulator. When fluid pressure is applied, precision sleeve grips plunger, locking it securely. Plunger retracts again when air pressure is released. Air-advanced version is also available without spring return for extremely sensitive contact-force adjustment (part no. CLR-7990-284-WS without base, CLR-110-WS with base).

ACCURACY: Height repeatability ± .0002 inches. Excellent repeatability because (1) sliding fit sleeve keeps plunger absolutely vertical while unlocked, avoiding inacurracy due to locking a tilted plunger, and (2) locking force is entirely radial, so plunger stays absolutely stationary during locking. Elastic deflection of plunger is only .00016 inches per 100 lbs. machining load.

MOUNTING: Screw work support into a tapped hole prepared as shown below. Hole bottom must be perpendicular to the hole's axis. with a 125 RMS maximum surface finish. Minimum seating torque 50 ft.-lbs. Supply fluid through passages drilled in the fixture.

SEQUENCING: If workpiece is too light to depress plunger (spring extended) or light enough that plunger contact may lift it (fluid advanced), a sequence valve is recommended. Sequence valve delays locking or advancing the plunger until after the workplace is clamped.

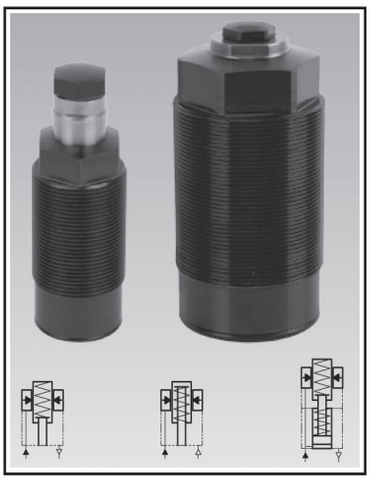
CONSTRUCTION: Steel plunger, hardened and ground. Plunger held inside a honed locking sleeve (sliding fit). Carbon steel body, black oxide finish. Hardened contact bolt furnished.

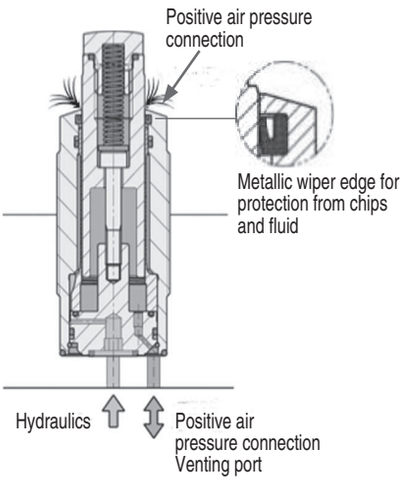
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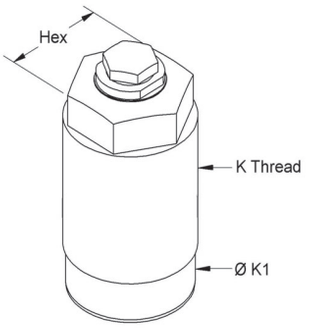
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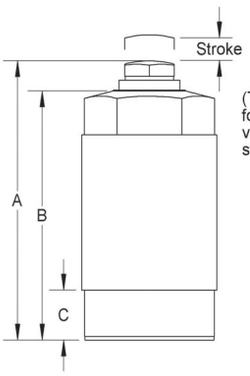
Thr. Body Work Support ■ 4 sizes ■ 3 types of function - Hydraulic, Air, Spring Single Acting ■ Max. Operating Pressure ■ 7250 psi (500 bar)



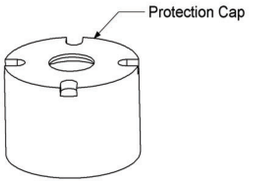


Work Supports are used to provide a self-adjusting rest of workpieces to minimize vibration and deflection from machining forces. This family of products provides multiple mounting options and four sizes within each of the three actuation types (Spring, Air, or Oil Extended). They are designed with an integrated metallix wiper esge backed up by a FKM wiper to provide excellent resistance to chips and fluid. If additional portection is required, the work supports can be piped to have low-pressure air blow-off from the wiper area.





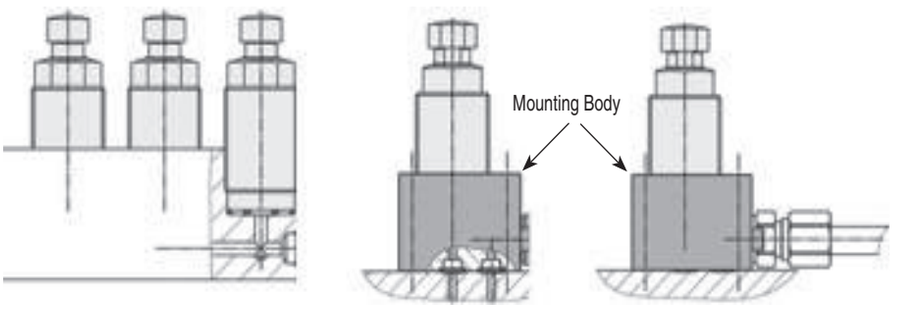
(The plunger position for the Spring Extended version is extended, so stroke in inverted.)



The Protection Cap can be installed between the contact bolt and plunger to protect the wiper area from high pressure coolant and chips.

Installation and connecting possibilities

Drilled channels **O-Ring connection** **Tube connection**



Load Capacity at 7250 psi (lbs)	1460	3370	5285	9440
Stroke (in.)	0.31	0.39	0.39	0.63
A (in.)	2.97	3.39	3.54	4.53
B (in.)	2.32	2.85	3.07	4.04
C (in.)	0.33	0.69	0.81	0.81
K Thread	M30 x 1.5	M36 x 1.5	M48 x 1.5	M60 x 1.5
Ø K1 (in.)	1.12	1.35	1.83	2.30
Hex (in.)	0.94	1.18	1.61	1.97
Weight (lbs)	0.66	1.10	1.98	4.19
Part No., Spring Extended	**CLR-1940-300**	**CLR-1940-400**	**CLR-1940-501**	**CLR-1940-601**
Part No., Air Advanced	**CLR-1941-300**	**CLR-1941-400**	**CLR-1941-501**	**CLR-1941-601**
Part No., Fluid Advanced	**CLR-1942-300**	**CLR-1942-400**	**CLR-1942-501**	**CLR-1942-601**

Accessories

Part No., Mounting Body	**CLR-0346-815**	**CLR-0346-816**	**CLR-0346-817**	**CLR-0346-818**
Part No., Protection Cap (splash guard)	**CLR-3546-110**	**CLR-3546-111**	**CLR-3546-112**	**CLR-3546-113**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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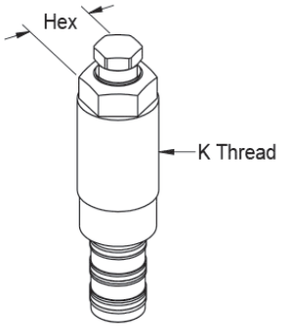
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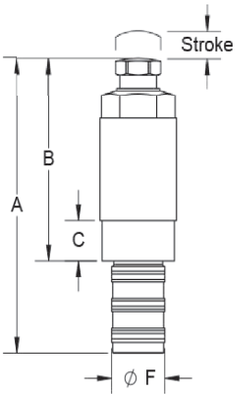
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Threaded-Body Work Support ■ with metal wiper ■ optional contact control
Double Acting ■ Max. Operating Pressure ■ 7250 psi (500 bar)



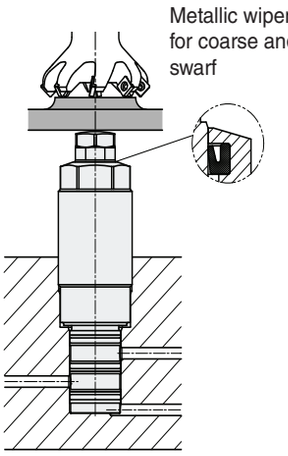
Hydraulic work supports are used to provide a self-adjusting rest for workpieces and avoid vibration and deflection under machining loads. The threaded-body design allows for space saving by direct installation into the fixture body. Double-acting allows for a defined time on the return stroke of the support plunger for cycle-dependent applications. Metallic wiper edge and FKM wiper come standard. To guarantee performance a vent port is imperative; by connecting a slight pneumatic pressure to the venting system the work support is effectively protected against the penetration of liquids. If a strong coolant jet is directed onto the support plunger or wiper edge an optional protective cap is available. Also optional is pneumatic workpiece contact control, allowing recognition of when work support has contacted the workpiece.

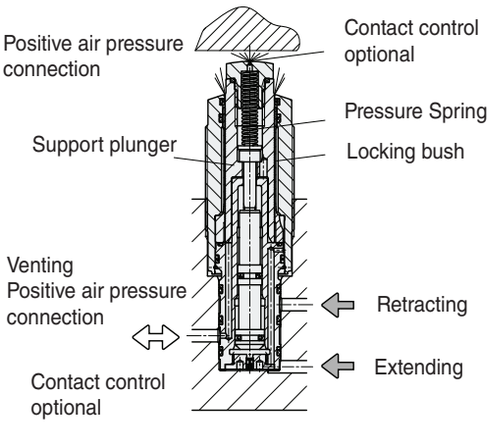






The Protection Cap can be installed between the contact bolt and plunger to protect the wiper area from high pressure coolant and chips.





Load capacity at 7250 psi (lbs)	1460	3370	5285	9440
Stroke (in.)	0.31	0.39	0.39	0.63
A (in.)	4.51	4.90	5.18	6.22
B (in.)	2.96	3.37	3.53	4.51
C (in.)	0.31	0.67	0.79	0.79
K Thread	M30 x 1.5	M36 x 1.5	M48 x 1.5	M60 x 1.5
Ø F (in.)	0.87	0.98	1.18	1.38
Hex (in.)	0.94	1.18	1.61	1.97
Weight (lbs)	1.04	1.50	2.71	5.4
Part No.	CLR-1942-310	CLR-1942-410	CLR-1942-510	CLR-1942-610
Part No., with contact control	CLR-1942-310P	CLR-1942-410P	CLR-1942-510P	CLR-1942-610P
Contact bolt for contact control	CLR-3614-390	CLR-3614-389	CLR-3614-391	CLR-3614-418

Accessories

Weight (lbs)	0.05	0.05	0.07	0.14
Protection Cap (splash guard)	CLR-3546-110	CLR-3546-111	CLR-3546-112	CLR-3546-113

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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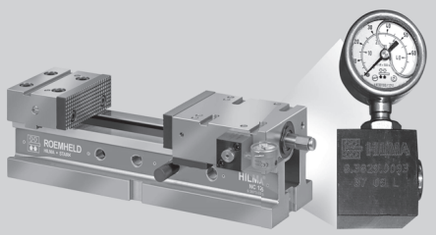
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Power Vises and Concentric Clamping

Power Machine Vises

Carr Lane Roemheld has a wide variety of machine vises for your applications, made of the finest quality construction for excellent rigidity and durability. More varieties can be found in the Machining Vises section at clrh.com.



NC-Series Machining Center Vises
pages 658-659

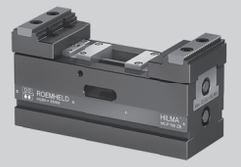
Machining Center Vises — NC-series Vises, available with or without gauge, are available in both hydraulic and hydromechanical versions. The hydraulic version provides automatic power clamping with exact high force at the push of a button. The hydromechanical version is manually operated, with final high force applied easily using hydraulic power assist.



MC-P Fixed Jaw Vises
page 665

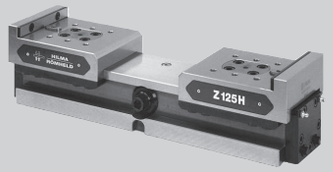


MC-P Z Concentric Vises
page 666



MC-P ZB Position Flexible Vises
page 667

MC-P Vises are especially advantageous for 5-axis machining. Compact design allows for collision-free tool paths and access to all 5 sides with short standard tools. The patented three-piece segment design allows for a high degree of precision. Due to the predesigned swarf protection, they are particularly suitable for use in pallet systems.



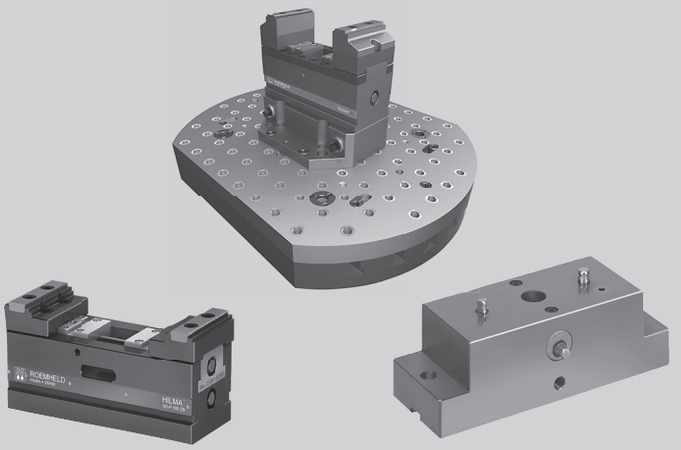
Concentric Vises
pages 670-670

Concentric Vises offer quick, accurate clamping of odd-sized workpieces. These vises may be used in machining centers, on machine tools and final processing machines as well as in special jigs and fixtures. These self-centering vises position and clamp workpieces precisely on a defined symmetrical axis, allowing for any contours, and have a high clamping repeatability of +/-0.01mm.

Vise Jaws and Accessories
pages 660-661, 666-669

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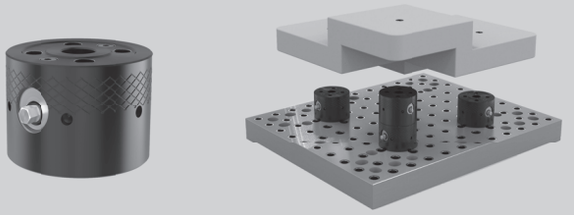
Power Vises and Fixturing Systems



CL5® Quick-Change Five-Axis Workholding
pages 663-669

Quick-Change Five-Axis Workholding

Accurate and versatile fixture for round, square, and hex-shaped workpieces. Mounts vertically or horizontally, and uses standard 5C collets. Advanced workpiece-release mechanism for flawless operation. Far better accuracy and repeatability than competitive collet vises. Workpiece is pulled solidly against the bottom stop for excellent height repeatability.



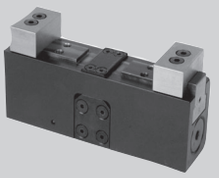
DropZero Modular Zero Point System
pages 672-675

Modular Zero Point System

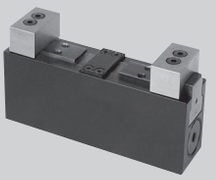
New DropZero Modular Zero-Point Clamping System enables complete machining of a workpiece in one setup, significantly reducing setup time and fixturing costs. With a few turns of a wrench, DropZero locates, supports, and securely clamps the workpiece from underneath, providing full machining access to 5 sides. Drop Zero can be used with modular or non-modular tooling.



With Fixed Jaw
page 677



Concentric
page 678



Position Flexible
page 679

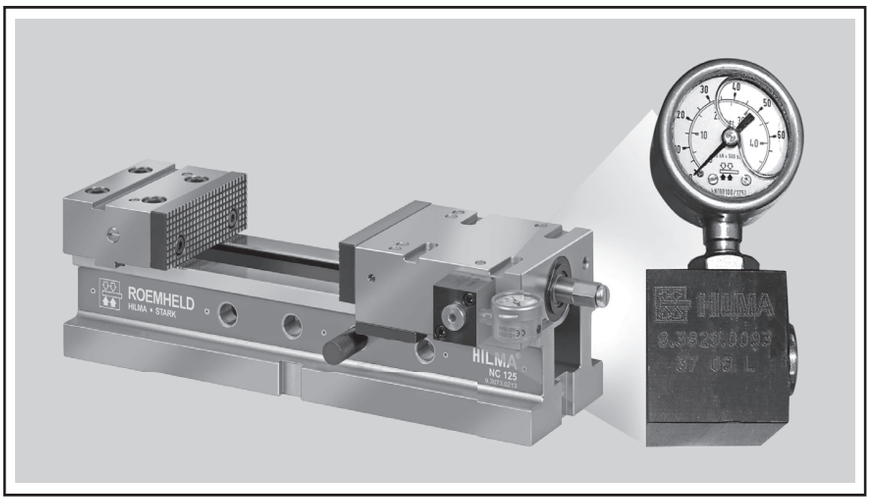
Fixture Clamps

Fixture clamps consist of a very compact body with integrated hydraulic cylinders that actuate the movable jaw. All threads and ports are at the bottom which allows for a very tight and space savings arrangement. Accessory blank jaws are also available that can be milled to match the workpiece contour.

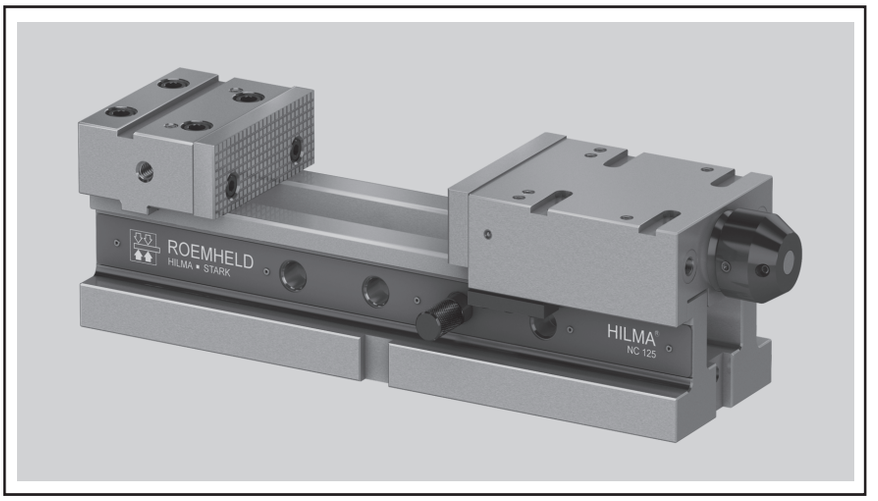
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Machining-Center Vises ■ NC Series

5075 psi max
Single acting



NC Series Hydra-Mechanical (shown with gauge)



NC Series Hydraulic

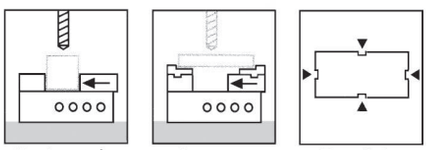
- **Hydraulic version provides automatic power clamping with exact high force at the push of a button (requires external power unit)**
- **Hydra-mechanical version is manually operated, with final high force applied easily using hydraulic power assist**
- **Finest-quality construction for excellent rigidity and durability**
- **Choice of three sizes**

OPERATION OF HYDRAULIC VERSION: To set up initially, adjust jaw opening to the workpiece using the removable crank handle. When fluid pressure is applied by actuating the external power unit, the sliding jaw moves through its power stroke to apply full clamping force (.276" maximum stroke for safety). Unclamping is by positive spring return.

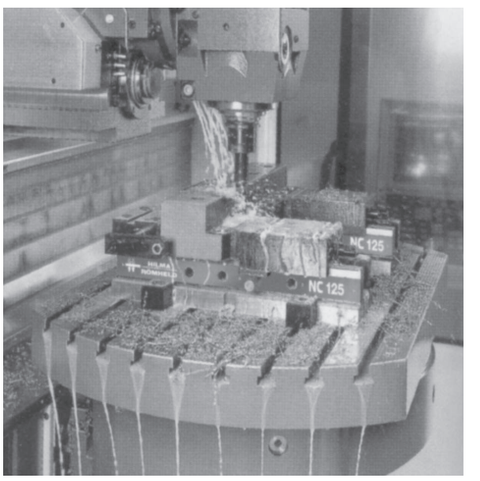
OPERATION OF HYDRA-MECHANICAL VERSION: Turning the crank handle clockwise moves the sliding jaw mechanically toward the workpiece. Once resistance is met, further turning automatically disengages the screw spindle and gradually applies full hydraulic pressure, with relatively little effort. Turn handle counterclockwise to unclamp.

MOUNTING: Vises are all slotted underneath for 20mm fixture keys, to provide accurate mounting on T-slotted machine tables. Use two Step Fixture Keys to adapt to a specific table-slot size (see tooling-component catalog section). A hardened steel pin fits into any of the adjustment holes on each side of the guide rails, to provide quick coarse adjustment of jaw opening.

ACCESSORIES: A crank handle is furnished with each vise. Optional right-angle-drive units (hydra-mechanical version only) are highly recommended if vises are mounted vertically.



Horizontal Mounting | Accepts Top Jaws | Two-Axis Location



NC-Series vises are ideal for precision, high-production machining on all types of vertical machining centers.

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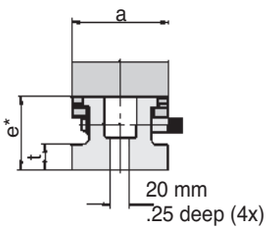
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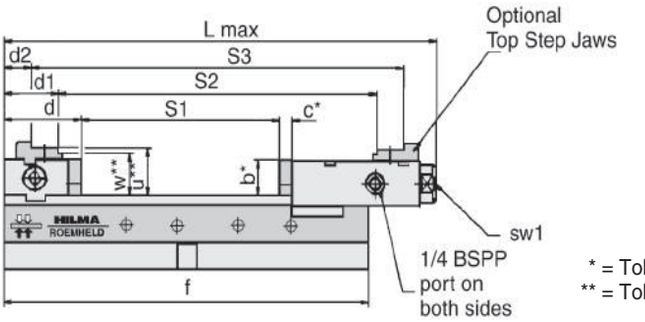
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Machining-Center Vises ■ NC Series

5075 psi max
Single acting

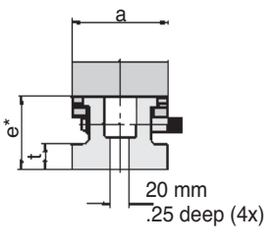
Hydraulic

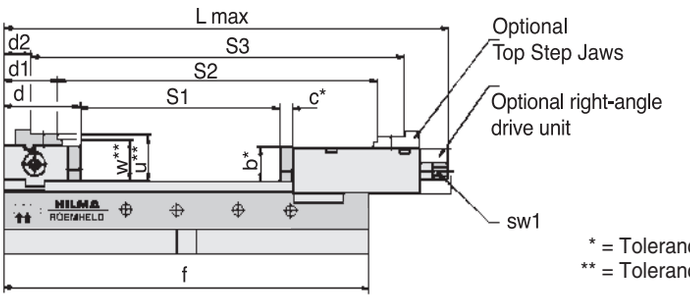




* = Tolerance ± .0004
** = Tolerance ± .0008

Hydra-Mechanical





* = Tolerance ± .0004
** = Tolerance ± .0008



Force Limiting Adapter	
100mm	CLRH-9-3762-0100-VSA
125mm	CLRH-9-3762-0125-VSA
160mm	CLRH-9-3762-0160-VSA

Jaw Width	100mm	125mm	160mm
a	3.937	4.921	6.299
b	1.3386	1.7717	2.1260
c	.5118	.5906	.7087
d	3.1496	3.9370	4.7244
d1	2.2047	2.7165	2.8346
d2	1.1024	1.3780	1.4567
e	2.7559	3.2283	3.7402
f	14.96	16.93	21.65
t	.94	1.06	1.06
u	1.7717	2.2835	2.7559
w	1.5748	2.0866	2.5591
Weight (lbs)	41	69	129

Hydraulic Vises

Max. clamping force (lbs)	5620	8990	14160
Power stroke	.197	.197	.276
Max. operating pressure (psi)	5000	5000	5000
Fluid required (cu.in.)	.31	.43	.85
L max	17.95	20.39	26.57
S1	8.23	8.98	12.36
S2	13.15	14.41	20
S3	15.35	17.09	22.76
sw1	8mm	8mm	10mm
Part No., Vise	**CLRH-9-3082-0203**	**CLRH-9-3083-0203**	**CLRH-9-3084-0203**

Hydra-Mechanical Vises

Max. clamping force (lbs)	5620	8990	11240
Max. cranking force required (lbs)	11	17	21
crank throw	3.15	3.94	4.92
L max	18.27	20.71	26.93
S1	8.07	8.86	12.17
S2	12.99	14.29	19.80
S3	15.20	16.97	22.56
sw1	14mm	17mm	19mm
Part No., Vise	**CLRH-9-3072-0203**	**CLRH-9-3073-0203**	**CLRH-9-3074-0203**
Part No., Right-Angle Drive Unit	**CLRH-9-3294-0505**	**CLRH-9-3294-0605**	**CLRH-9-3294-0705**
Part No., Vise with Gauge	**CLRH-9-3072-0215**	**CLRH-9-3073-0215**	**CLRH-9-3074-0215**



Optional Right-Angle Drive Unit for Hydra-Mechanical Version

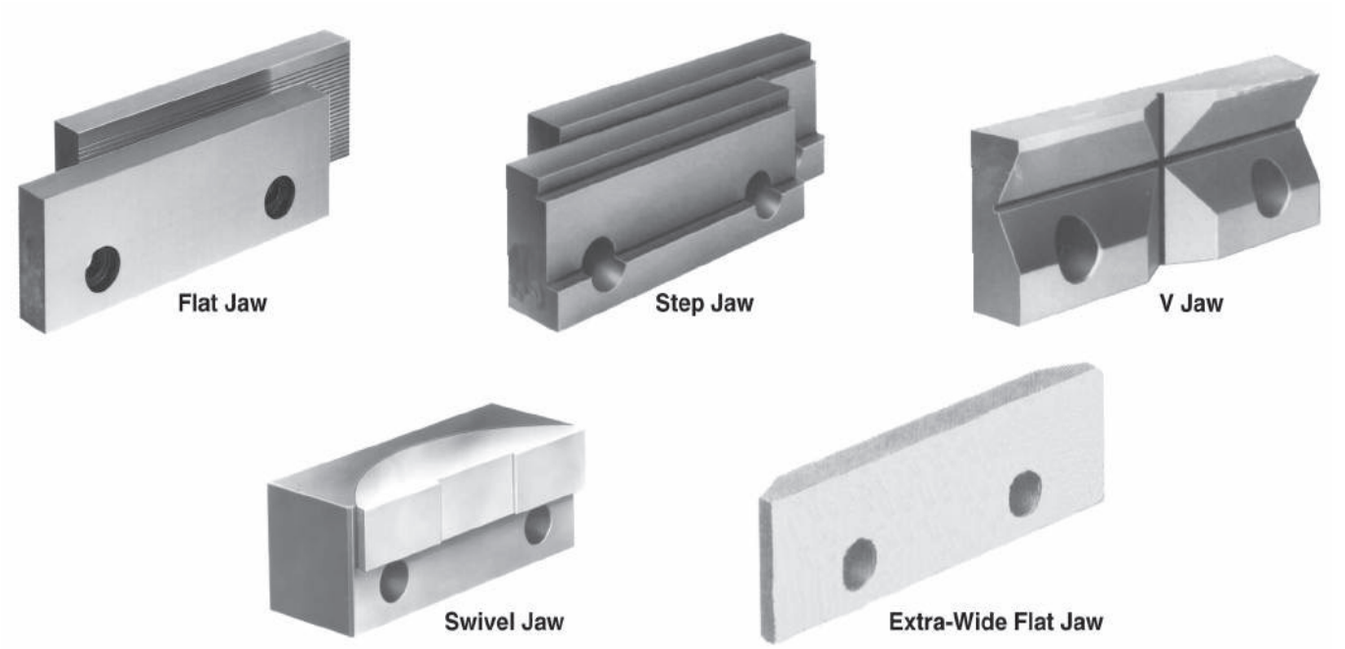
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Vise Jaws

Machine Vise Jaws



Jaw Type (Single Jaw)	100mm Vise	125mm Vise	160mm Vise
Part No., Standard Flat Jaw	CLRH-5-2058-1003-VSA	CLRH-5-2058-1004-VSA	CLRH-5-2058-1005-VSA
Part No., Soft Flat Jaw	CLRH-5-2055-0097-VSA	CLRH-5-2055-0098-VSA	CLRH-5-2055-0099-VSA
Part No., Extra Wide Flat Jaw	CLRH-5-2058-1025-VSA	CLRH-5-2058-1026-VSA	CLRH-5-2058-1027-VSA
Part No., V Jaw	CLRH-5-3030-0002-VSA	CLRH-5-3030-0003-VSA	CLRH-5-3030-0004-VSA
Part No., Swivel Jaw	CLRH-3711-02-VSA	CLRH-3711-03-VSA	CLRH-3711-04-VSA
Part No., Step Jaw	CLRH-5-2082-0001-VSA	CLRH-5-2082-0002-VSA	CLRH-5-2082-0003-VSA

Quick-Insert – System Jaws

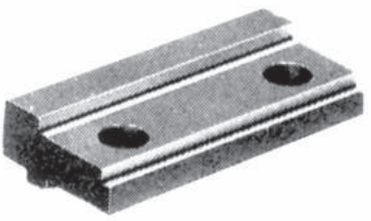
Base jaws are screwed to the fixed jaw and to the slide. Inserts, kept in place by two permanent magnets, can be changed in a few seconds.

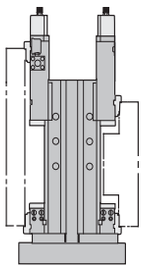


Jaw Type (Single Jaw)	100mm Vise	125mm Vise	160mm Vise
Part No., Magnetic Base Jaw	CLRH-3771-02-VSA	CLRH-3771-03-VSA	CLRH-3771-04-VSA
Part No., Standard Jaw Insert	CLRH-3771-12-VSA	CLRH-3771-13-VSA	CLRH-3771-14-VSA
Part No., Soft Jaw Insert	CLRH-3771-72-VSA	CLRH-3771-73-VSA	CLRH-3771-74-VSA
Part No., Serrated Jaw Insert	CLRH-3771-22-VSA	CLRH-3771-23-VSA	CLRH-3771-24-VSA
Part No., Step Jaw Insert	CLRH-3771-42-VSA	CLRH-3771-43-VSA	CLRH-3771-44-VSA
Part No., V Jaw Insert	CLRH-3771-52-VSA	CLRH-3771-53-VSA	CLRH-3771-54-VSA

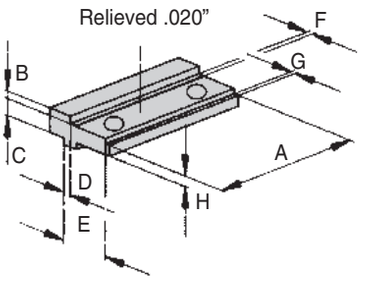
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Vise Accessories





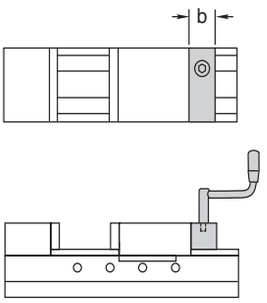
Precision step jaws that mount on top of the fixed and sliding jaws, extending jaw capacity significantly. These hardened and ground jaws are keyed to maintain excellent positional accuracy, as well as height accuracy. Note: top step jaws for sliding jaws have a wider hole spacing than those for fixed jaws. Two mounting screws are included.



Top Step Jaws

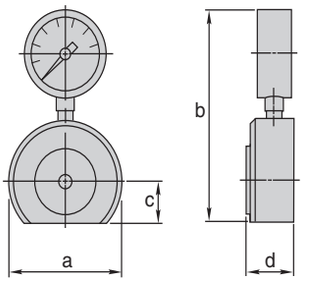
Part No. for Fixed Jaw	Part No. for Sliding Jaw	Jaw Width	A	B	C ±.0004	D ±.0004	E ±.0004	F	G	H ±.0004
CLRH-3284-02-VSA	CLRH-3284-12-VSA	100mm	3.9370	.197	.4528	.2362	1.3386	.197	.157	.2559
CLRH-3284-03-VSA	CLRH-3284-13-VSA	125mm	4.9213		.5512		1.5748			.3543
CLRH-3284-04-VSA	CLRH-3284-14-VSA	160mm	6.2992		.6693	.3150	1.6929			.4724





Extremely useful accessory for hydra-mechanical vises. Recommended when cranking from the end is difficult, especially when vises are mounted vertically.





Handy gauge for measuring clamping force in hydraulic or mechanical clamping systems. Flat side allows easier positioning in-line with the clamping force, especially for vises. Choice of two force ranges.

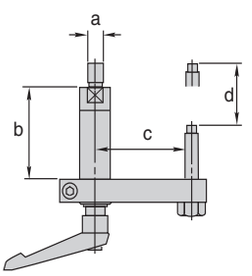
Right-Angle Drive Units

Part No.	Fits Jaw Width	Drive Hex Size	Crank Throw	b	Weight (lbs)
CLRH-3294-05-VSA	100mm	10mm	4.92	1.54	.5
CLRH-3294-06-VSA	125mm			1.69	1.0
CLRH-3294-07-VSA	160mm			1.81	2.0

Force Gauges (Load Cells)

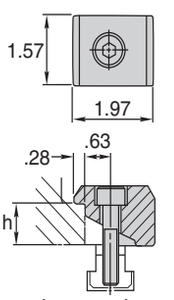
Part No.	Indicating Range	a dia	b	c	d
CLRH-2-9501-0001-VSA	0-60 kN (0-13,500 lbs)	3.46	5.91	1.14	1.46
CLRH-2-9501-0002-VSA	0-100 kN (0-22,500 lbs)	5.43	7.87	2.13	1.57





A precision workpiece stop that mounts into either side of the vise body. Reposition swing arm on the shaft by loosening the socket-head cap screw. Can be used as a swing-away stop, with the rapid-locking handle.





Set of four clamps with screws, for mounting one vise.

Adjustable Side Stops

Part No.	Fits Jaw Width	a	b max	c max	d max
CLRH-3291-02-VSA	100mm and 125mm	M12	2.40	3.74	1.81
CLRH-3291-03-VSA				4.13	
CLRH-3291-04-VSA	160mm	M16	3.19	4.88	2.60

Vise Clamps

Part No.	Fits Jaw Width	h	Socket-Head cap screws (furnished)
CLRH-9-3777-2011-VSA	100mm	.94	M12x45mm long
CLRH-9-3777-3011-VSA	125mm and 160mm	1.06	M12x45mm long
CLRH-9-3777-3021-VSA			M16x50mm long

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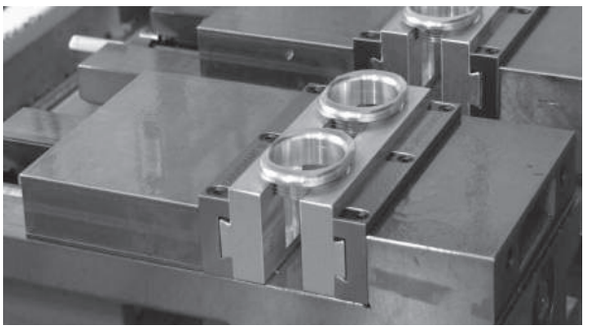
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CARVESMART™ QUICK CHANGE VISE JAWS

QUICK ▪ ACCURATE VERSATILE ▪ STURDY

The patented CARVESMART™ Quick-Change Vise Jaw System is a complete package of dovetailed jaws for production and toolroom vises that are accurately changed in seconds.

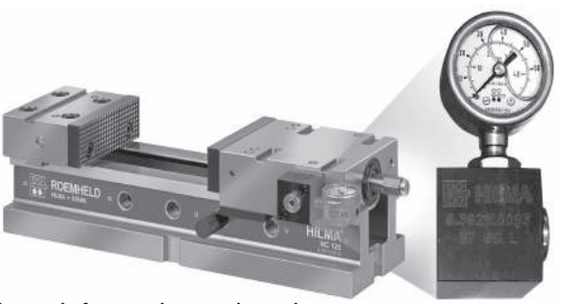




- CLAMP NUTS: 1018 steel with QPQ wear and corrosion resistant surface treatment.
- SPEED SCREWS: Black oxided, alloy steel differential screw. RH/LH travel moves twice as fast, lifts and pulls without gauling.
- SMARTstop™ is an internal-to-the-jaw set, slot and pin system for jobs that repeat.
- Extruded jaw stock can be cut to any length from 1/2" to 94", available in five profiles.
- Fully accessorized with dovetailed hard jaws, PERMAjaws and 1018 steel jaws.

Save $$ When Bundled with the NC Vise

Our NC vise is available with an *integrated force gauge* which tells you how much holding force is being applied to your workpiece. Minimal effort on the crank handle results in extremely high holding force because of the built-in hydraulic power of the vise. Now you'll know if your part is being held properly.



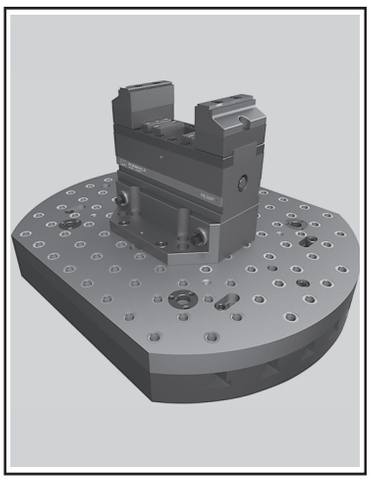
- Better clamping quality
- Correct clamping force every time
- Consistent process control
- Reduced tool breakage
- Workpiece deformation reduced
- Ideal for roughing and finishing
- Reduced operator fatigue

Visit clrh.com/carvesmart for more details, and to watch the video!

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Subplate Mounted On a Rotary Table

- **Designed specifically for 5-axis machining**
- **Also suitable for standard machining**
- **INFO+: Use in conjunction with the vises and jaws in the next few pages, as well as the subplates on pages 373-394**

DESCRIPTION: The CL5® quick-change, 5-Axis workholding system consists of three components: a subplate, a riser, and top tooling made up of a vise or a fixture plate. The subplate transforms a T-slot table into a modular fixturing plate, allowing flexible and easy clamping and locating of other tooling and/or fixtures. Designed to get the part up from the machine table, the Quintus quick-change riser allows 5-side part access. The Quintus combines the riser, quick-change capability and precise location in one piece.

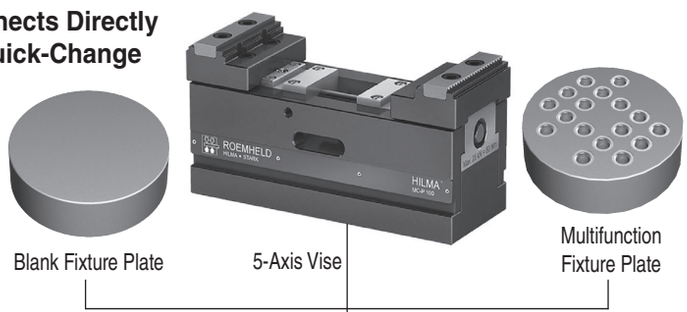
APPLICATIONS: The CL5® systems offers three primary methods of fixturing:

METHOD 1: Fixture Plate Mounted on a Rotary Table. This method is ideal for small rotary tables up to 210mm diameter. Fixture plates are accurately located and fastened directly to the rotary table.

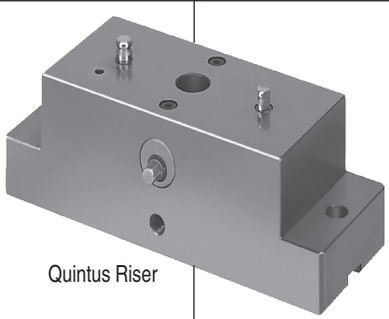
METHOD 2: Quintus Quick-Change Riser Mounted on Rotary Table. The method provides additional height for spindle clearance. It allows you to quickly and accurately mount directly on rotary tables 250mm diameter and larger.

METHOD 3: Subplate Mounted on Rotary Table. This method is appropriate for all machines. The Quintus riser is mounted on a subplate to allow quick exchange of the riser with other fixturing.

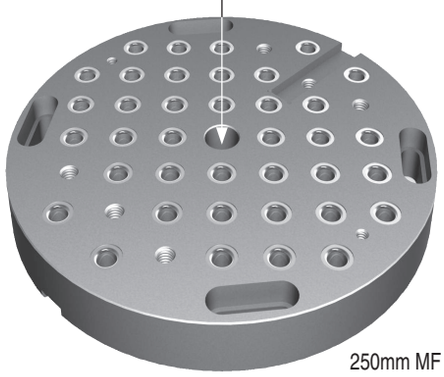
Top Tooling Connects Directly to the Quintus Quick-Change Riser



Quintus Quick-Change Riser Connects to Any Subplate, No Extra Adaptors Required



Use Subplate Alone or With Risers and Plates
INFO+: See Subplates pages 373-394



14

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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5-Axis MC-P Vise ■ Mechanically or Hydraulically Operated
Allows unrestricted tool access for 5-sided machining



MC-P Series Fixed Jaw Vise
INFO+: Page 665

- **Mechanically operated**
- **Jaw widths: 40, 60, 100 and 125 mm**
- **Conventional vise style with one fixed and one moving jaw**
- **Jaws not included, standard versions of jaws available - see page 681**



MC-P Z Series Concentric Vise
INFO+: Page 666

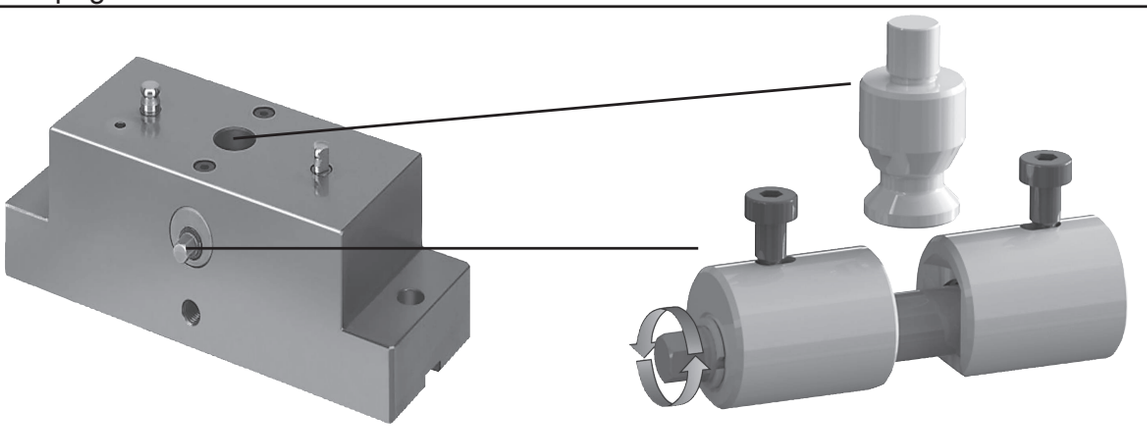
- **Mechanically or hydraulically operated**
- **Jaw widths: 40, 60, 100, 125 mm**
- **Two moving jaws that provide exact centering of the workpiece**
- **Jaws not included, standard versions of jaws available - see page 681**



MC-P ZB Series Position Flexible Vise
INFO+: Pages 667

- **Mechanically operated**
- **Jaw widths: 60, 100, 125 mm**
- **Two moving jaws that provide exact centering of the workpiece**
- **Clamping without deformation of workpieces by position flexible clamping point**
- **Jaws not included, standard versions of jaws available - see page 681**

Quintus Quick-Change Riser
INFO+: See page 668 for more details



Quintus Clamping Mechanism

Quintus Clamping Mechanism

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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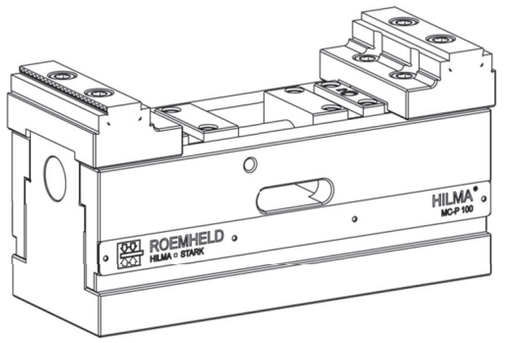
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MC-P Fixed Jaw Vise ■ Mechanically Operated
Jaw Widths 40, 60, 100 and 125 mm

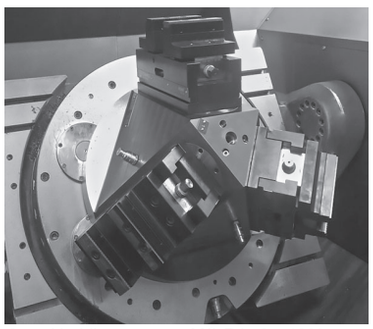


The workholding MC-P vises are especially advantageous for 5-axis machining. The patented three piece segment design allows for a high degree of precision. All essential components are made of hardened steel. Thanks to raising the spindle arranged in the upper part of the housing, deformation in the base during max. clamping is reduced significantly, improving stability and precision of the work- piece. The high force and stability eliminate the need for pre-stamping.

