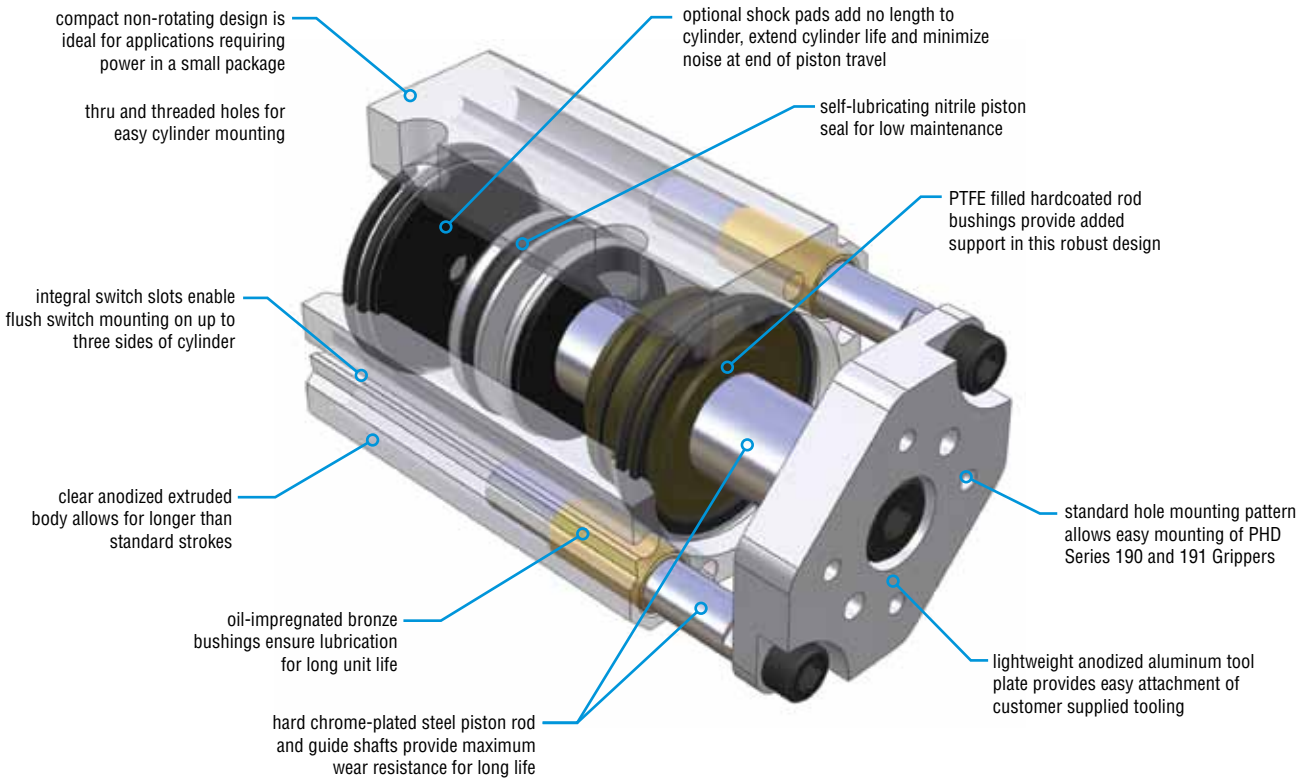
CTS

GUIDED PNEUMATIC COMPACT CYLINDER

Major Benefits

- Compact design for applications where space is limited.
- Hard chrome plated guide shafts for anti-rotation and increased side load capacity.
- Oil-impregnated bronze bushings for long cylinder life.
- Multiple mounting options.
- Easy mounting of other PHD components.
- Up to six switch slots for flush switch mounting.



ORDERING DATA: SERIES CTS COMPACT GUIDE ROD CYLINDERS

TO ORDER SPECIFY:
Product, Series, Type, Design No., Mounting Style, Bore Size, Stroke, and Options.

PRODUCT
C - Cylinder

TYPE
S - Single Rod, Double Acting (Standard)
D - Double Rod, Double Acting
Double rod units include tool plate on one end only.

MOUNTING STYLE
All units have 2 thru holes
U - Universal (Standard)
Thread and C'bore 4 Places, 2 Each End
J - Foot Mounting
Foot Inward, 1 each end
K - Foot Mounting
Foot Outward, 1 each end

IMPERIAL STROKE (CTx2)
STANDARD STROKE LENGTHS
1/8" = Minimum stroke
in 1/8" increments

BORE mm	MAXIMUM STROKE (in)
12	2-3/4
16	2-3/4
20	3-1/2
25	3-1/2
32	4
40	4
50	4-1/2
63	6

METRIC STROKE (CTx6)
STANDARD STROKE LENGTHS
5 mm = Minimum stroke
in 5 mm increments

BORE mm	MAXIMUM STROKE [mm]
12	70
16	70
20	90
25	90
32	100
40	100
50	115
63	150

C T S 2 U 32 x 1/2 - M-BB

SERIES
T - Compact Guide Rod

DESIGN NO.
2 - Imperial
6 - Metric

BORE SIZE

BORE mm	BORE in	AREA mm²	AREA in²
12	.47	113	.175
16	.63	201	.312
20	.79	314	.487
25	.98	490	.761
32	1.26	804	1.247
40	1.57	1256	1.948
50	1.97	1963	3.043
63	2.48	3117	4.832

OPTIONS
BB - Shock Pads in both directions (Option does not add any extra length)
M - Magnet for use with PHD Series 6790 & JC1 Switches. See Notes 2 and 4.
F11 - Extended length wrench flats
K_ - Extra Tool Plate Extension in 1/8" [5 mm] increments up to 1" [25 mm] maximum. Length code example: K1 = 1/8", K3 = 3/8", or K5 = 5 mm, K15 = 15 mm, etc.
V1 - Fluoro-Elastomer seals
WB - Blank Tool Plate (shipped with tool plate unassembled)
WR - Rectangular tool plate (12-16 mm units only)
WRB - Blank rectangular tool plate (12-16 mm units only)(shipped with tool plate unassembled)
Z1 - Corrosion-resistant, stainless steel rod and guideshafts, electroless nickel plated retaining rings, fasteners, and brackets (with J & K mounting)

NOTES:
1) See pages 1-29 and 1-30 for accessories.
2) PHD recommends the use of stainless steel or de-magnetized fasteners on units with -M option.
3) Longer stroke lengths are available. Consult PHD.
4) See options page for switch ordering information.

Options may affect unit length. See dimensional pages and option information details.

Refer to this product's online catalog in the product section for complete information including related dimensions and additional specifications. See link at bottom of this page.

SERIES 6790 & JC1 SWITCHES

PART NO.	DESCRIPTION
67902-1-05	PNP (Source) or NPN (Sink) Reed, 4.5-30 VDC, 5 m cable
JC1SDN-5	NPN (Sink) Solid State, 10-30 VDC, 5 m cable
JC1SDP-5	PNP (Source) Solid State, 10-30 VDC, 5 m cable
67922-1	PNP (Source) or NPN (Sink) Reed, 4.5-30 VDC, Quick Connect
JC1SDN-K	NPN (Sink) Solid State, 10-30 VDC, Quick Connect
JC1SDP-K	PNP (Source) Solid State, 10-30 VDC, Quick Connect
67929-2	PNP (Source) or NPN (Sink) Reed, 65-120 VAC, Quick Connect

NOTE: See Switches and Sensors section for additional switch information and complete specification. Switches must be ordered separately.