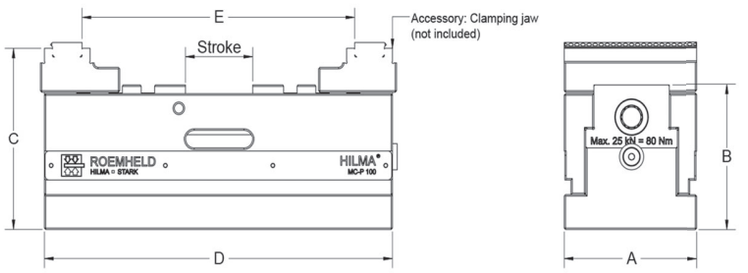
Compact design allows for collision-free tool paths and access to all 5 sides with short standard tools. Due to the predesigned swarf protection, they are particularly suitable for the use in pallet systems. The MC-P 100/125 are equipped to use on zero point clamping systems with threads for retractable nipples at the bottom side of the housing (nipples and pictured jaws not included).These clamps are intended to be used with hydraulic fluid only.



Application Example



3 workholding systems MC-P in 3 x 120° arrangement on a 5-axis machining center.



Accessories

- Clamping jaws and jaw inserts, accessories for mounting, positioning and operation see data sheet WS 5.450Z
- Rapid change block Quintus see data sheet WS 5.6150

Customized Versions

MC-P workholding systems can also be delivered as customized versions. For example in hydraulically-operated versions, other lengths or with individual mounting holes. Please contact us.

Operation	Manual	Manual	Manual	Manual
Type	MC-P 40	MC-P 60	MC-P 100	MC-P 125
Jaw Width (mm)	40	60	100	125
Clamping force (lbs) / Torque (ft-lbs)	1685 / 17	3370 / 37	5620 / 59	7870 / 147
Clamping stroke (in.)	0.79	1.18	1.97	3.97
A (in.)	1.57	2.36	3.94	4.92
B (in.)	2.05	2.75	3.94	5.12
C (in.)	2.52	3.46	4.92	6.30
D (in.)	4.33	6.69	10.24	11.14
E (in.)*	3.11	5.90	8.03	8.46
Weight (lbs) without clamping jaws	3.31	10.14	38.58	77.16
Part No., without clamping jaws	CLRH-9-4581-0101	CLRH-9-4583-0101	CLRH-9-4585-0101	CLRH-9-4586-0101

*Depending on the used clamping jaw

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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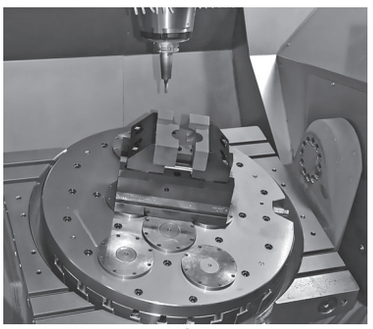
MC-P Z Concentric Vise ■ Mechanically or Hydraulically Operated
Jaw Widths 40, 60, 100 and 125 mm



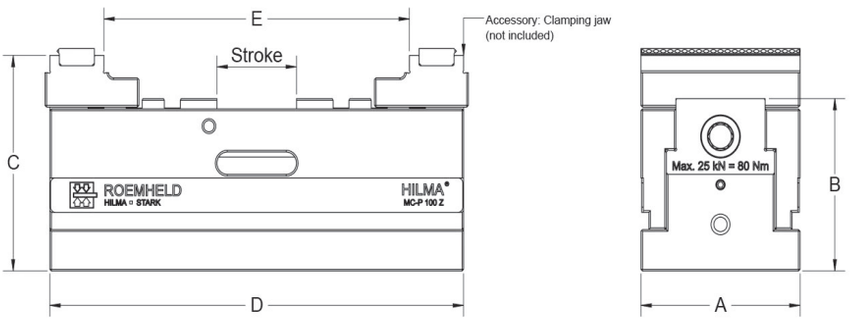
The workholding MC-P vises are especially advantageous for 5-axis machining. The patented three piece segment design allows for a high degree of precision. All essential components are made of hardened steel. Thanks to raising the spindle arranged in the upper part of the housing, deformation in the base during max. clamping is reduced significantly, improving stability and precision of the work- piece. The high force and stability eliminates the need for pre-stamping.

Compact design allows for collision-free tool paths and access to all 5 sides with short standard tools. Due to the predesigned swarf protection, they are particularly suitable for the use in pallet systems. The MC-P Z 100/125 are equipped to use on zero point clamping systems with threads for retractable nipples at the bottom side of the housing (nipples and pictured jaws not included).

Application Example



Workholding system MC-P with workpiece specific base jaw and form jaw used on a 5-axis machining center.



Accessories

- Clamping jaws and jaw inserts, accessories for mounting, positioning and operation see data sheet WS 5.450Z
- Rapid change block Quintus see data sheet WS 5.6150
- Hydraulic pressure generators on request

Customized Versions

MC-P workholding systems can also be delivered as customized versions. For example with other lengths, height or with individual mounting holes.
Please contact us.

Operation	Manual	Manual	Hydraulic	Manual	Hydraulic	Manual	Hydraulic	Manual
Type	MC-P 40 Z	MC-P 60 Z	MC-P 60 ZH	MC-P 100 Z	MC-P 100 ZH	MC-P 125 Z	MC-P 125 ZH	MC-P 125 Z Compact
Jaw Width (mm)	40	60	60	100	100	125	125	125
Clamping force (lbs) / Torque (ft-lbs)	1685 / 17	3370 / 37	-	5620 / 59	-	7870 / 147	-	7870 / 147
Clamping force (lbs) / Op. press. (psi)	-	-	3370 / 4640	-	5620 / 2900	-	7870 / 3480	-
Clamping stroke (in.)	0.79	1.18	1.18	1.97	1.97	3.97	3.97	3.97
A (in.)	1.57	2.36	2.36	3.94	3.94	4.92	4.92	4.92
B (in.)	2.05	2.75	3.15	3.94	3.94	5.12	5.12	5.12
C (in.)	2.52	3.46	3.86	4.92	4.92	6.30	6.30	6.30
D (in.)	4.33	6.69	6.69	10.24	10.47	18.31	18.31	11.14
E (in.)*	3.11	5.90	5.90	8.03	8.03	15.75	9.45	8.46
Weight (lbs) without clamping jaws	3.31	10.36	11.90	39.02	38.36	115.30	111.33	67.24
Part No. without clamping jaws	CLRH-9-4581-0301	CLRH-9-4583-0301	CLRH-9-4583-0401	CLRH-9-4585-0301	CLRH-9-4585-0401	CLRH-9-4586-0301	CLRH-9-4586-0401	CLRH-9-4586-0601

* Depending on the used clamping jaw

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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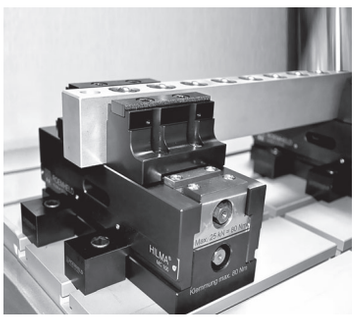
MC-P Z Balance Position Flexible Vise ■ Mechanically Operated
Jaw Widths 60, 100 and 125 mm



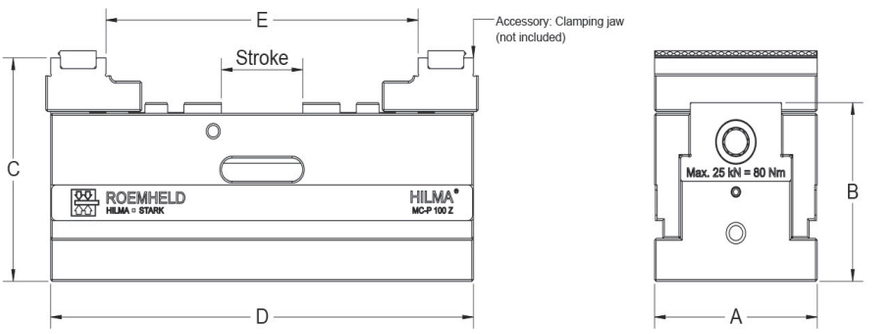
The workholding MC-P ZB vises are especially advantageous for 5-axis machining. It has a position flexible clamping point. This allows for similar workpiece with a variable clamping point to be utilized in the same fixture. The jaws move concentrically to the clamping point on the prelocated fixed workpiece. Once one jaw makes contact to the part the opposite jaw is the only one going to travel. When both jaws make contact with the workpiece, the desired clamping force is applied by means of a torque wrench. This does not deform the workpiece because the clamping point is still floating. Finally the locking spindle is used to lock the jaws into place.

The patented three piece segment design allows for a high degree of precision. All essential components are made of hardened steel. Thanks to raising the spindle arranged in the upper part of the housing, deformation in the base during max. clamping is reduced significantly, improving stability and precision of the workpiece. The high force and stability eliminates the need for pre-stamping. Compact design allows for collision-free tool paths and access to all 5 sides with short standard tools. Due to the predesigned swarf protection, they are particularly suitable for the use in pallet systems. The MC-P ZB 100/125 are equipped to use on zero point clamping systems with threads for retractable nipples at the bottom side of the housing (nipples and pictured jaws not included).

Application Example



Clamping of aluminium bars with workholding system MC-P 100 Z Balance.



Accessories

- Clamping jaws and jaw inserts, accessories for mounting, positioning and operation see data sheet WS 5.450Z
- Rapid change block Quintus see data sheet WS 5.6150

Customized Versions

MC-P Z Balance workholding systems can also be delivered as customized versions. For example with other lengths or with individual mounting holes. Please contact us.

Operation	Manual	Manual	Manual
Type	MC-P 60 ZB	MC-P 100 ZB	MC-P 125 ZB
Jaw Width (mm)	60	100	125
Clamping force (lbs) / Torque (ft-lbs)	3370 / 37	5620 / 59	7870 / 147
Clamping stroke (in.)	1.18	1.97	3.97
A (in.)	2.36	3.94	4.92
B (in.)	2.75	3.94	5.12
C (in.)	3.46	4.92	6.30
D (in.)	6.69	10.24	18.31
E (in.)*	5.90	8.03	15.75
Weight (lbs) without clamping jaws	10.14	38.58	115.30
Part No., without clamping jaws	CLRH-9-4583-0701	CLRH-9-4585-0701	CLRH-9-4586-0701

* Depending on the used clamping jaw

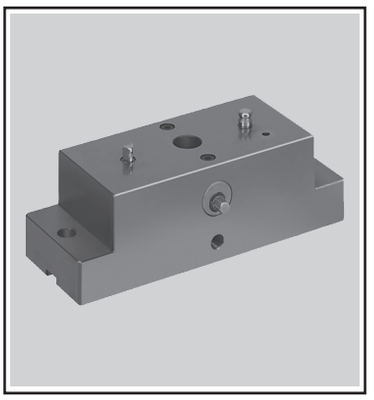
Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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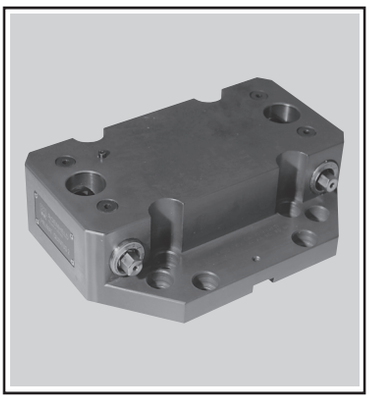
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Quintus Riser ■ Quick-Change Riser
Max. Retention Force per Clamping Pin ■ 4500 lbs



Quintus 1
Quick Change Riser

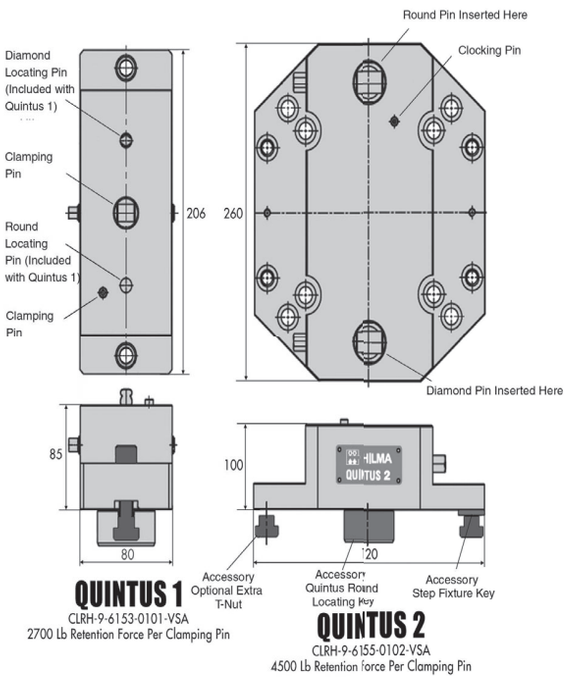


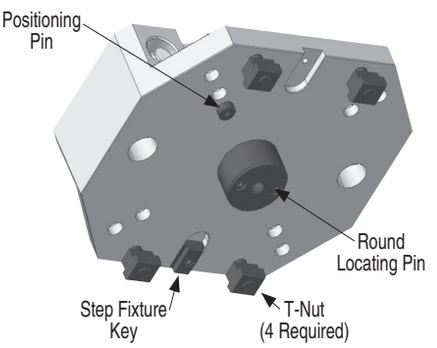
Quintus 2
Quick Change Riser

- **Vises and fixture plates mount directly onto the Quintus Quick-Change Riser**
- **Two sizes**
- **Extremely accurate**

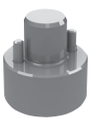
The CL5® quick-change, 5-Axis workholding system consists of three components: a subplate, a riser, and top tooling made up of a vise or a fixture plate. The subplate transforms a T-slot table into a modular fixturing plate, allowing flexible and easy clamping and locating of other tooling and/or fixtures. Designed to get the part up from the machine table, the Quintus quick-change riser allows 5-side part access. The Quintus combines the riser, quick-change capability and precise location in one piece.

Quick Change for Non-Quintus Riser
see data sheet WS 5.6150.





Bottom View of Quintus 2



Round Locating Key for Quintus 1, 2

PART NO.	Ømm	L1 / L2
CLRH-9-6153-5001-VSA	D 30 g6	15/38
CLRH-9-6153-5002-VSA	D 32 g6	15/38
CLRH-9-6153-5003-VSA	D 50 g6	25/48
CLRH-9-6153-5009-VSA	D 50 g6	18/41



Step Fixture Key
CLM-6x16-SHCS screw required

PART NO.	FIXTURE SLOT	TABLE SLOT
CLRH-9-6153-5004-VSA	20mm	14mm
CL-20-SFK-16	20mm	16mm
CL-20-SFK-18	20mm	18mm
CLM-20-FK	20mm	20mm



Quintus Pin Sets

PART NO.	INCLUDES
CLRH-9-3920-0201-VSA	QUINTUS 1 - w/o Centering
CLRH-9-3920-0202-VSA	QUINTUS 2 - Round & Diamond Pin



Positioning Pin
for Quintus 2. (1 piece)

PART NO.	Ømm
CLRH-9-3920-0102-VSA	10/14 h6



T-Nut
with screw (set of 4)

PART NO.		T-SLOT (mm)
CLRH-9-6153-5005-VSA	M12x30mm	14

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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MC-P Vise Jaws ■ Clamping Jaws
Jaw Widths 40, 60, 100 and 125 mm

Scope of delivery - clamping jaws

All clamping jaws are supplied with fastening screws.
Reversible step jaws are always delivered without jaw inserts.
For more accessories and jaw inserts option (see data sheet WS 5.450Z).

			MC-P 40, Z	MC-P 60, Z, ZH, ZB	MC-P 100, Z, ZH, ZB	MC-P 125, Z, ZH, Z Compact, ZB
	Step Jaw - Flat	Reversible step jaw, hardened and ground, (without jaw inserts)	-	CLRH-9-4583-6901	CLRH-9-4585-6901	CLRH-9-4585-6901
	Step Jaw - Wide	Reversible, interchangeable standard insert, one side serrated, one side smooth, may be replaced with custom inserts, (without jaw inserts)	-	CLRH-9-4583-6902	CLRH-9-4585-6902	CLRH-9-4586-6902
	Step Jaw - Medium		-	CLRH-9-4583-6903	CLRH-9-4585-6903	CLRH-9-4586-6903
	Step Jaw - Narrow		-	-	CLRH-9-4585-6904	-
	Pendulum Jaw	For compensating non-parallel clamping surfaces, hardened and ground (without jaw inserts)	-	-	CLRH-9-4585-6905	CLRH-9-4586-6905
	Vee Jaw	Vee Jaw with removable insert for increased part range, hardened	-	CLRH-9-4583-6921	CLRH-9-4585-6921	-
	Step Jaw	Reversible step jaw, 2 steps, hardened	CLRH-9-4581-6931	CLRH-9-4583-6931	CLRH-9-4585-6931	CLRH-9-4586-6931
	Soft Jaw	Machinable soft jaw	CLRH-9-4581-6932	CLRH-9-4583-6932	CLRH-9-4585-6932	CLRH-9-4586-6932

INFO+: The jaws on this page are designed to be used with the 5-axis machining vises on pages 665-667

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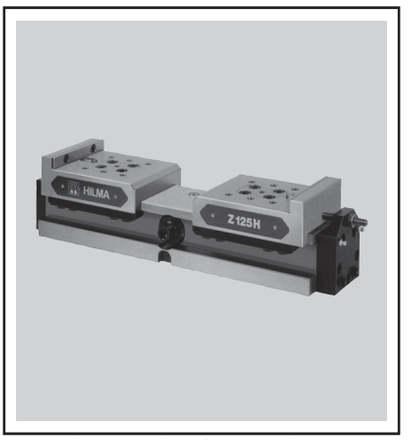
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Concentric Vises

2175 psi max clamp
290 psi max unclamp



Hydraulic Concentric

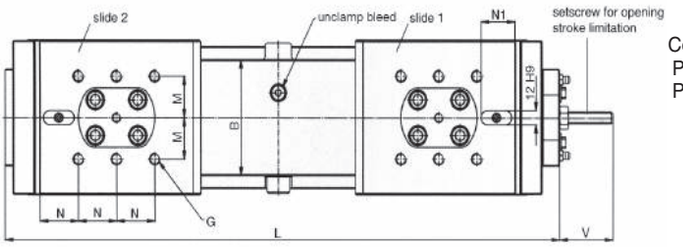
- **High clamping repeatability ± 0.01 mm**
- **Constant length and large clamping ranges**
- **Any mounting position**
- **Possibilities for positioning and fastening customer-specific jaws**
- **Protection against coolant and swarf by integral wipers in the clamping slides**
- **Large stroke of the slide**
- **Limitation of the opening stroke by an adjustable set screw**
- **An additional pilot-controlled check valve can be fitted to the 'clamping' port**

DESCRIPTION: Self-centering vises position and clamp workpieces exactly on a defined symmetrical axis, taking account of their contours.

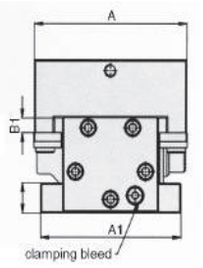
They may be used in machining centers, on machine tools and final processing machines as well as in special jigs and fixtures.

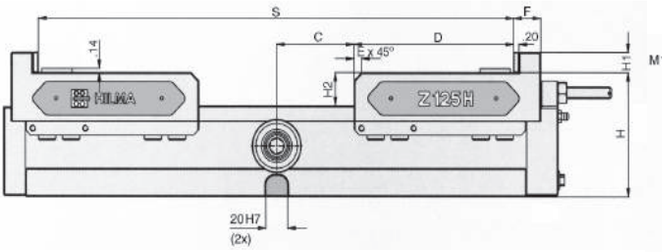
Hydraulic clamping and unclamping is powered by an external pressure transmitter with a double-acting circuit.

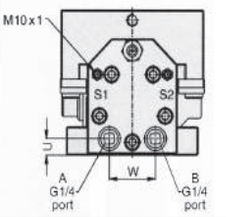
The adjustable synchronizing device ensures high centering precision.



Connections:
Port A - clamping
Port B - unclamping
S_1 - oil lubrication slide 1
S_2 - oil lubrication slide 2







Includes:
- Fitting key, positioning and mounting holes for standard and special jaws
- Keyway across the length for positioning
- Clamping edge for claws
- Lubrication nipples and connections, respectively, for central lubrication.
- Oil ports 1/4 BSPP, A - clamping, B - unclamping

INSTALLATION (EXAMPLE) For hydraulic oil supply, pump units working intermittently are preferred. In the clamped position, the directional valves are idle, and the operating pressure is maintained by an integral check valve.

Two pressure switches (pump control and machine safety) monitor the adjusted operating pressure.

Clamping and unclamping can be controlled by hand-operated valves, by selector or foot-operated switch or, fully automatic, by signals.

Do not exceed 300 psi on unclamp circuit. Recommended power unit CLR-886-EP.

Jaw Width (A)	100mm 3.937"	125mm 4.921"	160mm 6.299"
Max. clamping force (lbs)	3595	5620	8990
Power stroke/slide (in.)	0.87	1.38	1.77
Max. operating pressure (psi)	2175/290	2175/290	2175/290
Fluid required (cu.in.)	3.7	8.4	17
A	3.937	4.921	6.299
A_1	3.937	4.724	5.59
B	2.91	3.86	7.8
B_1	0.39	0.51	0.59
C	1.69	2.8	2.95
D	4.53	5.79	7.28
E	0.28	0.28	0.39
F	0.98	0.98	1.18
G	M8x12	M10x15	M12x18
H	3.74	4.13	4.92
H_1	0.63	0.67	0.79
H_1	1.02	1.1	1.34
L	15.35	19.69	23.62
M	1.18	1.38	1.57
N	0.98	1.38	1.97
N_1	0.98	1.26	1.26
S	12.44	17.17	20.47
U	0.51	0.55	0.63
V	1.30	1.93	2.36
W	1.42	1.65	1.81
Weight (lbs)	49	86	150
Part No.	**CLRH-9-3542-0101-VS**	**CLRH-9-3543-0101-VS**	**CLRH-9-3544-0101-VS**
Part No. with Proximity Switches	**CLRH-9-3542-0201-VS**	**CLRH-9-3543-0201-VS**	**CLRH-9-3544-0201-VS**

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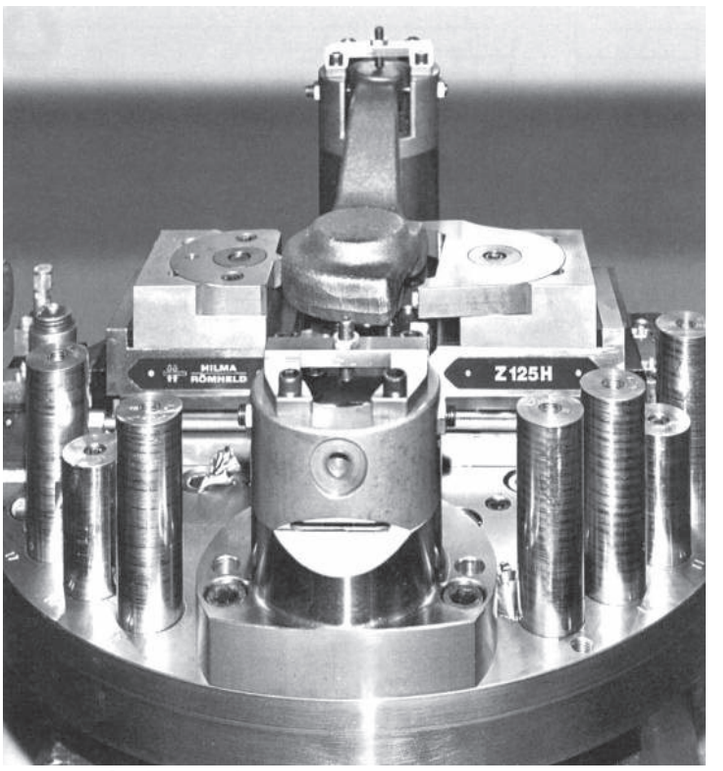
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Concentric Vises

2175 psi max to clamp
290 psi max to unclamp

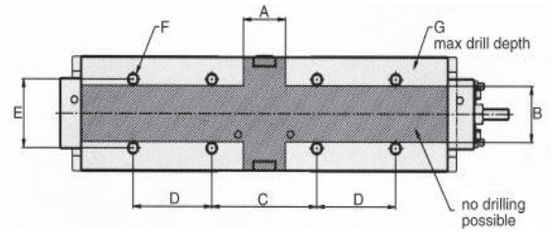


Jaws Quoted Upon Request.



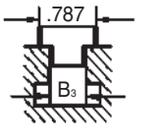
Self-centering vise, hydraulically operated

Drill template for customized fastening



Type	A	B	C	D	E	F	G
Z 100 H	1.58	1.93	3.94	2.95	2.36	M10x15	.78
Z 125 H	1.78	2.17	6.46	3.27	2.68	M12x20	.86
Z 160 H	2.17	2.37	6.30	4.72	3.15	M12x20	.86

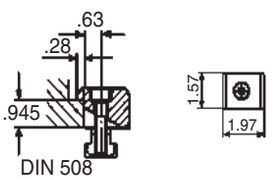
Accessories



Set of tenon blocks
DIN 6323

Part No.	Slot in the machine bed
CLRH-3917-4121-VSA	14h6 (B3)
CLRH-3917-4141-VSA	18h6 (B3)

1 set = 2 blocks



Set of clamping claws with screws M12x45

Part No.	For safe clamping on the machine bed
CLRH-3777-2011-VSA	1 set = 4 claws

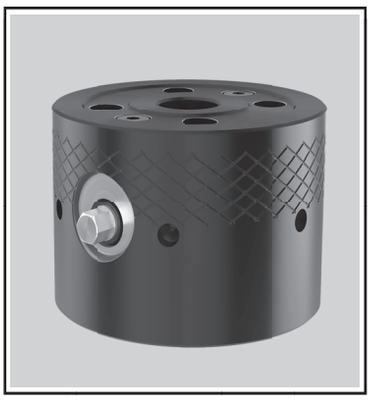
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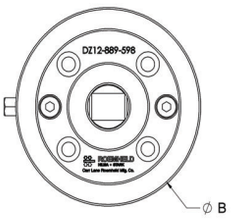
DropZero ■ 5-Axis System ■ Locates, Clamps and Supports a Workpiece Manual Operation ■ Max. Retention Force ■ 2700 lbs



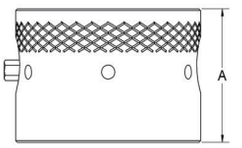
- **Reduces setup time and fixturing costs**
- **Modular design works with all of CLM's 1/2" and 5/8" modular tooling**
- **Can also be used with non-modular tooling**
- **Elevates workpiece for machine spindle clearance**
- **Access to all 5 sides of the part**
- **Stackable for added clearance**
- **High stability due to robust and wide design**

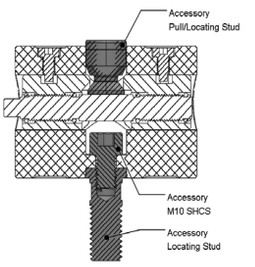
New item!

With a few turns of a wrench, new DropZero Modular Zero-Point System quickly unloads and loads new parts in one setup, all while having access to all five sides of the workpiece. Pull studs (round, diamond, and floating) are mounted directly to a part, and clamp modules can be mounted to any fixture plate and can be stacked for added height. DropZero gives you better part quality due to a completely machined part in one setup, reduced fixturing costs, and simpler tool paths.

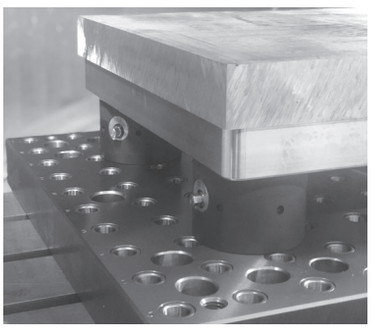




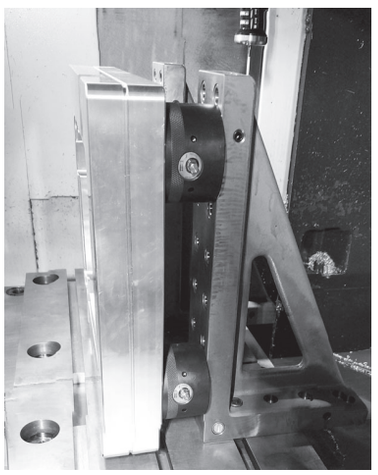




Application Examples



Four DropZeros mounted on a Carr Lane Mfg. modular fixturing plate holding an aluminum billet part.



Example of side work for vertical applications.

Operation	Manual
Type	Zero Point Mounting
Retention force (lbs) / Torque (ft-lbs)	2700 lbs/ 45 ft-lbs [12 kN/ 60 Nm]
A (in.)	2.35 ± 0.0004 in [59.8 ±0.01 mm]
Ø B (in.)	3.50 in [88.9 mm]
Weight (lbs)	5.64 lbs [2.56 kg]
Part No.	**CLR-DZ12-889-598**
Pallet Change Repeatability	**≤ 0.0004 in [0.01 mm]**

Accessories

Part No., housing unit only	**CLR-DZ12-889-598-H**
Part No., zero-point locating stud/screw (1/2-13 UNC-2A)	**CLR-DZ12T-500Z**
Part No., zero-point locating stud/screw (5/8-11 UNC-2A)	**CLR-DZ12T-625Z**
Part No., socket-head cap screw	**CLR-M10-1.50X16-SHCS**
Part No., clamping spindle	**CLR-DZ12M-25**
Part No., zero-point pull stud	**CLR-DZ12N-20Z**
Part No., diamond pull stud	**CLR-DZ12N-20D**
Part No., floating pull stud	**CLR-DZ12N-20F**
Part No., floating pull stud without pallet/part, locating shoulder	**CLR-DZ12N-195**
Part No., locating dowel	**CLR-DZ12D-15**
Custom standoff	**Available on request**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

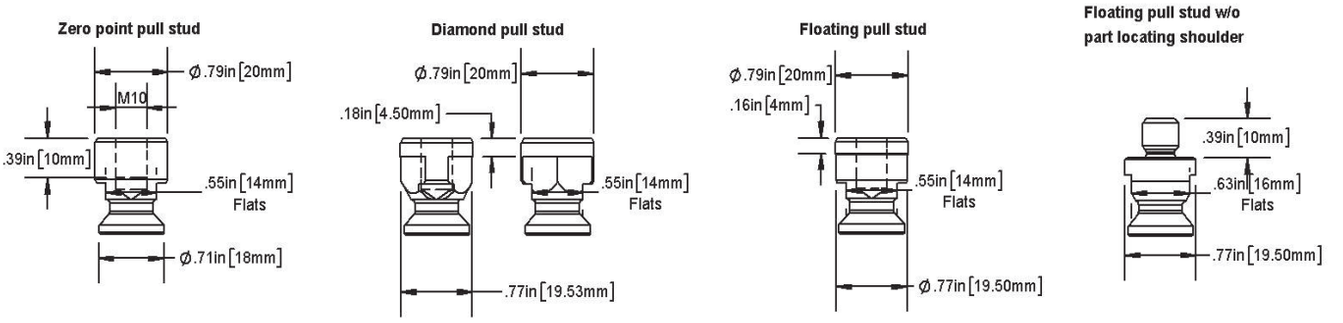
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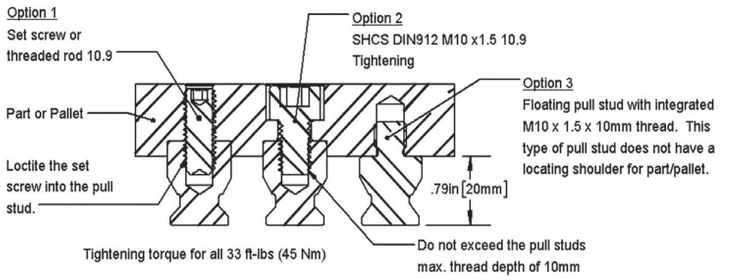
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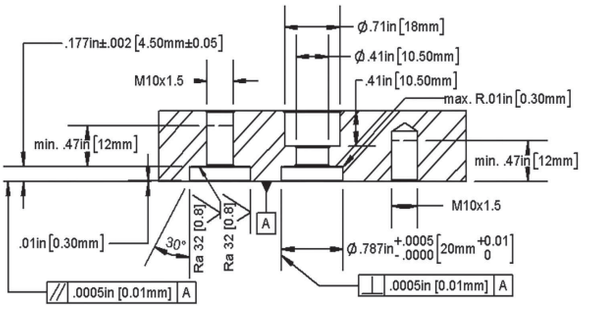
Pull Studs



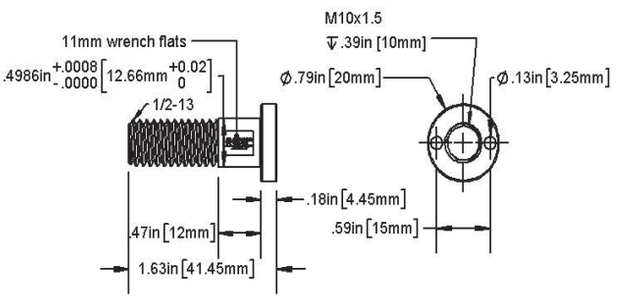
Pull Stud Mounting Options

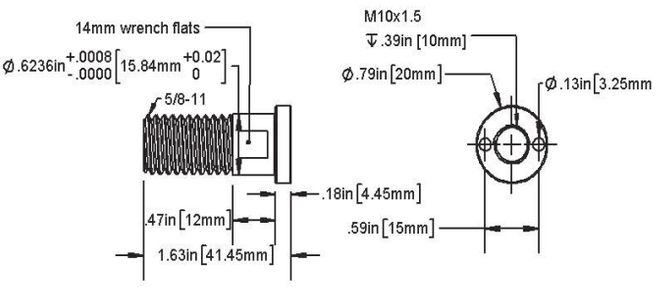


Pull Stud Mounting Options



Locating Studs for Modular Tooling





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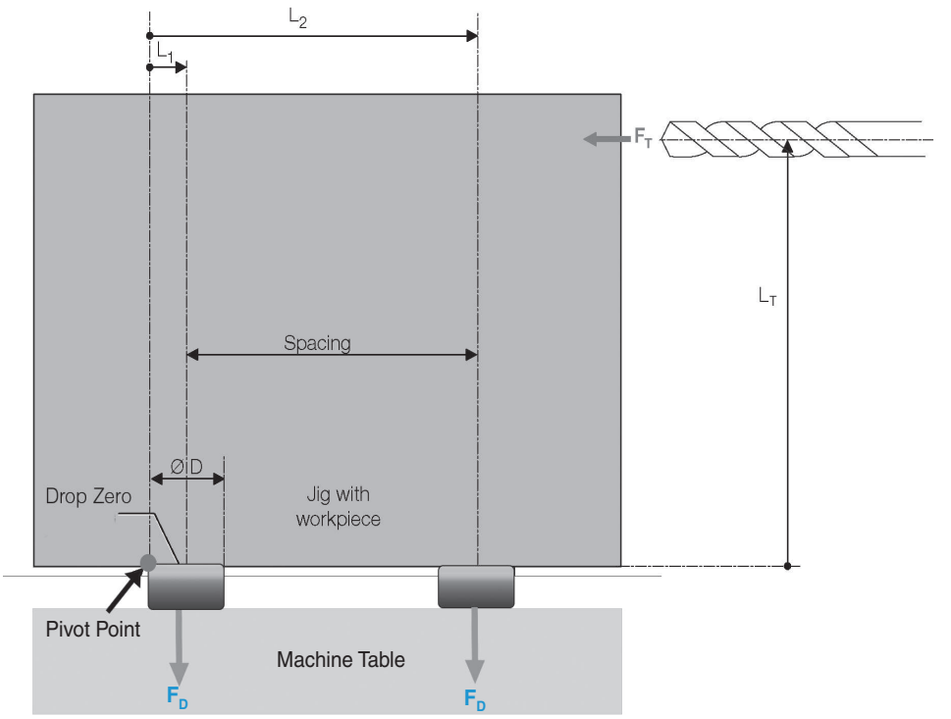
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Tilting torque calculation example
Benefit from our specialist competence

Example:
DropZero clamps, 4x, with 200 x 200 mm spacing and max. feed thrust force of 7 kN with distance of 400 mm.

Question:
Due to the predominance of roughing work, the system should be checked for 2x safety factor. Is the retention force, number of DropZero clamps and the selected spacing right for this application?



Solution:

$M_D > 2 \times M_T$?

$M_T = F_V \times L_V = 7{,}000\ N \times 0.4\ m$
M_T = **2,800 Nm**
$M_D = 2 \times (F_D \times L_1) + 2 \times (F_D \times L_2)$
$M_D = 2x\ F_D \times (L_1 + L_2)$

$L_1 = ØD / 2 = 0.0889/2 = 0.04445$
$L_2 = ØD / 2 + Spacing = 0.04445 + 0.20 = 0.24445$
$L_1 + L_2 = ØD + Spacing$
$L_1 + L_2 = 0.0889\ m + 0.20\ m = 0.2889\ m$

$M_D = 2 \times F_D \times (L_1 + L_2) = 2 \times 12{,}000\ N \times 0.2889\ m$
M_D = **6,933.6 Nm**

M_T : Moment from Feed Thrust Force
M_D : Moment from Retention force
F_T : Feed Thrust Force (7,000 N)
F_D : Retention force (12,000 N)
Spacing = 200 mm = 0.20 m
Ø D: 88.9 mm = 0.0889 m
L_T : 400 mm = 0.40 m

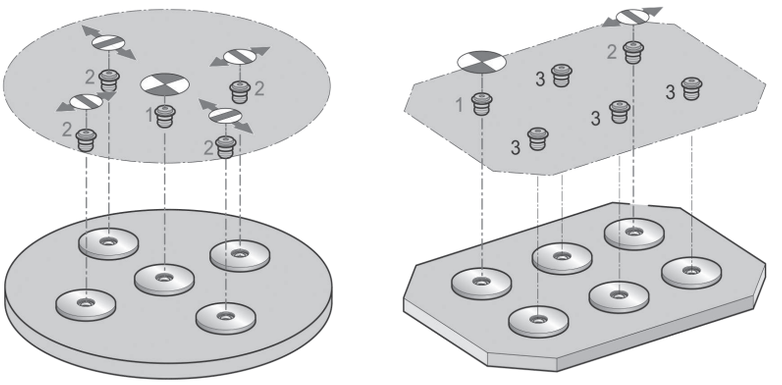
$M_D / M_T > 2$?
M_D / M_T = 6,933 Nm / 2,800 N M_D / M_T = **2.4 > 2** ✔

With this design, a safety factor of two is provided. All dimensions to be entered in SI units (meters, Newtons).

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Application Examples Of Pull Stud Arrangements



Standard Pull Stud Kits

Every standard Pull Stud Kit comes with at least one Zero-Point Pull Stud, one Diamond Pull Stud and one Locating Dowel. These are good for applications that require high repeatability between change overs.

Bundle Kit Part No.*	Quantities in Each Kit					
	DropZero CLR-DZ12-889-598	Locating Dowel CLR-DZ12D-15	Cap Screw CLR-M10-1.50X16-SHCS	Zero Point (Round) Pull Stud CLR-DZ12N-20Z	Diamond Pull Stud CLR-DZ12N-20D	Floating Pull Stud CLR-DZ12N-20F
CLR-DZ12K-2S	2	2	2	1	1	-
CLR-DZ12K-3S	3	3	3	1	1	1
CLR-DZ12K-4S	4	4	4	1	1	2
CLR-DZ12K-5S	5	5	5	1	1	3
CLR-DZ12K-6S	6	6	6	1	1	4

*** Add "F"** to the end of any of the above part numbers to make all the pull studs in the kit "Floating Pull Studs" part number CLR-DZ12N-20F.

*** Add "-500"** to the end of any of the above part numbers to replace the CLR-DZ12D-15 Locating Dowels with CLR-DZ12T-500Z 1/2-13 Locating Studs for use with Carr Lane Mfg. modular tooling.

*** Add "-625"** to the end of any of the above part numbers to replace the CLR-DZ12D-15 Locating Dowels with CLR-DZ12T-625Z 5/8-11 Locating Studs for use with Carr Lane Mfg. modular tooling.

Non-Standard Pull Stud Kits

Non-standard Pull Stud Kits come with Locating Dowels and our Floating Pull Stud that does not have a locating shoulder for mating with your part or pallet. These are best used for setup applications that do not require high repeatability between change overs or when probing will be done prior to machining.

Bundle Kit Part No.*	Quantities in Each Kit			
	DropZero CLR-DZ12-889-598	Locating Dowel CLR-DZ12D-15	Cap Screw CLR-M10-1.50X16-SHCS	Floating pull stud without pallet/part locating shoulder CLR-DZ12N-195
CLR-DZ12K-2F	2	2	2	2
CLR-DZ12K-3F	3	3	3	3
CLR-DZ12K-4F	4	4	4	4
CLR-DZ12K-5F	5	5	5	5
CLR-DZ12K-6F	6	6	6	6

*** Add "-500"** to the end of any of the above part numbers to replace the CLR-DZ12D-15 Locating Dowels with CLR-DZ12T-500Z 1/2-13 Locating Studs for use with Carr Lane Mfg. modular tooling.

*** Add "-625"** to the end of any of the above part numbers to replace the CLR-DZ12D-15 Locating Dowels with CLR-DZ12T-625Z 5/8-11 Locating Studs for use with Carr Lane Mfg. modular tooling.

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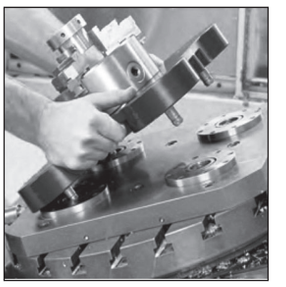


Power Sources



Compact Clamps and Cylinders

Zero Point Mounting





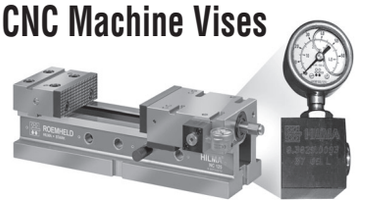
Valves, Fittings & Accessories

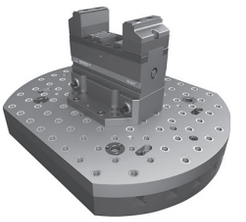




Concentric Clamping Elements

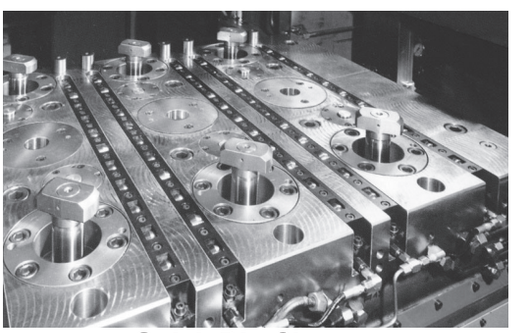
CNC Machine Vises



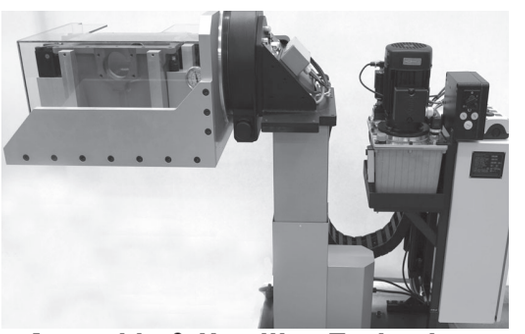


5-Axis Quick-Change Vises

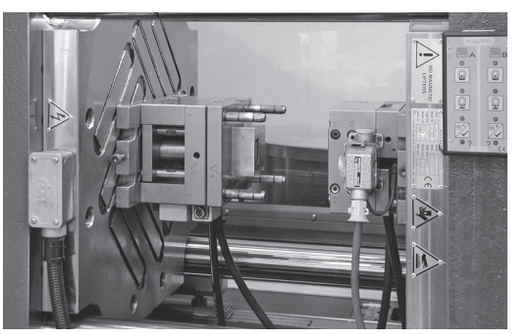
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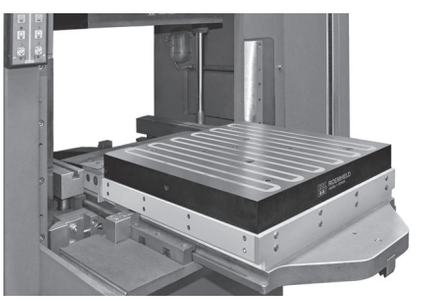
Quick Die Change



Assembly & Handling Technology



Quick Mold Change for Plastics



Quick Mold Change for Rubber

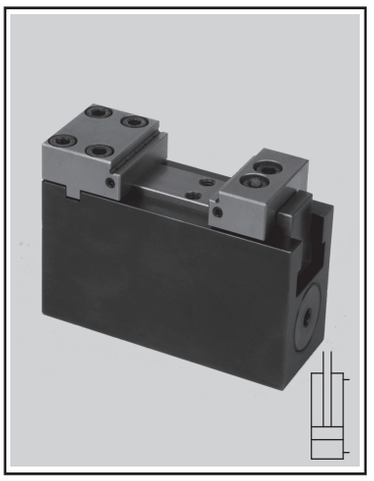
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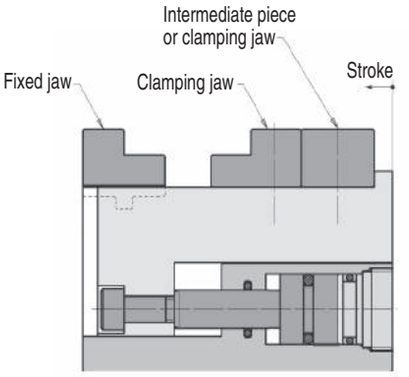
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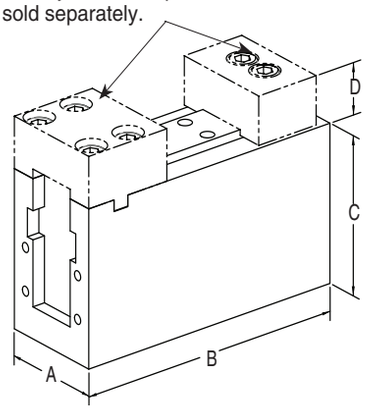
Fixture Clamps with Fixed Jaw ■ Compact vise with jaw widths 1.57" and 2.56" Double Acting ■ Max. Operating Pressure ■ 3625 psi (250 bar)



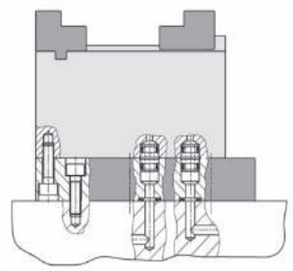
The fixed jaw fixture clamp consists of a very compact body with an integrated hydraulic cylinder that actuates the movable jaw. All threads and ports are at the bottom which allows for a very tight and space savings arrangement. If fastening from the bottom is not possible an adaptor plate for manifold mounting or tube connection is available. Accessory blank jaws are also available that can be milled to match the workpiece contour. The fixed jaw can be equipped with a pneumatic seat control which is well suited for automation applications.



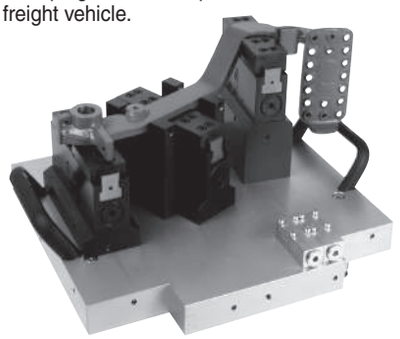
Blank jaws and cap screws sold separately.



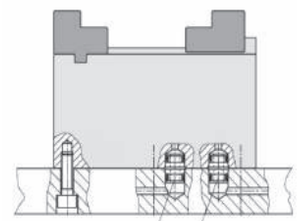
Fixing from above
with accessory adaptor plate
Drilled channels



Application example
Clamping fixture for a pedal of a freight vehicle.

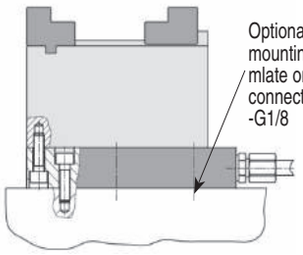


Fixing from below
Drilled channels



Connecting insert

Fitting connection



Jaw Width (in.)		1.57		2.56	
Stroke (in.)		0.20	1.18	0.20	1.77
Clamp Force (lbs)	3625 psi	2135	2135	3370	3370
	2000 psi	1180	1180	1860	1860
	1000 psi	600	600	930	930
A (in.)		1.57	1.57	2.56	2.56
B (in.)		4.13	6.10	6.30	9.45
C (in.)		2.17	2.17	2.56	2.56
D (in.)		0.71	0.71	1.06	1.06
Weight (lbs.)		3.66	4.94	11.13	15.43
Part No.		**CLR-4413-001**	**CLR-4413-031**	**CLR-4413-101**	**CLR-4413-131**

Accessories

Part No., Adapter Mounting Plate	**CLR-0441-300**	**CLR-0441-303**	**CLR-0441-310**	**CLR-0441-313**
Part No., Blank Clamping Jaw	**CLR-3548-070**	**CLR-3548-070**	**CLR-3548-080**	**CLR-3548-080**
Part No., Blank Fixed Jaw	**CLR-3548-071**	**CLR-3548-071**	**CLR-3548-081**	**CLR-3548-081**
Part No., Jaw Screws	**CLR-3301-107**	**CLR-3301-107**	**CLR-3300-700**	**CLR-3300-700**

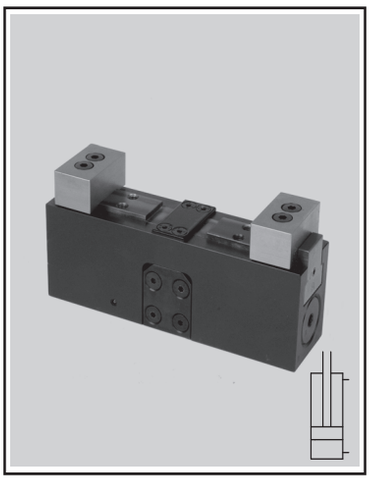
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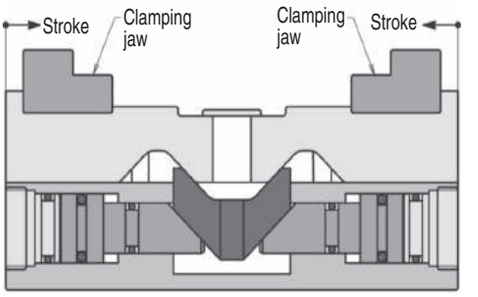
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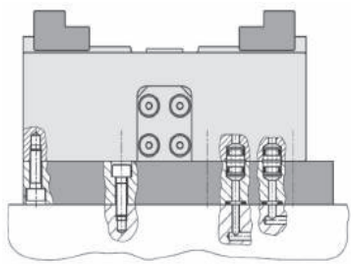
Fixture Clamps, Concentric ■ Compact vise with jaw widths 1.57" and 2.56" Double Acting ■ Max. Operating Pressure ■ 3625 psi (250 bar)



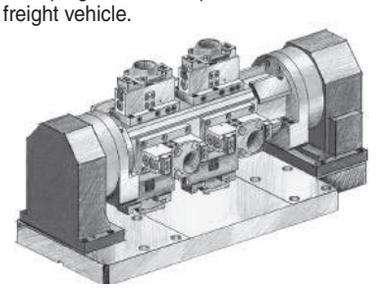
The concentric fixture clamp consists of a very compact body with two integrated hydraulic cylinders that actuate the movable jaws. The piston forces are transferred to a "V" linkage (see cut away below). The "V" linkage then pulls the jaws together in a self-centering fashion. All threads and ports are at the bottom which allows for a very tight and space savings arrangement. If fastening from the bottom is not possible an adaptor plate for manifold mounting or tube connection is available. Accessory blank jaws are also available that can be milled to match the workpiece contour.



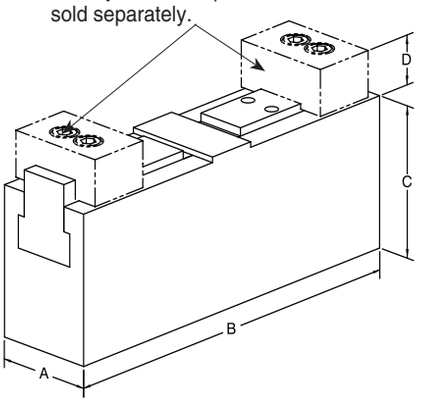
Fixing from above
with accessory adaptor plate
Drilled channels



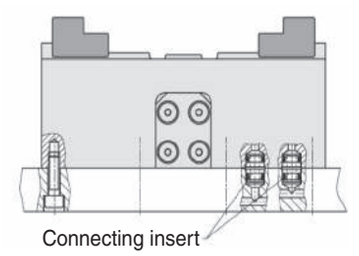
Application example
Clamping fixture for a pedal of a freight vehicle.



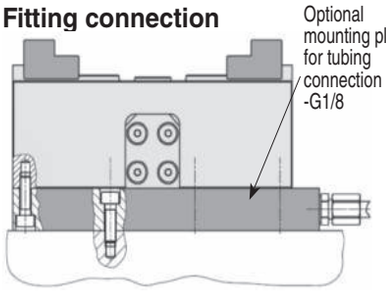
Blank jaws and cap screws sold separately.



Fixing from below
Drilled channels



Fitting connection



Jaw Width (in.)		**1.57**	**2.56**
Stroke per Jaw (in.)		**0.20**	**0.31**
Repeatability +/-		**0.0008**	**0.0008**
Clamp Force per Jaw (lbs)	3625 psi	1460	2025
	2000 psi	805	1115
	1000 psi	405	560
A (in.)		1.57	2.56
B (in.)		6.10	7.87
C (in.)		2.17	2.56
D (in.)		0.71	1.10
Weight (lbs.)		5.29	13.23
Part No.		**CLR-4413-051**	**CLR-4413-151**

Accessories

Part No., Adapter Mounting Plate	**CLR-0441-305**	**CLR-0441-315**
Part No., Blank Clamping Jaw	**CLR-3548-070**	**CLR-3548-080**
Part No., Jaw Screws	**CLR-3301-107**	**CLR-3300-625**

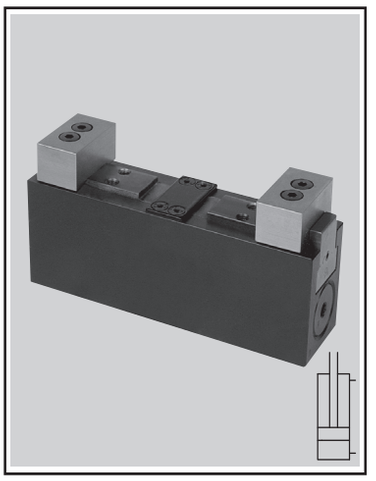
Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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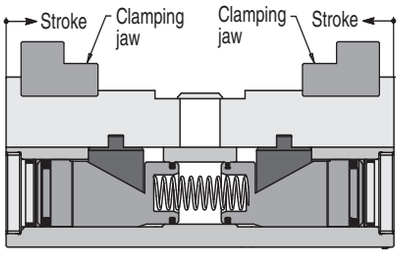
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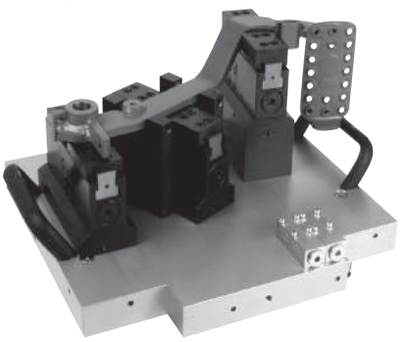
Fixture Clamps, Position Flexible ■ Compact vise with jaw width 1.57"
Double Acting ■ Max. Operating Pressure ■ 3625 psi (250 bar)



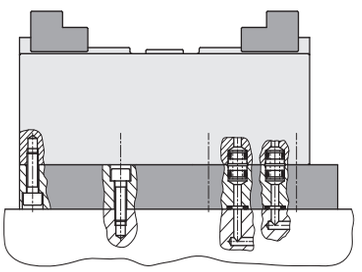
The position flexible fixture clamp consists of a very compact body with integrated hydraulic cylinders that actuate the movable jaws. The piston forces are transmitted via two channels to the clamping slides. The design allows the clamping slides to move independently of each. A minimal contact force is applied to the part until both jaws are in contact with the workpiece. At that point the pressure builds along with the clamping force. All threads and ports are at the bottom which allows for a very tight and space savings arrangement. If fastening from the bottom is not possible an adaptor plate for manifold mounting or tube connection is available. Accessory blank jaws are also available that can be milled to match the workpiece contour.



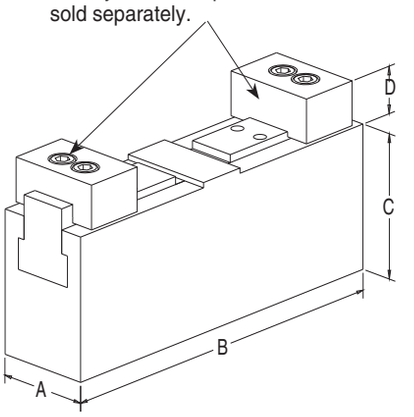
Application example
Clamping fixture for a pedal of a freight vehicle.



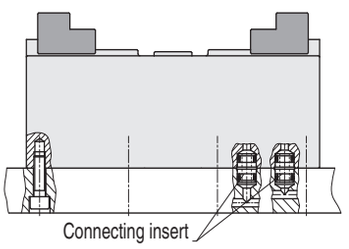
Fixing from above
with accessory adaptor plate
Drilled channels



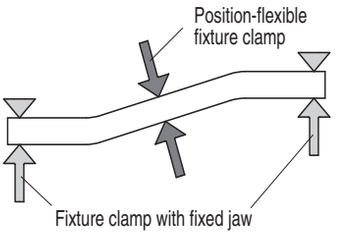
Blank jaws and cap screws sold separately.



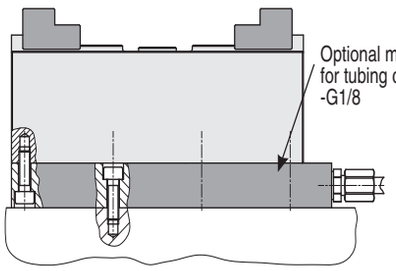
Fixing from below
Drilled channels



Clamping principle



Pipe thread



Jaw Width (in.)		1.57
Stroke per Jaw (in.)		0.31
Clamp Force per Jaw (lbs)	3625 psi	1800
	2000 psi	990
	1000 psi	495
A (in.)		1.57
B (in.)		6.10
C (in.)		2.17
D (in.)		0.71
Weight (lbs.)		5.51
Part No.		**CLR-4413-080**

Accessories

Part No., Adapter Mounting Plate	**CLR-0441-305**
Part No., Blank Clamping Jaw	**CLR-3548-070**
Part No., Jaw Screws	**CLR-3301-107**

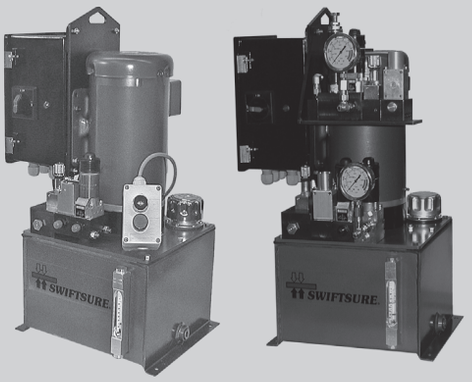
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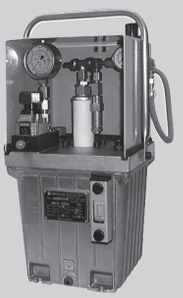
Power Sources



Electric Power Units
pages 682-685

Electric Power Units

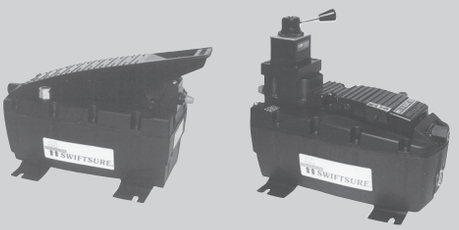
Electric Power Units are the best power source for most uses. Complete, compact, quiet, and fully automatic. Include pump, reservoir, switches, valves, gauge, and numerous safety devices. Extremely long life. Enough fluid capacity for virtually any fixture. Up to 7250 psi output pressures. 120, 220, or 440 volt.



Air Power Units
pages 686-687

Air Power Units

Economical power source, driven by shop air pressure, includes pump, reservoir, valves, gauges, air filter, muffler, and air extractor/ dryer. Very quiet. Ideal for hazardous locations. Enough fluid capacity for virtually any fixture. Up to 7250 psi output pressure.



Compact Air Power Units
page 688

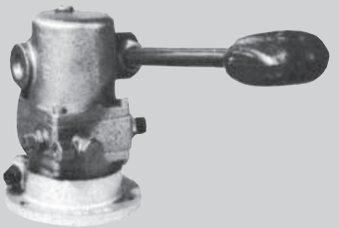
Compact Air Power Units are ideal for smaller hydraulic clamping and assembly fixtures with single or double-acting hydraulic elements. Ordinary shop air is all that is required to drive these units.

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Power Sources



Single Stage Pump
pages 689

Hand Pumps

Manual power source for moderate-size factors. Compact and portable. Ideal for sensitive test fixtures. Choice of hand or foot operation.



Screw Pumps
pages 690

Screw Pumps

Small enough to mount directly on fixture. Operate manually or with a power torque wrench. Ideal for rotary index tables and palletized fixtures where a feed line is impractical.



Compact Hydraulic Intensifier
pages 691-692

Hydraulic Intensifiers

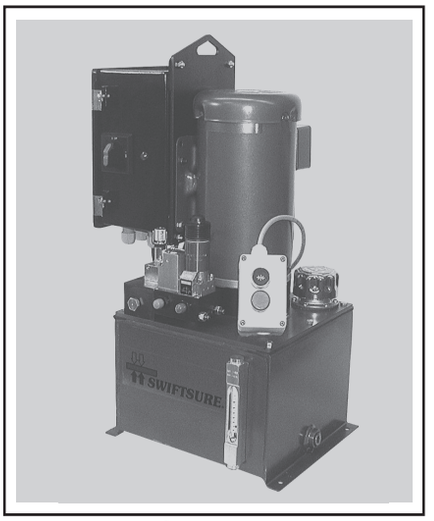
Hydraulic Intensifiers convert hydraulic pressure on the input to a higher pressure on the output. This compact cylinder style intensifier enables the use of the comparatively low pressure of machine tool hydraulics to pressurize hydraulic clamping fixtures with a correspondingly increased input pressure.

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Electric Power Units

7250/5000 psi max
Single and double acting

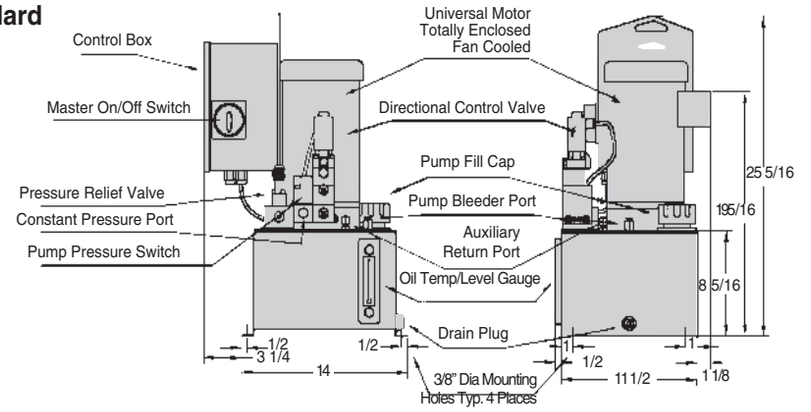


- **Complete power unit with electrical and hydraulic controls**
- **Totally enclosed fan cooled single and three phase universal motors**
- **Thermal overload relay with automatic reset when normal conditions return**
- **Remote clamp-unclamp push button switch(s)**
- **Pressure adjustable from 1500 to maximum**
- **Quiet long life radial piston pump**
- **Filler breather with inlet screen**
- **Leak free fittings and poppet valves**

SETUP AND OPERATION: Connect to fused electrical supply, fill with clean, approved hydraulic fluid and connect to fixture. Mount push button clamping switch near the operator (two furnished with shuttle machine units). Push one button to clamp and unclamp.

OPERATING PRINCIPLES: The heart of the unit is a precision, long-life radial-piston pump controlled upon pressure demand by the integral pressure switch. This switch is adjustable, to give you precise and repeatable clamping forces. Automatic pressure control is assured, because the pump restarts if pressure drops. Clamping pressure is assured even with an electrical power failure since the solenoid valves are mechanically held in the clamped position - and only need power to unclamp. The poppet design of these valves means positive, leakage-free sealing.

Standard



Adjustable Operating Pressure	1160-7250		725-5075		725-5075	
Power supply	460 volts 3 Phase 60Hz	230 volts 3 Phase 60Hz	230 volts 1 Phase 60Hz	115 volts 1 Phase 60Hz	460 volts 3 Phase 60Hz	230 volts 3 Phase 60Hz
Flow rate (cu.in/min)	66	66	66	66	106	106
Usable fluid capacity (cu.in)	400	400	400	400	400	400
Reservoir capacity (cu.in.)	690	690	690	690	690	690
Motor horsepower	1.5	1.5	1.0	1.0	1.5	1.5
Motor amperage	2.1	4.2	6.4	12.8	2.1	4.2
Noise level @ 3 ft.(dBA)	75	75	75	75	75	75
Max. uninterrupted running time (sec.)	15-120	15-120	15-120	15-120	15-120	15-120
Max. % of cycle pump should operate	25-40%	25-40%	25-40%	25-40%	25-40%	25-40%
Weight (lbs.)	110	110	110	110	110	110
Part No. Basic Pump (No Controls or Valves)	**CLR-9301-EP**	**CLR-8301-EP**	**CLR-93011-EP**	**CLR-83011-EP**	**CLR-9302-EP**	**CLR-8302-EP**
Part No. Single Acting System	**CLR-931-EP**	**CLR-831-EP**	**CLR-9321-EP**	**CLR-8321-EP**	**CLR-932-EP**	**CLR-832-EP**
Part No. Double Acting System	**CLR-933-EP**	**CLR-833-EP**	**CLR-9341-EP**	**CLR-8341-EP**	**CLR-934-EP**	**CLR-834-EP**
2 Independent S/A systems (shuttle machining)	**CLR-935-EP**	**CLR-835-EP**	**CLR-9361-EP**	**CLR-8361-EP**	**CLR-936-EP**	**CLR-836-EP**
2 Independent D/A systems (shuttle machining)	**CLR-937-EP**	**CLR-837-EP**	**CLR-9381-EP**	**CLR-8381-EP**	**CLR-938-EP**	**CLR-838-EP**
Manual Decoupling System Double Acting	**CLR-939-EP**	**CLR-839-EP**	**CLR-9401-EP**	**CLR-8401-EP**	**CLR-940-EP**	**CLR-840-EP**
Auto Decoupling System S/A Customer control	**CLR-941-EP**	**CLR-841-EP**	**CLR-9421-EP**	**CLR-8421-EP**	**CLR-942-EP**	**CLR-842-EP**
Auto Decoupling System D/A Customer control	**CLR-943-EP**	**CLR-843-EP**	**CLR-9441-EP**	**CLR-8441-EP**	**CLR-944-EP**	**CLR-844-EP**

All Pump Systems contain Controls and Valve packages ready to go. No add on packages required. Fluid Recommendations are in F&A section.
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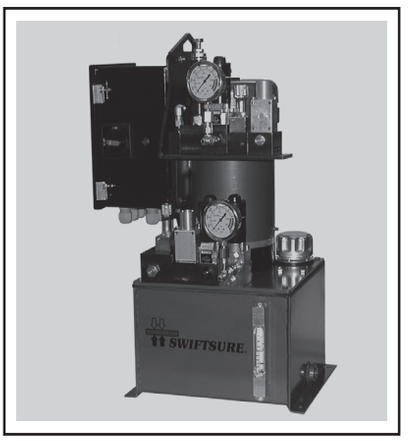
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Electric Power Units

7250/5000 psi max
Multi-Pressure in single and double acting

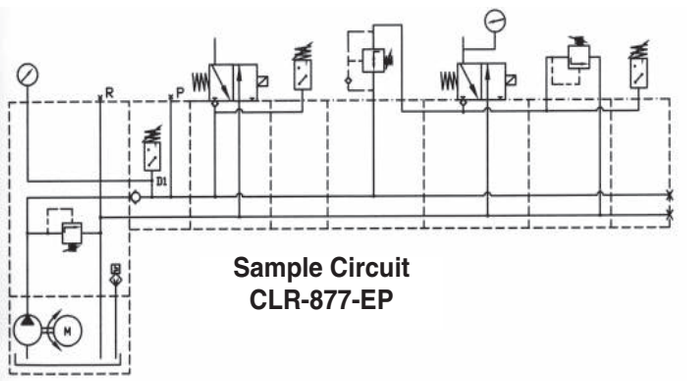


Multi-Pressure Pumps

- **Complete power unit with electrical and hydraulic controls**
- **Enclosed fan-cooled single or three phase motor with thermal protection**
- **Combination temperature/ level switch for pump protection**
- **Remote clamp-unclamp push button switch(es)**
- **Pressure adjustable from minimum to maximum as shown in pump chart**
- **Quiet long life radial piston pump**
- **Filler breather with inlet screen**
- **Leak free fittings and poppet valves**
- **Additional pressure gauges provided for reduced pressure circuits**

SET-UP SUMMARY: Connect to fused electrical supply, fill with oil, and connect to fixture. Prime pump and adjust to desired pressure. Mount push button switch(es) near the operator. Push one button to clamp and unclamp. For complete set-up instructions, see operating manual.

OPERATING PRINCIPLES: The heart of the unit is a precision, long-life radial-piston pump controlled upon pressure demand by the integral pressure switch. This switch is adjustable, to give you precise and repeatable clamping forces. The secondary pressure is controlled by a poppet style pressure reducing valve. This secondary low pressure circuit is adjustable between 450 and 5500 psi. Automatic pressure control is assured, because the pump restarts if pressure drops. Clamping pressure is assured even with an electrical power failure since the solenoid valves are mechanically held in the clamped position - and only need power to unclamp. The poppet design of these valves means positive, leakage-free sealing.



Sample Circuit
CLR-877-EP

Adjustable Operating Pressure	1160-7250 psi		725-5075 psi		725-5075 psi	
Power supply	460 volts 3 Phase 60Hz	230 volts 3 Phase 60Hz	230 volts 1 Phase 60Hz	115 volts 1 Phase 60Hz	460 volts 3 Phase 60Hz	230 volts 3 Phase 60Hz
Flow rate (cu.in./min.)	66	66	66	66	106	106
Usable fluid capacity (cu.in.)	400	400	400	400	400	400
Reservoir capacity (cu.in.)	690	690	690	690	690	690
Motor horsepower	1.5	1.5	1.0	1.0	1.5	1.5
Motor amperage	2.1	4.2	6.4	12.8	2.1	4.2
Nose level @ 3ft.(dBA)	75	75	75	75	75	75
Max. uninterrupted running time (sec.)	15-120	15-120	15-120	15-120	15-120	15-120
Max. % of cycle pump should operate	25-40%	25-40%	25-40%	25-40%	25-40%	25-40%
Two S/A Circuits, One Reduced W/One Pendent	**CLR-951-EP**	**CLR-851-EP**	**CLR-9521-EP**	**CLR-8521-EP**	**CLR-952-EP**	**CLR-852-EP**
Two D/A Circuits, One Reduced W/One Pendent	**CLR-953-EP**	**CLR-853-EP**	**CLR-9541-EP**	**CLR-8541-EP**	**CLR-954-EP**	**CLR-854-EP**
Two S/A Circuits, One Reduced W/Two Pendents	**CLR-955-EP**	**CLR-855-EP**	**CLR-9561-EP**	**CLR-8561-EP**	**CLR-956-EP**	**CLR-856-EP**
Two D/A Circuits, One Reduced W/Two Pendents	**CLR-957-EP**	**CLR-857-EP**	**CLR-9581-EP**	**CLR-8581-EP**	**CLR-958-EP**	**CLR-858-EP**
Two S/A Circuits, One Reduced W/One Pendent & Two Pressure Switches	**CLR-959-EP**	**CLR-859-EP**	**CLR-9601-EP**	**CLR-8601-EP**	**CLR-960-EP**	**CLR-860-EP**
Two D/A Circuits, One Reduced W/One Pendent & Two Pressure Switches	**CLR-971-EP**	**CLR-871-EP**	**CLR-9721-EP**	**CLR-8721-EP**	**CLR-972-EP**	**CLR-872-EP**
Two S/A Circuits, One Reduced W/Two Pendents & Two Pressure Switches	**CLR-973-EP**	**CLR-873-EP**	**CLR-9741-EP**	**CLR-8741-EP**	**CLR-974-EP**	**CLR-874-EP**
Two D/A Circuits, One Reduced W/Two Pendents & Two Pressure Switches	**CLR-975-EP**	**CLR-875-EP**	**CLR-9761-EP**	**CLR-8761-EP**	**CLR-976-EP**	**CLR-876-EP**
Two S/A Circuits, One Reduced W/One Pendent, Two Pressure Switches & One Pressure Relief Valve	**CLR-977-EP**	**CLR-877-EP**	**CLR-9781-EP**	**CLR-8781-EP**	**CLR-978-EP**	**CLR-878-EP**
Two D/A Circuits, One Reduced W/One Pendent, Two Pressure Switches & One Pressure Relief Valve	**CLR-979-EP**	**CLR-879-EP**	**CLR-9801-EP**	**CLR-8801-EP**	**CLR-980-EP**	**CLR-880-EP**
Two S/A Circuits, One Reduced W/Two Pendents, Two Pressure Switches & One Pressure Relief Valve	**CLR-981-EP**	**CLR-881-EP**	**CLR-9821-EP**	**CLR-8821-EP**	**CLR-982-EP**	**CLR-882-EP**
Two D/A Circuits, One Reduced W/Two Pendents, Two Pressure Switches & One Pressure Relief Valve	**CLR-983-EP**	**CLR-883-EP**	**CLR-9841-EP**	**CLR-8841-EP**	**CLR-984-EP**	**CLR-884-EP**

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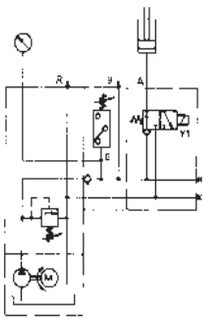
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Electric Power Units

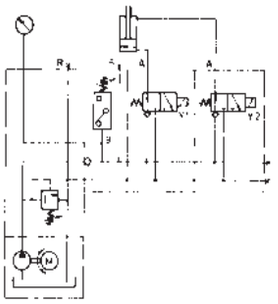
7250/5000 psi max
Single and double acting

CONTROL OPTIONS: Electric Power Units are offered with three standard hydraulic/electrical-control options: (1) Single acting, (2) Double acting, (3) Single acting for two independent fixtures.

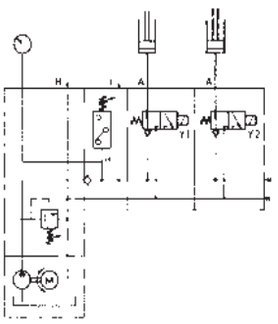
The following hydraulic-circuit diagram shows a single-acting unit.



The diagram below shows a double-acting unit. Double-acting units can be used as single acting units simply by capping the return pressure connection, with a CLR-501-F cap fitting.

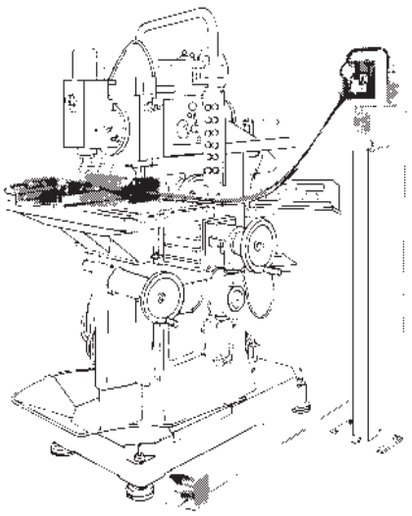


The third diagram shows a single-acting unit for two independent fixtures (shuttle machining). These units have separate clamping switches and valves for each fixture.

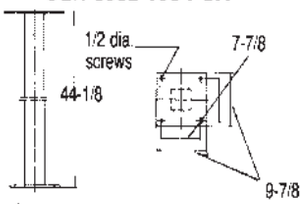


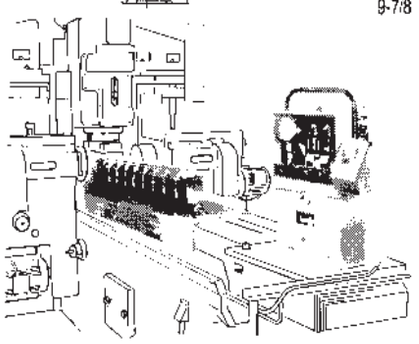
SAFETY FEATURES: Fail-safe operation in case of electrical-power failure since the solenoid-operated clamping valves are de-energized in "clamped" position. These valves are poppet type, so they provide tight zero leakage sealing. Units are also equipped with fluid-level and fluid-temperature sensors to protect power units from abuse. If fluid level drops below a minimum level or fluid temperature exceeds 140° F, the unit shuts off and lights an LED. When fluid is replenished or temperature drops, the unit resets itself automatically.

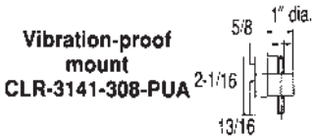
MOUNTING: Mount unit upright, preferably above fixture level to keep unit clean. We offer an attractive, economical power-unit stand (below) that bolts to the floor. For mounting directly on machine-tool tables, we offer a vibration-proof mount (also below).



Power Unit Stand
CLR-3532-168-PUA

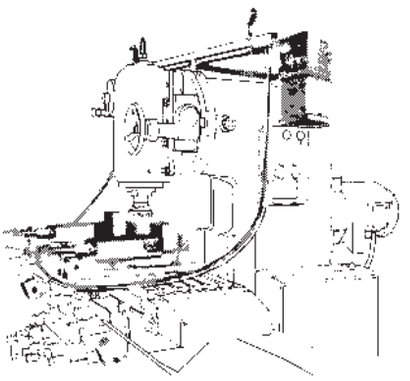




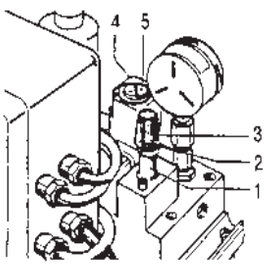


Vibration-proof mount
CLR-3141-308-PUA

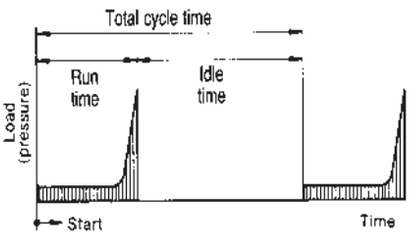
Units can also be mounted on the machine tool using an angle bracket. The photo below shows an overhead traverse bar for convenient hose arrangement. Push-button switches are installed within the operator's reach.



PRESSURE SETTING: Set system pressure by adjusting the setting screw (5) on the unit's pressure switch (4) in combination with the knurled knob (3) on the unit's pressure-relief valve (1). Basically, the pressure switch establishes the minimum system pressure (10% drop below setting) and the pressure-relief valve establishes the maximum in case of over pressurization.



DUTY CYCLE: Electric Power Units are designed specifically and purely for work-holding, with intermittent clamping and unclamping between machining cycles (not continuous running). For most workholding applications, actual running time is a small percentage of total cycle time. The graph below shows typical pump-pressure buildup during a machining cycle.

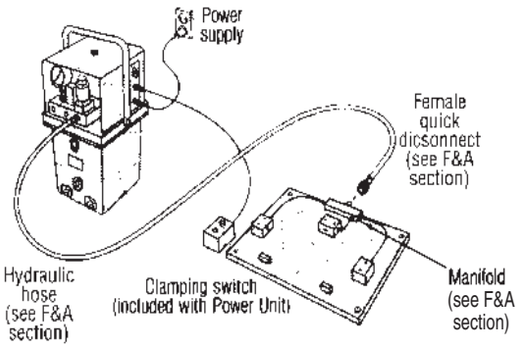


Run time must be less than 40% of total cycle time with maximum fluid level, 25% with minimum fluid level (7250-psi units). Run time must also be less than 120 seconds with maximum fluid level, 15 seconds with minimum fluid level (7250-psi units). Otherwise the fluid will overheat and the unit will shut off automatically.

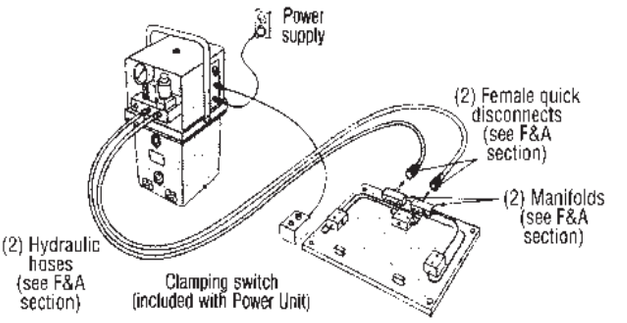
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Electric Power Units

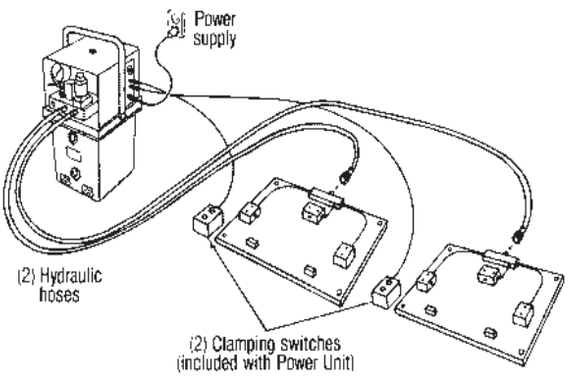
Connection Examples



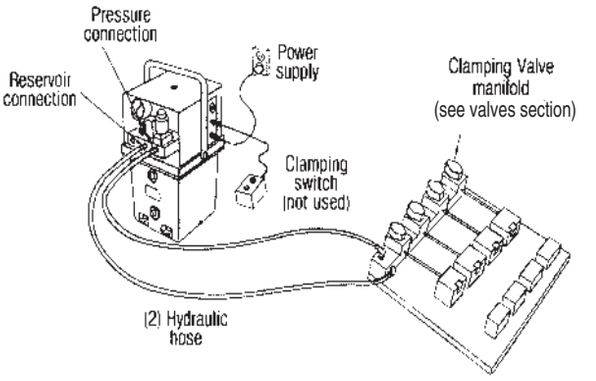
Single Fixture
Single Acting
(use any Electric Power Unit)



Single Fixture
Double Acting
(use CLR-933-EP or CLR-833-EP)



Two Fixtures
Single Acting
(use CLR-935-EP or CLR-835-EP)



Multiple Parts Clamped Independently
Single Acting or Double Acting
(use any Electric Power Unit)

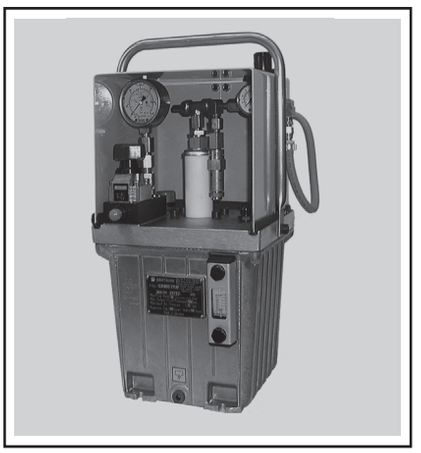
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Air Power Units

7250 psi max
Single and double acting



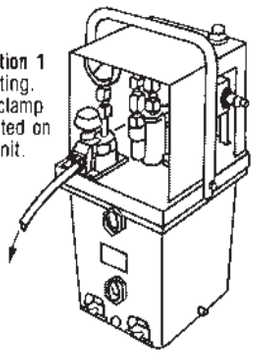
- **Economical and self-contained. . .just fill with fluid**
- **Up to 7250 psi from shop air pressure (only 70-psi air pressure required)**
- **Tandem, reciprocating pump automatically restarts to maintain system pressure**
- **Holds pressure even if air supply fails**
- **Safe in hazardous locations**
- **Complete turnkey unit includes clamping valve, filter/regulator/ lubricator, air and hydraulic pressure gauges, muffler, and air extractor/dryer**

**** Do not use NPT fittings**

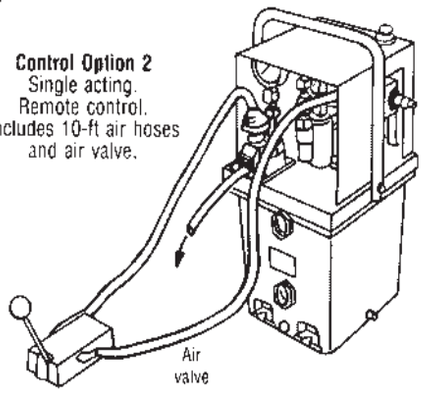
OPERATION: Unit is ready to run after you fill the reservoir with fluid (order separately, F&A section) and connect it to an air supply. Adjust the input air pressure, using the unit's air regulator, to adjust output fluid pressure (2200 to 7250-psi range). Only 70-psi air pressure is required to provide 7250-psi fluid pressure.

FLOW CONTROL: When using these power units in small circuits containing a Swing Clamp, Extending Clamp, or fluid-advanced Work Support, a simple flow control valve may be necessary. If clamps do not cycle properly, install flow control valve anywhere along the fluid lines to control flow to any or all workholding components.

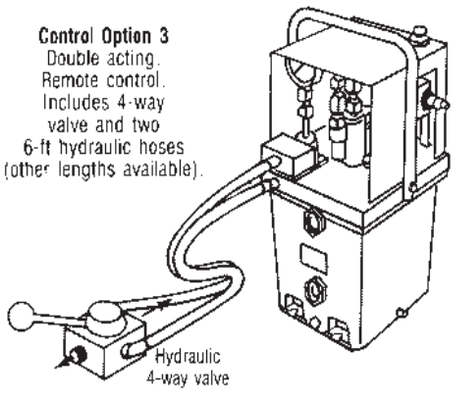
Control Option 1
Single acting.
Clamp/unclamp valve mounted on power unit.

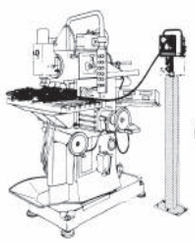


Control Option 2
Single acting.
Remote control.
Includes 10-ft air hoses and air valve.



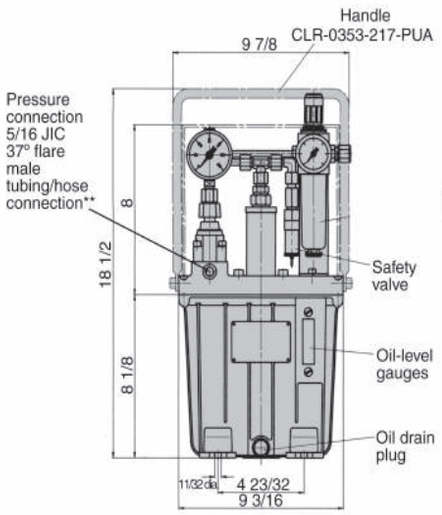
Control Option 3
Double acting.
Remote control.
Includes 4-way valve and two 6-ft hydraulic hoses (other lengths available).

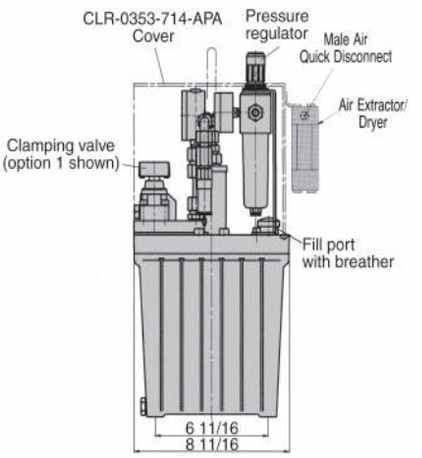




Power Unit Stand CLR-3532-168-PUA available upon request

Input Air Pressure (psi)	Output Fluid Pressure (psi)											
	Free flow		1500		3000		4500		6000		7250	
	Flow Rate cu. in./min.	Input Air Vol. CFM	Flow Rate cu. in./min.	Input Air Vol. CFM	Flow Rate cu. in./min.	Input Air Vol. CFM	Flow Rate cu. in./min.	Input Air Vol. CFM	Flow Rate cu. in./min.	Input Air Vol. CFM	Flow Rate cu. in./min.	Input Air Vol. CFM
30	74	23	46	14	8	4	—	—	—	—	—	—
40	82	29	62	22	35	13	—	—	—	—	—	—
50	88	37	69	30	50	20	24	10	—	—	—	—
60	91	43	75	36	60	28	38	18	8	5	—	—
70 and higher	94	48	80	42	68	35	50	27	27	15	5	3





Fluid Recommendations see F&A section.