SERIES 6790 & JC1SDx CORDSET CHART

PART NO.	DESCRIPTION
63549-02	M8, 3 pin, Straight Female Connector, 2 m cable
63549-05	M8, 3 pin, Straight Female Connector, 5 m cable

NOTE: Cordsets must be ordered separately.

SPECIFICATIONS	SERIES CTS
OPERATING PRESSURE	20 psi min to 150 psi max at zero load [1.4 bar min to 10 bar max] air
STROKE TOLERANCE	± 0.031 inch [± 0.8 mm] (See Shock Pad Usage)
TEMPERATURE LIMITS	-20° to +180°F [-28° to +82°C]
VELOCITY	20 in/sec [.5 m/sec] typical min, zero load at 100 psi [7 bar]
LIFE EXPECTANCY	30 million linear inches [762000 linear meters] min (-V1 & -Z1 options may reduce life)
LUBRICATION	Pre-lubricated for use with non-lubricated or lubricated air
MAINTENANCE	Field repairable

CYLINDER FORCE AND WEIGHT TABLE

BORE		ROD DIA.		ROD	EFFECTIVE AREA		BASE WEIGHT		ADDER PER 1" [25 mm] OF STROKE	
mm	in	in	mm	DIRECTION	in²	mm²	lb	kg	lb	kg
12	.472	.250	6.35	EXTEND	.175	113	.17	.08	.11	.05
				RETRACT	.126	81				
16	.630	.250	6.35	EXTEND	.312	201	.20	.09	.12	.05
				RETRACT	.263	169				
20	.787	.375	9.53	EXTEND	.487	314	.37	.17	.19	.09
				RETRACT	.376	242				
25	.984	.375	9.53	EXTEND	.761	490	.43	.19	.20	.09
				RETRACT	.650	419				
32	1.260	.625	15.88	EXTEND	1.247	804	.72	.33	.31	.14
				RETRACT	.940	606				
40	1.575	.625	15.88	EXTEND	1.948	1256	.96	.44	.37	.17
				RETRACT	1.641	1058				
50	1.969	.750	19.05	EXTEND	3.043	1963	1.65	.75	.49	.22
				RETRACT	2.602	1678				
63	2.480	.750	19.05	EXTEND	4.832	3117	2.36	1.07	.58	.26
				RETRACT	4.390	2832				

NOTE: Use retract figures for calculating double rod end cylinder forces in both directions.

APPLICATION

The PHD Series CTS Compact Guide Rod Cylinders are designed for use as compact non-rotating cylinders and as light duty slides where precise location is not required and side loading is minimal. On double rod units, rear rod increases stability of the tool plate. Rear rod thread not intended as a load attach point. Shock pads are intended for use where there is end-of-stroke impact with an attached load. For maximum cylinder life with attached load, PHD recommends the use of external stops or shock absorbers. See best application practices on page 1-20-3 in online catalog.

Proper application of CTS Cylinders in horizontal applications is dependent upon travel and attached load. In addition, where there is end-of-stroke impact with an attached load, cylinder speed must be considered. Refer to sizing catalog.

Proper application of CTS Cylinders in vertical applications is dependent upon both attached load and cylinder speed. Refer to sizing catalog.

CYLINDER FORCE CALCULATIONS

		IMPERIAL F = P x A	METRIC F = 0.1 x P x A
F	= Cylinder Force	lbs	N
P	= Operating Pressure	psi	bar
A	= Effective Area (Extend or Retract)	in²	mm²

SHOCK PAD USAGE

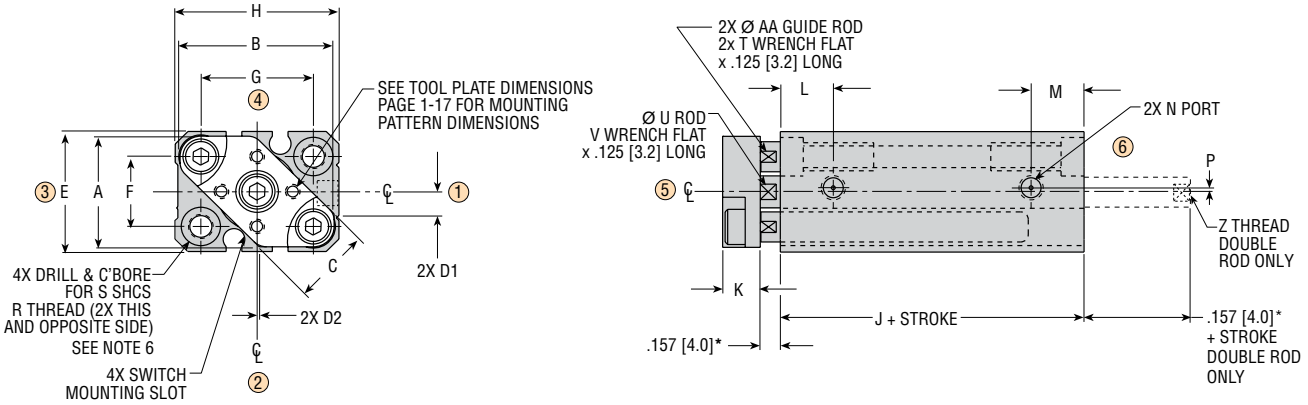
Optional shock pads are recommended for applications where the piston contacts the bushing and plug ends with an attached load. The use of shock pads reduces noise and provides maximum cylinder life in these applications. Shock pads are not required for applications where external stops prevent end-of-stroke impact or where end impact occurs without an attached load. See best application practices on page 1-20-3 in online catalog. Stroke tolerance changes to ± .050 [± 1.3 mm] with -BB option.

Sizing & Application Assistance

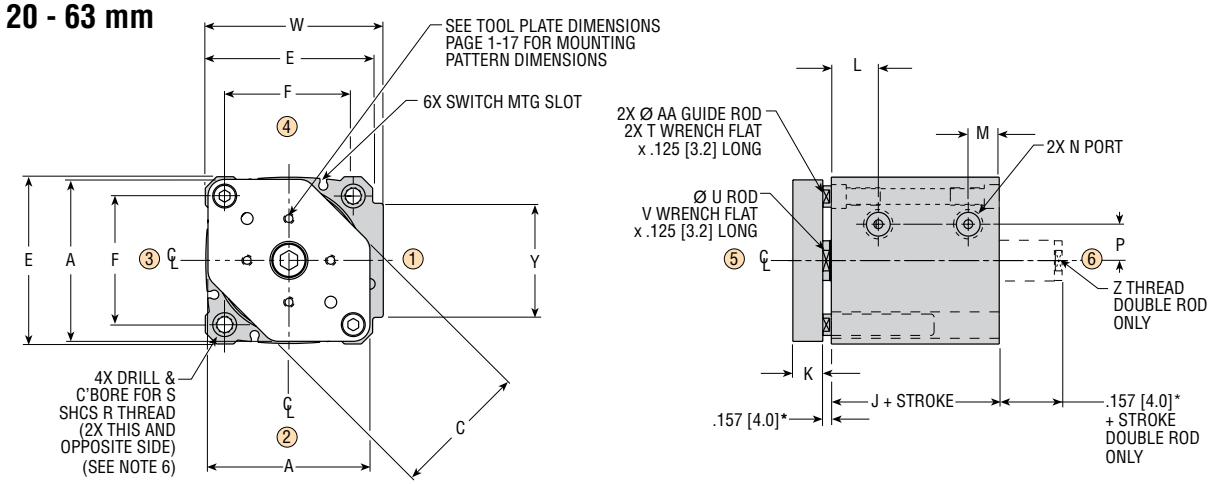
Use PHD's free online Product Sizing Application or view the Product Sizing Catalog at: www.phdinc.com/apps/sizing