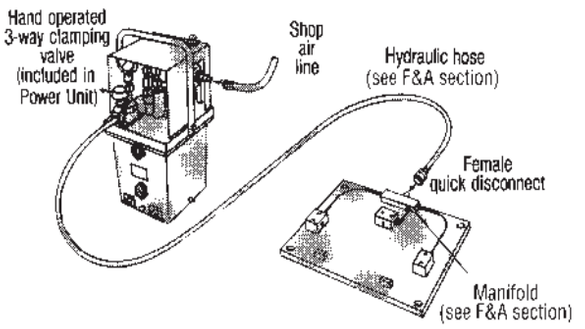
Operating pressure range	2350-7250 psi
Intensification Ratio	108:1
Flow Rate (cu. in./min.)	see table
Min. input air pressure (psi)	14.5
Usable fluid capacity (cu. in.)	150
Reservoir capacity (cu. in.)	260
Noise level at 3 ft. (dBA)	76
Weight (lbs)	50
Part No. Control option 1	**CLR-100-AP**
Part No. Control option 2	**CLR-102-AP**
Part No. Control option 3	**CLR-105-AP**
Part No. Pump without valves	**CLR-106-AP**

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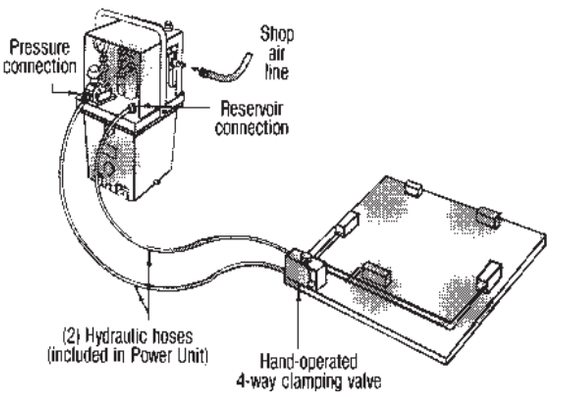
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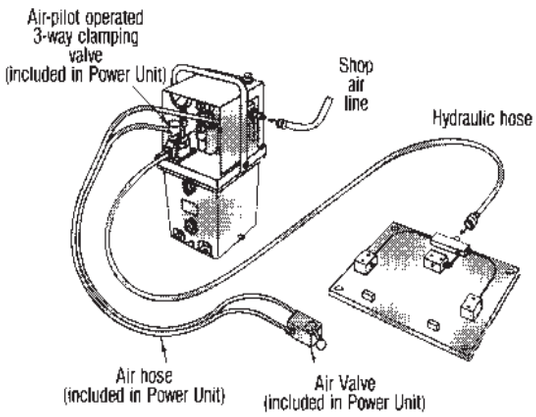
Connection Examples



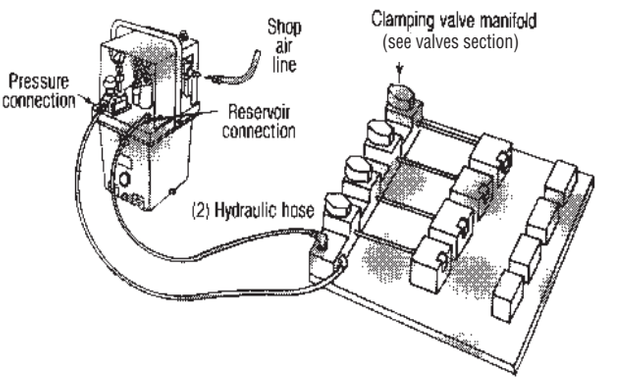
Single Fixture
Valve mounted on unit
Single Acting
CLR-100-AP



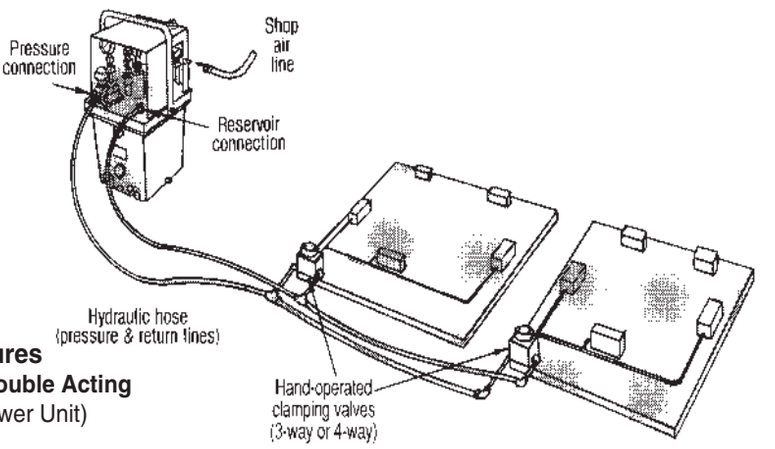
Single Fixture
Double Acting
CLR-103-AP



Single Fixture
Remote Valve
Single Acting
CLR-102-AP



Multiple Parts Clamped Independently
Single Acting or Double Acting
(Use any Air Power Unit)



Two Fixtures
Single Acting or Double Acting
(use any Air Power Unit)

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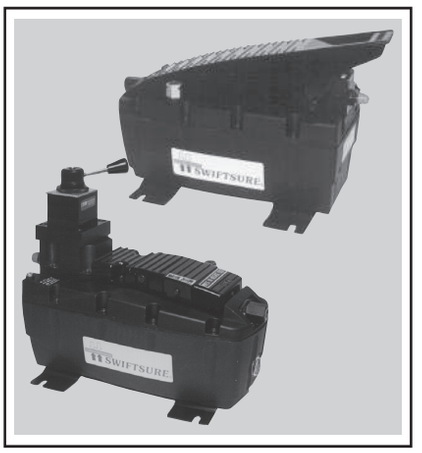
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Air Power Units

7250 psi max
Single/double acting

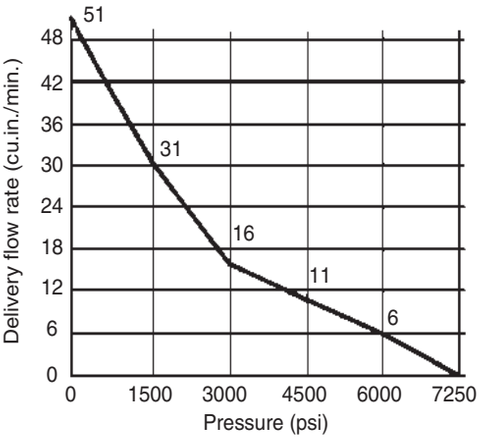


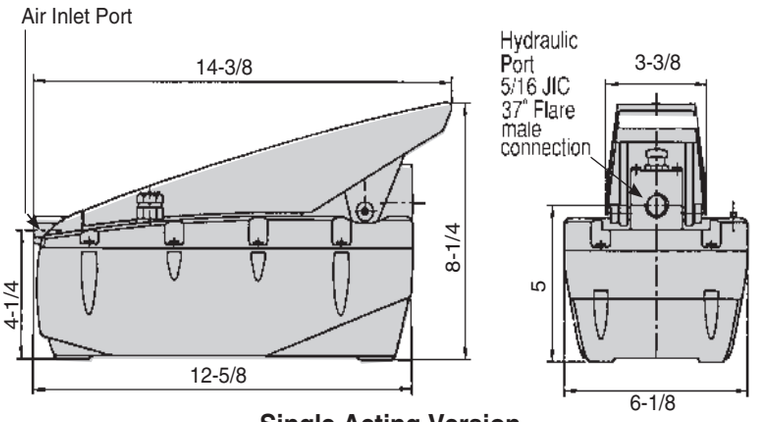
- **The hydro-pneumatic pump unit can be operated with oil-free air.**
- **Due to suitable sound insulation only minimum working noises are obtained.**
- **The low starting pressure (40 psi) guarantees a quick start of the pump and short cycle time.**
- **The hydro-pneumatic pump unit is delivered ready for connection**

APPLICATION: The hydro-pneumatic pump unit is particularly suitable for smaller hydraulic clamping and assembly fixtures with single or double-acting hydraulic elements. As the power supplied is compressed air, it can be used without restriction in hazardous surroundings.

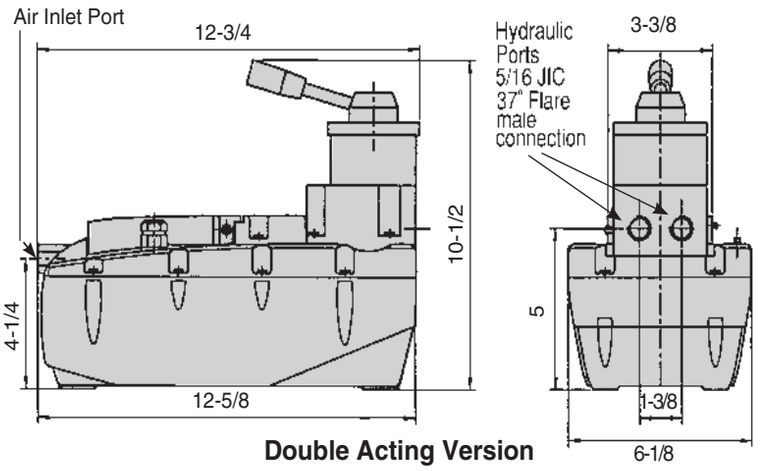
OPERATION: **Single acting version** The single-acting hydro-pneumatic pump unit is manually operated. By operating the pedal the fixture will be clamped or unclamped. The pump delivers oil as long as necessary to achieve the desired hydraulic operating pressure. The air pressure is adjusted by a pneumatic service unit and maintained by an integrated check valve.

Double acting version By means of a locking device the pneumatic directional control valve (at the pneumatic side) is permanently in the opened switching position. By means of the mounted hand-operated hydraulic 4/3 directional control valve double-acting cylinders can be controlled. In the case of a pressure loss, the pneumatic pump operates automatically until the desired hydraulic pressure is realized.

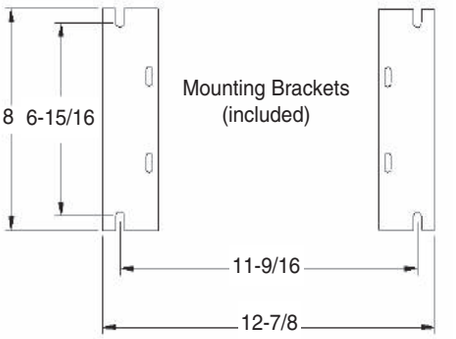




Single Acting Version



Double Acting Version



Operating Pressure Range	4000-7250 psi
Intensification Ratio	100:1
Flow Rate (cu.in./min.)	see graph
Min. input air pressure (psi)	40
Usable fluid capacity (cu.in.) Horiz/Vert	125/90
Reservoir capacity (cu.in.) Horiz/Vert	150/135
Connecting Threads	
• Oil	G 1/4 BSPP
• Air	1/4 NPT
Weight (lbs)	14
Part No., single acting	**CLR-200-AP**
Part No., double acting	**CLR-203-AP**
Part No., pump only - no valves	**CLR-201-AP**

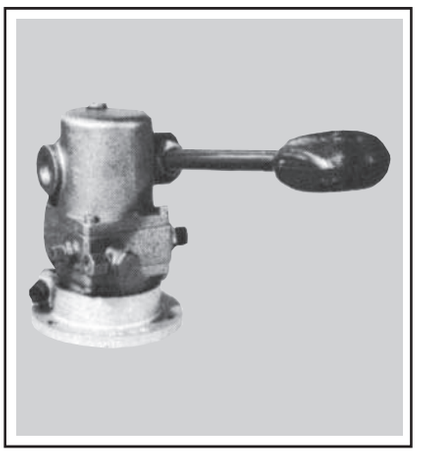
Fluid Recommendations see F&A section.

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Hand Pumps

7250/3000 psi max
Single acting



Single Stage

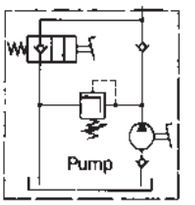
- **Very compact**
- **Pump and release with the same lever**
- **Easily adjustable pressure setting**
- **Choice of hand or foot operation**

**** Do not use NPT fittings**

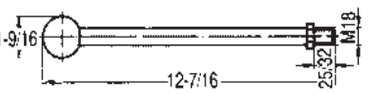
CLAMPING: Move pump lever downward to pump fluid, through a 40-degree stroke. Lever returns upward by spring force. Repeat until you reach the set pressure and the lever declutches.

UNCLAMPING: Lift pump lever 10 degrees upward against spring force to release clamping force instantly.

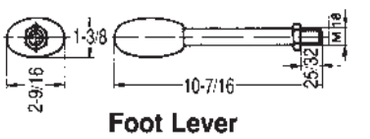
CONSTRUCTION: Totally self-contained power source. Virtually wearfree due to metallic seal on pump piston.



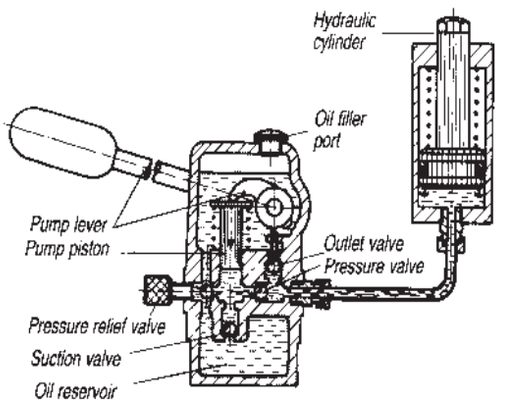
Symbol

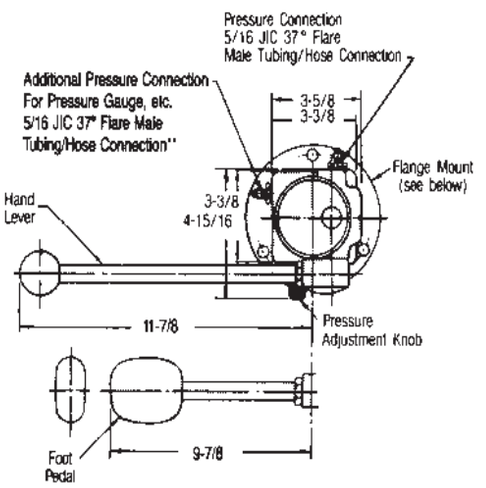


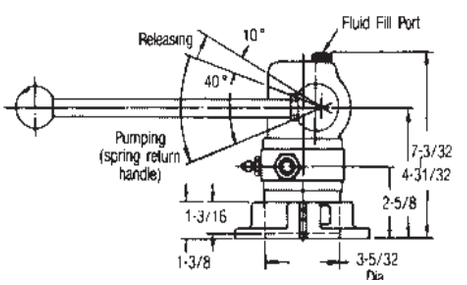
Hand Lever
CLR-003-HPA

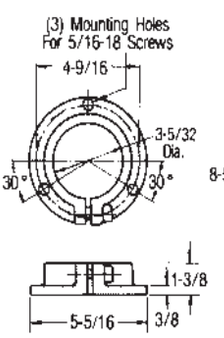


Foot Lever
CLR-002-HPA

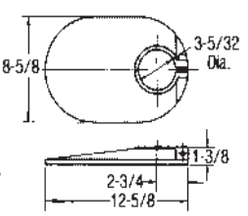




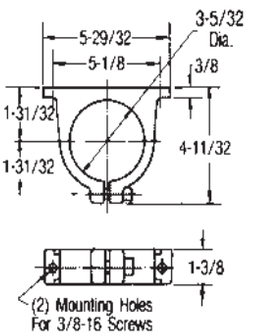




Flange
CLR-303-HPA



Weighted Base
CLR-301-HPA



Bracket
CLR-302-HPA

Operating pressure range	0-7250 psi	0-3000 psi
Displacement per stroke (cu.in.)	.12	.24
Usable oil volume (cu.in.)	9	9
Reservoir capacity (cu.in.)	18	18
Relief valve adjustment range (psi)	150-7250	150-3000
Weight (lbs)	16-27	16-27
Part No. with flange and hand lever	**CLR-601-HP**	**CLR-401-HP**
with flange and foot lever	**CLR-602-HP**	**CLR-402-HP**
Part No. with base and hand lever	**CLR-603-HP**	**CLR-403-HP**
with base and foot lever	**CLR-604-HP**	**CLR-404-HP**
Part No. with bracket and hand lever	**CLR-605-HP**	**CLR-405-HP**
with bracket and foot lever	**CLR-606-HP**	**CLR-406-HP**
Part No., pump only	**CLR-600-HP**	**CLR-400-HP**

Fluid Recommendations see F&A section.

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Screw Pumps

7250 psi max
Single acting



Compact Block

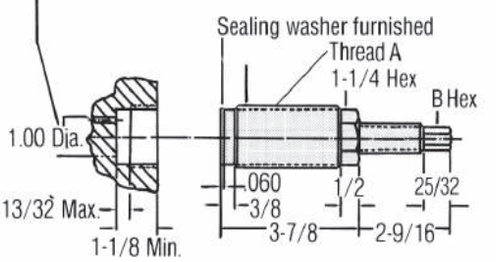


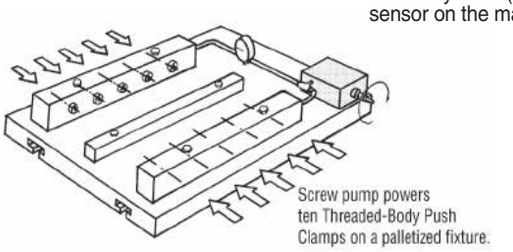
Cartridge/Manifold Mounted

- **Compact pressure source**
- **Ideal for rotary tables or pallets where fluids supply lines are impractical**
- **Excellent for holding pressure while fixture is transferred**
- **Can be used in multiples for more fluid capacity**
- **May be operated with a power torque wrench (non-impact)**
- **7250 psi pressure from 38 ft-lbs torque**
- **** Do not use NPT fittings**

DESIGN CONSIDERATIONS:

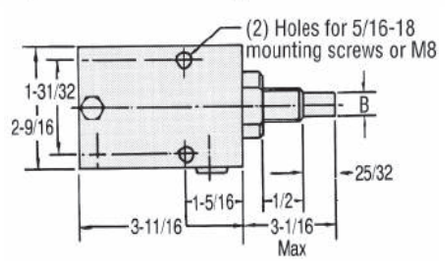
1. Include a pressure gauge in the system (see F&A section).
2. All clamps and components must be leak free, so use only Roemheld products.
3. Since fluid capacity is limited, use only on small fixtures. For best results, clamps should use only 65% of total fluid capacity. Due to limited capacity, use only with smallest accumulator CLR-9606-102-PDA.
4. Systems must be bled carefully and designed to avoid air pockets. Include a separate fill plug on the cartridge mounted version, at the highest point in the system.
5. Mount block-type Screw Pump only horizontally with fluid fill port up.
6. For safety on palletized fixtures, use a control cylinder (F&A section) with a position sensor on the machine.

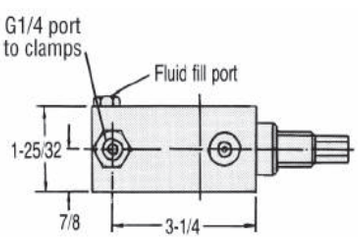


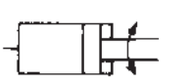


Screw pump powers ten Threaded-Body Push Clamps on a palletized fixture.

Hole Preparation for manifold mounting







Symbol

Operating Pressure Range	0-7250 psi
Total fluid capacity (cu. in.)	1.28
Fluid displacement per revolution (cu. in.)	.06
Installation torque, manifold mounting (ft. lbs.)	58
Weight (lbs)	4.0

INCH

A body thread	1-1/2- 16
B Hex	1/2
Part No., compact block	**CLR-900-SP**
Part No., manifold mounted	**CLR-901-SP**
Part No., sealing washer	**CLR-3000-843-SW**

METRIC

A body thread	M38 x 1.5
B Hex	SW 13
Part No., compact block	**CLR-8819-001-SP**
Part No., manifold mounted	**CLR-8819-101-SP**
Part No., sealing washer	**CLR-3000-843-SW**

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Hydraulic Intensifier

7250 psi max



APPLICATION: The hydraulic intensifier converts a hydraulic pressure on the primary side (input) into a higher pressure on the secondary side (output).

This enables the use of the comparatively low pressure of machine tool hydraulics to pressurize a hydraulic cylinder with a correspondingly increased intenisification ratio.

DESCRIPTION: The construction of the hydraulic intensifier corresponds to the principle of pressurizing areas of different sizes. Regulation of the high pressure at the secondary side is made by regulation of the low pressure side and is directly proportional.

First the intensifier delivers a high flow rate at a low pressure (displacement of the cylinders), with increasing counterpressure the intensifier switches automatically to pressure intensification. For unclamping, the cylinder is directly controlled with the low-pressure of the primary side (see example below).

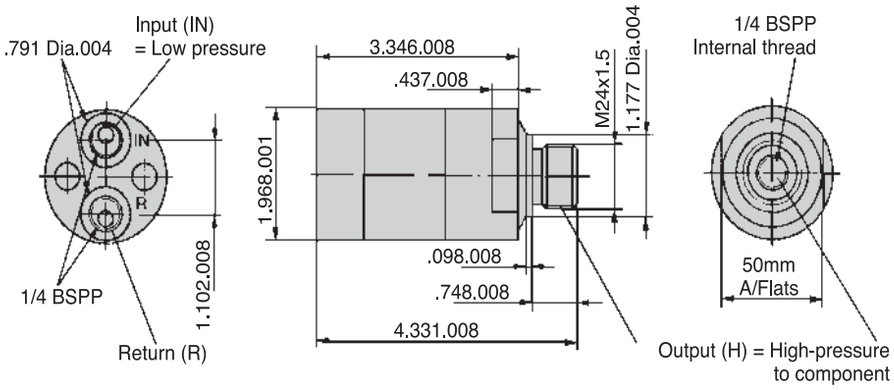
FUNCTION: the oil is supplied through input **IN** via the check valves **RV1, RV2,** and **DV** to the high pressure output **H** and thereby to the cylinders. In this phase the intensifier is in rapid function. According to the intensification **i** the max. flow rate can be up to 10 liters/ min. With increasing pressure in the cylinder the oscillating pump unit **OP** (pulsation) automatically functions. If the adjusted high-pressure is obtained, pulsation of the intensifier is stopped. Pulsation continues in case of dynamic application. Max. frequence of pulsation is 30 Hz.

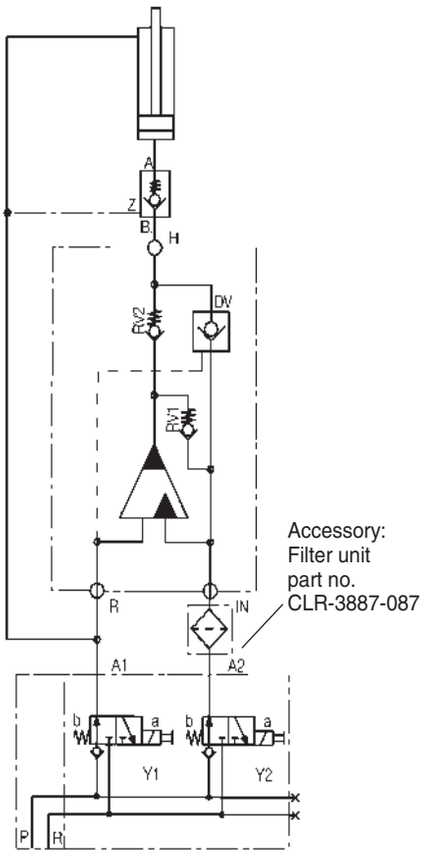
To retract the cylinder, the internal check vlave **DV** is controlled via port **R** and thereby free return through the intensifier is guaranteed.

IMPORTANT NOTES: The hydraulic oil must be perfectly filtered with particles not larger than nominally 10 micron. This is the reason why we offer a filter unit (part no. CLR-3887-087), which can be directly integrated in the tubing of the low-pressure side. If the intensifier will be used on uncoupled systems (no connection to the pressure generator) a pilot-controlled check valve should be mounted at the high-pressure side (consider min. control pressure for opening). For pilot-operated check valve, see valves section.

When designing an installation, pay attention that there can be leakage between the ports **IN** and **R** of the high-pressure intensifier.

Leakage rate approx. 50 cm3/min. When using the intensifier in uncoupled systems there will be a pressure increase in the unclamping line due to the leakage. — Please contact us.





Accessory:
Filter unit
part no.
CLR-3887-087

Intensification Ratio	1.5	2.0	3.2	4.0	5.0
Max. flow rate Low-pressure side Q_{max} (cu.in)	488	488	915	854	854
Max. flow rate, High-pressure side Q_{max} (cu.in)	61	48	150	120	98
Max. operating pressure Low-pressure side P_{max} psi	3000	3000	2000	1800	1500
Max. operating pressure High-pressure side P_{max} psi	4500	6000	7250	7250	7250
Weight (lbs)	2	2	2	2	2
Part No.	**CLR-8755-015**	**CLR-8755-020**	**CLR-8755-032**	**CLR-8755-040**	**CLR-8755-050**

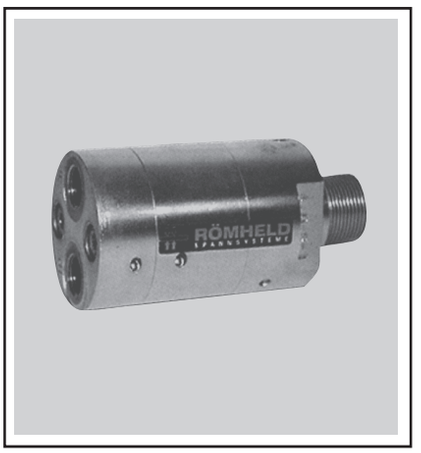
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Hydraulic Intensifier

7250 psi max



APPLICATION: The hydraulic intensifier converts a hydraulic pressure on the primary side (input) into a higher pressure on the secondary side (output).

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DESCRIPTION: The construction of the hydraulic intensifier corresponds to the principle of pressurizing areas of different sizes. Regulation of the high pressure at the secondary side is made by regulation of the low pressure side and is directly proportional.

First the intensifier delivers a high flow rate at a low pressure (displacement of the cylinders), with increasing counterpressure the intensifier switches automatically to pressure intensification. For unclamping, the cylinder is directly controlled with the low-pressure of the primary side (see example on previous page).

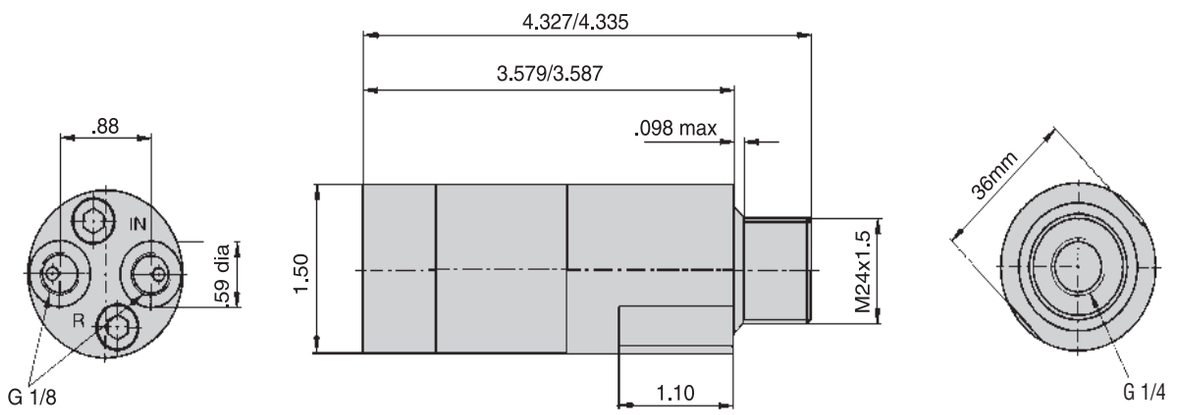
FUNCTION: the oil is supplied through input **IN** via the check valves **RV1, RV2,** and **DV** to the high pressure output **H** and thereby to the cylinders. In this phase the intensifier is in rapid function. According to the intensification **i** the max. flow rate can be up to 10 liters/min. With increasing pressure in the cylinder the oscillating pump unit **OP** (pulsation) automatically functions. If the adjusted high-pressure is obtained, pulsation of the intensifier is stopped. Pulsation continues in case of dynamic application. Max. frequency of pulsation is 30 Hz.

To retract the cylinder, the internal check valve **DV** is controlled via port **R** and thereby free return through the intensifier is guaranteed.

IMPORTANT NOTES: The hydraulic oil must be perfectly filtered with particles not larger than nominally 10 micron. This is the reason why we offer a filter unit (part no. CLR-3887-087), which can be directly integrated in the tubing of the low-pressure side. If the intensifier will be used on uncoupled systems (no connection to the pressure generator) a pilot-controlled check valve should be mounted at the high-pressure side (consider min. control pressure for opening). For pilot-operated check valve, see valves section.

When designing an installation, pay attention that there can be leakage between the ports **IN** and **R** of the high-pressure intensifier.

Leakage rate approx. 50 cm3/min. When using the intensifier in uncoupled systems there will be a pressure increase in the unclamping line due to the leakage. — Please contact us.



Intensification Ratio	3.2	4.0	4.8	6.2	7.5
Max. flow rate Low-pressure side Q_{in} (cu.in/min)	490	490	490	490	490
Max. flow rate, High pressure side Q_{in} (cu.in/min)	25	25	25	25	25
Max. operating pressure Low-pressure side P_{in} psi	2250	1800	1500	1100	950
Max. operating pressure High-pressure side P_{in} psi	7250	7250	7250	7250	7250
Weight (lbs)	2.2	2.2	2.2	2.2	2.2
Part No.	**CLR-8755-132**	**CLR-8755-140**	**CLR-8755-148**	**CLR-8755-162**	**CLR-8755-175**

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Clamping Valves



Hand-Operated
Single Acting



Hand-Operated
Double Acting

For clamping several workpieces from a single power source.



Cam Roller
Single Acting



Air/Hydraulic Pilot
Single Acting

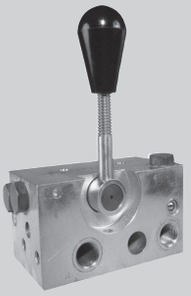
page 695



DC Solenoid
Single or Double Acting

page 696

Extremely compact, for clamping several workpieces from a single power source.



page 697

Heavy Duty Clamping Valve

Poppet style 4-way clamping valve can be used for single acting or double acting. Great for clamping several workpieces independently with a single power source. Heavy duty for extra-long life.

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Control Valves

Sequence Valves



Manifold Mounted Or Series Mounted

pages 699-700

For automatic sequencing of locating, clamping, and supporting operations. Easily adjustable trigger pressure. Use in multiples for multi-step sequencing.

Pressure Control



Pressure Closing

page 698



Pressure Reducing

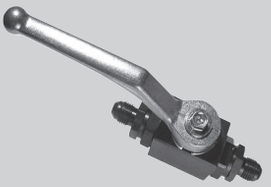
page 701



Pressure Relief

page 703

Shut Off



Use to hold pressure in a fixture during machining.

page 703

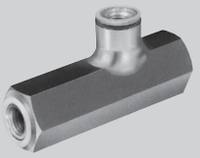
Flow Control



Use to restrict flow in one direction while allowing free return flow.

page 704

Check Valves



Pilot-Operated

Check valve that permits only one-way flow until released by a pilot fluid line. Available inline or manifold mounted.

page 702



Inline, Cartridge Type

Allows fluid to flow in only one direction.

page 704

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Clamping Valves

7250 psi max
Single or double acting



Hand Operated Single Acting Standard Fittings

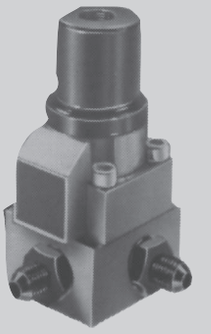


Hand Operated Double Acting Standard Fittings



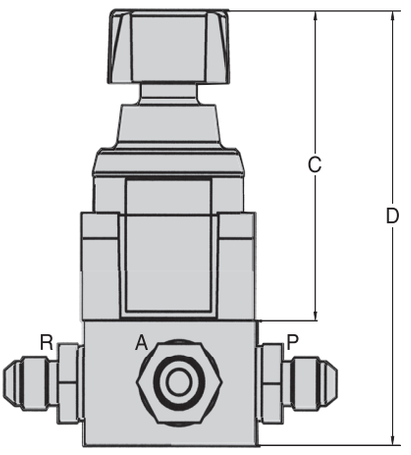
Cam-Roller Single Acting Standard Fittings

11/16 Stroke

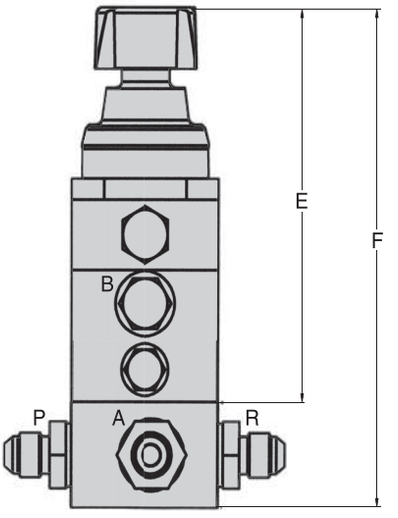


Air/Hydraulic Pilot Single Acting Standard Fittings

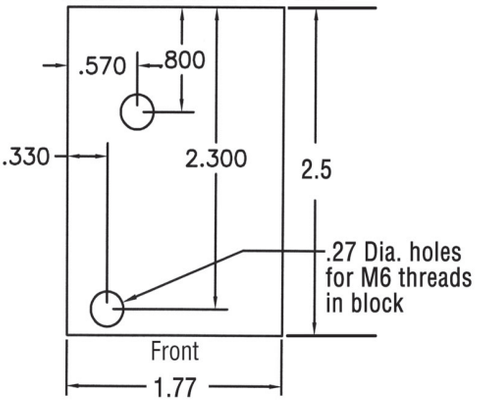
SINGLE ACTING UNITS



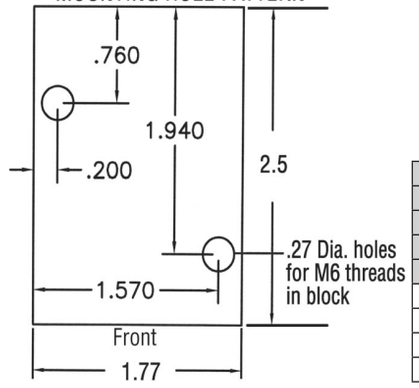
DOUBLE ACTING UNITS



DOUBLE ACTING - STANDARD FITTINGS
MOUNTING HOLE PATTERN



SINGLE ACTING - STANDARD FITTINGS
MOUNTING HOLE PATTERN



Type	Hand Operated	Cam Operated	Air Pilot	Hydraulic Pilot	24V DC Solenoid
C	4.13	4.34	2.81	2.81	5.63
D	5.63	5.84	4.31	4.31	7.13
E	5.51	5.72	4.19	4.19	7.01
F	7.01	7.22	5.69	5.69	8.51
Single Acting Standard Fittings	**CLR-225-V**	**CLR-415-V**	**CLR-335-V**	**CLR-345-V**	**CLR-645-V**
Single Acting Manifold Mount	**CLR-219-V**	**CLR-411-V**	**CLR-319-V**	**CLR-325-V**	**CLR-629-V**
Double Acting Standard Fittings	**CLR-4220-V**	**CLR-4412-V**	**CLR-4320-V**	**CLR-4326-V**	**CLR-4630-V**
Double Acting Manifold Mount	**CLR-4219-V**	**CLR-4411-V**	**CLR-4319-V**	**CLR-4325-V**	**CLR-4629-V**

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Clamping Valves

7250 psi max
Single or double acting

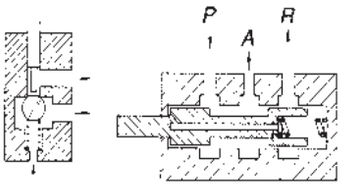


DC Solenoid Operated

- **Use to clamp several workpieces independently with a single power source**
- **For single-acting or double-acting clamps**
- **Zero-leakage poppet design with built-in check valve**
- **Extremely compact**
- **All electrical coils are continuous duty rated**

** **Do not use NPT fittings**

Poppet Valves **Spool Valves**



Only Roemheld offers all zero-leakage poppet valves. Others use spool valves, which always have internal leakage due to clearance between the bore and spool.

DESIGN CONSIDERATIONS: Port connections and flow directions must be exactly as shown on the drawings. Otherwise the valves will not function correctly.

P - Pressure into valve from power

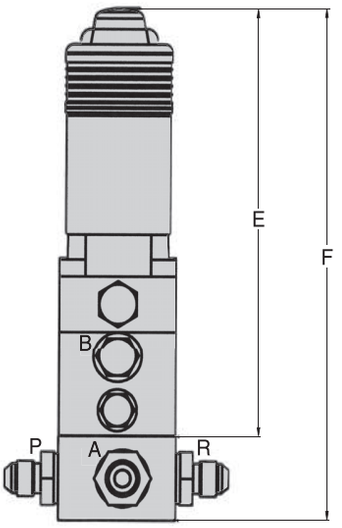
R - Return from valve to power source

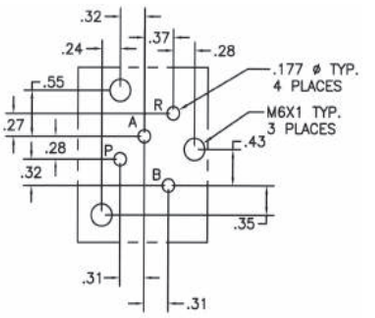
A - Flow from valve to clamps and back

Use these valves only with the fluid types we recommend, CLR-2-FL equivalent on **INFO+** page 722). Fluid must be clean (10 micron or better nominal filtration).

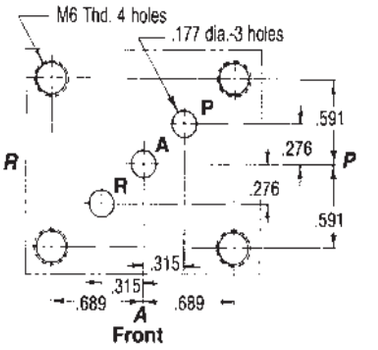
SOLENOID OPERATED: Clamp and unclamp automatically using electrical signals from a machine-tool controller. Operate clamps all at once, or individually using one valve per clamp. Stays clamped even if electric power fails, since solenoid is de-energized in the clamped position. 24 Volts DC (+5/-10% allowable voltage deviation). 2000 cycles/hour maximum. 20 watts power consumption. 120, 220, and 440 volt AC valve also available.

DOUBLE ACTING UNITS





Double Acting



Single Acting

Mounting-hole pattern for manifold mounting. Grind surface flat, 32 Ra max. Order valves without base.

Standard DC Solenoid Valve

Type	Solenoid operated
Max. operating pressure (psi)	7250
Max. inrush draw (watts)	20
Max. flow rate (cu. in./min.)	490
Voltage (+5%/-10%)	24 VDC
Make time (milliseconds)	100
Break time (milliseconds)	50
Max. cycles per hour	2000
Weight (lbs)	1.5
Part No., Single Acting	**CLR-645-V**
Part No., Double Acting	**CLR-4630-V**

Part no.	Type	Normal position (no signal)	Check valve	Symbol
CLR-4630-V	4-way 2-position	N/A	Yes	
CLR-645-V	3-way 2-position	Open	Yes	
CLR-32361-200-V			No	
CLR-32362-300-V		Closed	Yes	
CLR-32362-200-V			No	
CLR-32361-301-V	2-way 2-position	Closed	No	
CLR-32361-302-V		Open	No	

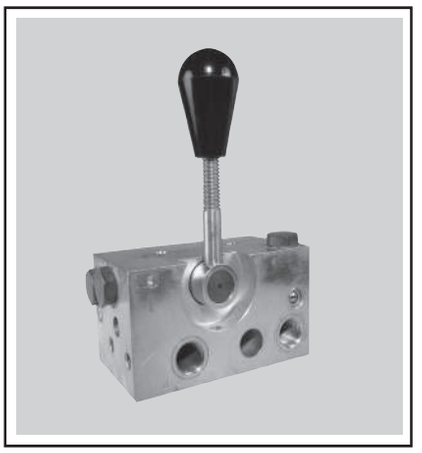
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Clamping Valves (4-Way)

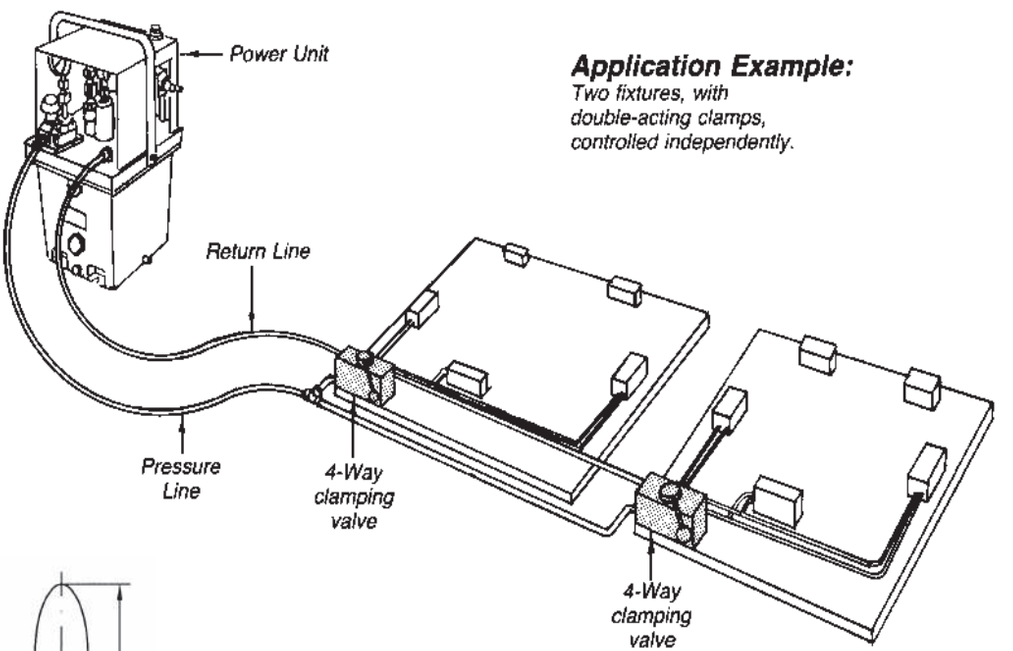
7250 psi max
Single and double acting



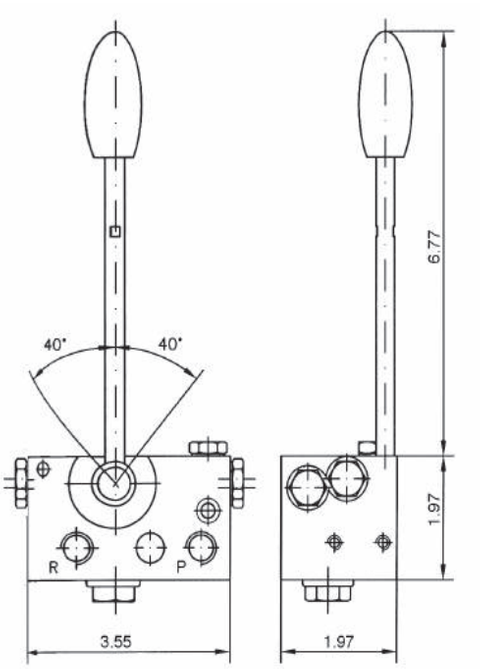
- **Use to clamp several work pieces independently with a single power source**
- **For double-acting clamps**
- **Zero-leakage double-poppet design**

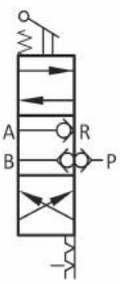
** **Do not use NPT fittings**

Heavy-duty for extra-long life. Unique double-poppet design for zero leakage. To use with single-acting clamps, use Port Plug CLR-810-F on Port B. Internal check valves ensure fail-safe clamping.



Application Example:
Two fixtures, with double-acting clamps, controlled independently.





Max. Oper. Pressure (psi)	7250
Max. Flow Rate (cu. in./min.)	730
Direction of Flow	See Drawing
Port Size	G1/4
Weight (lbs)	2.5
Part No.	**CLR-302-V**

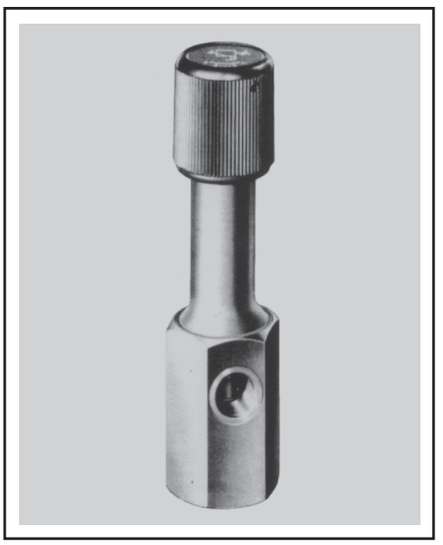
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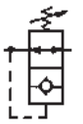
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Pressure-Controlled Closing Valves

7250 psi max



- **Allows different operating pressures in two parts of a fixture**
- **Can be used on pallet fixtures disconnected from a power source, since no return line is needed**
- **Allows fine tuning the clamping force of selected components while keeping others constant**
- **Holds reduced pressure to exact setting, regardless of input pressure**
- **Zero-leakage poppet design**



Symbol

OPERATION: Adjust downstream pressure using knob on top of valve. The valve shuts off downstream fluid flow as soon as system exceeds the set pressure.

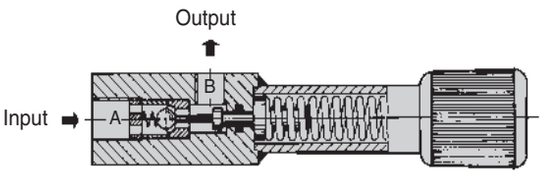
MOUNTING: In line. Fittings furnished with valve provide 5/16" JIC 37° flare connections.