DIMENSIONS: SERIES CTS COMPACT GUIDE ROD CYLINDERS

12 - 16 mm



20 - 63 mm

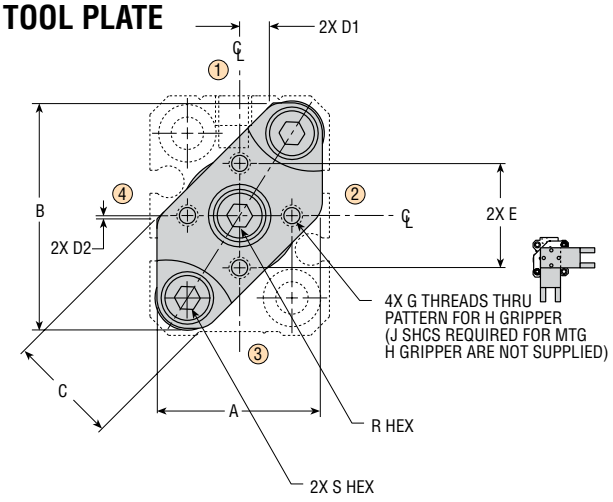


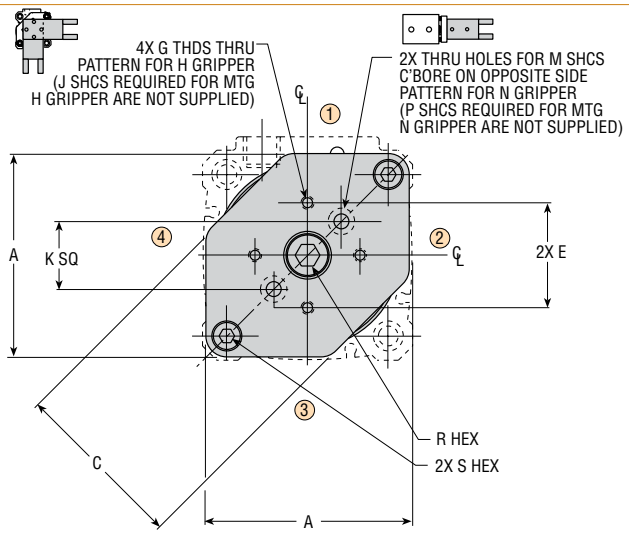
BORE [mm]	DIMENSIONS																							
	A	B	C	D1	D2	E	F	G	H	J	K	L	M	N	P	R THREAD	S	T	U	V	W	Y	Z THREAD	AA
12	.876 [22.25]	1.200 [30.48]	.591 [15]	.182 [4.62]	.020 [0.51]	.944 [24.0]	.550 [13.97]	.866 [22.0]	1.260 [32.0]	1.380 [35.05]	.295 [7.5]	.415 [10.5]	.415 [10.5]	10-32 x .15 [M5 x .8 x 4]	.032 [0.8]	10-24 x .550 [M5 x .8 x 14.5]	#6 [M4]	.219 [5.6]	.250 [6.35]	.219 [5.6]	—	—	6-32 x .210 [M4 x 0.7 x 7]	.236 [6.0]
16	1.000 [25.40]	1.250 [31.75]	.710 [18]	.025 [0.64]	.075 [1.91]	1.91 [28.0]	.710 [18.03]	.946 [24.0]	1.340 [34.0]	1.380 [35.05]	.295 [7.5]	.415 [10.5]	.415 [10.5]	10-32 x .15 [M5 x .8 x 4]	.098 [2.5]	10-24 x .550 [M5 x .8 x 14.5]	#6 [M4]	.219 [5.6]	.250 [6.35]	.219 [5.6]	—	—	6-32 x .210 [M4 x 0.7 x 7]	.236 [6.0]
20	1.374 [34.90]	—	.906 [23]	—	—	1.476 [37.5]	1.000 [25.4]	—	—	1.615 [41.02]	.394 [10.0]	.670 [17.0]	.415 [10.5]	10-32 x .15 [M5 x .8 x 4]	.207 [5.3]	1/4-20 x .875 [M6 x 1.0 x 22.5]	#10 [M5]	.250 [6.4]	.375 [9.53]	.312 [7.9]	1.576 [40.0]	.788 [20.0]	10-32 x .285 [M5 x 0.8 x 7]	.314 [8.0]
25	1.500 [38.10]	—	1.024 [26]	—	—	1.576 [40.0]	1.100 [28.0]	—	—	1.615 [41.02]	.394 [10.0]	.670 [17.0]	.398 [10.1]	10-32 x .15 [M5 x .8 x 4]	.236 [6.0]	1/4-20 x .875 [M6 x 1.0 x 22.5]	#10 [M5]	.250 [6.4]	.375 [9.53]	.312 [7.9]	1.746 [44.4]	1.000 [25.4]	10-32 x .285 [M5 x 0.8 x 7]	.314 [8.0]
32	1.744 [44.30]	—	1.378 [35]	—	—	1.870 [47.5]	1.334 [34.0]	—	—	1.790 [45.47]	.394 [10.0]	.710 [18.0]	.450 [11.4]	1/8 NPT [1/8 BSP]	.324 [8.2]	1/4-20 x .875 [M6 x 1.0 x 22.5]	#10 [M5]	.250 [6.4]	.625 [15.88]	.500 [12.7]	2.037 [52.0]	1.340 [34.0]	1/4-28 x .375 [M6 x 1.0 x 9]	.314 [8.0]
40	2.000 [50.80]	—	1.650 [42]	—	—	2.205 [56.0]	1.574 [40.0]	—	—	1.790 [45.47]	.394 [10.0]	.710 [18.0]	.450 [11.4]	1/8 NPT [1/8 BSP]	.364 [9.3]	1/4-20 x .875 [M6 x 1.0 x 22.5]	#10 [M5]	.250 [6.4]	.625 [15.88]	.500 [12.7]	2.363 [60.0]	1.420 [36.0]	1/4-28 x .375 [M6 x 1.0 x 9]	.314 [8.0]
50	2.500 [63.50]	—	2.086 [53]	—	—	2.598 [66.0]	1.968 [50.0]	—	—	1.970 [50.04]	.551 [14.0]	.790 [20.1]	.535 [13.6]	1/8 NPT [1/8 BSP]	.476 [12.1]	5/16-18 x .900 [M8 x 1.25 x 22.5]	1/4 [M6]	.312 [7.9]	.750 [19.05]	.625 [15.9]	2.795 [71.0]	1.600 [40.6]	5/16-24 x .312 [M8 x 1.25 x 8]	.394 [10.0]
63	2.974 [75.54]	—	2.560 [65]	—	—	3.070 [78.0]	2.362 [60.0]	—	—	2.090 [53.09]	.551 [14.0]	.865 [22.0]	.570 [14.5]	1/4 NPT [1/4 BSP]	.670 [17.0]	5/16-18 x .900 [M8 x 1.25 x 22.5]	1/4 [M6]	.312 [7.9]	.750 [19.05]	.625 [15.9]	3.266 [83.0]	2.094 [53.2]	5/16-24 x .312 [M8 x 1.25 x 8]	.394 [10.0]