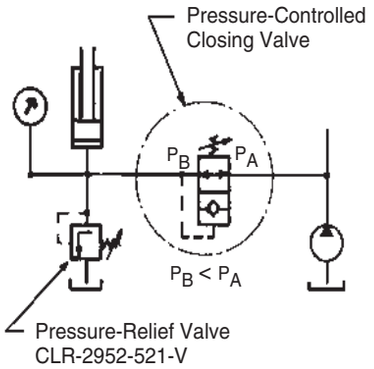
DESIGN CONSIDERATIONS: After closing, the oil pressure on the secondary side B is not regulated. There can be the following consequences:

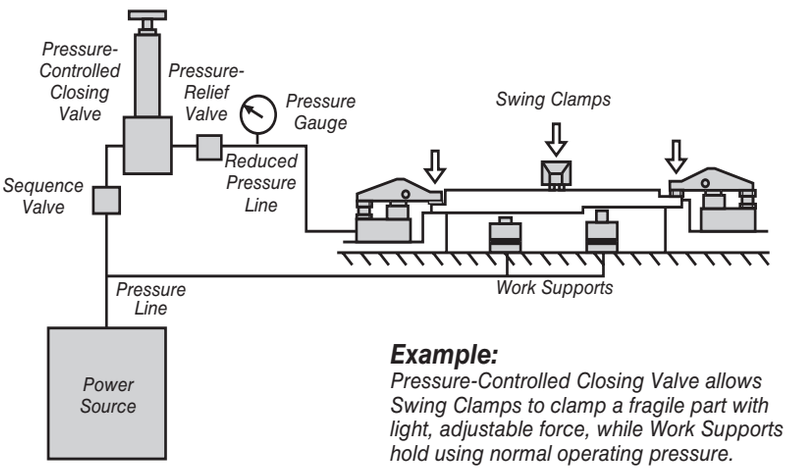
1. Pressure drop if there are leakages or if clamping elements are used which are not leakage free.
2. Pressure increases if there is an increase in temperature or if contamination has gotten in the valve seat and damaged it.

Therefore, it is highly recommended to install a pressure relief valve (CLR-2952-521-V) on the secondary side as a safety measure against pressure increase. By means of a pressure gauge the adjusted pressure can be monitored.

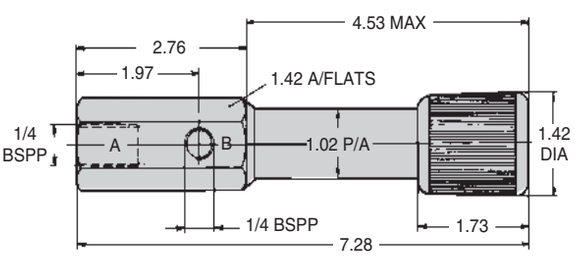
When using this valve in series with other valves (clamp/unclamp valves, sequence valves, etc.), pressure closing valve must be closest to clamps. Please contact factory if pilot operated check valves are to be used on clamps.







Example:
Pressure-Controlled Closing Valve allows Swing Clamps to clamp a fragile part with light, adjustable force, while Work Supports hold using normal operating pressure.



Reduced-pressure adjustment range (psi)	High	Medium	Low
	2900-7250	870-3190	435-1800
Max. operating pressure, input (psi)	7250	7250	7250
Repeatability (+/- psi)	150	150	150
Max. fluid flow rate (cu. in./min.)	730	730	730
Part No.	**CLR-2953-002-V**	**CLR-2953-003-V**	**CLR-2953-001-V**

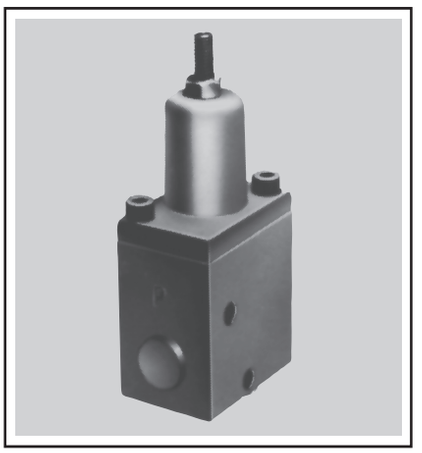
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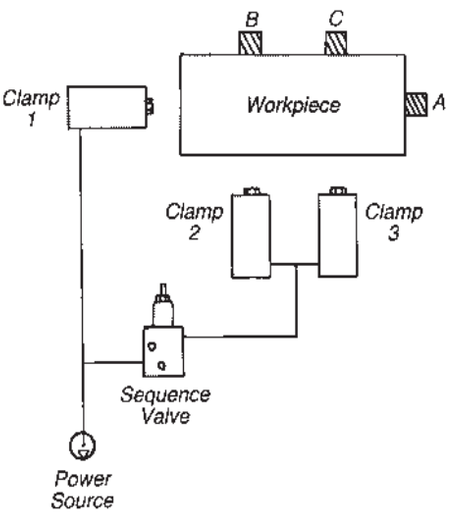
Sequence Valves

7250 psi max



- **Use to automatically sequence positioning, clamping, and supporting**
- **Easily adjustable trigger pressure**
- **Use in multiples for multi-step sequencing**

**** Do not use NPT fittings**



DESIGN CONSIDERATIONS: Choose normal pressure-adjustment-range valves instead of low-range valves whenever possible. Normal range models offer a wider adjustment range, especially when used with an Air Power Unit. For multi-stage sequencing, set trigger pressures in steps of at least 750 psi (normal range) or 375 psi (low range).

STANDARD FITTINGS: Mount in line. Fasten with two #10 cap screws if desired.

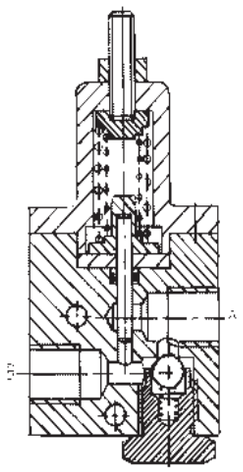
MANIFOLD MOUNTING: Fluid enters and exits through two O-ring ports fed by drilled fixture passages. Mount on a ground surface (32 Ra max.) using three #10 cap screws.

SERIES MOUNTING: Use one input valve and up to five series valves. Only one pressure connection is required, to the input valves P port. The other valves are connected by an internal passage, sealed with an O-ring between each valve. All required plugs, O-rings, and nuts are furnished.

Example clamping sequence:

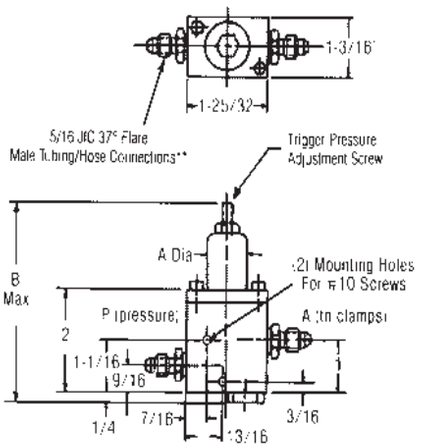
Workpiece to be positioned and clamped sequentially. Sequence valve set for 1500 psi trigger pressure.

1. When clamps are actuated, clamp 1 pushes workpiece against stop A.
2. As soon as pressure reaches 1500 psi, sequence valve opens.
3. Clamps 2 and 3 simultaneously push workpiece against stops B and C.
4. Fluid pressure rises uniformly in all clamps.



Trigger pressure adjustment range (psi)	Low Range 150 to 2200	Normal Range 1500 to 6500
Max. operating pressure (psi)	7250	7250
Pressure change per turn (psi)	220	440
Maximum flow	490 cu. in./min.	490 cu. in./min.
A Dia.	7/8	1-3/32
B	4-5/16	5-3/4
Weight (lbs)	1.1	1.4

Standard Fittings



Standard Fittings

Part No.	CLR-420-V	CLR-440-V

Manifold Mounted

Part No.	CLR-429-V	CLR-449-V
Part No., Spare O-Ring	CLR-3000-342-SW	CLR-3000-342-SW

Series Mounted

Part No., Input Valve	CLR-2954-427-V	CLR-2954-441-V
Part No., Series Valve	CLR-2954-428-V	CLR-2954-442-V
Part No., Connecting Bolt, 2 Valves	CLR-3619-029-VA	CLR-3619-029-VA
Part No., Connecting Bolt, 3 Valves	CLR-3619-031-VA	CLR-3619-031-VA
Part No., Connecting Bolt, 4 Valves	CLR-3619-032-VA	CLR-3619-032-VA
Part No., Connecting Bolt, 5 Valves	CLR-3619-033-VA	CLR-3619-033-VA
Part No., Connecting Bolt, 6 Valves	CLR-3619-034-VA	CLR-3619-034-VA

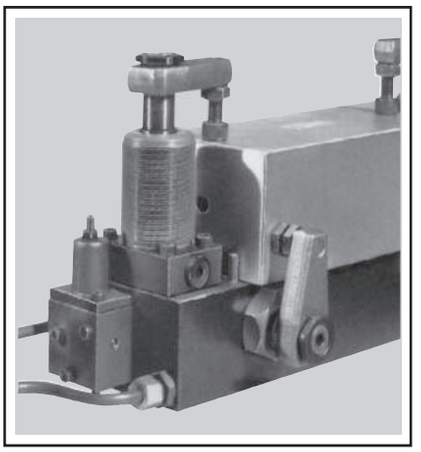
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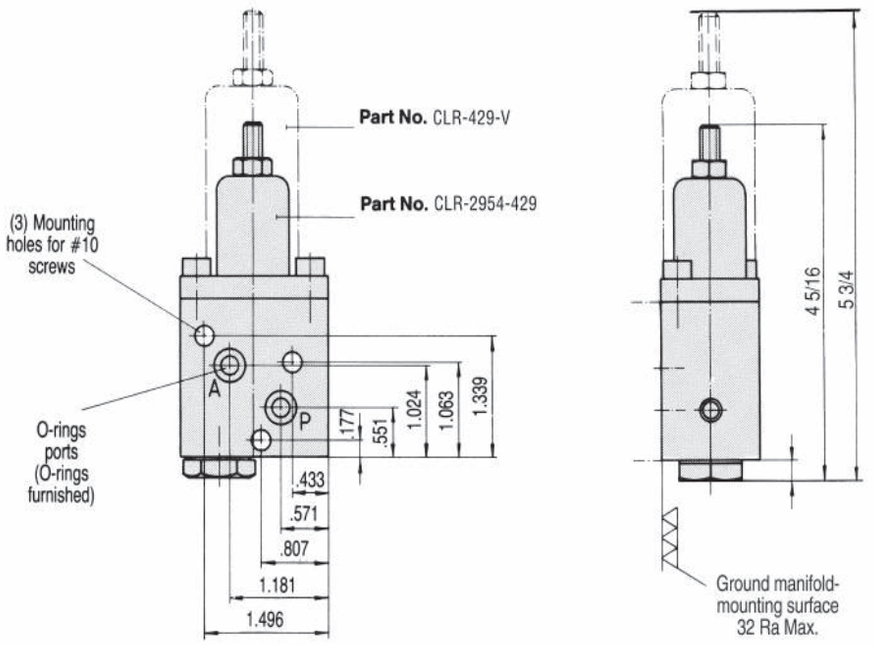
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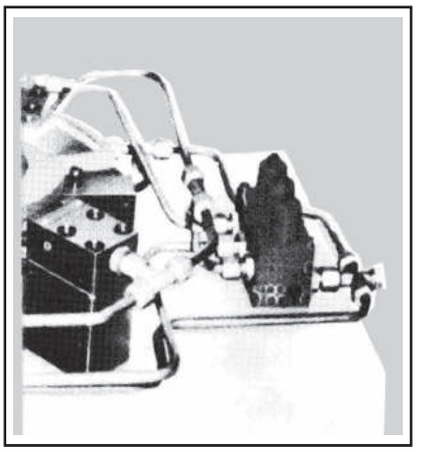
Sequence Valves

7250 psi max

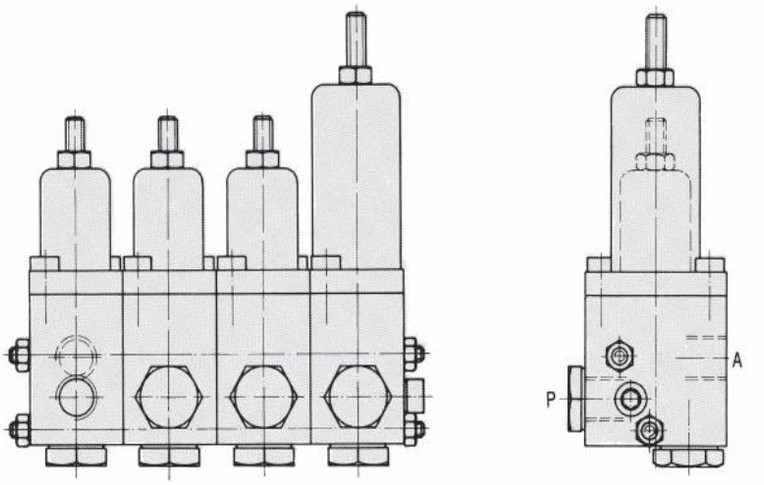


Manifold Mounted

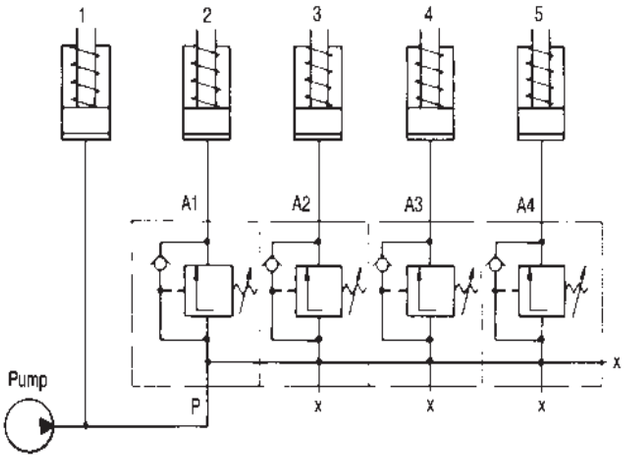




Series Mounted



Hydraulic Diagram



Ordering Example:
Series combination of three low-range sequence valves and one normal-range sequence valve:

(1) CLR-2954-427-V	Input Valve
(2) CLR-2954-428-V	Series Valve
(1) CLR-2954-442-V	Series Valve
(2) CLR-3619-032-VA	Connecting bolts

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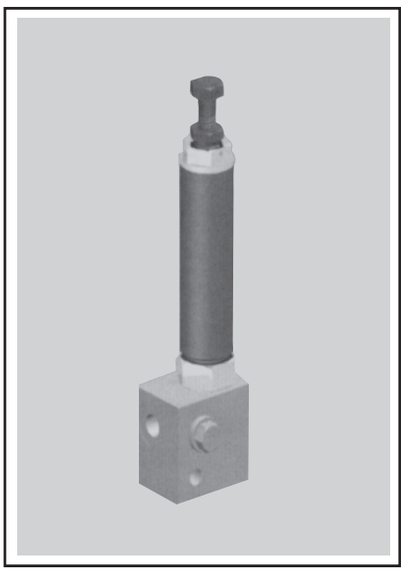
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Pressure-Reducing Valves

7250 psi max



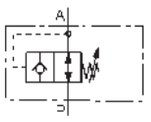
Pipe Connection Type

- **Allows operating a single clamp, or group of clamps, at a lower pressure than the rest of the fixture.**
- **Great new design that can be used on pallet fixtures disconnected from a power source, since no return line is needed**
- **Allows fine tuning of the clamping force for selected components while keeping others at full pressure**
- **Holds reduced pressure to exact setting, regardless of input pressure**
- **Zero leakage poppet design**

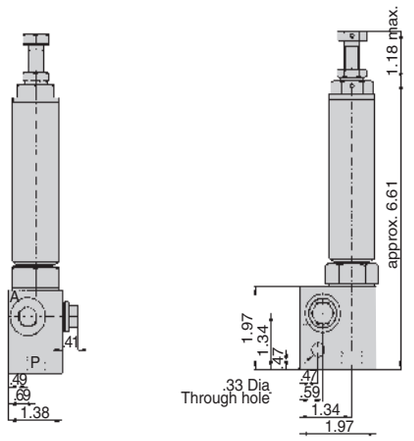
OPERATION: Adjust the downstream pressure using the adjusting screw on top of valve. The valve shuts off downstream fluid flow as soon as the system pressure equals the set pressure. As long as the system is connected to the power source, the valve will open again, if additional fluid is required to maintain the downstream pressure. Valve is also ideal for use on palletized (uncoupled) systems.

UNIQUE FEATURES: In normal systems (connected to power source) valve performs as a true pressure reducing valve, and in Palletized (uncoupled) systems as a pressure closing valve.

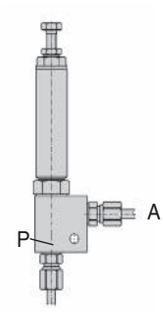
DESIGN CONSIDERATIONS: When using this valve in series with other valves (clamp/unclamp valves, sequence valves, etc.,) the pressure reducing valve must be the one closet to the clamp(s) that it is protecting. When used in uncoupled systems, it is strongly recommended that a pressure relief valve be included to prevent pressure increases in the downstream (low pressure) side of the system.

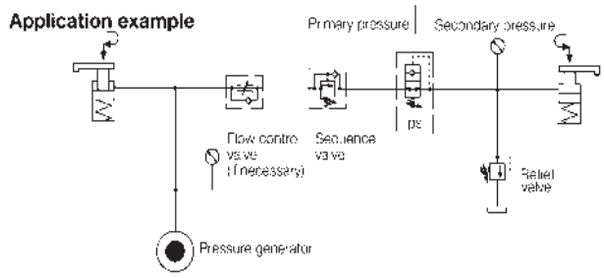


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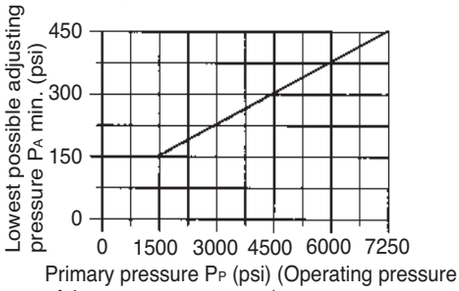


Ports A, P and M = 1/4 BSPP





Limit curve of the lowest possible adjusting pressure $P_{A\,min.}$ as a function of the operating pressure P_p



Output pressure setting range (psi)	450 to 5500
Valve Type	Poppet
Max. operating pressure (psi)	7250
Output repeatability (psi)	±75
Max. hysteresis to re-open (psi)	375
Approx. pressure change per rotation (psi)	580
Max. fluid flow rate (cu.in./min.)	600
Range of adjustment (psi)	435-5510
Weight, approx. (lbs)	2.9
Part No.	**CLR-2953-111-V**

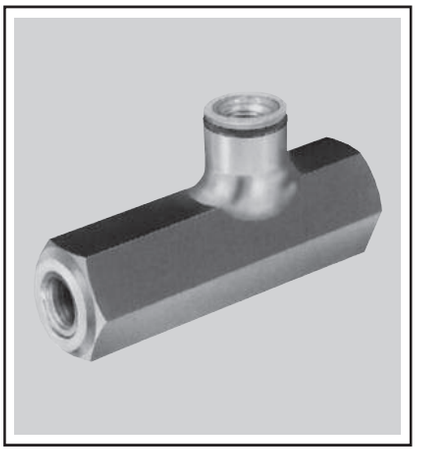
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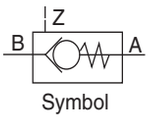
Pilot-Operated Check Valves

7250 psi max



In-Line Mounted

- **Holds clamping pressure until released by a separate pilot pressure line**
- **Allows only one-way flow until released**
- **Excellent safety device if fluid line to fixture may become damaged**
- **May be used to prevent workpieces from floating between opposing clamps**
- **Spring-loaded ball-seat valve (leakage free)**



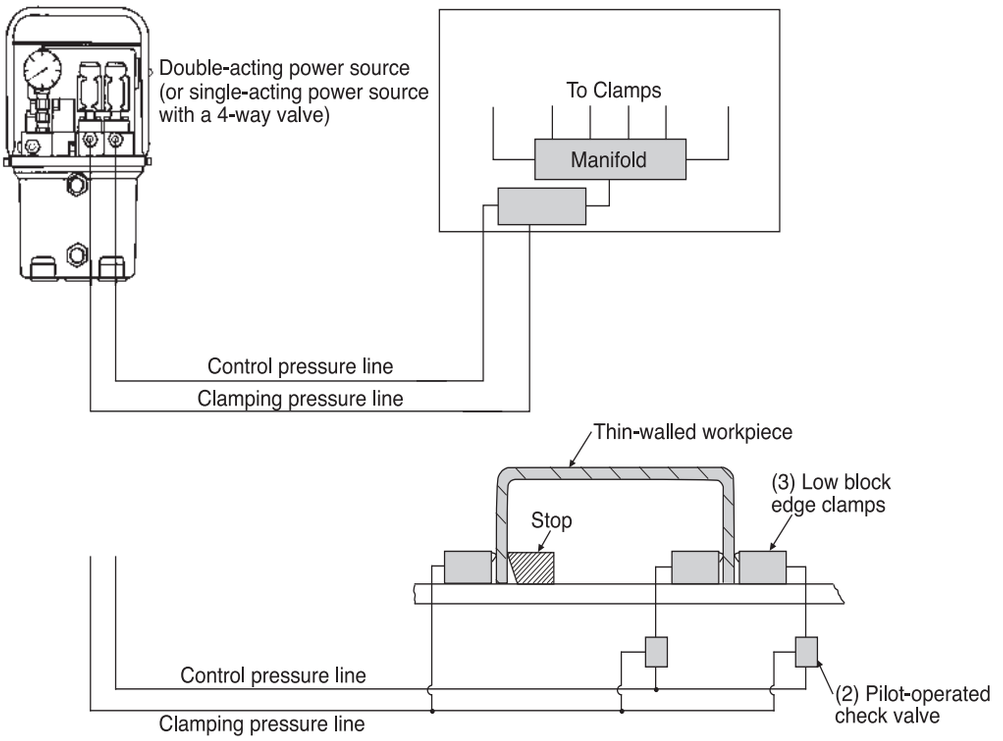
Symbol

OPERATION: The flow from B ⟶A is free. The flow from A ⟶B is locked, but can be hydraulically unlocked by pressurizing control port Z.

CONTROL PRESSURE: To unlock the check valve for return flow, control (pilot) pressure must be greater than (0.32 x $Pressure_A$) + 175 psi for the smaller valve and (0.38 x $Pressure_A$) + 175 psi for the larger size.

MOUNTING: In-line mounting with tubing connectors. Control port Z is 1/4 BSPP. Ports A & B are 1/4 BSPP on the smaller size, 1/2 BSPP on the larger size. To reduce 1/2 BSPP to 1/4 BSPP, order adaptor CLR-3613-015-F.

DESIGN CONSIDERATIONS: This pilot-operated check valve is not suitable for locking of double-acting swing clamps (pull-type cylinders). Due to the unfavorable surface ratio of these elements, the control pressure is not sufficient for unlocking and dangerous pressure intensification can occur.

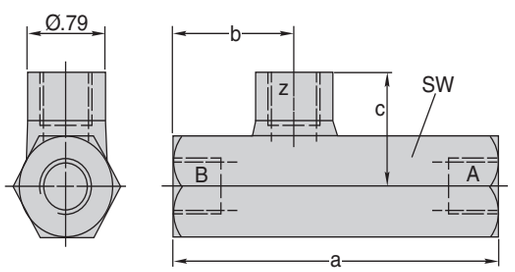


Example 1:

Workpieces remain clamped even if fluid line between power source and fixture becomes damaged.

Example 2:

Two opposing clamps (on right side) allow the workpiece to float between them to avoid distorting it. Without check valves, the workpiece would remain unstable since either clamp could retract or extend further by shifting fluid to the other. Check valves lock the clamps in their settled position by allowing only one-way flow.



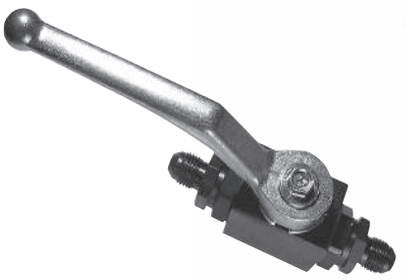
Max. flow rate (cu. in./min.)	920	3360
Max. operating pressure (psi)	7250	7250
Control fluid volume (cu. in.)	.01	.02
Port size, A & B	1/4 BSPP	1/2 BSPP
Port Size, Z	1/4 BSPP	1/4 BSPP
a	3.31	3.94
b	1.24	1.44
c	1.06	1.22
SW	24mm	32mm
Weight (lbs)	.9	1.3
Part No.	**CLR-2951-417-V**	**CLR-2951-501-V**

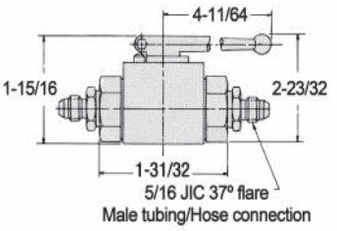
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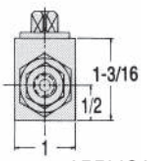
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Shutoff Valves









Symbol

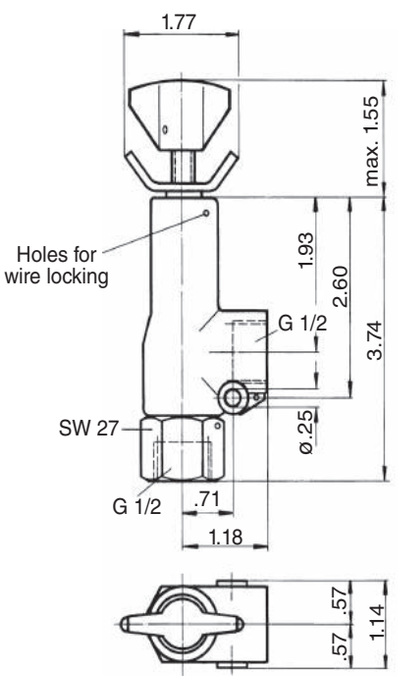
APPLICATIONS:
1. Shutting off unused lines in a multi-purpose fixture.
2. Holding fixture pressure temporarily while transporting with power source disconnected.

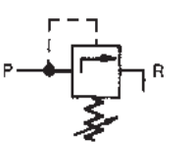
DESIGN CONSIDERATIONS: Note: a shutoff valve cannot be used to clamp and unclamp. See valves section for clamping valves.

Max. operating pressure (psi)	7250
Mounting	In line
Lever Movement	90°
Weight (lbs)	0.7
Part No.	**CLR-400-V**

Relief Valves







Symbol

APPLICATIONS: To protect hydraulic circuits from unexpected pressure increases, such as when the temperature of a closed system increases beyond maximum operating pressure.

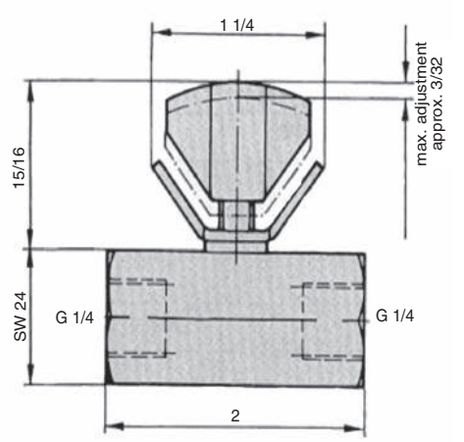
CONSTRUCTION: Poppet-type valve, directly controlled.

Max. operating pressure (psi)	7250
Adjustment range (psi)	0-7250
Mounting	In line
Weight (lbs)	0.66
Part No.	**CLR-2952-521-V**

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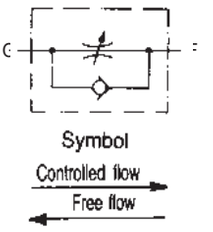
Flow Control Valves





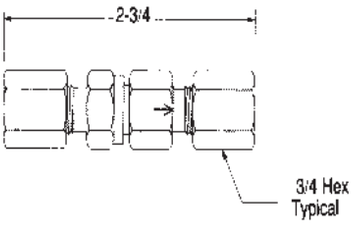
APPLICATIONS: To restrict flow from highflow-rate power sources for proper component operation (Swing Clamps, Extending Clamps, and Fluid-Advanced Work Supports for example).

OPERATION: Turn knob for precision flow control in one direction, with unrestricted free flow in the opposite.



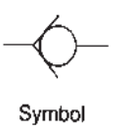
Max. operating pressure (psi)	7250
Mounting	In line
Weight (lbs)	0.7
Part No.	**CLR-541-V**

Check Valves



APPLICATION: Simple flow restrictor. Allows fluid to flow in only one direction (see arrow).





Cartridge-type check valves are also available. Please contact factory for more information.

Max. operating pressure (psi)	7250
Mounting	In line
Weight (lbs)	0.3
Part No.	**CLR-9208-111**

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Fittings & Accessories

Rotary Couplings



Single Passage (90°)
page 706



Single Passage (straight)
page 706



Two Passage
pages 707-708



Four Passage
pages 707-708



Six Passage
pages 707-708



Rotary Valve Couplings
pages 709-711



Rotary Air Valve Couplings
page 712

Pallet Coupling



Pallet Decouplers
pages 713-714



Accumulators
page 715



Threaded Coupling Elements
pages 716-717

Pressure Monitoring



Pressure Switches
page 718

Air Accessories



Filter/Regulator/ Lubricators
page 719



Fine Pressure Regulators
page 719



Air Flow Controls
page 719



Air Extractor/Dryers
page 719



Air Vent Fittings
page 724

Fittings, Tubing, Hose, etc.



Manifolds
page 719



Gauges
page 719



Hose
page 722



Fittings
pages 724-729



Fluid Filters
page 721

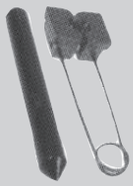


Quick Disconnects
page 720

Tubing
page 722



Fluid
page 722



Tubing Installation & Manifold Mounting
pages 723, 730-731



Contact Bolts
page 732

14

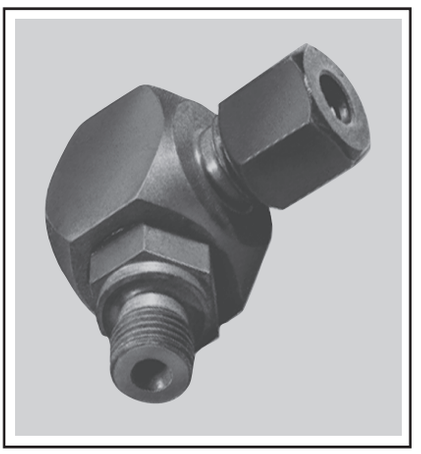
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Rotary Couplings

7250 psi max
Single acting



Single Passage — Elbow

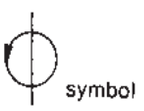


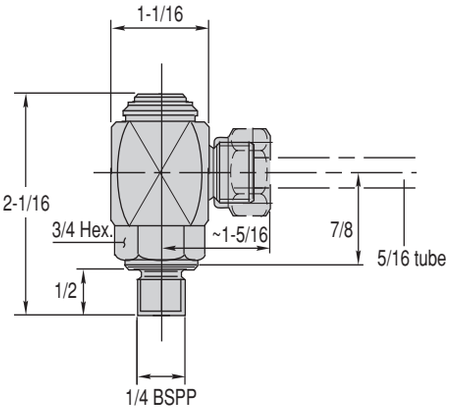
Single Passage — Straight

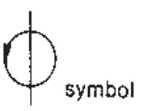
- **Best choice for feeding fluid to rotating pallet changers, due to constant connection.**
- **Ideal for rotary index tables.**
- **Also good for elbow connections that regularly swing through a small arc**
- **Choice of elbow or straight version**

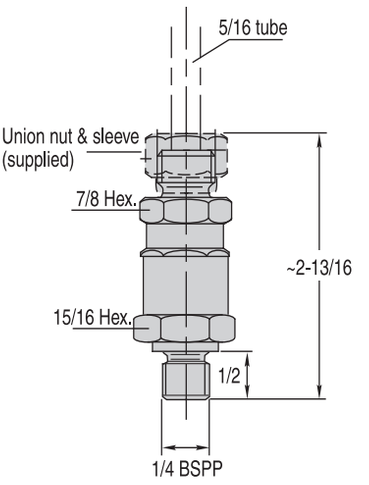
**** Do not use NPT fittings**

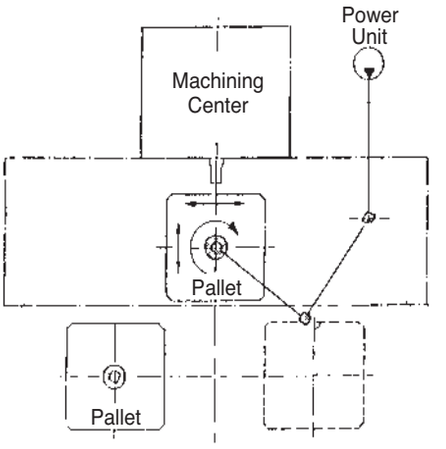
MOUNTING: Mount at rotational center to prevent side loading. Screw into standard 1/4 BSPP port.



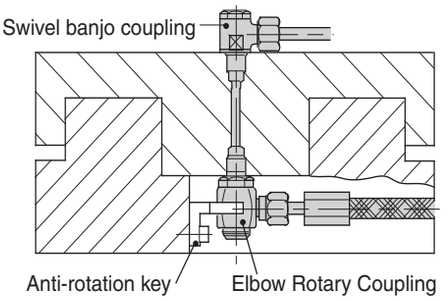


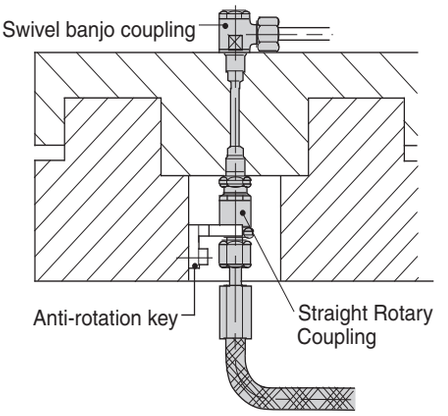






Machining-center pallet changer with continuous fluid feed using Rotary Couplings.





Number of passages	1
Operating pressure range (psi)	145 - 7250
Maximum rotational speed (RPM)	10
Max. seating torque (ft-lbs)	44
Starting torque at 7500 psi (ft-lbs)	1.0
Part No., Elbow	**CLR-843-F**
Part No., Straight	**CLR-845-F**

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Rotary Couplings

7250 psi max
Single and double acting



Two Passage



Symbol



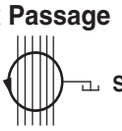
Four Passage



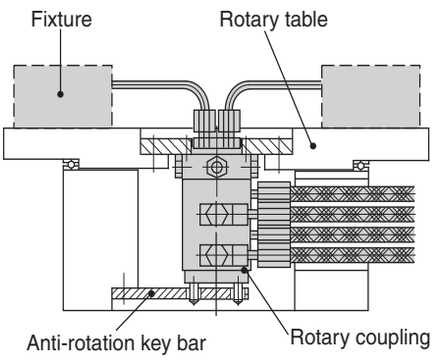
Symbol



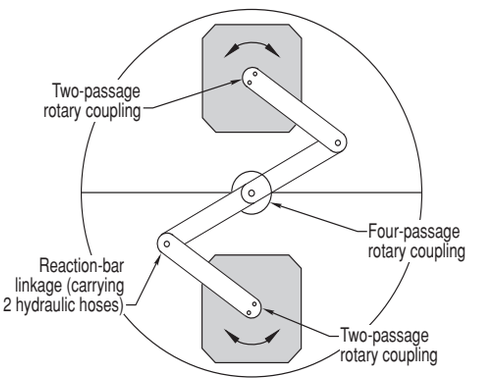
Six Passage



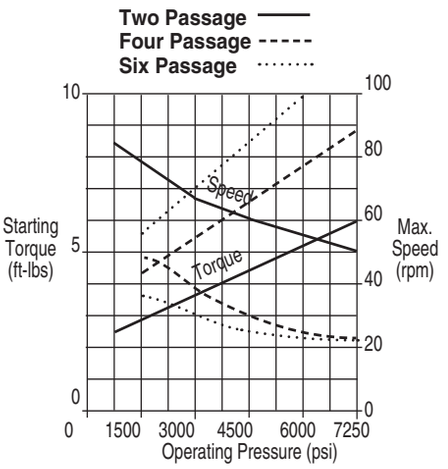
Symbol



Four-passage rotary coupling with a reaction-bar to prevent stress on hose connections.



Rotary couplings are frequently used on horizontal machining centers with rotary pallet changers. A reaction-bar linkage holds the top portion of each two-passage coupling stationary while the bottom portion revolves freely. Couplings are not designed to carry load. Side load will cause excessive, uneven wear resulting in failure.



Number of passages	2	4	6
Max. flow rate (cu. in./min.)	493	493	493

Standard

Leakage rate (cu. in./hr.)	.02	.04	—
Weight (lbs)	5.3	10.1	—
Part No., 150-7250 psi	**CLR-9281-136-F**	**CLR-9284-036**	—

With Leakage Recirculation

Weight (lbs)	6.1	12.1	15.9
Part No., 150-7250 psi	**CLR-9281-135**	**CLR-9284-135**	**CLR-9286-135**

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Rotary Couplings

7250 psi max
Single and double acting

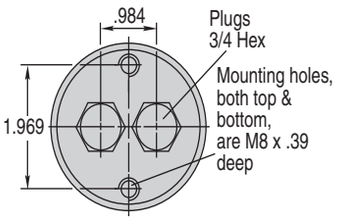
- **Best choice for feeding fluid to rotating pallet changers, due to constant connection.**
- **Ideal for rotary index tables.**
- **Can also be used for double-acting clamps.**
- **Choice of two, four, or six independent passages.**
- **Specials are readily available. Please contact factory.**

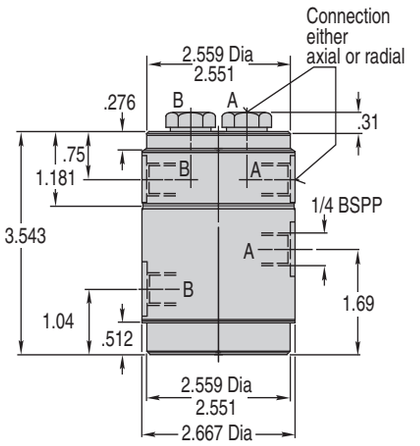
OPERATION: Each passage is supplied separately. This allows independent operation of two, four, or six (depending on model) sets of spring-return (single-acting) clamps.

MOUNTING: Either the top or bottom can be mounted by screws through the supplied holes. Do not hard mount both sides. Use anti-rotational key on one side.

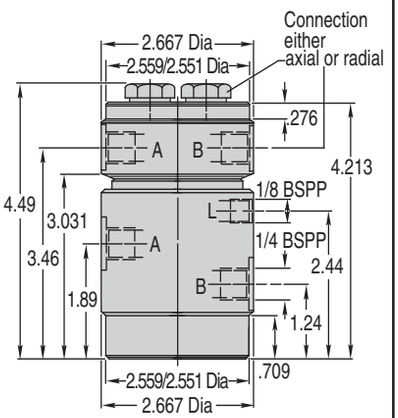
DESIGN CONSIDERATIONS: The fluid pressure in the rotary coupling will add to the table's starting torque requirement and affect the maximum table operating speed. Please check the graph on the previous page. Fluid must be clean (10 micron or better nominal filtration). Couplings can not be side-loaded. Any weight applied will shorten the life of the unit.

Two Passage



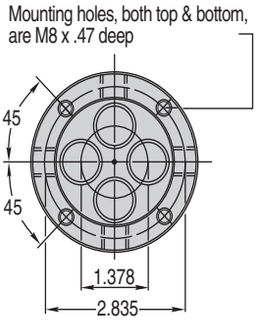


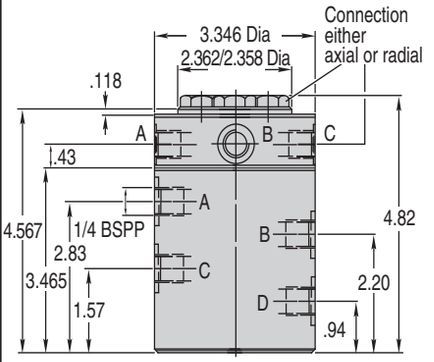
Standard



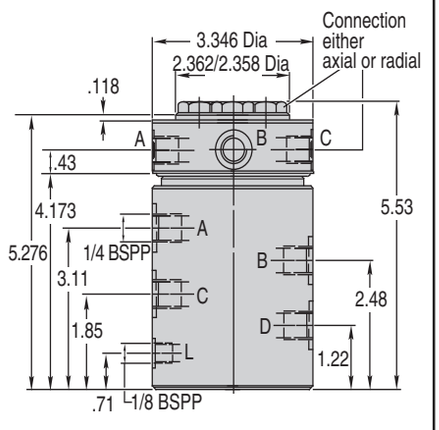
With Leakage Recirculation

Four Passage



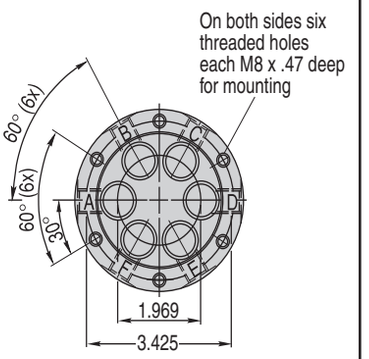


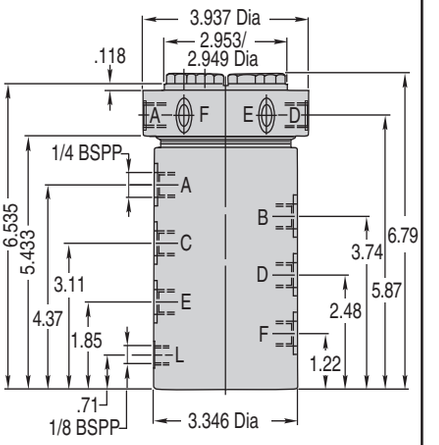
Standard



With Leakage Recirculation

Six Passage





With Leakage Recirculation

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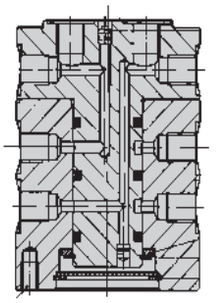
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Rotary Valve Couplings

7250 psi max
Single and double acting



- **For rotary index tables with an independent load/unload station**
- **Unload and reload while all other stations remain clamped**
- **Unclamps automatically at load station, or via a clamping valve**
- **Available from stock for rotary tables with 2 through 8 stations**



OPERATION: One half of the Rotary Valve Coupling rotates with the index table, while the other half remains stationary. Each time the table and coupling index, a new station automatically becomes the load/unload station. The coupling supplies fluid to the loading station separately from all other stations. The loading station can be either unclamped and reclamped automatically as the coupling rotates, or controlled by a separate clamping valve.

CLAMPING MANUALLY: The loading station can be clamped and unclamped manually (or by a machine controller's electrical signal) using a 3-way valve mounted off the rotating table. This insures that a new workpiece will not move during indexing, before it is securely clamped. See valves section for hand-, cam- or air pilot-operated valves. Double-acting clamps require a 4 way valve.

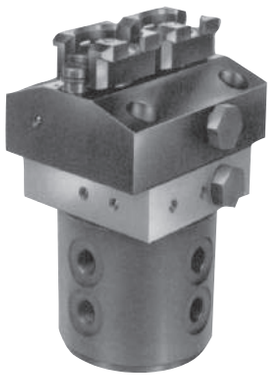
CLAMPING AUTOMATICALLY: To automatically unclamp and reclamp the load station as the coupling rotates, connect the coupling's return line R directly to the power source's reservoir (no pressure). To avoid any pressure drop as the table indexes, the power source's fluid flow rate (cu.in./min.) should be at least 240 times the fluid required at any one clamping station (cu.in.). Otherwise an accumulator must be installed on the pressure line from the power source.

DESIGN CONSIDERATIONS:

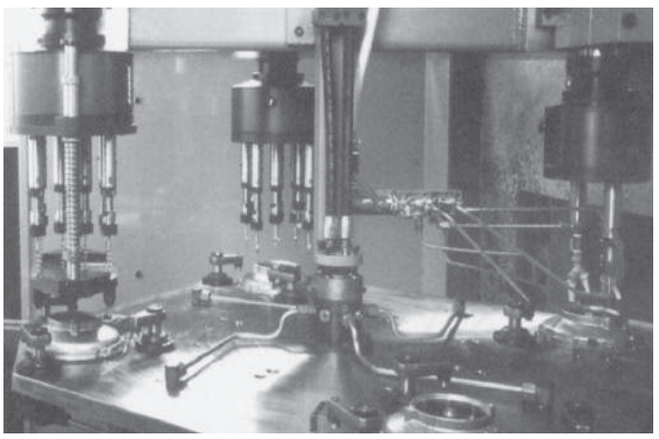
1. To use a standard Rotary Valve Coupling, the table must rotate through the same angle during each indexing movement.
2. Turning the coupling requires additional table-motor starting torque, especially when clamping automatically during indexing.
3. Maximum rotational speed is 10 RPM.
4. Use only with the following hydraulic fluids: those listed in F&A section. To use any other hydraulic fluid, check with factory first. Fluid must be clean (10 micron or better nominal filtration).
5. Do not turn coupling while dry, even before installation. Fill unused ports with fluid before capping off (e.g. when using an 8-station coupling for 4 stations.
6. Use only 1/4 BSPP fittings. Fitting-installation torque must be 28-35 ft.lbs.
7. Couplings can not carry load. Especially side load which will cause excessive, uneven wear.
8. With the load station unclamped, there is a small return-line leakage rate. Always install an accumulator, especially above 3000 psi.

MOUNTING: Firmly fasten either the top or bottom half of the coupling using the tapped mounting holes provided. Use a floating reaction bar to prevent the other half from rotating. Mount at the center of rotation, either above, below, or on the rotary table.

SPECIALS: For additional stations or special features, please contact factory.



Rotary Valve Couplings are also available for use with automatic coupling systems, for loading multi-sided tooling blocks. Please contact factory for information.



This application shows a multiple-spindle machine with four stations, for machining aluminum covers. An 8-station rotary valve coupling is at the center, with its four unused ports plugged.

Type of clamps	Single Acting	Double Acting
Max. operating pressure (psi)	7250	7250

Type 1 — Single Station for Load/Unload

Part No., 5 station	CLR-9295-001-V	CLR-9295-002-V
Part No., 6 Station (also 2 & 3)	CLR-9296-001-V	CLR-9296-002-V
Part No., 8 Station (also 4)	CLR-9298-001-V	CLR-9298-002-V
Part No., 10 Station	CLR-9290-001-V	CLR-9290-002-V

Type 2 — Two Stations for Load/Unload Commonly Controlled

Part No., 6 station (also 2 & 3)	CLR-9296-011-V	CLR-9296-012-V
Part No., 8 Station (also 4)	CLR-9298-011-V	CLR-9298-012-V
Part No., 10 Station (also 5)	CLR-9290-011-V	CLR-9290-012-V

Type 3 — Two Stations for Load/Unload Separately Controlled

Part No., 6 station (also 2 & 3)	CLR-9296-101-V	CLR-9296-102-V
Part No., 8 Station (also 4)	CLR-9298-101-V	CLR-9298-102-V
Part No., 10 Station (also 5)	CLR-9290-101-V	CLR-9290-102-V

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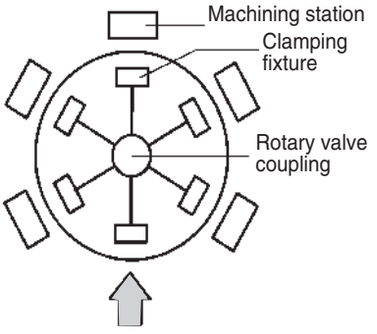
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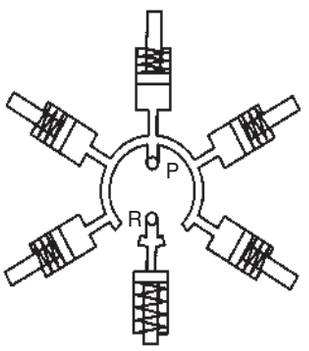
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Rotary Valve Couplings

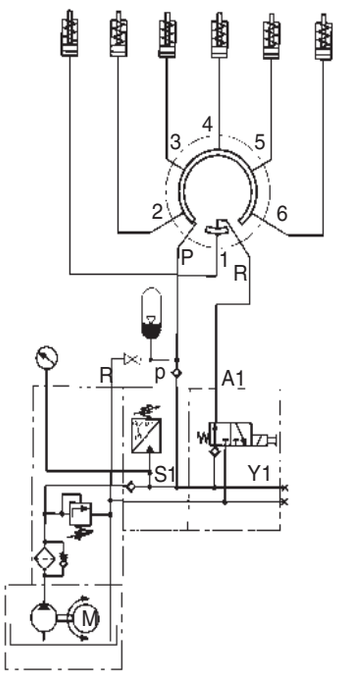
7250 psi max
Single and double acting

Type 1
Single Station for Load/Unload

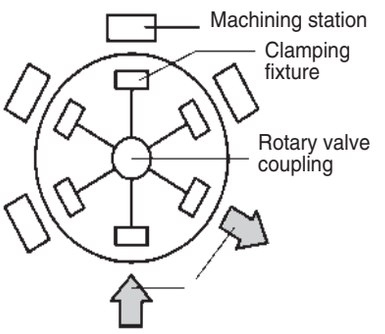


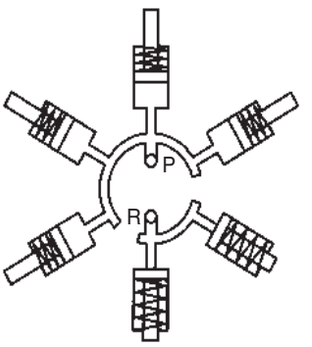


Circuit example - 6 stations

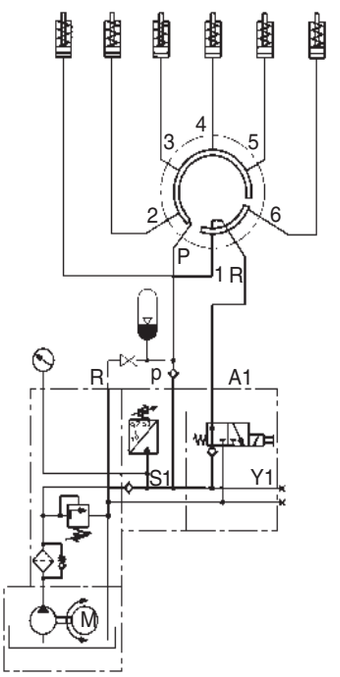


Type 2
Two Stations for Load/Unload Commonly Controlled

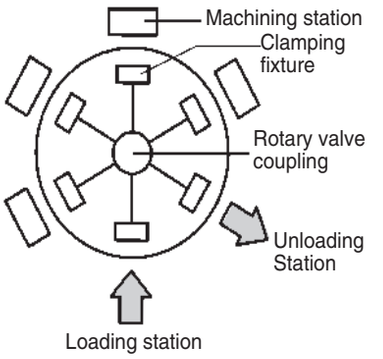


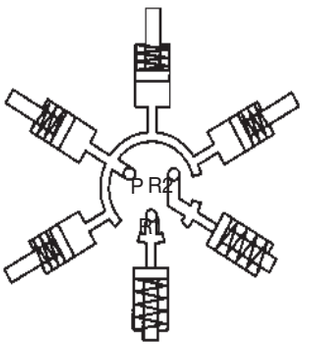


Circuit example - 6 stations

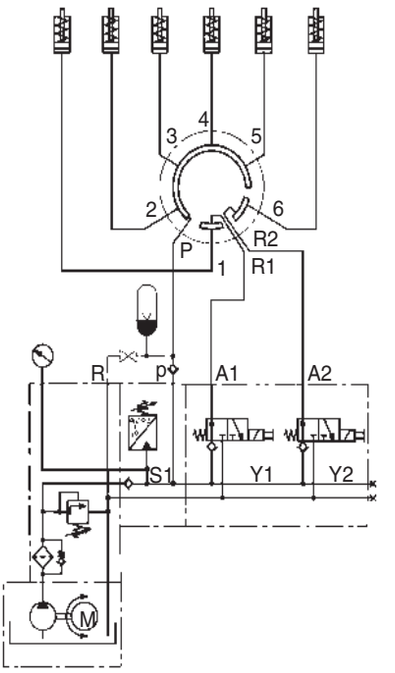


Type 3
Two Stations for Load/Unload Separately Controlled





Circuit example - 6 stations



14

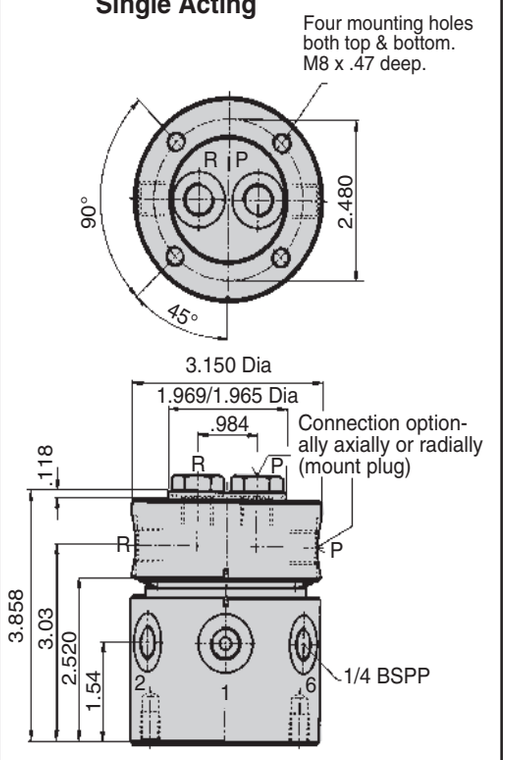
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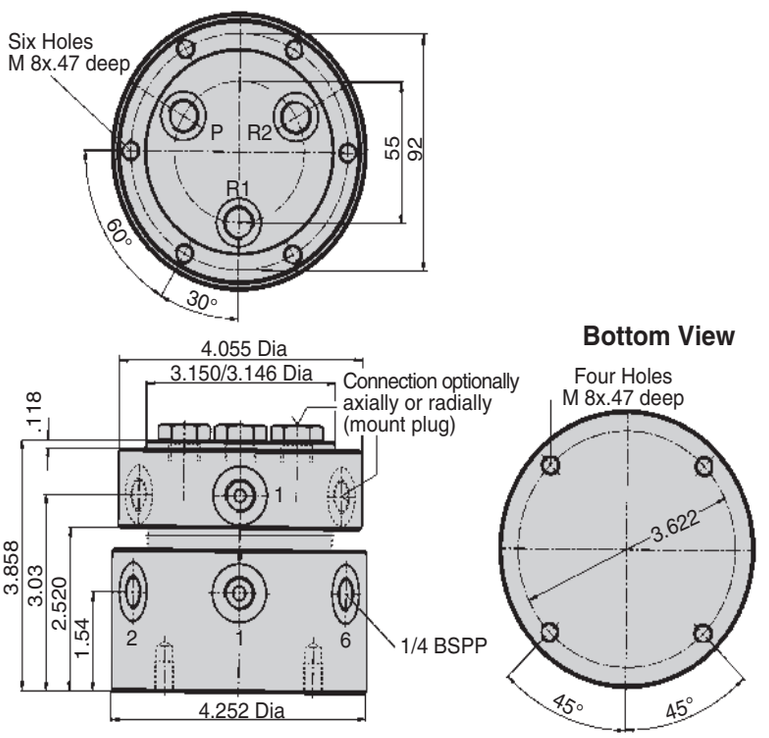
Rotary Valve Couplings

7250 psi max
Single and double acting

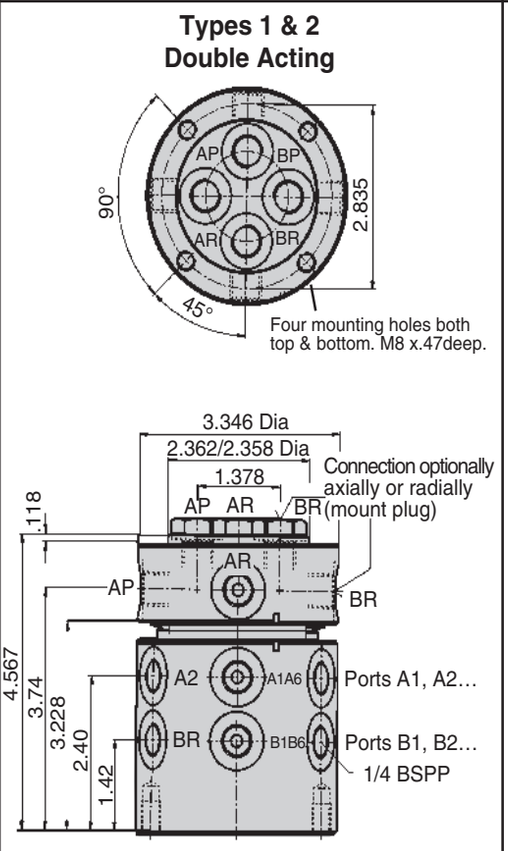
Types 1 & 2 Single Acting



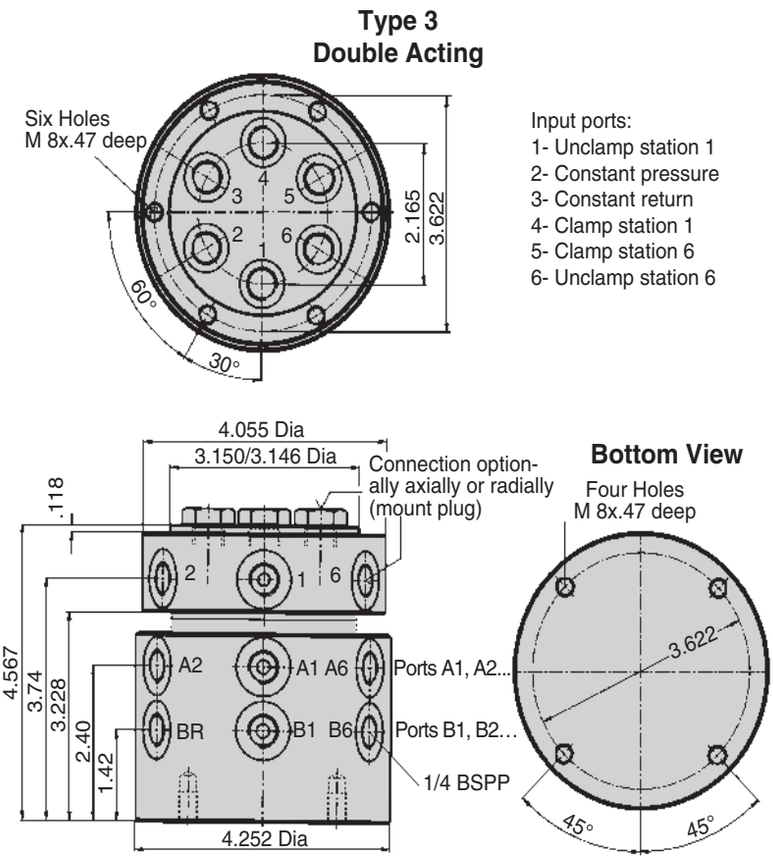
Type 3 Single Acting



Types 1 & 2 Double Acting



Type 3 Double Acting



14

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Rotary Air Valve Couplings

145 psi air max
Single and double acting



Single Acting

- **For rotary index tables with an independent load/unload station**
- **Unload and reload while all other stations remain clamped**
- **Unclamps automatically at load station, or via a clamping valve**
- **Available from stock for rotary tables with 2 through 10 stations**

OPERATION: One half of the Rotary Valve Coupling rotates with the index table, while the other half remains stationary. Each time the table and coupling index, a new station automatically becomes the load/unload station. The coupling supplies loading station separately from all other stations. The loading station can be either unclamped and reclamped automatically as the coupling rotates, or controlled by a separate clamping valve.

DESIGN CONSIDERATIONS:

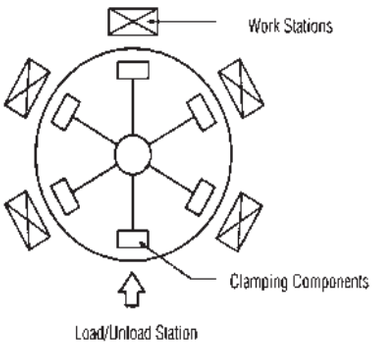
1. To use a standard Rotary Valve Coupling, workpiece must be unloaded and reloaded at the same station. Also, the table must rotate through the same angle during each indexing movement.
2. Turning the coupling requires additional table-motor starting torque, especially when clamping automatically during indexing.
3. Maximum rotational speed is 10 RPM.
4. Although couplings are well sealed, an external cover may be necessary to protect the coupling's siding surfaces against extreme dirt and grit.

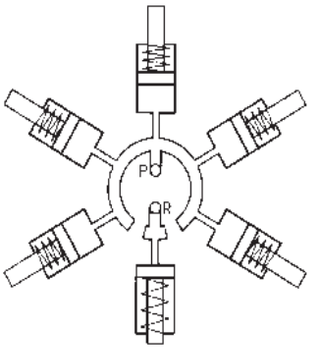
CLAMPING BY CONTROL VALVE: The loading station can be clamped and unclamped manually (or by a machine controller's electrical signal) using a 3-way valve mounted off the rotating table. This insures that a new workpiece will not move during indexing, before it is securely clamped. Double-acting clamps require a 4-way valve.

MOUNTING: Firmly fasten either the top or bottom half of the coupling using the tapped mounting holes provided. Use a floating reaction bar to prevent the other half from rotating. Mount at the center of rotation, either above, below, or on the rotary table.

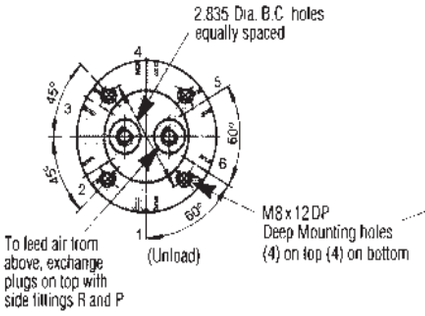
SPECIALS: For additional stations or special features, please contact factory. Possibilities include:

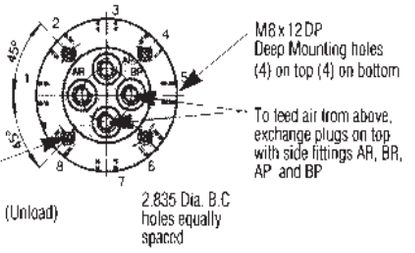
1. Any number of stations
2. Multiple load stations (2 or more)
   — Controlled independently or together
   — Side by side, opposite, or at any other orientation

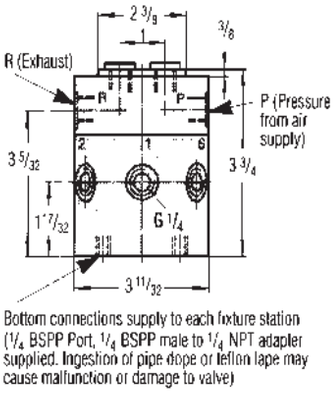


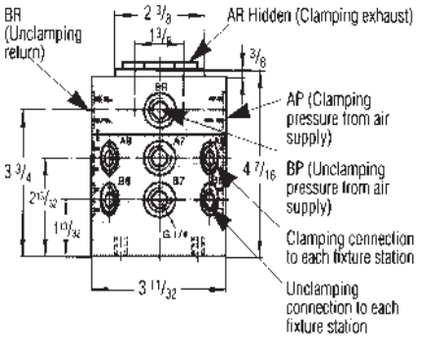


Single Acting **Double Acting**









Type Clamp	Single-Acting	Double-Acting
Max. Operating Pressure (psi)	145	145
Part No., 5 Station	CLR-9295-601-V	CLR-9295-602-V
Part No., 2, 3, 6 Station	CLR-9296-601-V	CLR-9296-602-V
Part No., 7 Station	CLR-9297-601-V	CLR-9297-602-V
Part No., 4, 8 Station	CLR-9298-601-V	CLR-9298-602-V

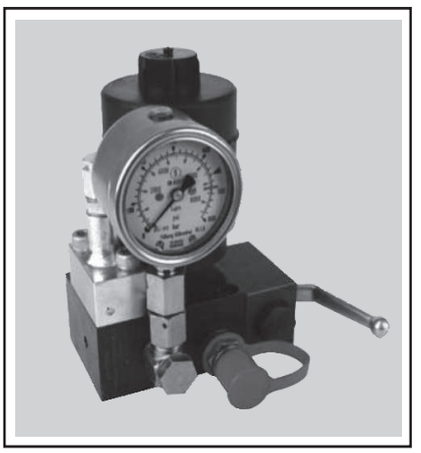
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Pallet Decouplers

7250 psi max
Single acting



Single Acting

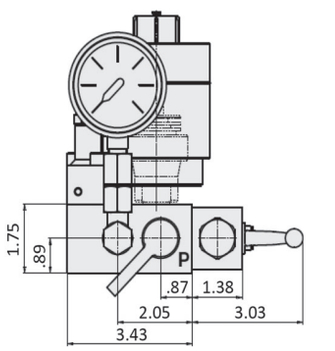
- **Allows disconnecting a single-acting fixture from its power source before machining**
- **Compact assembly mounts easily on fixture (lay gauge flat for an even lower profile)**
- **Ideal for pallets and rotating fixtures where a fluid feed line is impractical**
- **Decoupler includes shutoff valve, quick disconnect, accumulator, pressure gauge, and pressure-relief valve**
- **Do not use NPT fittings**

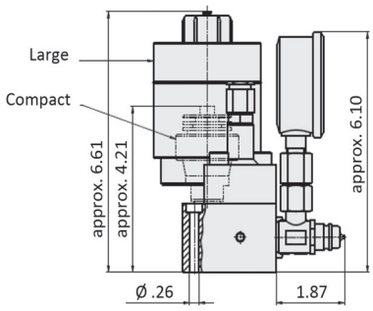
POWER UNIT: Any standard single-acting power unit can be used with this pallet decoupler.

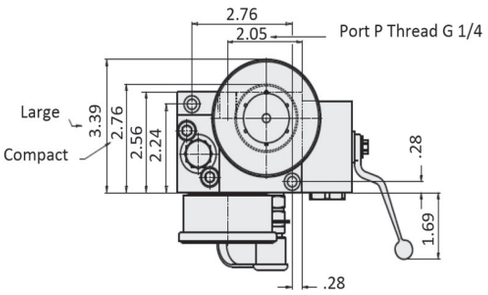
OPERATION:

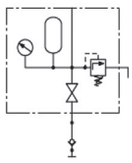
1. Remove protective cap from male quick disconnect on decoupler. Clean coupling components if necessary.
2. Connect hydraulic hose, with female quick disconnect, to the pallet decoupler. The power unit should be in unclamped mode (depressurized) before connection.
3. Open shutoff valve on decoupler to unclamp fixture.
4. After unloading and reloading fixture, actuate power unit to clamp.
5. After pressure gauge shows proper clamping pressure, close shutoff valve on decoupler.
6. Switch power unit to unclamped mode.
7. Disconnect hose and replace protective cap on male quick disconnect. Hose can be connected to optional safety support while not in use.

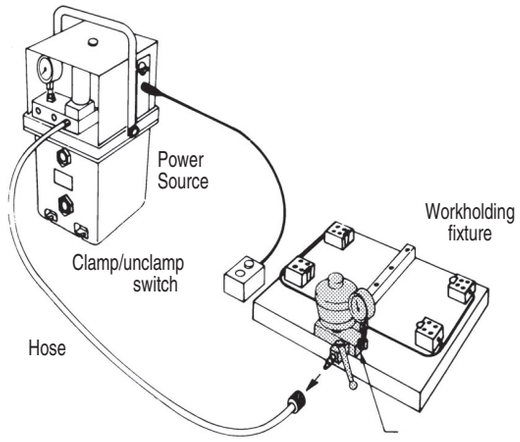
SAFETY FEATURES: Pallet decouplers include an accumulator to compensate for pressure changes due to temperature variations. Important: use pallet decouplers only with Roemheld components, because all system components must be zero leakage. These decouplers are equipped with a pressure-relief valve to protect the fixture and the accumulator from extreme temperature increases. An optional safety support with a limit switch can be used to hold the hydraulic hose after uncoupling, to ensure that the fixture is disconnected before moving.











Accumulator Size	Compact	Large
Maximum operating pressure (psi)	7250	7250
Minimum operating pressure (psi)	1800	1800
Accumulator volume at 7250 psi (cu. in.)	0.6	3.4
Accumulator volume at 1800 psi (cu. in.)	0.16	0.9
Accumulator gas preload (psi)	1450	1450
Weight (lbs)	8.4	12.7
Part No., Decoupler	**CLR-9425-012-PD**	**CLR-9425-011-PD**
Part No., Female Disconnect	**CLR-9384-106-F**	
Part No., Safety Support	**CLR-0942-001-PDA**	

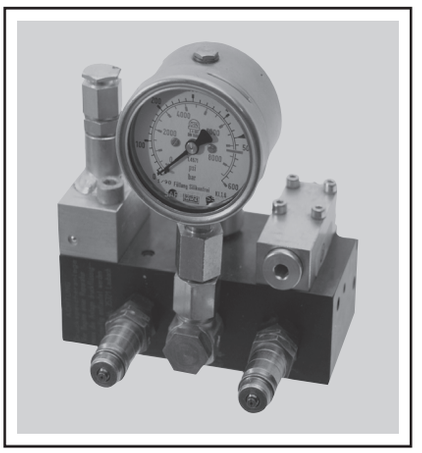
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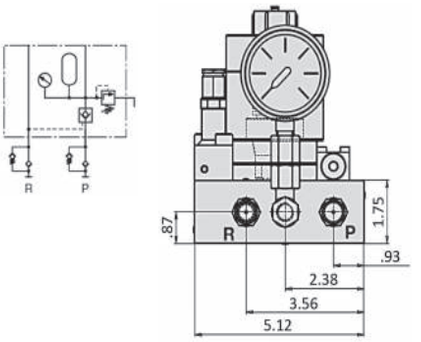
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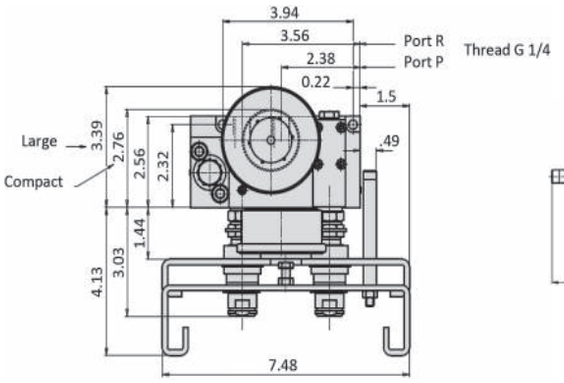
Pallet Decouplers

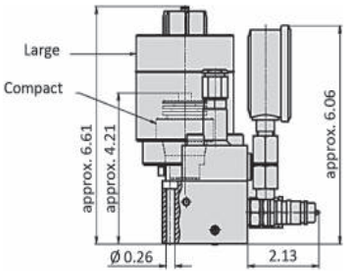
7250 psi max
Single or double acting



Single Acting or Double Acting with Automatic Shutoff



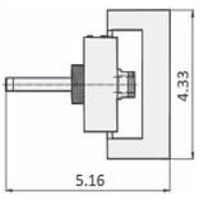




- **Allows disconnecting a single-acting fixture, a double-acting fixture, or a fixture with several individual clamping valves from its power source before machining**
- **Automatic shutoff using a pilot-operated check valve…no manual shutoff valve required!**
- **Compact assembly mounts easily on fixture**
- **Ideal for pallets and rotating fixtures where a fluid feed line is impractical**
- **Decoupler includes pilot-operated check valve, quick disconnects, accumulator, pressure gauge, and pressure-relief valve**

POWER UNIT: A double-acting power unit with a four-button control switch (B1, B2, B3, B4) is required to use this pallet decoupler for either a single-acting fixture or a double-acting fixture. The power unit provides automatic shutoff capability, via the decoupler's pilot-operated check valve, and allows depressurizing both pressure hoses simultaneously for uncoupling. See table below for power-unit part number. This pallet decoupler can also be used where clamping is controlled by individual clamping valves on the fixture (3-way valves for single acting or 4-way valves for double acting). In that application, one constant-pressure hose and one return hose are connected to the decoupler, so any standard single-acting power unit can be used.

Female Disconnect Double Coupler
(order separately)



OPERATING SEQUENCE FOR UNCLAMPING/CLAMPING:

A) SINGLE-ACTING CYLINDERS
Operating sequence for **unclamping** with coupling for single-acting cylinders:
1) Remove dust cap and clean coupling parts, if necessary.
2) Connect coupler of quick-disconnect coupling in depressurized mode.
3) Open high-pressure shut-off valve.

Operating sequence for **clamping** with coupling unit for double-acting cylinders.
1) Coupler of quick-disconnect coupling is coupled and high-pressure shut-off valve is opened.
2) Actuate power unit until pressure gauge shows required clamping pressure.
3) Shut high-pressure shut-off valve.
4) Set pressure generator to unclamping position.
5) Disconnect coupler of quick-disconnect coupling and put into a safety support, if necessary.
6) Attach dust cap to coupling nipple and coupler.

B) DOUBLE-ACTING CYLINDERS
Operating sequence for **unclamping** with coupling unit for double-acting cylinders:
1) Remove dust cap and clean coupling parts, if necessary.
2) Connect multi-coupler in depressurized mode: For the purpose switch selector switch to **"couple."**
3) Switch selector switch to **"unclamp."**

Operating sequence for **clamping** with coupling unit for double-acting cylinders.
1) Multi-coupler is coupled.
2) Switch selector switch to **"clamp."** After pressure build up, the green lamp is signaled.
3) Set multi-coupler to depressurized mode: For the purpose switch selector switch to **"couple."**
4) Disconnect multi-coupler and put it into a safety support, if necessary.
5) Attach dust cap to coupling nipple and coupler.

SAFETY FEATURES: Pallet decouplers include an accumulator to compensate for pressure changes due to temperature variations. Important: use pallet decouplers only with **Roemheld** components, because all system components must be zero leakage. These decouplers are equipped with a pressure-relief valve to protect the fixture and the accumulator from extreme temperature increases. An optional safety support with a limit switch can be used to hold the double coupler after uncoupling, to ensure that the fixture is disconnected before moving.

Accumulator Size	Compact	Large
Maximum operating pressure (psi)	7250	7250
Minimum operating pressure (psi)	1800	1800
Accumulator volume at 7250 psi (cu. in.)	0.6	3.4
Accumulator volume at 1800 psi (cu. in.)	0.16	0.9
Accumulator gas preload (psi)	1450	1450
Weight (lbs)	9.6	13.5
Part No., Decoupler	**CLR-9425-022-PD**	**CLR-9425-021-PD**
Part No., Female Disconnect Double Coupler	**CLR-9425-102-PDA**	
Part No., Safety Support	**CLR-0942-002-PDA**	
Electric Power Unit, 7500 psi, 460V	**CLR-939-EP**	
Electric Power Unit, 7500 psi, 230V	**CLR-839-EP**	
Electric Power Unit, 5000 psi, 460V	**CLR-940-EP**	
Electric Power Unit, 5000 psi, 230V	**CLR-840-EP**	

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Accumulators

7250 psi max



Compact



Large

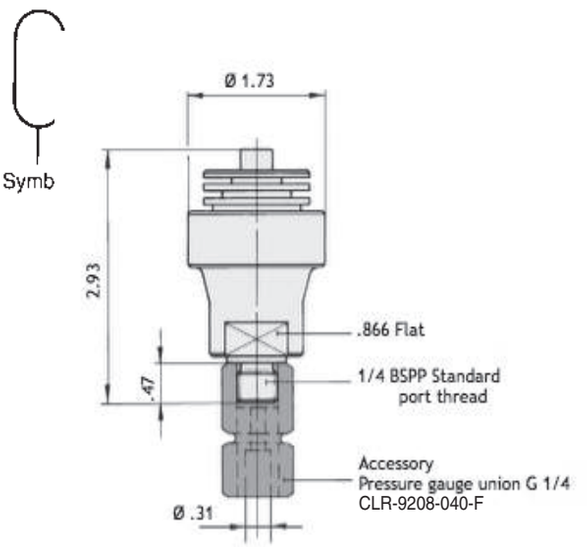
- **Extremely compact accumulator, ideal for workholding applications**
- **Can also store fluid potential energy between working cycles**
- **Operates comfortably at up to 7250 psi**
- **Choice of large or compact size**

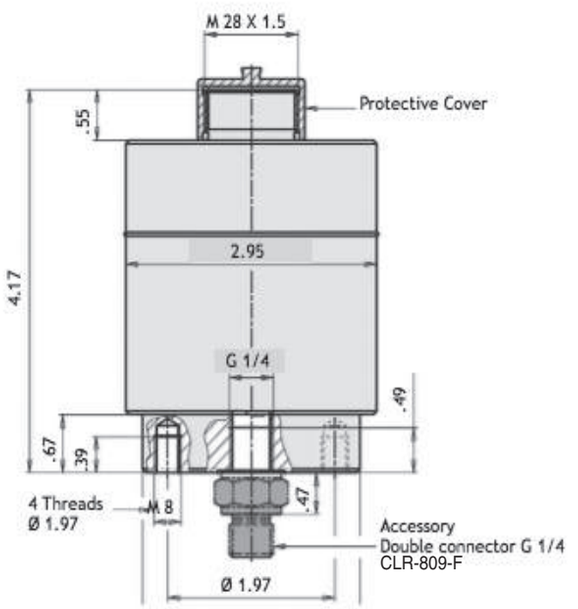
****Do not use NPT fittings**

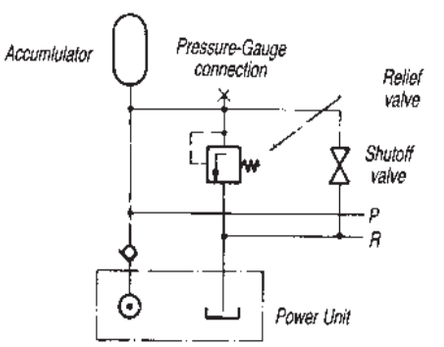
SPECIFICATIONS: Nitrogen-filled diaphragm type accumulator. Allowable operating temperature 15 to 175° F. Install in any position, horizontal or vertical.

DESIGN CONSIDERATIONS:

1. Use only with Roemheld components because all system components should be leakfree.
2. Since a fixture's fluid lines are sealed after disconnection from the power source, fluid pressure will actually increase if fixture temperature increases. This increase can be quite substantial: about 80 psi per 1°F. Be careful not to exceed 7250 psi at any time during the machining cycle. Always install a pressure gauge in the closed system.
3. If the possibility of exceeding 7250 psi exists, install a Relief Valve (see valves section) in the system.
4. Shield accumulator if the possibility of accidental damage exists.







Example:
Accumulator circuit with all safety devices installed.

Size	Compact	Large
Maximum operating pressure (psi)	5800	7250
Minimum operating pressure (psi)	1800	1800
Accumulator volume at 7250 psi (cu. in.)	.60	3.4
Accumulator volume at 1800 psi (cu. in.)	.16	.9
Accumulator gas preload (psi)	1450	1450
Weight (lbs)	0.7	5.0
Part No.	**CLR-9606-102-PDA**	**CLR-9605-611**

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Threaded Coupling Elements

7250 psi max



Manifold Mounted

- **Very compact coupling units**
- **Flush mounting in uncoupled mode**
- **Ideal for pallet coupling with vertical guided connection**
- **Optional return line relief**
- **Two sizes with and without coupling against pressure**

Depending on the version, the coupling elements can either be coupled in energized mode, or de-energized mode only. The operating mode depends on the type of sealing elements which are used and can be taken from the table below.

The max. positioning tolerances in axial and radial direction are indicated in the table below.

The sealing areas at the side of the coupling elements have to be cleansed before coupling, to ensure the tightness in coupled mode. We recommend to wash the elements and finally clean them with compressed air. Dust caps should be used as far as possible.

APPLICATION: Compared to other coupling elements the threaded coupling elements are very compact devices.

If the slide movement of the workpiece carrier is to be used or if a fixture is to be used or if a fixture is to be connected to the base plate without lines, the threaded nipple and the coupling mechanisms can be directly screwed into the parts which are to be connected. The coupling mechanisms have the advantage that they are flush-faced in uncoupled mode.

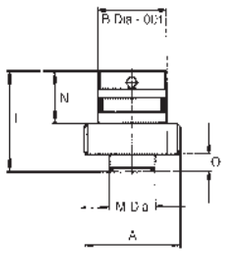
Flange-type housings are available to simplify the manufacture of the fixture mounting hole contours. In cramped conditions it is possible to make and install the flange-type housing retrospectively.

The fixture bodies which are to take up the coupling parts have to be guided .125 in. parallel before they are coupled.

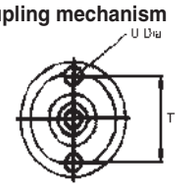
The axial forces which arise during the pressure build-up in coupled mode (see diagram) have to be absorbed outside the coupling parts.

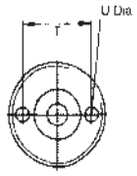
The threaded nipples, which are installed into the tank lines, are equipped with a pre-loaded valve (VSV). The pre-loaded valve limits a possible pressure build-up in the return line, caused by internal leakage in the hydraulic clamping elements, to approx. 75 psi. In coupled mode the pre-loaded valve is not effective.

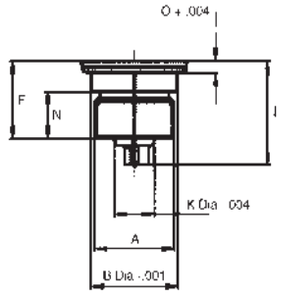
Threaded nipple

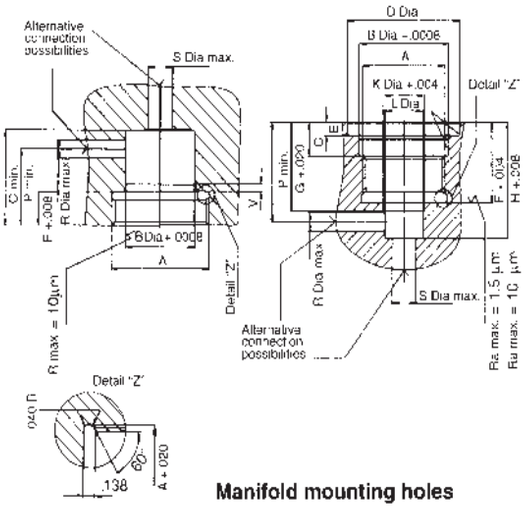


Coupling mechanism









Manifold mounting holes

Element	Coupling mechanism	Threaded nipple	Threaded nipple with VSV	Coupling mechanism	Threaded nipple	Threaded nipple with VSV
Nominal ID		3mm			5mm	
p. max./min.	7250/450	7250/450	7250/450	7250/450	7250/450	7250/450
A	M20x1.5	M24x1.5	M24x1.5	M24x1.5	M28x1	M28x1
B Dia	.8661	.7874	.7874	1.0236	.7874	.7874
C	.138	1.063	1.181	.354	.945	1.181
D Dia	—	—	—	1.280	—	—
E	—	—	—	.138	—	—
F	.846	.394	.394	.846	.335	.335
G	.925	—	—	.925	—	—
H	1.22	—	—	1.22	—	—
I	1.15	1.16	1.34	1.15	1.06	1.280
K Dia	.472	—	—	.472	—	—
L Dia	.441	—	—	.441	—	—
M Dia	—	.59	.268	–	.531	.531
N	.73	.65	.65	.51	.55	.77
O	—	.177	.177	.126	.177	.177
P	1.10	.827	.98	1.10	.81	.81
R Dia	.197	.197	.197	.197	.197	.197
S Dia	.276	.276	.276	.276	.276	.276
T	.630	.670	.670	.945	.787	.787
U Dia	.138	.138	.138	.197	.157	.157
V	—	2x15°	2x15°	1x15°	2x15°	2x15°
max. position tolerance (axial)	+.020	+.020	+.020	+.020	+.020	+.020
max. position tolerance (radial)	+/-.004	+/-.004	+/-.004	+/-.008	+/-.008	+/-.008

Can be coupled with or without pressure

Part No.	CLR-0460-725-TBC	CLR-0460-727-TBN	-	CLR-0460-735-TBC	CLR-0460-638-TBN	-

Can only be coupled without pressure

Part No.	CLR-0460-730-TBC	CLR-0460-731-TBN	CLR-0460-728-TBN	CLR-0460-736-TBC	CLR-0460-740-TBN	CLR-0460-637-TBN

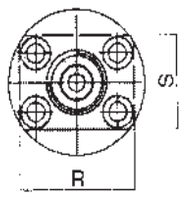
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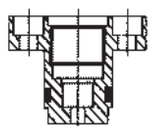
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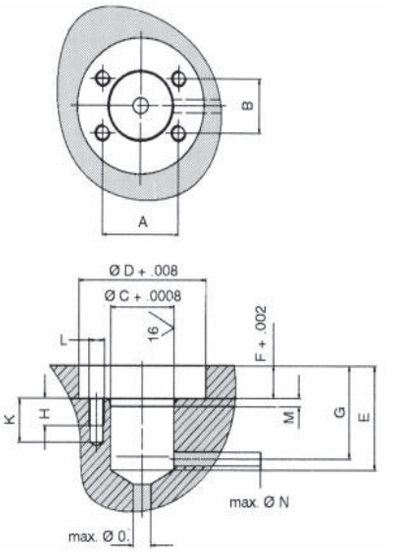
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Threaded Coupling Elements

Optional Housing for Coupling Mechanism







Mounting dimensions

If it is not required that the housing is flush-fitting with the pallet, the D dia. can be omitted.

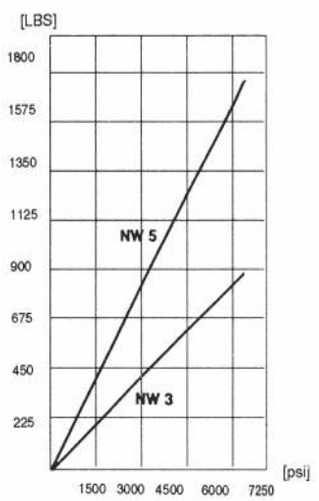
The depth dimensions are then shortened by dimension F.

In cramped installation conditions the housing can be milled according to dimensions R and S.

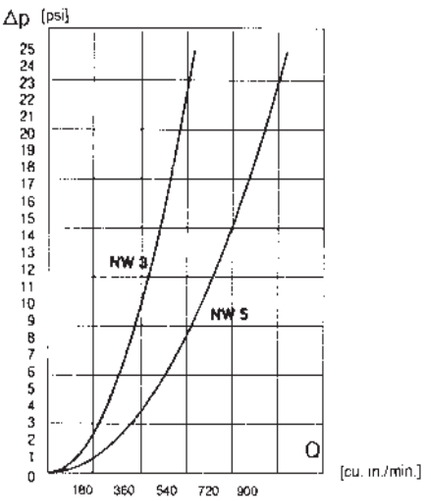
Housings for Coupling Mechanisms

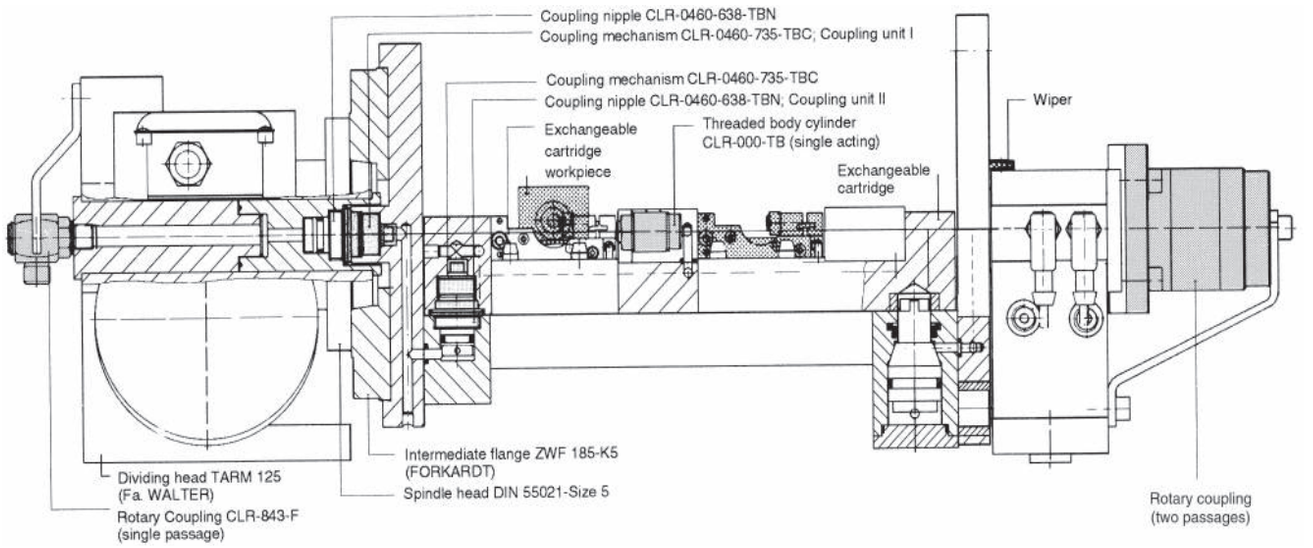
Useable for	CLR-0460-725-TBC	CLR-0460-735-TBC
A	1.181	1.693
B	.787	.906
C Dia	0.9843	1.2598
D Dia	1.9685	2.5591
E	1.50	1.50
F	0.472	0.591
G min.	1.34	1.38
H	0.39	0.47
K	0.63	0.71
L	1/4-20	5/16-18
M	0.12x15°	0.12x15°
N Dia max.	0.197	0.24
P Dia	0.28	0.28
R	1.65	2.36
S	1.26	1.57
Part no.	**CLR-0460-655-TBCH**	**CLR-0460-654-TBCH**

Coupling force



Δp-Q characteristic line for kinetic viscosity from $53x10^{-6}m^2/s$





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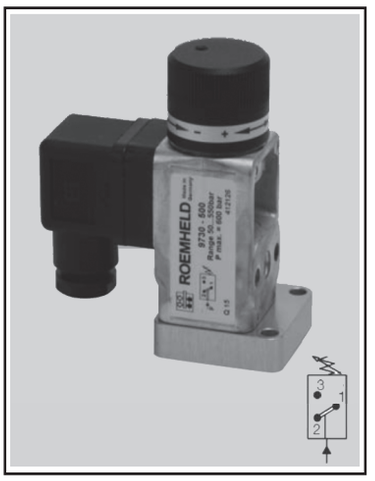
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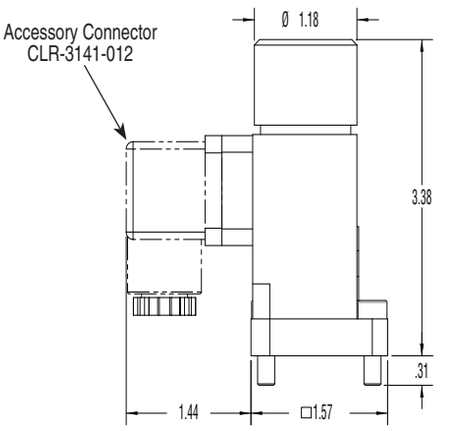
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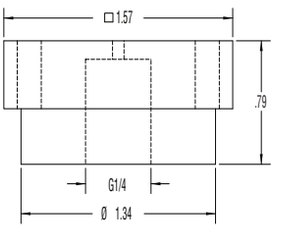
Pressure Switches ■ F9.732

Pressure Switches ■ Hydra-electrical signal converter ■ Pressure adjustment ranges ■ 75-1885 psi, 725-5075 psi & 725-7975 psi (5-130 bar, 50-350 bar & 50-550 bar)

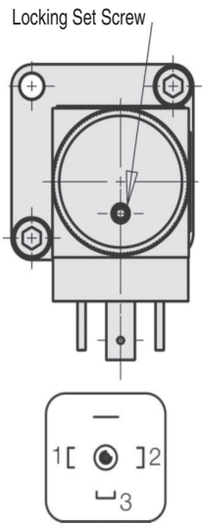


Hydra-electric pressure switches are devices which close or open electrical contacts under pressure. They are used to switch on or off pump motors, valves, machine tool interlocks or similar applications in power units, machines and installations. The switching point can be adjusted to the desired hydraulic pressure via a knurled knob. The knob can be looked in placed by tightening a set screw. The installed microswitch is a change-over switch which can be connected as break or make contact. The electrical connector can be index 4 x 90°.