NOTES:
1) Dimension shown in [ ] are in mm for metric units [CTx6].
2) Designated centerline ℄ is centerline of cylinder bore.
3) Unless otherwise dimensioned, mounting hole patterns and other features are centered on designated cylinder centerline.
4) 1/8" [5 mm] minimum stroke required
5) *See J & K mounting dimensions for standard extension with those options.
6) PHD recommends the use of stainless steel or de-magnetized fasteners on units with the -M option.

DIMENSIONS: SERIES CTS COMPACT GUIDE ROD CYLINDERS

TOOL PLATE





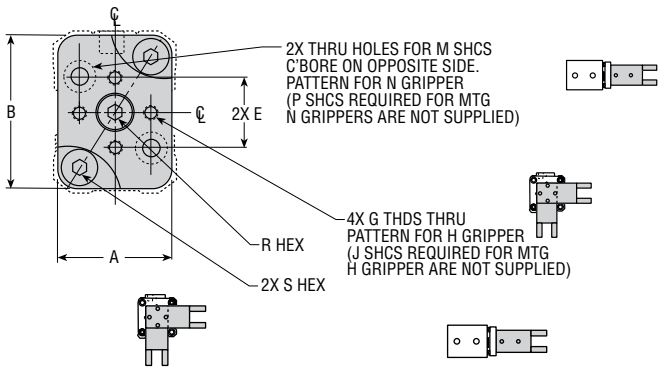
12 - 16 mm

20 - 63 mm

BORE [mm]	DIMENSIONS																	
								H (SERIES 190)*					N (SERIES 19x)*					
	A	B	C	D1	D2	E	G	ANGULAR	PARALLEL	J	K	M	ANGULAR	PARALLEL	P	R	S
12	.876 [22.25]	1.200 [30.48]	.591 [15.0]	.182 [4.62]	.020 [0.51]	.550 [13.97]	4-40 [M3 x .5]	— [19002]	1906x [1906x]	4-40 x 1 [M3 x .5 x 20]	—	—	—	—	—	[3.0]	[3.0]
16	1.000 [25.40]	1.250 [31.75]	.710 [18.0]	.025 [0.64]	.075 [1.91]	.550 [13.97]	4-40 [M3 x .5]	— [19002]	1906x [1906x]	4-40 x 1 [M3 x .5 x 20]	—	—	—	—	—	[3.0]	[3.0]
20	1.374 [34.90]	—	.906 [23.0]	—	—	.710 [18.03]	6-32 [M3 x .5]	— [19012]	1907x [1907x]	6-32 x 1-1/4 [M3 x .5 x 30]	.550 [13.97]	#4 [M3]	— [19x02]	19x6x [19x6x]	4-40 x 3/8 [M3 x .5 x 10]	[5.0]	[4.0]
25	1.500 [38.10]	—	1.024 [26.0]	—	—	.710 [18.03]	6-32 [M3 x .5]	— [19012]	1907x [1907x]	6-32 x 1-1/4 [M3 x .5 x 30]	.550 [13.97]	#4 [M3]	— [19x02]	19x6x [19x6x]	4-40 x 3/8 [M3 x .5 x 10]	[5.0]	[4.0]
32	1.744 [44.30]	—	1.378 [35.0]	—	—	1.100 [27.94]	8-32 [M4 x .7]	— [19022]	1908x [1908x]	8-32 x 1-5/8 [M4 x .7 x 40]	.710 [18.03]	#6 [M3]	— [19x12]	19x7x [19x7x]	6-32 x 3/8 [M3 x .5 x 8]	[6.0]	[4.0]
40	2.000 [50.80]	—	1.650 [42.0]	—	—	1.100 [27.94]	8-32 [M4 x .7]	— [19022]	1908x [1908x]	8-32 x 1-5/8 [M4 x .7 x 40]	.710 [18.03]	#6 [M3]	— [19x12]	19x7x [19x7x]	6-32 x 3/8 [M3 x .5 x 8]	[6.0]	[4.0]
50	2.500 [63.5]	—	2.086 [53.0]	—	—	1.535 [38.99]	10-24 [M5 x .8]	— [19032]	1909x [1909x]	10-24 x 2-1/4 [M5 x .8 x 55]	1.100 [27.94]	#8 [M4]	— [19x22]	19x8x [19x8x]	8-32 x 5/8 [M4 x .7 x 12]	[8.0]	[5.0]
63	2.974 [75.54]	—	2.560 [65.0]	—	—	1.535 [38.99]	10-24 [M5 x .8]	— [19032]	1909x [1909x]	10-24 x 2-1/4 [M5 x .8 x 55]	1.535 [38.99]	#10 [M5]	— [19x32]	19x9x [19x9x]	10-24 x 3/4 [M5 x .8 x 12]	[8.0]	[5.0]

NOTES:
1) Numbers in [ ] are in mm for metric units [CTx6].
2) *Imperial grippers mount to CTx2 only. Metric grippers mount to CTx6 only
3) Designated centerline ℄ is centerline of cylinder bore
4) Unless otherwise dimensioned, mounting hole patterns and other features are centerline on designated cylinder centerline.

OPTIONAL RECTANGULAR TOOL PLATE (12-16 mm ONLY) -WR OPTION



BORE [mm]	DIMENSIONS												
					H (SERIES 190*)				N (SERIES 19x)*				
	A	B	E	G	ANGULAR	PARALLEL	J	M	ANGULAR	PARALLEL	P	R	S
12	.876 [22.25]	1.200 [30.5]	.550 [13.97]	4-40 [M3 x .5]	— [19002]	1906x [1906x]	4-40 x [M3 x .5 x 20]	#4 [M3]	— [19x02]	19x6x [19x6x]	4-40 x 3/8 [M5 x .5 x 8]	[3.0]	[3.0]
16	1.000 [25.5]	1.250 [31.75]	.550 [13.97]	4-40 [M3 x .5]	— [19002]	1906x [1906x]	4-40 x 1 [M3 x .5 x 20]	#4 [M3]	— [19x02]	19x6x [19x6x]	4-40 x 3/8 [M3 x .5 x 8]	[3.0]	[3.0]

NOTES:
1) Numbers in [ ] are in mm for metric units [CTx6].
2) *Imperial grippers mount to CTx2 only. Metric grippers mount to CTx6 only.
3) See J & K mounting dimensions for standard rod extension with those options.

All dimensions are reference only unless specifically toleranced.

BB SHOCK PADS ON EXTENSION AND RETRACTION

Shock pads eliminate metal-to-metal contact and minimize piston impact. Shock pads are recommended for applications where the piston contacts the head and/or cap (with attached loads). The use of shock pads reduces noise and provides maximum cylinder life in these applications.

F11 EXTENDED LENGTH WRENCH FLATS

The design of a compact guide rod cylinder requires the length to be as short as possible. The standard wrench flat length is .125" [3 mm]. The option -F11 provides wrench flats which allow standard wrench access. On double rod units, rear rod also receives extended flats with option -F11.

K_ EXTRA TOOL PLATE EXTENSION

Extra tool plate extension can be specified by calling out the -K option followed by the length code.

Length code example (for imperial CTx2 units)
K1 = 1/8" of extra tool plate extension
K3 = 3/8", etc.

Length code example (for metric CTx6 units)
K5 = 5 mm of extra tool plate extension
K15 = 15 mm, etc.

.157" [4 mm] of tool plate extension is standard. Available in 1/8" [5 mm] increments only. Maximum extension is 1" [25 mm].

NOTE: On double rod units, rear rod receives same extension as tool plate (tool plate on front end only).

V1 FLUORO-ELASTOMER SEALS

Fluoro-Elastomer seals are compatible with certain fluids which degrade standard Nitrile seals. Seal compatibility should be checked with the fluid manufacturer for correct application. Consult PHD for high temperature use.

Options may affect unit length. See dimensional pages and option information details.

Refer to this product's online catalog in the product section for complete information including related dimensions and additional specifications. See link at bottom of this page.

M MAGNET FOR PHD SERIES 6790 & JC1 SWITCHES

This option equips the cylinder with a magnetic band on the piston for use with PHD Series 6790 and JC1 Switches. These switches mount easily into the integral slots in the body and are locked into place with a set screw. PHD recommends the use of stainless steel or de-magnetized fasteners when mounting Series CTx Cylinders equipped with the -M option. The design of a compact guide rod cylinder requires the length to be as short as possible. Installation of switches on units with J or K mounts will require temporary removal of the rear bracket prior to mounting the cylinder.

WR RECTANGULAR TOOL PLATE

With this option, available only on the 12-16 mm cylinders, the unit is assembled with a rectangular tool plate. This provides an additional mounting orientation for Series 190 and 191 Grippers. This option with J or R mounting affects tool plate extension.

WB BLANK TOOL PLATE

WRB BLANK RECTANGULAR TOOL PLATE

With these options, PHD provides a tool plate without mounting threads and counterbores. The tool plate is supplied unassembled for easy modification by the customer. Assembly and torque specifications are furnished with each unit. When assembling the unit, a threadlocking adhesive is required on tool plate mounting screws. This option with J or K mounting affects tool plate extension.

Z1 CORROSION RESISTANT

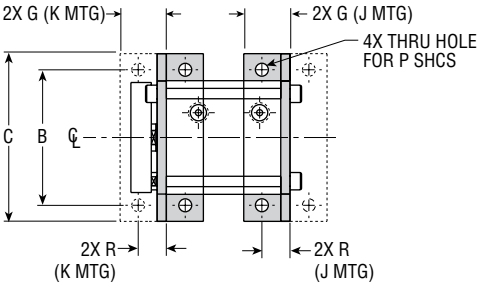
Electroless nickel plating is provided on the retaining rings, tool plate mounting screws, "J" and "K" brackets, and bracket mounting screws. Stainless steel rod and guideshafts are also supplied. This option may reduce unit life.

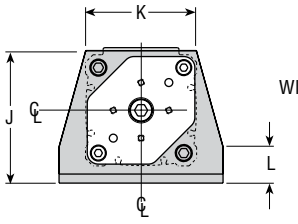
J MOUNTS

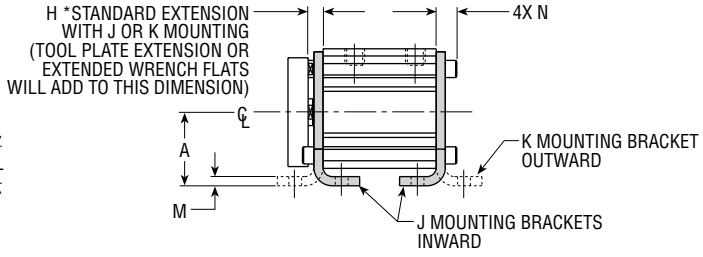
J mounting provides foot brackets (with mounting feet under the cylinder) with minimal distance between the cylinder and mounting surface. This mounting comes preassembled by PHD with proper tool plate extension. **NOTE:** Double rods will also receive H standard extension.

K MOUNTS

K mounting provides foot brackets (with mounting feet extended outward from the cylinder.) Mounting is simplified with mounting holes away from the body. This mounting comes preassembled by PHD with proper tool plate extension.
NOTE: Double rods will also receive H standard extension.





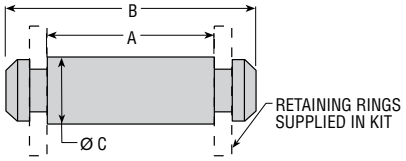


BORE [mm]	DIMENSIONS											
	A	B	C	G	H	J	K	L	M	N	P	R
12	.830 [21.1]	1.380 [35.1]	1.810 [46.0]	.600 [15.2]	.282 [9.0]	1.510 [38.4]	.945 [24.0]	.390 [9.9]	.105 [2.67]	.295 [7.5]	#10 [M5]	.380 [9.7]
16	.870 [22.1]	1.535 [39.0]	1.970 [50.0]	.610 [15.5]	.282 [9.0]	1.620 [41.2]	1.122 [28.5]	.450 [11.4]	.120 [3.05]	.310 [7.9]	#10 [M5]	.395 [10.0]
20	.945 [24.0]	1.969 [50.0]	2.520 [64.0]	.710 [18.0]	.282 [9.0]	1.750 [44.5]	1.470 [37.4]	.450 [11.4]	.120 [3.05]	.370 [9.4]	1/4 [M6]	.435 [11.1]
25	1.005 [25.5]	2.047 [52.0]	2.600 [66.0]	.725 [18.4]	.282 [9.0]	1.890 [48.0]	1.581 [40.2]	.490 [12.5]	.135 [3.43]	.390 [9.9]	1/4 [M6]	.450 [11.4]
32	1.221 [31.0]	2.362 [60.0]	2.950 [74.9]	.834 [21.2]	.282 [9.0]	2.240 [57.0]	1.873 [47.6]	.630 [16.0]	.169 [4.29]	.414 [10.5]	1/4 [M6]	.519 [13.2]
40	1.400 [35.6]	2.677 [68.0]	3.310 [84.1]	.885 [22.5]	.282 [9.0]	2.560 [65.0]	2.190 [55.7]	.670 [17.0]	.179 [4.55]	.429 [10.9]	1/4 [M6]	.534 [13.6]
50	1.730 [44.0]	3.189 [81.0]	3.940 [100.1]	1.110 [28.2]	.407 [11.0]	3.150 [80.0]	2.577 [65.5]	.850 [21.6]	.204 [5.18]	.531 [13.5]	5/16 [M8]	.699 [17.8]
63	2.010 [51.1]	3.661 [93.0]	4.530 [115.1]	1.250 [31.8]	.407 [11.0]	3.660 [93.0]	3.055 [77.6]	1.000 [25.4]	.250 [6.35]	.570 [14.5]	5/16 [M8]	.760 [19.3]

NOTES:
1) Numbers in [ ] are in mm for metric units [CTx6].
2) *Standard rod extension on units with J or K mounts and -WR or -WRB option is .407 [11.0]
3) Installation of switches on units with J or K mounts will require temporary removal of the rear bracket prior to the mounting cylinder.
4) Designated centerline ℄ is centerline of cylinder.