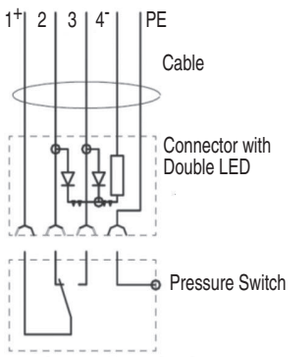




Accessory Manifold Block
CLR-3534-051



Contact Layout



Switching Symbol
Connector with Double LED
CLR-3141-802

Hydraulic characteristics

Pressure adjustment range	725 - 7975 psi	725 - 5075 psi	75 - 1885 psi
Hysteresis	8 - 12% at 7250 - 3625 psi	8 - 12% at 4350 - 1450 psi	8 - 12% at 1450 - 435 psi
Part No., (switch only)	**CLR-9730-500**	**CLR-9730-501**	**CLR-9730-502**
Part No., (switch + CLR-3141-012 DIN connector)	**CLR-9730-500-PS**	**CLR-9730-501-PS**	**CLR-9730-502-PS**

Electrical characteristics

Connection	DIN 43650 connector, form A
Switching element	Change-over switch
Max. load	4A at 250VAC; max 3.0A at 28VDC; min. 5mA
Code class (ED 60529)	IP 65

Technical characteristics

Operating fluid	Hydraulic oil HLP 22, 32 and 46
Fluid temperature	max. 176 °F
Fluid connection	Manifold mounting or G1/4 with manifold block
Enviromental temp.	-50 °F - 176 °F
Max. operating pressure	8700 psi
Vibration resistance	10 g (10 - 2000 Hz)
Shcok resistance	30 g
Material	Housing: zinc diecasting Adjusting knob: aluminum (powder coated)
Seals	FKM
Weight	0.72 lbs
Mounting position	Any

Accessories

Part No., Manifold block	**CLR-3534-051**
Part No., Connector DIN 43650, 4 x 90° indexable	**CLR-3141-012**
Part No., Connector with 1.97' cable	**CLR-3141-928**
Part No., Connector with 8.2' cable	**CLR-3141-818**
Part No., Connector with double LED and 9.84' cable	**CLR-3141-802**
Part No., Spare FKM O-ring	**CLR-3001-147**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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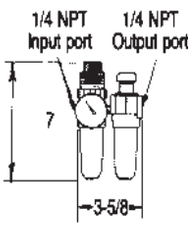
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Accessories

100 psi air max

Air Filter/Regulator/Lubricator

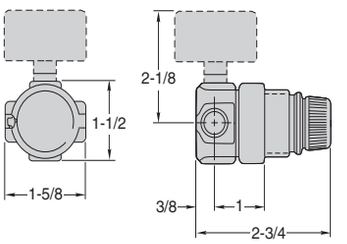




CLR-100-FRL
Recommended for all incoming air-pressure lines (included with air power unit). Filter removes solid contaminates and water from the air supply. Lubricator provides an oil mist to lubricate the system. Regulator is essential to control input air pressure, and thereby control output fluid pressure.

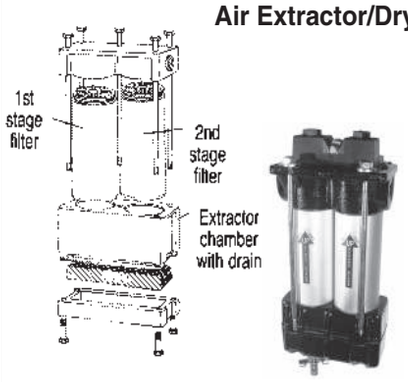
Fine Air-Pressure Regulator





CLR-200-FR
Miniature regulator for adjusting air pressure between 1 and 10 psi (30 psi gauge). Use with air-advanced work supports to finely adjust contact force. 1/4 NPT ports.

Air Extractor/Dryer



CLR-105F-AED
Effective extractor/dryer that removes air moisture and dirt to increase the life of air-powered components. Replace or clean filter/gasket every 6-12 months (part no. CLR-403-AEDA).

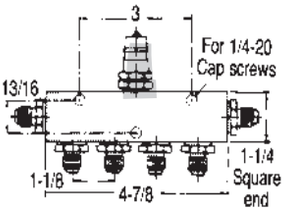
Air Flow-Control Valve



CLR-100-AFC
Simple valve to reduce air flow rates and reduce clamping speed. Release air pressure to adjust setting.

Fluid 6-Port Manifolds

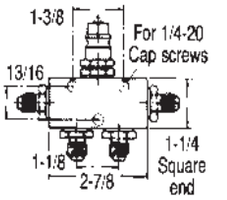




CLR-106-F
(6) Male 37° fittings (1) Male quick disconnect
CLR-107-F
(7) Male 37° fittings
CLR-106-BP
(7) 1/4 BSPP ports, without fittings

Fluid 4-Port Manifolds

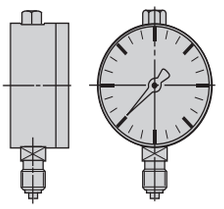




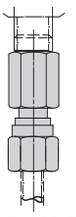
CLR-104-F
(4) Male 37° fittings (1) Male quick disconnect
CLR-105-F
(5) Male 37° fittings
CLR-104-BP
(5) 1/4 BSPP ports, without fittings

Fluid Pressure Gauges

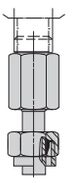




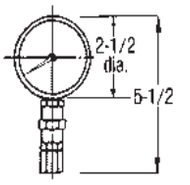
CLR-100-GA
Gauge only
without adaptor



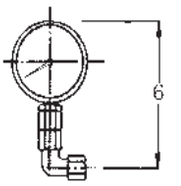
CLR-808-F
Female gauge adaptor
Compression type



CLR-9208-041-F
Male gauge adaptor
Compression type



CLR-101-GA
Gauge with
Female 37° fitting



CLR-102-GA
Gauge with Elbow
Female 37° fitting

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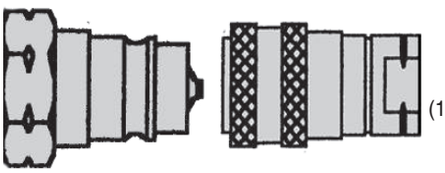
Quick Disconnects

General Use

6000 psi max. (415 bar)

Nipple Coupler

G 1/4 (1/4 BSPP)



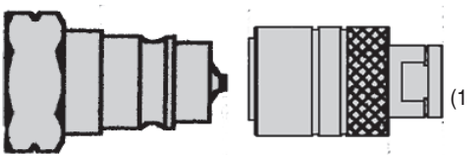
G 1/4 (1/4 BSPP)

CLR-200-BP **CLR-202-BP**

7250 psi max. (500 bar)

Nipple Coupler

G 1/4 (1/4 BSPP)



G 1/4 (1/4 BSPP)

CLR-9384-206-F **CLR-9384-106-F**

Flat Face Non-Spill

10000 psi max. (690 bar)

Nipple Coupler

G 1/4 (1/4 BSPP)



G 1/4 (1/4 BSPP)

CLR-221-BP **CLR-223-BP**

Color Coded with Alignment Pins

7250 psi max. (500 bar)

Nipple Coupler

G 1/4 (1/4 BSPP)



G 1/4 (1/4 BSPP)

CLR-9384-7X7 **CLR-9384-7X6**

X Color Code
1 = Black
2 = White*
3 = Red
4 = Yellow
5 = Green
6 = Blue

Our color coded quick connects are not only easily identified by color but each color contains its own unique alignment pin so that it is physically impossible to mix them up.

*** The white nipple only, 9384-727, comes with a built-in pressure relief valve. This limits possible pressure build up due to internal leakage. Relief pressure = 72 psi (5 bar).**

*** For G 1/4 fittings and adapters see Fitting Pages**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

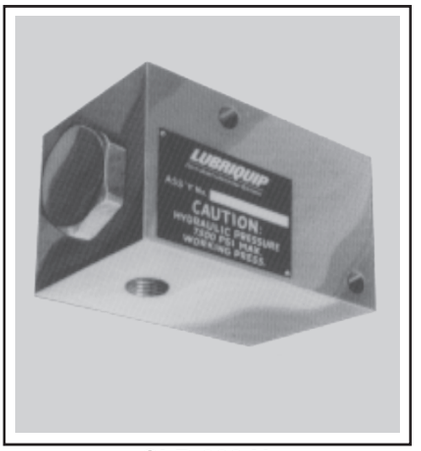
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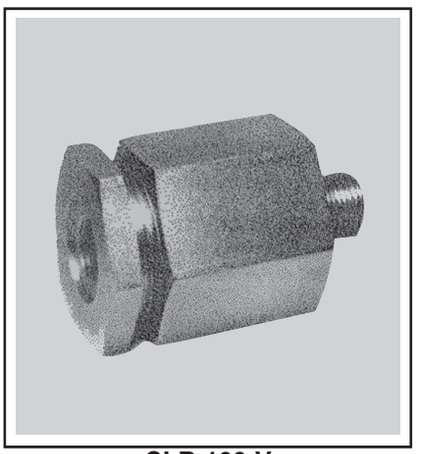
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High Pressure Inline Filters

7250/3000 psi max



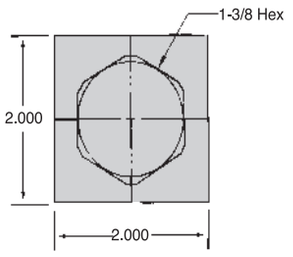
CLR-000-V

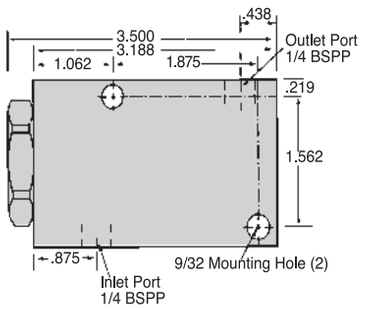


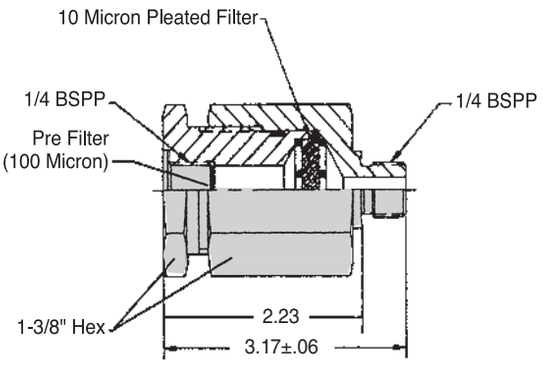
CLR-100-V

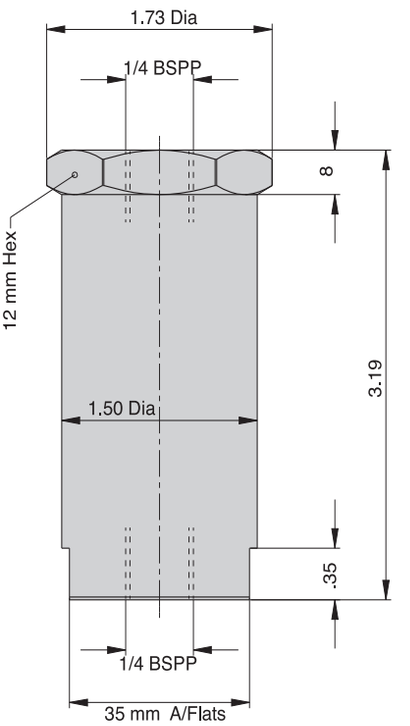


CLR-3887-087









- **Replaceable filter elements**
- **Simple and compact in design**
- **Easy to install on any new or existing system**
- **Do not use NPT fittings**

OPERATION: Install the filter in the output line of the pump to provide filtration of the oil entering the system. The oil passes through the filter assembly from inlet port to outlet port.

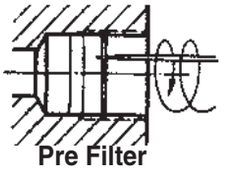
CAUTION: Do not attempt to replace filter element with pressure in system.

Recommended mouting position is with filter body vertical, plug on the bottom. This mounting position allows contaminated filter elements to be changed without removing existing piping or tubing. Simply remove the end plug, spring, and spring retainer to get at the filter element.

CAUTION: Mounting position other than as recommended…remove entire filter assembly for servicing.



Pre Filter (100 micron)



Pre Filter Installations

Max. Oper. Pressure (psi)	7250	7250	5000
Filter Rating (Nom. Filtration)	10 microns	10 microns	10 microns
Typical Flow Rate (cu. in./min.)	120*	230	120
Direction of Flow	Either direction	Either direction	Either direction
Material (Body)	Steel	Steel	Steel
Weight (lbs)	3	.75	1
Part No.	**CLR-000-V**	**CLR-100-V**	**CLR-3887-087**
Part No. of Filter Element	**CLR-001-FIL**	**CLR-100-FIL**	**CLR-3887-061-FIL**
Part No. of Pre-Filter	**—**	**CLR-3887-009-FIL**	**—**

*AP 35 psi across filter

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Fixture Hose



Small-Diameter high-pressure hose perfect for workholding applications. Abrasion and chemical resistant outer cover with seamless nylon inner sleeve reinforced with synthetic yarn. Other lengths and diameters available upon request.

Nominal ID	0.156 in
Nominal OD	0.34 in
Min. bend radius	1.6 in
Burst pressure	25,520 psi
Temperature range	-40 to +150°F

Length	End Type
	#5 JIC
Part No., 9 inch	CLR-HH-156-009-5J5J
Part No., 12 inch	CLR-HH-156-012-5J5J
Part No., 15 inch	CLR-HH-156-015-5J5J
Part No., 18 inch	CLR-HH-156-018-5J5J
Part No., 24 inch	CLR-HH-156-024-5J5J

Tubing



Steel Tubing

Seamless heavy-wall tubing. C1010 steel, cold drawn, fully annealed 1/4", 5/16" and 3/8" OD available. Do not use any other type of tubing. See next page for installation guidelines and tools (CLR-300-TL flaring tool is strongly recommended).

Part No.	O.D.	Wall Thickness	Length*
CLR-TC-2500-049-060	1/4"	0.049"	60"
CLR-TC-3125-065-060	5/16"	0.065"	60"
CLR-TC-3750-065-060	3/8"	0.065"	60"

*Custom lengths available on request

Heavy-Duty Hose



High-pressure hydraulic hose. 1/4" inside diameter. Reinforced with four plies of high-tensile wire, for remarkably little expansion under pressure. Fluid required due to expansion is only .066 cu. in. per foot at 7500 psi. 5" minimum bend radius. Two female ends, 5/16 JIC 37° flare, or straight tube ends for use with compression fittings.

NOTE! 10'-0" MAXIMUM RECOMMENDED LENGTH

	JIC 37° flare	Compression Type
18"	CLR-18-H	CLR-18-H-CC
24"	CLR-24-H	CLR-24-H-CC
30"	CLR-30-H	CLR-30-H-CC
36"	CLR-36-H	CLR-36-H-CC
42"	CLR-42-H	CLR-42-H-CC
48"	CLR-48-H	CLR-48-H-CC
60"	CLR-60-H	CLR-60-H-CC
72"	CLR-72-H	CLR-72-H-CC

(Special lengths available)

Hydraulic Fluid



Roemheld Hydraulic oils are compounded from premium, paraffinic base oils, plus a thermally stable zinc additive system that affords improved anti-wear and hydrolytic stability while maintaining superior oxidation stability. Use only ROEMHELD oil or an exact equivalent. **FLUID MUST BE CLEAN (10 micron or better nominal filtration) See also high pressure in-line filters.**

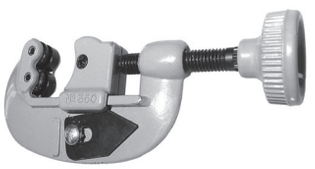
Part No.	ISO GRADE	Container Size
CLR-22-FL	22	1 gal.
CLR-32-FL	32	1 gal.
CLR-46-FL	46	1 gal.

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Tubing Installation



CLR-100-TL
Tubing Cutter

Cutting

1. Use only steel tubing as specified on the previous page.
2. Cut tubing with a tubing cutter or hacksaw.
3. File or sand tubing end square. End must be square to achieve a proper flare.



Drill Bit Deburring Tool
deburrs O.D. and I.D. simultaneously, adjustable chamfer, 50-200 rpm

PART NO.	For Tube O.D.	Shank Ø
CLR-202-TL	1/4"	1/4"
CLR-203-TL	5/16"	5/16"
CLR-204-TL	3/8"	3/8"

CLR-201-TL
Hand Deburring Tool
I.D. & O.D. 1/4" - 1-1/2" pipe

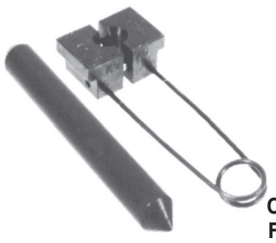


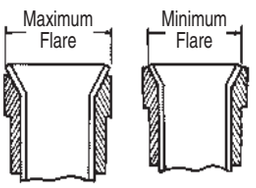


Tubing Benders

PART NO.	For Tube O.D.
CLR-401-TL	1/4"
CLR-402-TL	5/16"
CLR-403-TL	3/8"

The **Roemheld** tube bender shown is a simple, effective bender we highly recommend. When bending tubing carefully avoid wrinkling, flattening or kinking the tube. Please note: complete flaring before bending.

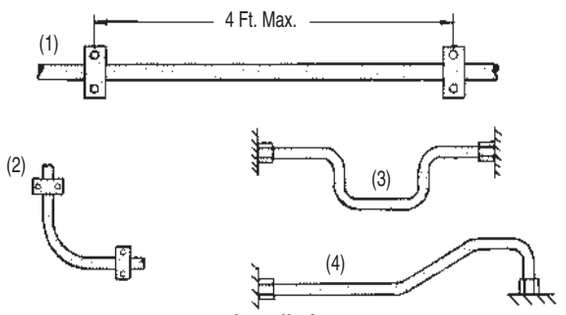




CLR-300-TL
Flaring Tool

Flaring

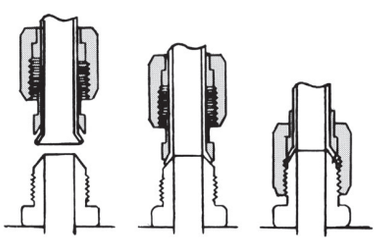
1. Place nut and sleeve over tube before flaring.
2. Place tube in flaring tool, approximately 1/8" above top of block.
3. Clamp assembled block in vise.
4. Center pin guide of flaring tool in tube.
5. Strike flaring tool 3-4 times with sharp hammer blow. Remove from block.
6. Inspect flare so that their outside diameters extend beyond the inner lip of the sleeve, but not beyond the sleeve's OD.



Installation

We recommend using tubing clamps as this will increase the life of the installation. Tubing clamps should be less than four feet apart (Figure 1) and bends should be supported also (Figure 2). Use bends as shown in Figures 3 and 4 instead of straight-line connections to prevent stressing the tubing.

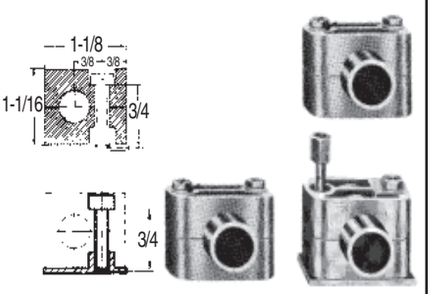
Important: Never use tubing lines as handles to lift fixtures.



Assembly

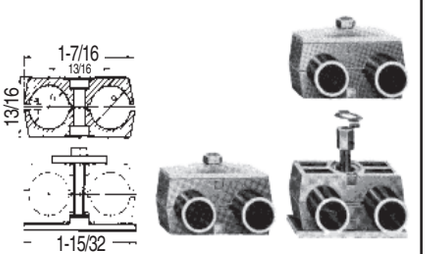
1. Slide nut and sleeve on to flared tubing end and finger tighten.
2. Finish tightening with a wrench, 1/4 to 1/2 turn.

Note: Do not over torque.



Single Tube
Regular and Stack Mounting

CLR-3300-892-TA Single clamp
CLR-3300-600-TA Single mounting plate
CLR-3300-225-TA Mounting screw
CLR-3300-604-TA Stack-mounting screw
CLR-3300-335-TA Stack-mounting clip



Twin Tubes
Regular and Stack Mounting

CLR-3300-891-TA Twin clamp
CLR-3300-607-TA Twin mounting plate
CLR-3300-609-TA Washer
CLR-3300-225-TA Mounting screw
CLR-3300-613-TA Stack-mounting screw
CLR-3300-615-TA Stack-mounting clip

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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Hydraulic Compression Fittings
(7250 psi static)

Port Fitting - Male



5/16 Tubing	G 1/4	CLR-802-F
	G 1/8	CLR-805-F
1/4 Tubing	G 1/4	CLR-806-F
	G 1/8	CLR-826-F

Banjo Elbow



5/16 Tubing	G 1/4	CLR-803-F
1/4 Tubing	G 1/4	CLR-823-F**

Branch Tee



5/16 Tubing	G 1/4	CLR-804-F
1/4 Tubing	G 1/4	CLR-824-F

Union



5/16 Tubing	CLR-701-F
1/4 Tubing	CLR-721-F

Elbow



5/16 Tubing	CLR-702-F
1/4 Tubing	CLR-722-F*

Tee



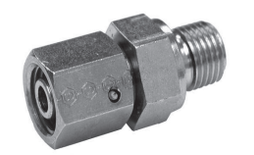
5/16 Tubing	CLR-703-F
1/4 Tubing	CLR-723-F*

Cross



5/16 Tubing	CLR-704-F
1/4 Tubing	CLR-724-F*

Stand Pipe Union



5/16 Tubing	G 1/4	CLR-9208-018-F

Nut



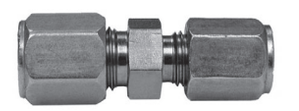
5/16 Tubing	CLR-800-F
1/4 Tubing	CLR-820-F

Sleeve



5/16 Tube	CLR-801-F
1/4 Tube	CLR-821-F

Tube Adaptor



1/4 tube to 5/16 tube	CLR-606-F

Port Reducer



G1/4 to G1/8	CLR-3613-003-F
G1/2 to G1/4	CLR-3613-015-F

Air-Vent Fittings
250 psi air

Barbed for 3/16 ID Hose



M5 Port	CLR-805-AF
G1/4 Port	CLR-815-AF

Barbed for 1/4 ID Hose



M5 Port	CLR-3890-091-AF
G1/8 Port	CLR-806-AF
G1/4 Port	CLR-3890-093-AF

Vent Fitting



G1/4 Port	CLR-817-AF

Vent Fitting - Metal Filter



G1/8 Port	CLR-0361-012-F
G1/4 Port	CLR-0361-000-F
G1/2 Port	CLR-0361-006-F

*Max 6600 psi **Max 6000 psi

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Hydraulic 37° Flare Fittings
(7250 psi static)

Tube End



5/16 Tubing	CLR-400-F
1/4 Tubing	CLR-420-F

Nut Elbow



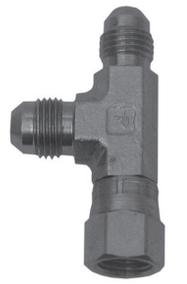
5/16 Tubing	CLR-402-F
1/4 Tubing	CLR-422-F

Branch Tee



5/16 Tubing	CLR-403-F
1/4 Tubing	CLR-423-F

Run Tee



5/16 Tubing	CLR-404-F
1/4 Tubing	CLR-424-F

Union



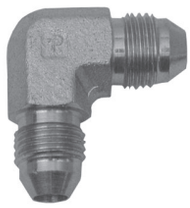
Male



Female (1.75 in. Flare to Flare)

5/16 Tubing	Male	CLR-301-F
1/4 Tubing	Male	CLR-321-F
5/16 Tubing	Female	CLR-401-F
1/4 Tubing	Female	CLR-421-F

Elbow



5/16 Tubing	CLR-302-F
1/4 Tubing	CLR-322-F

Tee



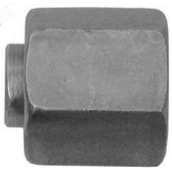
5/16 Tubing	CLR-303-F
1/4 Tubing	CLR-323-F

Cross



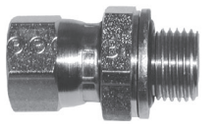
5/16 Tubing	CLR-304-F
1/4 Tubing	CLR-324-F

Cap



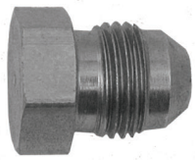
5/16 Tubing	CLR-501-F
1/4 Tubing	CLR-521-F

Port Fitting Female



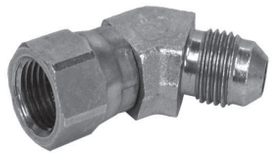
5/16 Tubing	CLR-813-F*
1/4 Tubing	CLR-815-F*

Tube Plug



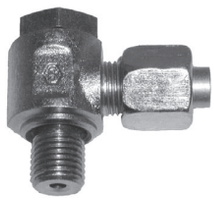
5/16 Tubing	CLR-502-F
1/4 Tubing	CLR-522-F

Nut 45



5/16 Tubing	CLR-406-F
1/4 Tubing	CLR-426-F

Banjo Elbow



5/16 Tubing	CLR-814-F

Port Fitting Male



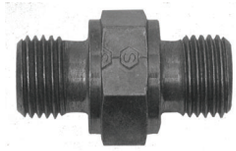
5/16 Tubing	G 1/4	CLR-807-F
5/16 Tubing	G 1/8	CLR-903-F
1/4 Tubing	G 1/4	CLR-816-F*

Port Plug



G 1/8 Port	CLR-3610-263
G 1/4 Port	CLR-810-F
G 1/2 Port	CLR-3610-000-F

Double Port



G 1/4 Port	CLR-809-F

*Max. 6600 psi.

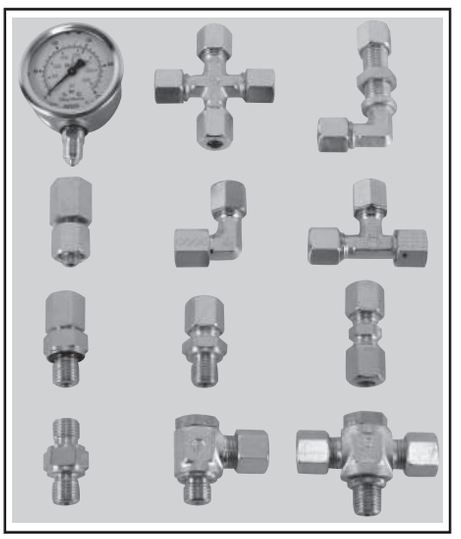
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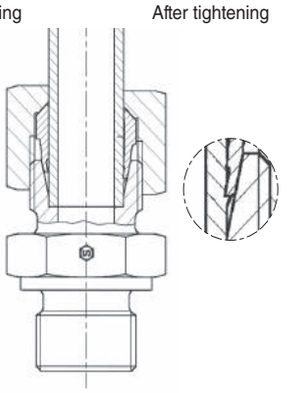
Fitting accessories ■ with 24° cone as per DIN EN ISO 8434-1 plug-type connectors ■ hydraulic pipes ■ pipe clamps



- **Worldwide spread high-pressure fitting system with quadruple safety**
- **Leak-free connection of piping and components**
- **Positive and safe connection by defined and limited digging into the hydraulic pipe**
- **Retightening of the union nut is not required**
- **The fitting can be disconnected and connected again as often as required.**

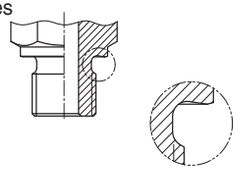
Tube male stud coupling with cutting ring and union nut

Before tightening | After tightening



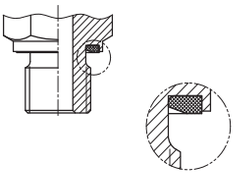
Screwed plug with knife edge

Suitable for high temperatures
and aggressive media.
DIN 3852 T2 form B and
EN ISO 1179-4



Screwed plug with elastic sealing

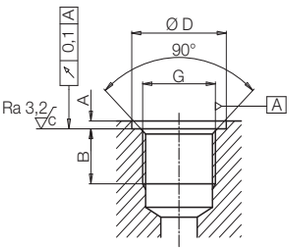
DIN 3852 T11 form E and EN ISO 1179-2
NBR: –35°C.....+100°C (series)
FKM: –25°C.....+200°C (available)



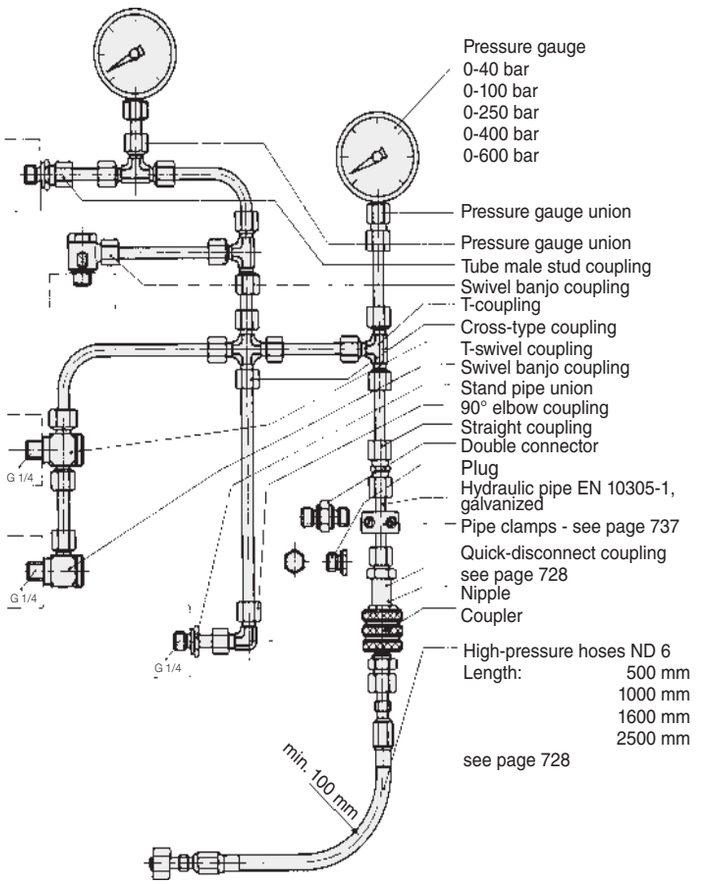
Suitable for soft mating materials (Alu).
High precision sealing (no sweating).
No retightening required.
Unlimited repeated mounting.
Interchangeable sealing ring.

Tapped hole
with Whitworth pipe thread

EN ISO 1179-1 counterbore form N



Application example



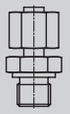
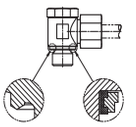
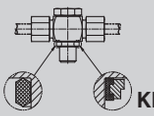
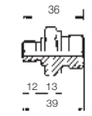
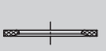
Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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Fitting accessories ■ with 24° cone as per DIN EN ISO 8434
Plug-type connectors ■ hydraulic pipes ■ pipe clamps

Description	Pipe Ø	Screw-in threads	Type	PN [bar]	Part no.	Type	PN [bar]	Part no.
Tube male stud coupling 	6	G1/8	D6L	250	**9206-003**	D6L ED	250	**9206-028**
	8	G1/8	D8L G1/8	250	**9208-034**	D8L G-1/8 ED	250	**9208-075**
	8	G1/4	D8L	250	**9208-003**	D8L ED	250	**9208-131**
	10	G1/4	D10L	250	**9210-004**	D10L ED	250	**9210-028**
	15	G1/2	D15L	250	**9215-003**	D15L ED	250	**9215-033**
	8	G1/8	D8S G1/8	400	**9208-116**	D8S G-1/8 ED	500	**9208-164**
	8	G1/4	D8S	400	**9208-102**	D8S ED	630	**9208-132**
	10	G3/8	D10S	400	**9210-104**	D10S ED	630	**9210-029**
	16	G1/2	D16S	400	**9216-004**	D16S ED	500	**9216-021**
Stand pipe union with sealing cone 	8	G1/4	-	-	-	DCD8L	250	**9208-017**
	10	G1/4	-	-	-	DCD10L	250	**9210-109**
	8	G1/4	-	-	-	DCD8S	630	**9208-018**
	10	G3/8	-	-	-	DCD10S	630	**9210-136**
Swivel banjo coupling  **KDS**	6	G1/8	SVH6LR	250	**9206-004**	DSVK6LROKDS	250	**9206-044**
	8	G1/4	SVH8LR	250	**9208-004**	DSVK8LROKDS	250	**9208-080**
	10	G1/4	SVH10LR	250	**9210-015**	DSVK10LROKDS	250	**9210-038**
	15	G1/2	SVH15LR	250	**9215-004**	DSVK15LROKDS	250	**9215-048**
	8	G1/4	SVH8SR/SA	400	**9208-108**	SVH8SR ED	500	**9208-177**
	10	G3/8	SVH10SR	315	**9210-105**	DSVK10SROKDS	400	**9210-149**
	16	G1/2	SVH16SR	250	**9216-005**	DSVK16SROKDS	315	**9216-033**
T-swivel coupling  **KDS**	6	G1/8	DSVQ6LRO	250	**9206-019**	DSVQ6LROKDS	250	**9206-048**
	8	G1/4	DSVQ8LRO	250	**9208-120**	DSVQ8LROKDS	250	**9208-169**
	10	G1/4	DSVQ10LRO	250	**9210-006**	DSVQ10LROKDS	250	**9210-154**
	15	G1/2	DSVQ15LRO	250	**9215-030**	DSVQ15LROKDS	250	**9215-050**
	8	G1/4	DSVQ8SR/SA	400	**9208-115**	DSVQ8SR ED	500	**9208-178**
	10	G3/8	DSVQ10SRO	315	**9210-107**	DSVQ10SROKDS	400	**9210-153**
	16	G1/2	DSVQ16SRO	315	**9216-007**	DSVQ16SROKDS	315	**9216-035**
Plug 	-	G1/8	VSDG 1/8 A	400	**3610-047**	VSG 1/8 ED	400	**3610-158**
	-	G1/4	VSDG 1/4 A	400	**3300-821**	VSG 1/4 ED	400	**3610-191**
	-	G3/8	VSDG 3/8 A	400	**3610-100**	VSG 3/8ED	400	**3610-099**
	-	G1/2	VSDG 1/2A	400	**3610-045**	VSG 1/2 ED	400	**3610-098**
	-	G1/8	SW 14x7 high	400	-	SW 14x7 high	500	**3610-263**
	-	G1/4	SW 19x8 high	400	-	SW 19x8 high	500	**3610-264**
	-	G1/2	SW 27x11 high	400	-	SW 27x11 high	500	**3610-265**
Thread reducing adaptor 	-	G3/8	GWR 3/8–1/4	400	**3613-016**	GWR 3/8 ED–1/4	400	**3613-073**
	-	G1/2	GWR 1/2–1/4	315	**3613-015**	GWR 1/2 ED–1/4	400	**3613-055**
	-	G1/2	GWR 1/2– 3/8	315	**3613-018**	GWR 1/2 ED–3/8	400	**3613-074**
Double connector 	-	G1/4 – G1/4	-	400	**3610-037**	-	500	**3610-261**
	-	G1/4 – G1/2	-	400	**3610-062**	-	500	**3610-262**
Elastic sealing for screwed plug form E 					**NBR**			**FKM**
	-	G1/8	ED10X1-G1/8	630	**3002-253**	ED10X1-G1/8	630	**3002-253**
	-	G1/4	ED14X1,5-G1/4	630	**3002-142**	ED14X1,5-G1/4	630	**3002-254**
	-	G3/8	ED G3/8	630	**3002-256**	ED G-3/8	630	**3002-257**
	-	G1/2	ED G1/2	500	**3002-258**	ED G-1/2	500	**3002-259**
KDS sealing ring for swivel banjo couplings (...KDS) 	-	G1/8	KDS10	250	**3002-260**	KDS10	250	**3001-766**
	-	G1/4	KDS14	400	**3002-261**	KDS14	400	**3001-765**
	-	G3/8	KDS16	400	**3002-262**	KDS16	400	**3002-323**
	-	G1/2	KDS22	315	**3002-263**	KDS22	315	**3002-324**

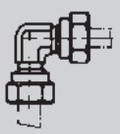
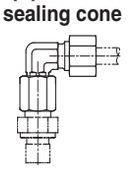
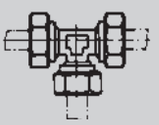
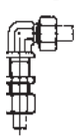
Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

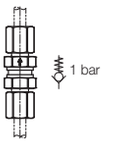
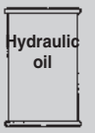
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Fitting accessories ■ with 24° cone as per DIN EN ISO 8434
Plug-type connectors ■ hydraulic pipes ■ pipe clamps

Description	Pipe Ø	Union nut	Type	PN [bar]	Part no.
Straight coupling 	6	M 12 x 1.5	E6L	250	**9206-007**
	8	M 14 x 1.5	E8L	250	**9208-007**
	10	M 16 x 1.5	E10L	250	**9210-007**
	15	M 22 x 1.5	E15L	250	**9215-007**
	8	M 16 x 1.5	E8S	630	**9208-106**
	10	M 18 x 1.5	E10S	630	**9210-108**
	16	M 24 x 1.5	E16S	500	**9216-008**
90° elbow coupling 	6	M 12 x 1.5	K6L	250	**9206-008**
	8	M 14 x 1.5	K8L	250	**9208-008**
	10	M 16 x 1.5	K10L	250	**9210-008**
	15	M 22 x 1.5	K15L	250	**9215-008**
	8	M 16 x 1.5	K8S	630	**9208-107**
	10	M 18 x 1.5	K10S	630	**9210-112**
	16	M 24 x 1.5	K16S	500	**9216-009**
Standpipe elbow with sealing cone 	8	M 14 x 1.5	KED8L	250	**9208-038**
	8	M 16 x 1.5	KED8S	630	**9208-036**
T-coupling 	6	M 12 x 1.5	Q6L	250	**9206-009**
	8	M 14 x 1.5	Q8L	250	**9208-009**
	10	M 16 x 1.5	Q10L	250	**9210-009**
	15	M 22 x 1.5	Q15L	250	**9215-009**
	8	M 16 x 1.5	Q8S	630	**9208-108**
	10	M 18 x 1.5	Q10S	630	**9210-113**
	16	M 24 x 1.5	Q16S	500	**9216-010**
Cross-type coupling 	6	M 12 x 1.5	KV6L	250	**9206-011**
	8	M 14 x 1.5	KV8L	250	**9208-010**
	10	M 16 x 1.5	KV10L	250	**9210-010**
	15	M 22 x 1.5	KV15L	250	**9215-010**
	8	M 16 x 1.5	KV8S	630	**9208-109**
	10	M 18 x 1.5	KV10S	630	**9210-114**
	16	M 24 x 1.5	KV16S	400	**9216-011**
Straight bulk head fitting 	6	M 12 x 1.5	R6L	250	**9206-026**
	8	M 14 x 1.5	R8L	250	**9208-023**
	10	M 16 x 1.6	R10L	250	**9210-117**
	15	M 22 x 1.5	R15L	250	**9215-022**
	8	M 16 x 1.5	R8S	630	**9208-117**
	10	M 18 x 1.5	R10S	630	**9210-119**
	16	M 24 x 1.5	R16S	500	**9216-017**
90° elbow bulk head fitting 	6	M 12 x 1.5	U6L	250	**9206-014**
	8	M 14 x 1.5	U8L	250	**9208-029**
	10	M 16 x 1.5	U10L	250	**9210-110**
	15	M 22 x 1.5	U15L	250	**9215-018**
	8	M 16 x 1.5	U8S	630	**9208-018**
	10	M 18 x 1.5	U10S	630	**9210-027**
	16	M 24 x 1.5	U16S	500	**9216-020**

Description	Pipe Ø	Union nut	Type	PN [bar]	Part no.
Check valve, poppet type 	6	M 12 x 1.5	RWD6L	250	**9206-012**
	8	M 14 x 1.5	RWD8L	250	**9208-012**
	10	M 16 x 1.5	RWD10L	250	**9210-012**
	15	M 22 x 1.5	RWD15L	250	**9215-011**
	8	M 16 x 1.5	RWD8S	400	**9208-111**
	10	M 18 x 1.5	RWD10S	400	**9210-116**
	16	M 24 x 1.5	RWD16S	400	**9216-012**
Union nut 	6	M 12 x 1.5	m6L	250	**9206-001**
	8	M 14 x 1.5	m8L	250	**9208-001**
	10	M 16 x 1.5	m10L	250	**9210-002**
	15	M 22 x 1.5	m15L	250	**9215-001**
	8	M 16 x 1.5	m8S	630	**9208-100**
	10	M 18 x 1.5	m10S	630	**9210-102**
	16	M 24 x 1.5	m16S	500	**9216-002**
Cutting ring 	6		s6L	250	**9206-002**
	8		s8L/S	250	**9208-101**
	10		s10L/S	250	**9210-103**
	15		s15L	250	**9215-002**
	8		s8L/S	630	**9208-101**
	10		s10L/S	630	**9210-103**
	16		s16S	500	**9216-003**
Blanking plug 	6		VB6S	630	**9206-023**
	8		VB8S	630	**9208-039**
	10		VB10S	630	**9210-024**
	15		VB15L	250	**9215-031**
	16		VB16S	500	**9216-016**
Hydr. pipe galvanized as per EN 10305-1 	8 x 1			250	**3128-112**
	8 x 1.5			400	**3128-113**
	8 x 2			500	**3128-212**
	10 x 1			200	**3128-114**
	15 x 1.5			200	**3128-119**
Available lengths 1.5 or 3.0 m					
Hydraulic oil as per DIN 51524-2 (max. 120 °C) 			HLP 22	1 L	**9892-001**
				5 L	**9893-001**
				10 L	**9894-001**
			HLP 32	1 L	**9895-001**
				5 L	**9891-001**
				10 L	**9899-001**
			HLP 46	1 L	**9896-001**
				5 L	**9897-001**
				10 L	**9898-001**
Fire-resistant hydraulic liquids Oemeta HF-Du (max. 200 °C)				1 L	**9892-002**
				5 L	**9893-002**
				10 L	**9894-002**

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

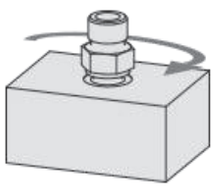
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Fitting accessories ■ with 24° cone as per DIN EN ISO 8434
Plug-type connectors ■ hydraulic pipes ■ pipe clamps

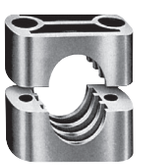
Mounting torques for tube male stud couplings and swivel banjo couplings



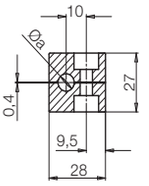
Body material: Steel lubricated
Aluminum -15%

Fitting			Mounting torque [Nm]			
Series	Pipe OD	Thread	Screwed plug with		Swivel banjo couplings	
			Knife edge	Sealing ring	Knife edge	KDS ring
L	6	G1/8	18	18	18	18
L	8	G1/4	35	35	45	40
L	10	G1/4	35	35	45	40
L	15	G1/2	140	90	120	90
S	8	G1/4	55	55	45	40
S	10	G3/8	90	80	70	65
S	16	G1/2	130	115	120	110

Single pipe clamps

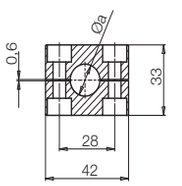


Material: polyamide
Depth: 30 mm
Fixing Screws: M6



Clamp Size 1

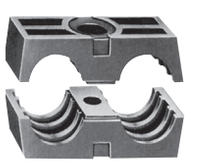
Pipe Ø a (mm)	Part no.
8	**3300-892**
10	**3300-893**
12	**3300-895**



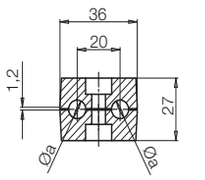
Clamp Size 2

Pipe Ø a (mm)	Part no.
15	**3300-897**
16	**3300-890**

Twin clamp



Material: polyamide
Depth: 30 mm
Fixing Screws: M6

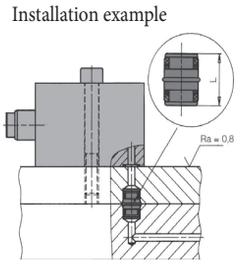


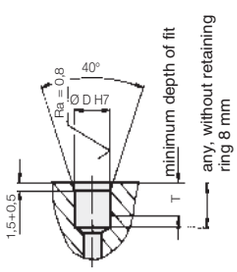
Pipe Ø a (mm)	Part no.
8	**3300-891**
10	**3300-449**

Plug-type connectors with FKM sealings for plates and piping strips (max. operating pressure 500 bar)

Short version
for connections without space

Installation example



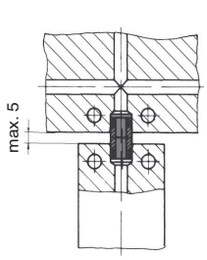


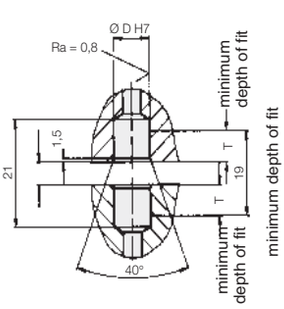
Note: max. mismatch of bore holes: short version 0.05 mm

ND	Ø D H7	L	T	Part No.
3	8	12	5.5	**9210-145**
5	10	14	7	**9210-132**

Long version
for connections with space up to 5 mm

Installation example





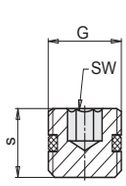
Note: max. mismatch of bore holes: short version 0.1 mm

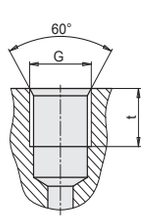
ND	Ø D H7	L	T	Part No.
5	10	19	7	**9210-127**

Screw plug with threaded sealing ring (max. operating pressure 500 bar)

G	G1/8	G1/4
S (mm)	8.5	12
T (mm)	8.5	12.5
SW (mm)	4	6
Part No.	**0361-986**	**0361-987**
Spare O-ring	**3001-748**	**3000-102**

Porting details





Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

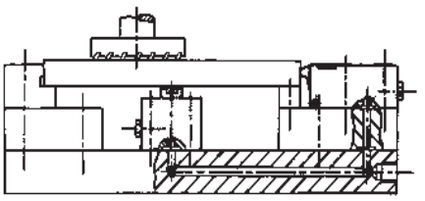
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Manifold Mounting

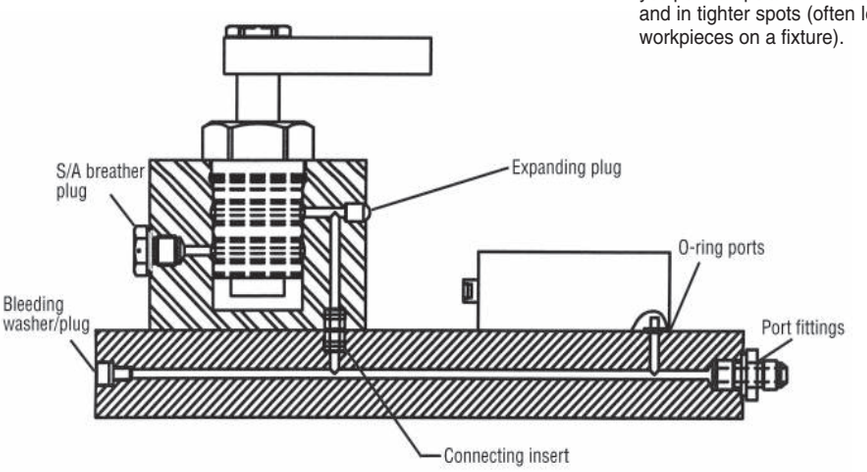
Benefits



- **Eliminates tubing or hoses from working area**
- **Very close mounting of clamps**
- **Only one fluid feed line**
- **No traps for chips due to "clean" design**
- **Do not use NPT fittings**

Many Roemheld components can be manifold mounted... powered directly through fluid passages drilled in a fixture. This unique mounting capability eliminates tubing and hoses in the working area, for clean fixtures without chip traps. Even fluid passages longer than your drilling capacity are possible by drilling shorter passages in separate blocks, then connecting them using connecting inserts.