CYLINDER FULCRUM PIN KIT

Cylinder Fulcrum Pin Kit replacement for base pivot or for use with PHD cylinder pivot. Pin is Brite Zinc plated. Retaining rings supplied.



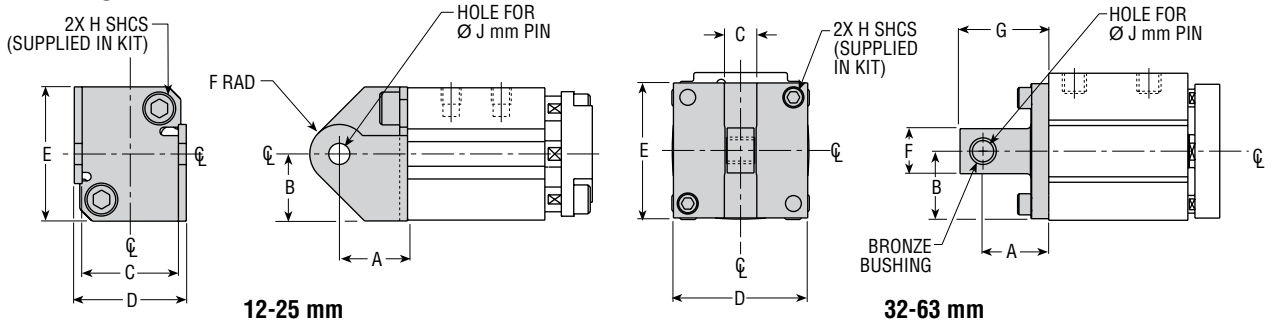
BORE	DIMENSIONS			KIT: CTx2x, CTx6x IMPERIAL/METRIC
	A	B	ØC	
12/16	1.120 [28.5]	1.300 [33.0]	.197 [5.0]	60330-1
20/25	1.550 [39.4]	1.730 [44.0]	.236 [6.0]	60331-1
32/40	1.240 [31.5]	1.490 [37.9]	.394 [10.0]	60332-1
50/63	1.690 [42.9]	1.970 [50.0]	.472 [12.0]	60333-1

Numbers in [ ] are in mm for metric units [CTx6].

All dimensions are reference only unless specifically toleranced.

ACCESSORIES: SERIES CTS COMPACT GUIDE ROD CYLINDERS

CYLINDER PIVOT KIT



12-25 mm

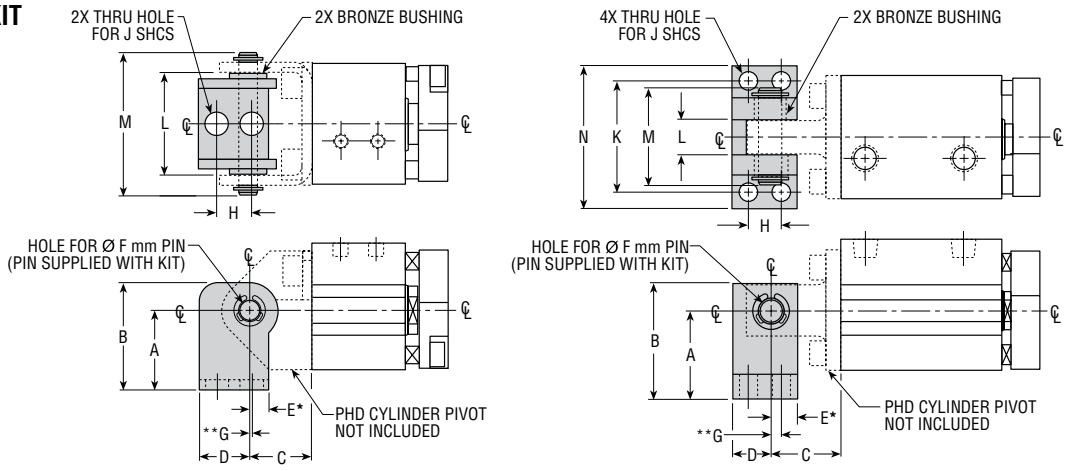
32-63 mm

BORE [mm]	DIMENSIONS A	B	C	D	E	F	G	H	J	KIT NO. IMPERIAL CTx2	KIT NO. METRIC CTx6
12	.650 [16.5]	.638 [16.2]	.905 [23.00]	1.064 [27.0]	1.276 [32.9]	.281 [7.1]	— —	10-24 [M5 x .8]	.197 [5.0]	60278-1	60286-1
16	.650 [16.5]	.678 [17.2]	.905 [23.00]	1.064 [27.0]	1.356 [34.9]	.281 [7.1]	— —	10-24 [M5 x .8]	.197 [5.0]	60279-1	60287-1
20	.790 [20.1]	.750 [19.1]	1.250 [31.75]	1.500 [38.1]	1.500 [38.1]	.355 [9.0]	— —	1/4-20 [M6 x 1.0]	.236 [6.0]	60280-1	60288-1
25	.790 [20.1]	.800 [20.3]	1.250 [31.75]	1.500 [38.1]	1.600 [40.6]	.355 [9.0]	— —	1/4-20 [M6 x 1.0]	.236 [6.0]	60281-1	60289-1
32	1.065 [27.0]	.935 [23.8]	.490 [12.45]	1.870 [47.5]	1.870 [47.5]	.820 [21.0]	1.475 [37.5]	1/4-20 [M6 x 1.0]	.394 [10.0]	60282-1	60290-1
40	1.065 [27.0]	1.105 [28.1]	.490 [12.45]	2.210 [56.1]	2.210 [56.1]	.820 [21.0]	1.475 [37.5]	1/4-20 [M6 x 1.0]	.394 [10.0]	60283-1	60291-1
50	1.460 [37.1]	1.300 [33.0]	.600 [15.24]	2.600 [66.0]	2.600 [66.0]	1.000 [25.4]	1.970 [50.0]	5/16-18 [M8 x 1.25]	.472 [12.0]	60284-1	60292-1
63	1.460 [37.1]	1.500 [38.1]	.600 [15.24]	3.000 [76.2]	3.000 [76.2]	1.000 [25.4]	1.970 [50.0]	5/16-18 [M8 x 1.25]	.472 [12.0]	60285-1	60293-1

Numbers in [ ] are in mm for metric units [CTx6].