Perhaps most important, manifold mounting lets you put clamps and work supports closer together and in tighter spots (often letting you place more workpieces on a fixture).



Installation Steps

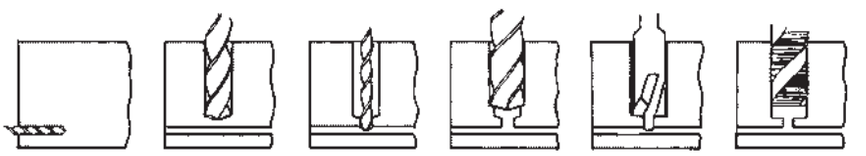
Installing Threaded Body Components

For easiest installation, we recommend the following procedure (Step 1 through 6). For proper sealing, the tapped hole's bottom must be flat, with a surface finish 125 RMS or better, and perpendicular to the hole's axis. A small drill-point is allowable (see component's catalog page for dimensions). A delrin sealing washer for the hole bottom is furnished with each component. **Do not use sealing compound or teflon tape.** Part numbers to order bottoming taps:

1-1/4 — 16 CLR-512-TL

1-1/2 — 16 CLR-515-TL

1-7/8 — 16 CLR-518-TL



Step 1 Drill fluid passage

Step 2 Pilot drill to desired installation depth (less than max. drill point dia.)

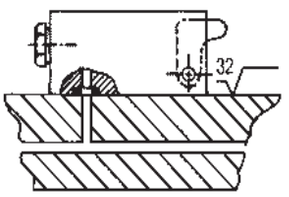
Step 3 Drill connecting fluid passage

Step 4 Tap drill for body thread

Step 5 Counterbore hole to produce flat bottom

Step 6 Tap body thread

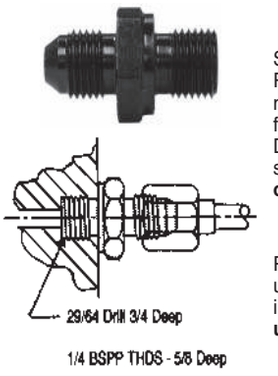
Installing Components with O-Ring Ports



Mounting surface should be ground flat with a 32 RMS or better surface finish, so that the 0-ring seals properly. Torque mounting screws evenly. **Do not use sealing compound or teflon tape.**

Order Extending Clamps, Swing Clamps, and Sequence Valves by a different part number for manifold mounting (O-rings are included, and no port plugs are needed). Edge Clamps and Block Work Supports are easily converted to manifold mounting (order o-ring CLR-3000-343-SW and CLR-810-F port plug).

Port Fittings



CLR-807-F
1/4 BSPP Port Fitting

Standard port fitting found in virtually all Roemheld components. To use for custom manifolds, order special bottoming tap for installation, part number CLR-514-TL. Drill, tap (5/8-inch minimum depth) and spotface. **Do not use sealing compound or teflon tape.**

CLR-902-F
1/2-20 Port Fitting

Port fitting for custom manifolds. Install using a standard 1/2-20 tap. Drill, tap (5/8-inch minimum depth) and spotface. **Do not use sealing compound or teflon tape.**

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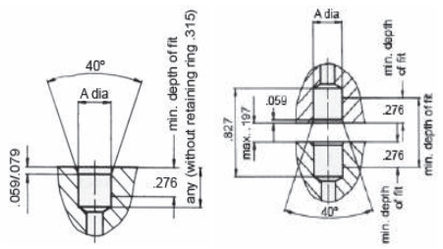
Manifold Mounting

Benefits



Connecting Plates Together

Connecting Inserts are used to provide a leak-free connection when a fluid passage goes through two separate sections of a fixture. The insert has two O-ring seals to provide leak-free sealing. Choice of two insert lengths: short (for flush connections) and long (for connections with a gap of up to .197"). Do not use sealing compound or teflon tape. Made from steel, with FKM O-rings. **For removable plates consider flush faced coupling elements CLR-0460-735-TBC and CLR-0460-638-TBN.**

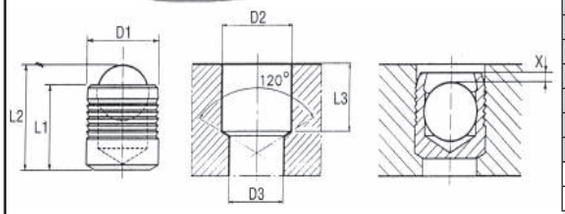


Type	Short	Long-Metric	Long-USA
Max. operating pressure	7250 psi	7250 psi	7250 psi
A dia.	.3937/.3943	.3937/.3943	.3750/.3756
Insert length	.551	.748	.748
Max. misalignment of holes	.002	.004	.004
Part No.	**CLR-9210-132**	**CLR-9210-127-F**	**CLR-901-F**

Plugging Drilled Passages



Expanding Plugs are used to plug the end of an oil channel. Each plug consists of a ball mounted into a sleeve which, when installed, expands and seals to the inner bore of the hole. Installation consists of preparing the hole, inserting the plug, and striking the ball to expand the sleeve. Do not use sealing compound or tape. Please consider using bleed screws instead of expanding plugs in some holes. This allows bleeding of the drilled channels.

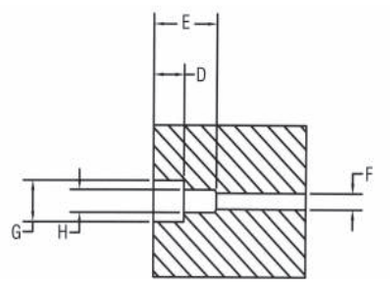


Size	1	2	3
D1	.236	.315	.394
D2 +0.004, -0.0	.236	.315	.394
D3 max.	.208	.291	.37
L1	.256	.335	.433
L2	.339	.461	.598
L3 min.	.248	.327	.425
X +/-0.008	.016	.012	.016
Part No.	**CLR-916-F**	**CLR-906-F**	**CLR-926-F**
Installation Tool for Expanding Plug	**CLR-HT-MBM-060**	**CLR-HT-MBM-080**	**CLR-HT-MBM-100**

Hydraulic Bleeding



Some drilled oil passages should have the ability to be opened for fixture bleeding. By using a sealing washer and plug, air in oil passages can be released. This is only recommended for small holes. Larger holes should be prepared to accept larger threaded plugs like CLR-810-F.



Size	1	2
D	.197	.276
E	.404	.67
F	.16	.24
G	.325	.441
H	M4	M6
Part No., Washer	**CLR-3001-713-F**	**CLR-3000-779**
Part No., Bolt	**CLR-3300-357-F**	**CLR-3300-223-F**

Air Venting - Single Acting Elements

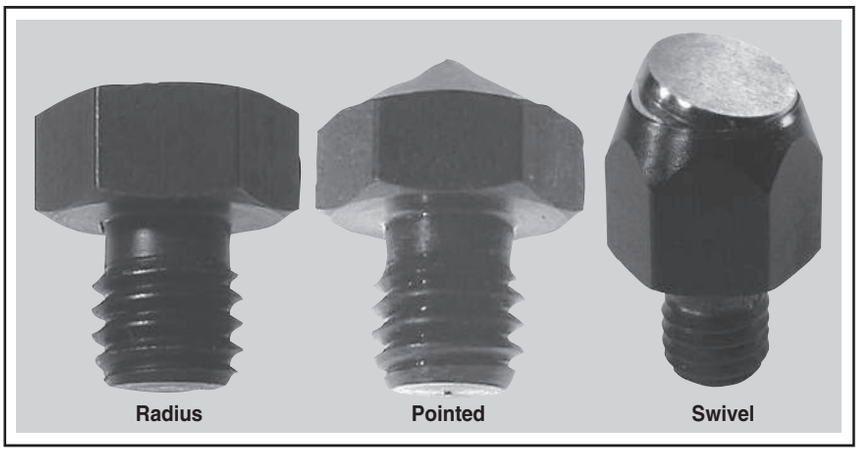


When using Single Acting cylinders or work supports, it is important to vent the spring volume to a clean environment. If this is not done, coolant and chips can be sucked into the element during the return stroke.

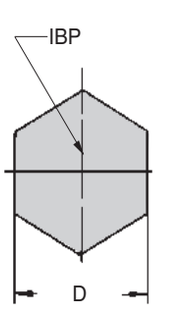
Port size	G 1/8	G 1/4	G 1/2
Part No., Filter Plug	**CLR-0361-012-F**	**CLR-0361-000-F**	**CLR-0361-006-F**

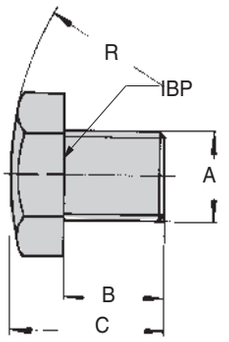
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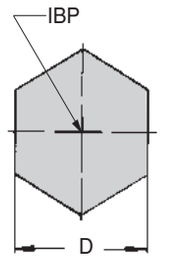
Contact Bolts

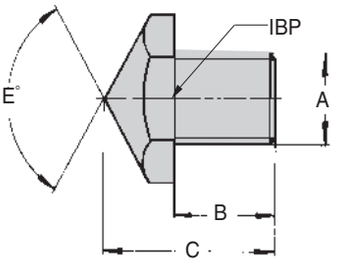


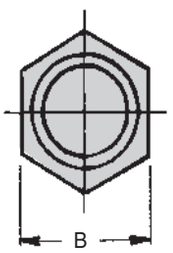
- **Radius contact bolt for most applications**
- **Pointed contact bolt for clamping in holes, and point clamping**
- **Swivel contact bolt distributes clamping force to prevent marring**
- **1144 steel, hardened 50-60 RC**

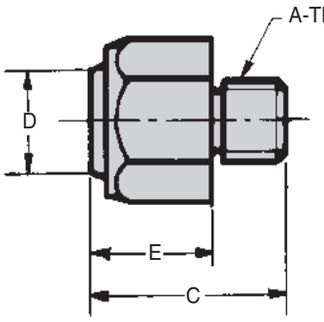












Radius

Part No.	A	B	C	D Hex	R Radius
CLR-401-CB	1/4-20	1/4	3/8	7/16	25/32
CLR-400-CB		3/8	25/32		
CLR-404-CB	5/16-18	5/16	1/2	1/2	1
CLR-402-CB		3/8	25/32		25/32
CLR-403-CB	3/8-16	1/2	7/8	9/16	1-3/8
CLR-405-CB	1/2-13	1/2	7/8	3/4	1-3/4
CLR-406-CB	5/8-11	25/32	1-3/16	15/16	2-3/8
CLR-408-CB	3/4-10	1	1-3/8	1-1/8	2-3/8
CLR-409-CB	1-8	1-3/16	1-27/32	1-1/2	3-15/16
CLR-3614-027-CB	M5	.35	.75	8mm	.79
CLR-3614-039-CB*	M6	.24	.37	10mm	.79
CLR-3614-016-CB		.39	.79		
CLR-3614-038-CB*	M8	.31	.51	13mm	.98
CLR-3614-001-CB		.39	.79	11mm	.79
CLR-3614-002-CB	M10	.47	.87	17mm	1.38
CLR-3614-028-CB	M12	.47	.87	19mm	1.77
CLR-3614-015-CB	M20	.98	1.38	30mm	2.36
CLR-3614-018-CB	M30	1.38	2.13	46mm	3.94
CLR-3614-019-CB	M42	1.77	2.80	65mm	5.51
CLR-3614-020-CB	M48	2.36	3.54	75mm	9.84

* These sizes are not heat treated.

Pointed

Part No.	A	B	C	D Hex	E°
CLR-413-CB	1/4-20	1/4	3/4	7/16	90
CLR-414-CB	3/8-16	1/2	1-1/16	9/16	90
CLR-415-CB	1/2-13	1/2	1	3/4	120
CLR-416-CB	5/8-11	25/32	1-3/8	15/16	120
CLR-417-CB	3/4-10	1	1-9/16	1-1/8	120
CLR-418-CB	1-8	1-3/16	1-31/32	1-1/2	120
CLR-3614-033-CB	M5	.35	.63	8mm	120°
CLR-3614-068-CB	M6	.24	.71	10mm	90°
CLR-3614-032-CB		.39	.87		
CLR-3614-069-CB	M8	.31	.87	13mm	90°
CLR-3614-021-CB	M10	.47	1.06	17mm	90°

Swivel

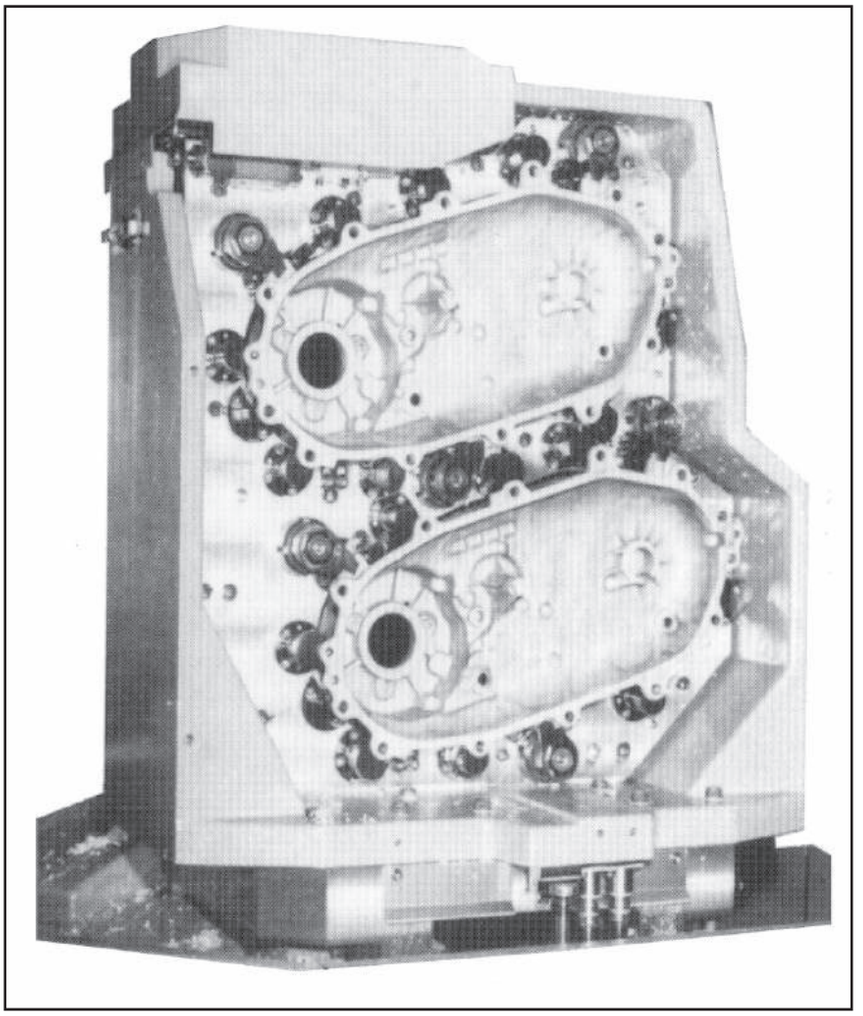
Part No.	A Dia	B Hex	C	D Dia	E
CLR-420-CB	5/16-18	9/16	.82	13/32	1/2
CLR-421-CB	3/8-16	13/16	1.29	19/32	13/16
CLR-422-CB	1/2-13	7/8	1.23	5/8	13/16
CLR-423-CB	5/8-11	1-1/16	1.61	13/16	1
CLR-3614-228-CB	M6	11mm	21mm	7.2mm	13mm
CLR-3614-072-CB	M8	11mm	21mm	7.2mm	13mm
CLR-3614-073-CB	M10	17mm	28mm	10,5mm	18mm
CLR-3614-074-CB	M12	17mm	30mm	10.5mm	18mm

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Application Example



Two-sided Palletized Fixture for Machining Both Sides of an Aluminum Housing

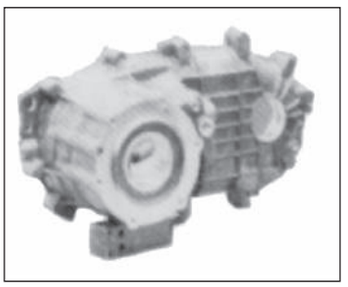


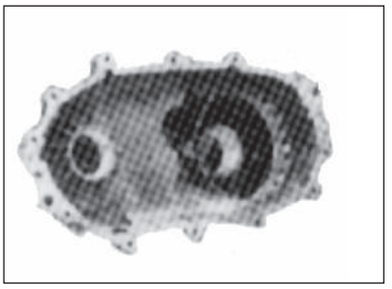
Cartridge/Manifold-Mounted Swing Clamps
(See Swing Clamps section)



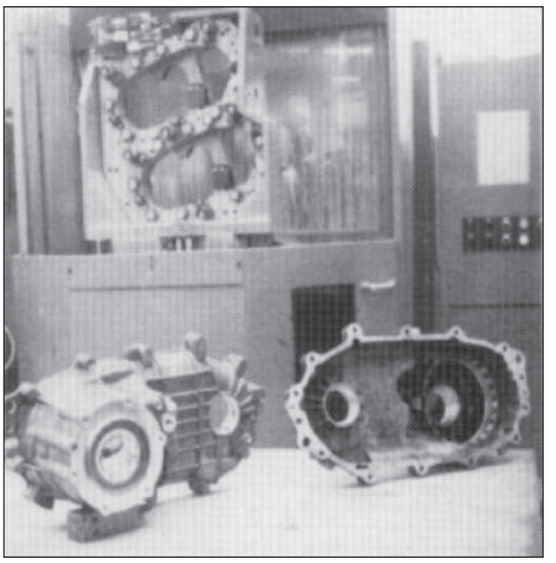
Fluid-Advanced Work Supports
(See Work Supports section)

Palletized fixture holds two aluminum castings, allowing complete machining of both sides with only one setup. The fixture uses manifold-mounted Swing Clamps and Work Supports. Fluid is supplied through passages in the vertical fixture plate, so the fixture is free of tubing lines.





Both faces of the workpiece (above) are machined with one setup. Vertical fixture plate has cutouts (see photo at right) to allow access from both sides. Product designers integrated special clamping areas into the casting for easier fixturing.

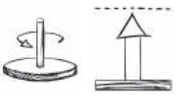


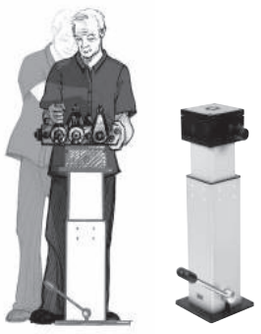
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Lifting module operated by foot pedal with rotating module vertical axis



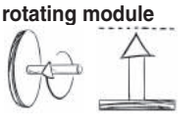


Here a complex hydraulic subassembly requires access to 5 sides during the installation of its components.

The employee can rotate the workpiece 360˚ in both directions about the vertical axis of this rotating module. Now the employee can select the most ergonomic position via manual or electric operation. Model versions with indexing are available too; standard index angles are 45˚, 60˚, 90˚, 120˚.

The appropriate working height is adjusted by the foot pedal of the self-contained hydraulic lifting module.

Lifting module operated by hand pendant with rotating module horizontal axis

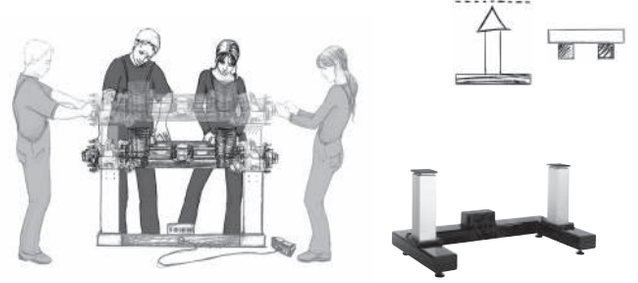




Multi-shift organizations know that every shift change also ushers in the change of each and every employee's size and ability. Modular combinations adapt to such changes and this one is composed of two modules: electric lift and horizontal-axis rotating. The electric lifting module effortlessly adjusts to an employee's height via a hand or foot push-button pendant. The horizontal-axis rotating module does just what its name implies; it spins a workpiece about its horizontal axis. It has 360˚ of rotation in both directions. Push or pull your workpiece to rotate the version without indexing or automatically index to your next position using the hand-lever or foot-pedal versions.

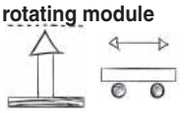
Electrically operated lifting module in sync

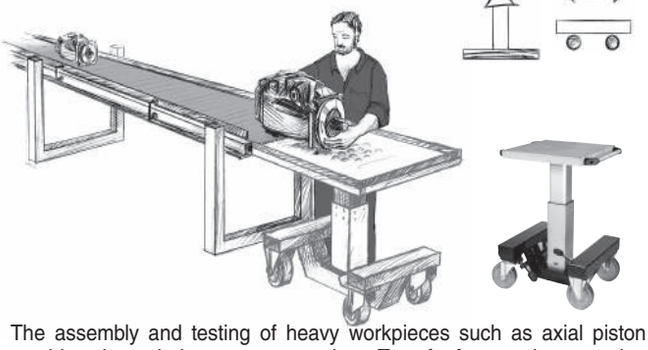




Assembly of truck axles is carried out by two employees at the same time. Components are installed and fastened from above as well as from both ends. The working height is adjusted via a foot pendant that controls two synchronized electric lifting modules. The synchronized lifts guarantee a level work surface throughout the entire stroke. The lifting modules are mounted to a floor module to improve stability.

Lifting module operated by hand pendant with rotating module horizontal axis

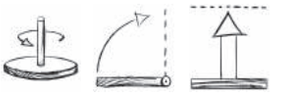




The assembly and testing of heavy workpieces such as axial piston machines is carried out at many stations. Transfer from station to station is made easy by fastening a tabletop plate to a hydraulic lift module that is mounted on top of a cart module.

Applying the brake on the cart module locks the unit in place. The operator can easily raise or lower the tabletop by pumping the foot pedal of the hydraulic lifting module.

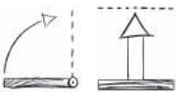
Lifting module operated by foot pedal with tilting module and rotating module vertical axis

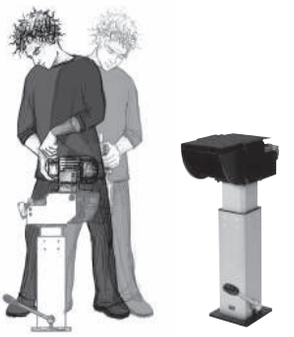




Optimum assembly of car seats requires the ability to quickly and easily move the seat into different positions. This modular combination allows the employee to raise, lower, rotate and tilt the seat. The tilting module is equipped with a pneumatic balancer that counteracts almost all of the tilting torques. This means very little force is required of the employee to tilt heavy objects.

Lifting module operated by foot pedal with tilting module





Here the employee is carrying out the final assembly of an electric motor followed by a series of tests.

The working height is adjusted by the foot pedal of the hydraulic lifting module. The tilting module mounted on top of the lifting module allows the employee to tilt the motor back and forth by 90˚. The integrated pneumatic-counterbalance feature makes tilting the motor a nearly effortless task.

Subject to change. For further details, including detailed dimensions and mounting instructions, visit roemheld-usa.com.

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Lifting Units



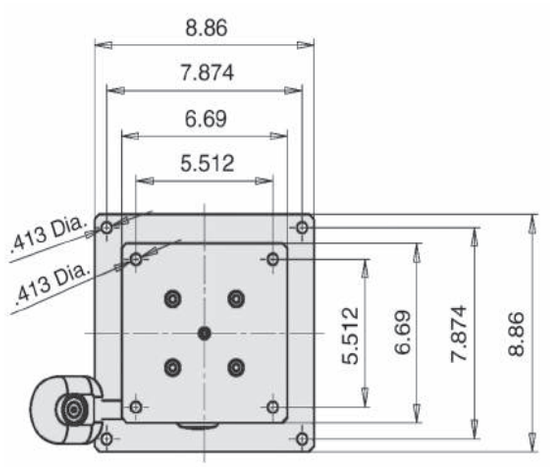
- **Self-contained units for lifting and height adjustment**
- **Single-pedal operation for sensitive, controlled lifting**
- **Square column resists torsional loads**
- **Choice of five stroke lengths, up to 23.62 inches**
- **To decend the lifting unit a maximum of 10% of Fz max. load is required**
- **The center of gravity should be within the traverse of the mounting bolts**

OPERATION: Raise and lower unit using the same lever. Pump foot lever down 45 degrees to raise platform. To lower unit, lift lever 10 degrees to release pressure.

PRESSURE RELIEF: If pumping continues after reaching full height extension, pressure relieves automatically and returns fluid to the reservoir.

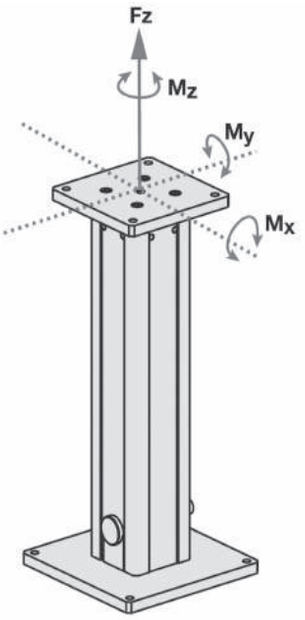
MOUNTING: Tapped holes in top and bottom plates allow attaching custom bases and tables.

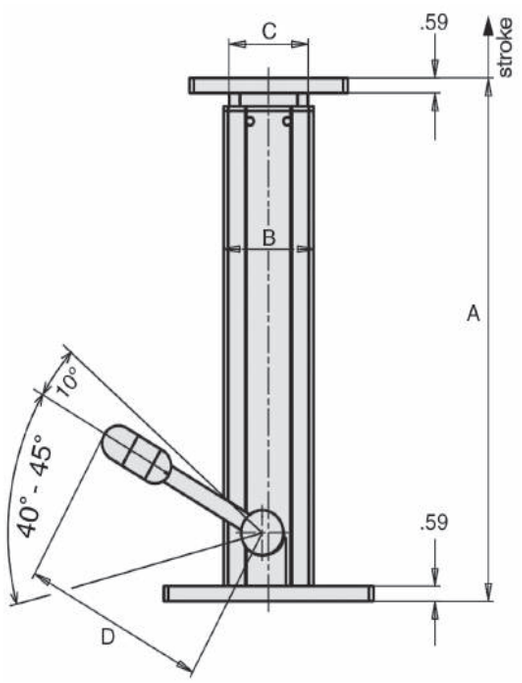
CONSTRUCTION: Square column is made from anodized aluminum. Top and bottom mounting plates are black anodized aluminum. The operating lever is steel with bright zinc plating, with a molded plastic foot pedal.



MAXIMUM TORQUE LOAD: In the case of eccentric loads, it is recommended to compensate these by counterweights. In off-position the indicated maximum torques may occur.

The forces and torques have to be considered by the operator. During the lifting motion only 50% of the maximum values are admitted.





Fz lifting capacity with centered load	225 lbs		450 lbs		900 lbs	1350 lbs	1350 lbs	
Pump motions per 3.94 in. of stroke	8		8		8	10	10	
Fully Extended Height Stroke + A	Stroke	A	Stroke	A			Stroke	A
	7.87	16.54	7.87	16.54			7.87	20.47
	11.81	20.47	11.81	20.47			11.81	24.41
	15.75	24.41	15.75	24.41			15.75	28.35
	19.69	28.35	19.69	28.35			NA	NA
	23.62	32.28	23.62	32.28			NA	NA
B Sq	3.82		5.91				5.91	
C Sq	3.35		5.24				NA	
D	7.7		11.7				11.3	
Mx/y (Max. Torque Load)	74 ft. lbs.		369 ft. lbs.				590 ft. lbs.	
Mz (Max. Torque Load)	37 ft. lbs.		221 ft. lbs.				295 ft. lbs.	
Part No.	CLR-8910-01-X0-H		CLR-8915-0X-X0-H				CLR-8919-06-X0-H	
	Stroke 2=7.87 3=11.81 4=15.75 5=19.69 6=23.62		Max. Lift Force 2=450 lbs. 4=900 lbs. 6=1350 lbs. Stroke 2=7.87 3=11.81 4=15.75 5=19.69 6=23.62				Stroke 2=7.87 3=11.81 4=15.75	

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Limited Warranty

Seller warrants that the product described herein will be free from defects in material and workmanship. If any failure to conform to this warranty be found within twelve (12) months, from date of receipt of the product by Buyer, and Seller is given immediate notification thereof, Seller, upon being satisfied of the existence of such nonconformity, will correct the same by replacement of the defective product or making suitable repairs. If the Seller is unable to correct such nonconformity by replacement of the product or making suitable repairs, whether due to the nature of such nonconformity, the use made by the Buyer of the product, or for any other reason, it will return to Buyer the price set forth herein, or where appropriate, the unit price for such number or quantity of products as shall have such nonconformity which Seller is unable to correct, upon Seller's receipt of the nonconforming product f.o.b. its plant; provided, however, no product shall be returned to Seller without its express written consent; and provided further that such receipt of any nonconforming product will not be required where it is no longer possible for Buyer to return the same to Seller. In no event shall Seller be liable to Buyer, either directly or by way of contribution or indemnity, for direct, special, incidental or consequential damages such as, but not limited to, property damage, loss of profit, damages based on loss of use of the product, or damages for cover, whether the claim for any such damages be based on warranty, express or implied, contract, tort, or otherwise. THE FOREGOING IS SELLER'S SOLE WARRANTY WITH RESPECT TO THE PRODUCT. SELLER MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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INCH DRILL SIZES

Drill/Decimal		Drill/Decimal		Drill/Decimal	
80	.0135	9/64	.1406	23/64	.3594
79	.0145	27	.1440	U	.3680
1/64	.0156	26	.1470	**3/8**	**.3750**
78	.0160	25	.1495	V	.3770
77	.0180	24	.1520	W	.3860
76	.0200	23	.1540	25/64	.3906
75	.0210	5/32	.1562	X	.3970
74	.0225	22	.1570	Y	.4040
73	.0240	21	.1590	13/32	.4062
72	.0250	20	.1610	Z	.4130
71	.0260	19	.1660	27/64	.4219
70	.0280	18	.1695	**7/16**	**.4375**
69	.0292	11/64	.1719	29/64	.4531
68	.0310	17	.1730	15/32	.4688
1/32	.0312	16	.1770	31/64	.4844
67	.0320	15	.1800	**1/2**	**.5000**
66	.0330	14	.1820	33/64	.5156
65	.0350	13	.1850	17/32	.5312
64	.0360	**3/16**	**.1875**	35/64	.5469
63	.0370	12	.1890	**9/16**	**.5625**
62	.0380	11	.1910	37/64	.5781
61	.0390	10	.1935	19/32	.5938
60	.0400	9	.1960	39/64	.6094
59	.0410	8	.1990	**5/8**	**.6250**
58	.0420	7	.2010	41/64	.6406
57	.0430	13/64	.2031	21/32	.6562
56	.0465	6	.2040	43/64	.6719
3/64	.0469	5	.2055	**11/16**	**.6875**
55	.0520	4	.2090	45/64	.7031
54	.0550	3	.2130	23/32	.7188
53	.0595	7/32	.2188	47/64	.7344
1/16	**.0625**	2	.2210	**3/4**	**.7500**
52	.0635	1	.2280	49/64	.7656
51	.0670	A	.2340	25/32	.7812
50	.0700	15/64	.2344	51/64	.7969
49	.0730	B	.2380	**13/16**	**.8125**
48	.0760	C	.2420	53/64	.8281
5/64	.0781	D	.2460	27/32	.8438
47	.0785	E	.2500	55/64	.8594
46	.0810	**1/4**	**.2500**	**7/8**	**.8750**
45	.0820	F	.2570	57/64	.8906
44	.0860	G	.2610	29/32	.9062
43	.0890	17/64	.2656	59/64	.9219
42	.0935	H	.2660	**15/16**	**.9375**
3/32	.0938	I	.2720	61/64	.9531
41	.0960	J	.2770	31/32	.9688
40	.0980	K	.2810	63/64	.9844
39	.0995	9/32	.2812	**1**	**1.0000**
38	.1015	L	.2900		
37	.1040	M	.2950	+64th	
36	.1065	19/64	.2969	increments up	
7/64	.1094	N	.3020	to 1-7/8"	
35	.1100	**5/16**	**.3125**		
34	.1110	O	.3160	+32nd	
33	.1130	P	.3230	increments up	
32	.1160	21/64	.3281	to 2-1/4"	
31	.1200	Q	.3320		
1/8	**.1250**	R	.3390	+16th	
30	.1285	11/32	.3438	increments up	
29	.1360	S	.3480	to 4-1/4"	
28	.1405	T	.3580		

METRIC DRILL SIZES

Drill/Decimal		Drill/Decimal		Drill/Decimal	
.35mm	.0138	3.60mm	.1417	8.70mm	.3425
.38mm	.0150	3.70mm	.1457	8.75mm	.3445
.40mm	.0157	3.75mm	.1476	8.80mm	.3465
.42mm	.0165	3.80mm	.1496	8.90mm	.3504
.45mm	.0177	3.90mm	.1535	**9.00mm**	**.3543**
.48mm	.0189	**4.00mm**	**.1575**	9.10mm	.3583
.50mm	.0197	4.10mm	.1614	9.20mm	.3622
.55mm	.0217	4.20mm	.1654	9.25mm	.3642
.60mm	.0236	4.25mm	.1673	9.30mm	.3661
.65mm	.0256	4.30mm	.1693	9.40mm	.3701
.70mm	.0276	4.40mm	.1732	9.50mm	.3740
.75mm	.0295	4.50mm	.1772	9.60mm	.3780
.80mm	.0315	4.60mm	.1811	9.70mm	.3819
.85mm	.0335	4.70mm	.1850	9.75mm	.3839
.90mm	.0354	4.75mm	.1870	9.80mm	.3858
.95mm	.0374	4.80mm	.1890	9.90mm	.3898
1.00mm	**.0394**	4.90mm	.1929	**10.00mm**	**.3937**
1.05mm	.0413	**5.00mm**	**.1969**	10.20mm	.4016
1.10mm	.0433	5.10mm	.2008	10.50mm	.4134
1.15mm	.0453	5.20mm	.2047	10.80mm	.4252
1.20mm	.0472	5.25mm	.2067	**11.00mm.4331**	
1.25mm	.0492	5.30mm	.2087	11.20mm	.4409
1.30mm	.0512	5.40mm	.2126	11.50mm	.4528
1.35mm	.0531	5.50mm	.2165	11.80mm	.4646
1.40mm	.0551	5.60mm	.2205	**12.00mm**	**.4724**
1.45mm	.0571	5.70mm	.2244	12.20mm	.4803
1.50mm	.0591	5.75mm	.2264	12.50mm	.4921
1.55mm	.0610	5.80mm	.2283	**13.00mm**	**.5118**
1.60mm	.0630	5.90mm	.2323	13.50mm	.5315
1.65mm	.0650	**6.00mm**	**.2362**	**14.00mm**	**.5512**
1.70mm	.0669	6.10mm	.2402	14.50mm	.5709
1.75mm	.0689	6.20mm	.2441	**15.00mm**	**.5906**
1.80mm	.0709	6.25mm	.2461	15.50mm	.6102
1.85mm	.0728	6.30mm	.2480	**16.00mm**	**.6299**
1.90mm	.0748	6.40mm	.2520	16.50mm	.6496
1.95mm	.0768	6.50mm	.2559	**17.00mm**	**.6693**
2.00mm	**.0787**	6.60mm	.2598	17.50mm	.6890
2.05mm	.0807	6.70mm	.2638	**18.00mm**	**.7087**
2.10mm	.0827	6.75mm	.2657	18.50mm	.7283
2.15mm	.0846	6.80mm	.2677	**19.00mm**	**.7480**
2.20mm	.0866	6.90mm	.2717	19.50mm	.7677
2.25mm	.0886	**7.00mm**	**.2756**	**20.00mm**	**.7874**
2.30mm	.0906	7.10mm	.2795	20.50mm	.8071
2.35mm	.0925	7.20mm	.2835	**21.00mm**	**.8268**
2.40mm	.0945	7.25mm	.2854	21.50mm	.8465
2.45mm	.0965	7.30mm	.2874	**22.00mm**	**.8661**
2.50mm	.0984	7.40mm	.2913	22.50mm	.8858
2.55mm	.1004	7.50mm	.2953	**23.00mm**	**.9055**
2.60mm	.1024	7.60mm	.2992	23.50mm	.9252
2.65mm	.1043	7.70mm	.3031	**24.00mm**	**.9449**
2.70mm	.1063	7.75mm	.3051	24.50mm	.9646
2.75mm	.1083	7.80mm	.3071	**25.00mm.9843**	
2.80mm	.1102	7.90mm	.3110		
2.90mm	.1142	**8.00mm**	**.3150**	+1.00mm	
3.00mm	**.1181**	8.10mm	.3189	increments	
3.10mm	.1220	8.20mm	.3228	up to 48mm	
3.20mm	.1260	8.25mm	.3248		
3.25mm	.1280	8.30mm	.3268	+5.00mm	
3.30mm	.1299	8.40mm	.3307	increments	
3.40mm	.1339	8.50mm	.3346	from 50mm	
3.50mm	.1378	8.60mm	.3386	up to 105mm	

TAP GUIDE SIZES
(Priced as specials)

Tap Size*	Tap Guide Nominal ID Size	Tap Drill Size**
#0-80	.0616	3/64
#2-56	.0883	#50
#2-64	.0880	#50
#4-40	.1152	#43
#4-48	.1147	#42
#5-40	.1282	#38
#5-44	.1280	#37
#6-32	.1421	#36
#6-40	.1412	#33
#8-32	.1681	#29
#8-36	.1676	#29
#10-24	.1954	#25
#10-32	.1941	#21
1/4-20	.2565	#7
1/4-28	.2546	#3
5/16-18	.3197	F
5/16-24	.3179	I
3/8-16	.3831	5/16
3/8-24	.3804	Q
7/16-14	.4468	U
7/16-20	.4440	25/64
1/2-13	.5100	27/64
1/2-20	.5065	29/64
9/16-12	.5733	31/64
9/16-18	.5697	33/64
5/8-11	.6368	17/32
5/8-18	.6322	37/64
3/4-10	.7630	21/32
3/4-16	.7581	11/16
7/8-9	.8894	49/64
7/8-14	.8843	13/16
1-8	1.0162	7/8
1-14	1.0093	15/16
METRIC		
M1.6x0.35	.0651	1.25mm or #55
M2x0.4	.0810	1.60mm or #52
M2.5x0.45	.1008	2.05mm or #46
M3x0.5	.1207	2.50mm or #39
M3.5x0.6	.1407	2.90mm or #32
M4x0.7	.1613	3.30mm or #30
M5x0.8	.2010	4.20mm or #19
M6x1	.2410	5.00mm or #8
M8x1.25	.3214	6.80mm or H
M8x1	.3197	7.00mm or J
M10x1.5	.4009	8.50mm or R
M10x1.25	.4002	8.80mm or 11/32
M12x1.75	.4805	10.20mm or 13/32
M12x1.25	.4789	10.80mm or 27/64
M14x2	.5600	12.00mm or 15/32
M14x1.5	.5584	12.50mm or 1/2
M16x2	.6387	14.00mm or 35/64
M16x1.5	.6372	14.50mm or 37/64
M18x2.5	.7191	15.50mm or 39/64
M18x1.5	.7159	16.50mm or 21/32
M20x2.5	.7978	17.50mm or 11/16
M20x1.5	.7946	18.50mm or 47/64
M22x2.5	.8765	19.50mm or 49/64
M22x1.5	.8734	20.50mm or 13/16
M24x3	.9583	21.00mm or 53/64
M24x2	.9537	22.00mm or 7/8

* Coarse series shown in bold. Pitch callout not required on metric coarse series.
** Closest size for 75% theoretical thread.

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