NOTES:
1) 12-25 mm IS BRITE ZINC PLATED STEEL
2) 32-63 mm IS ANODIZED ALUMINUM WITH LUBRICATED BRONZE BUSHINGS
3) FULCRUM PIN NOT INCLUDED (SEE "FULCRUM PIN KITS" TO PURCHASE)
4) DESIGNATED CENTERLINE ℄ IS CENTERLINE OF CYLINDER
5) UNLESS OTHERWISE DIMENSIONED, FEATURES ARE CENTERED ON CYLINDER CENTERLINE

BASE PIVOT KIT



12 - 25 mm

32-63 mm

BORE [mm]	DIMENSIONS A	B	C	D	E	ØF	G	H	J	K	L	M	N	KIT: CTx2x, CTx6x IMPERIAL/METRIC
12/16	.865 [22.0]	1.145 [29.0]	.650 [16.5]	.490 [12.5]	.220 [5.6]	.197 [5.0]	.060 [1.5]	.375 [9.5]	#10 [M5]	N/A	.877 [22.3]	1.300 [33.0]	N/A	60294-1
20/25	1.000 [25.4]	1.355 [34.4]	.790 [20.1]	.630 [16.0]	.260 [6.5]	.237 [6.0]	.040 [1.0]	.435 [11.0]	1/4 [M6]	N/A	1.221 [31.0]	1.730 [44.0]	N/A	60295-1
32/40	1.375 [34.9]	1.800 [45.7]	1.065 [27.0]	.600 [15.2]	.400 [10.2]	.394 [10.0]	.156 [4.0]	.510 [13.0]	1/4 [M6]	1.695 [43.0]	.540 [13.7]	1.490 [38.0]	2.165 [55.0]	60296-1
50/63	1.890 [48.0]	2.365 [60.0]	1.460 [37.1]	.755 [19.2]	.508 [12.9]	.472 [12.0]	.236 [6.0]	.709 [18.0]	5/16 [M8]	2.265 [57.5]	.659 [16.7]	1.970 [50.0]	2.835 [72.0]	60297-1

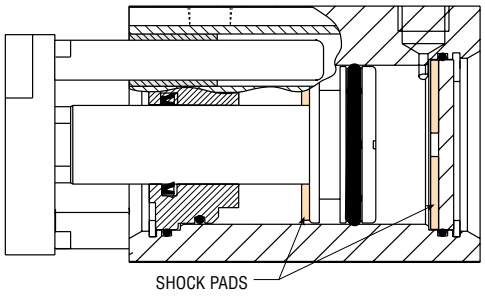
Numbers in [ ] are in mm for metric units [CTx6].

NOTES:
1) 12-25 mm IS BRITE ZINC PLATED STEEL WITH LUBRICATED BRONZE BUSHINGS
2) 32-63 mm IS ANODIZED ALUMINUM WITH LUBRICATED BRONZE BUSHINGS
3) FULCRUM PIN INCLUDED. DOES NOT INCLUDE CYLINDER PIVOT KIT
4) *E IS TO CENTER OF PIVOT PIN
5) **G IS FROM CENTER OF PIVOT PIN TO CENTER OF FIRST MOUNTING HOLE
6) DESIGNATED CENTERLINE ℄ IS CENTERLINE OF CYLINDER AND PIVOT PIN

All dimensions are reference only unless specifically toleranced.

BB SHOCK PADS ON EXTENSION AND RETRACTION

Shock pads eliminate metal-to-metal contact and minimize piston impact. Shock pads are recommended for applications where the piston contacts the head and/or cap (with attached loads). The use of shock pads reduces noise and provides maximum cylinder life in these applications.

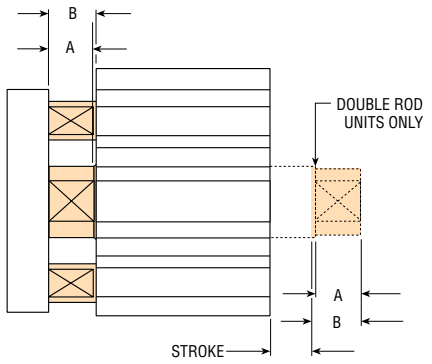


F11 EXTENDED LENGTH WRENCH FLATS

The design of a compact guide rod cylinder requires the length to be as short as possible. The standard wrench flat length is .125" [3 mm]. The option -F11 provides wrench flats which allow standard wrench access. On double rod units, rear rod also receives extended flats with option -F11.

BORE [mm]	A EXTENDED ROD & GUIDE SHAFT WRENCH FLATS		B ROD EXTENSION	
12/16	.200	[5.08]	.250	[6.5]
20/25	.200	[5.08]	.250	[6.5]
32/40	.315	[8.00]	.344	[9.0]
50/63	.315	[8.00]	.344	[9.0]

Numbers in [ ] are in mm for metric units [CTx6].



K_ EXTRA TOOL PLATE EXTENSION

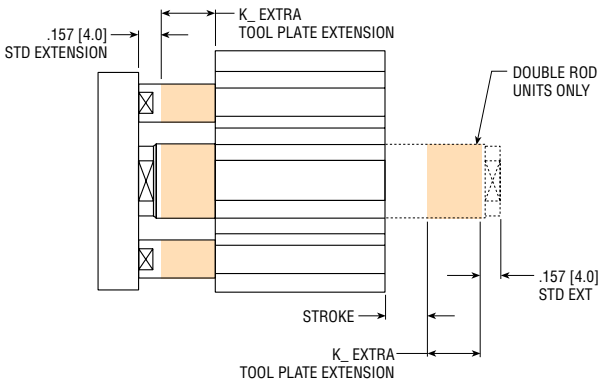
Extra tool plate extension can be specified by calling out the -K option followed by the length code.

Length code example (for imperial CTx2 units)
K1 = 1/8" of extra tool plate extension
K3 = 3/8", etc.

Length code example (for metric CTx6 units)
K5 = 5 mm of extra tool plate extension
K15 = 15 mm, etc.

.157" [4 mm] of tool plate extension is standard. Available in 1/8" [5 mm] increments only. Maximum extension is 1" [25 mm].

NOTE: On double rod units, rear rod receives same extension as tool plate (tool plate on front end only).

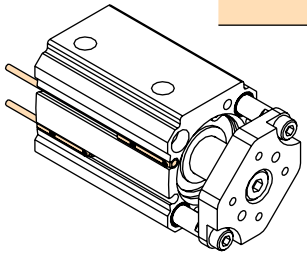


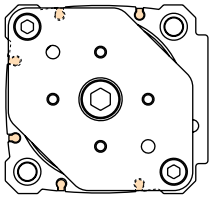
M MAGNET FOR PHD SERIES 6790 & JC1 SWITCHES

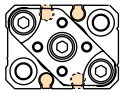
This option equips the cylinder with a magnetic band on the piston for use with PHD Series 6790 and JC1 Switches. These switches mount easily into the integral slots in the body and are locked into place with a set screw. PHD recommends the use of stainless steel or de-magnetized fasteners when mounting Series CTx Cylinders equipped with the -M option. The design of a compact guide rod cylinder requires the length to be as short as possible. Installation of switches on units with J or K mounts will require temporary removal of the rear bracket prior to mounting the cylinder.

TORQUE CHART

SWITCH	TORQUE
6790	16 in-oz
JC1SDx	Hand tighten clockwise until switch is securely retained. Do not overtighten.







SERIES 6790 & JC1 SWITCHES

PART NO.	DESCRIPTION
67902-1-05	PNP (Source) or NPN (Sink) Reed, 4.5-30 VDC, 5 m cable
JC1SDN-5	NPN (Sink) Solid State, 10-30 VDC, 5 m cable
JC1SDP-5	PNP (Source) Solid State, 10-30 VDC, 5 m cable
67922-1	PNP (Source) or NPN (Sink) Reed, 4.5-30 VDC, Quick Connect
JC1SDN-K	NPN (Sink) Solid State, 10-30 VDC, Quick Connect
JC1SDP-K	PNP (Source) Solid State, 10-30 VDC, Quick Connect
67929-2	PNP (Source) or NPN (Sink) Reed, 65-120 VAC, Quick Connect

NOTE: See Switches and Sensors section for additional switch information and complete specification.

SERIES 6790 & JC1SDx CORDSET CHART

PART NO.	DESCRIPTION
63549-02	M8, 3 pin, Straight Female Connector, 2 m cable
63549-05	M8, 3 pin, Straight Female Connector, 5 m cable

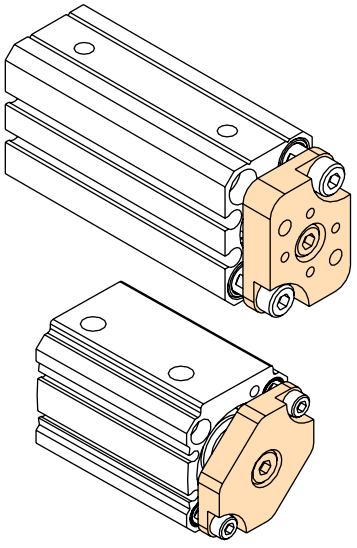
WR RECTANGULAR TOOL PLATE

With this option, available only on the 12-16 mm cylinders, the unit is assembled with a rectangular tool plate. This provides an additional mounting orientation for Series 190 and 191 Grippers. This option with J or R mounting affects tool plate extension. See page 1-19.

WB BLANK TOOL PLATE

WRB BLANK RECTANGULAR TOOL PLATE

With these options, PHD provides a tool plate without mounting threads and counterbores. The tool plate is supplied unassembled for easy modification by the customer. Assembly and torque specifications are furnished with each unit. When assembling the unit, a threadlocking adhesive is required on tool plate mounting screws. This option with J or K mounting affects tool plate extension. See page 1-19.



NOTE: Blank tool plates are shipped unassembled.

V1 FLUORO-ELASTOMER SEALS

Fluoro-Elastomer seals are compatible with certain fluids which degrade standard Nitrile seals. Seal compatibility should be checked with the fluid manufacturer for correct application. Consult PHD for high temperature use.

Z1 CORROSION RESISTANT

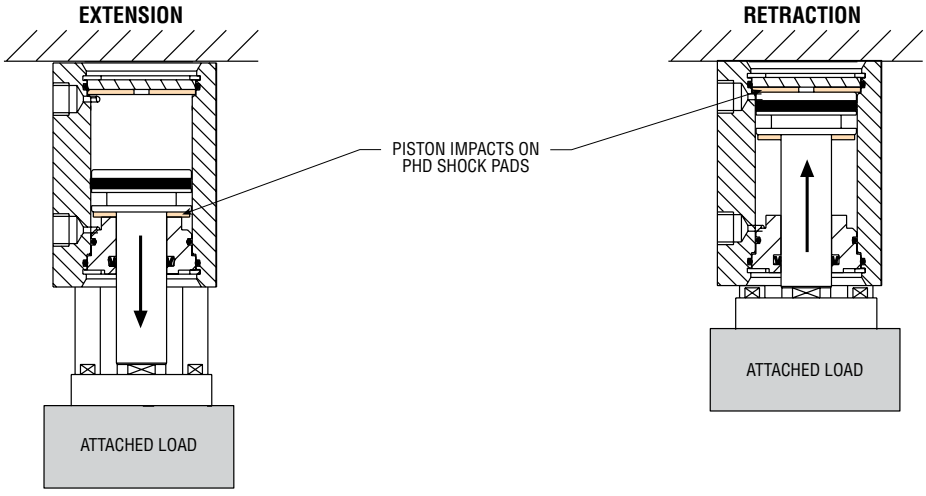
Electroless nickel plating is provided on the retaining rings, tool plate mounting screws, “J” and “K” brackets, and bracket mounting screws. Stainless steel rod and guideshafts are also supplied. This option may reduce unit life.

BEST PRACTICES FOR MAXIMUM CYLINDER LIFE

Maximum cylinder life can be achieved by using the cylinder to provide power and motion while externally stopping any attached loads. Shown below are examples of how to apply the Series CTS Cylinder.

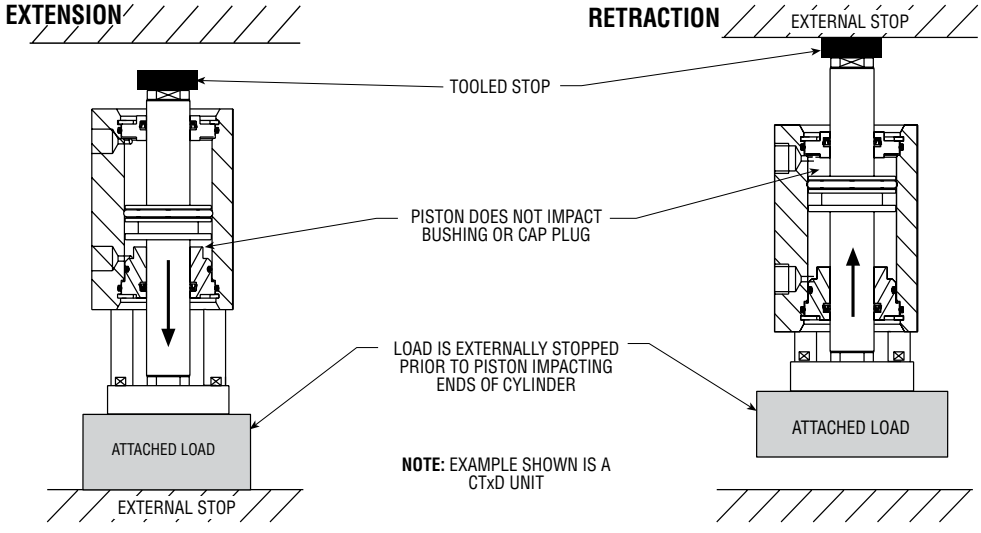
APPLICATION #1 - ATTACHED LOAD (WITH INTERNAL SHOCK PADS)

When attached loads cannot be stopped externally, optional internal shock pads are required for maximum cylinder life. It is also recommended that flow controls are used to regulate the velocity of the load and limit the kinetic energy at end of stroke.



APPLICATION #2 - ATTACHED LOADS EXTERNALLY STOPPED (WITHOUT INTERNAL SHOCK PADS)

Shock pads are not required if an attached load is externally stopped to prevent piston from contacting the bushings or cap plugs.



APPLICATION #3 - UNATTACHED LOADS (WITHOUT INTERNAL SHOCK PADS)

Shock pads are not required on units with unattached loads.