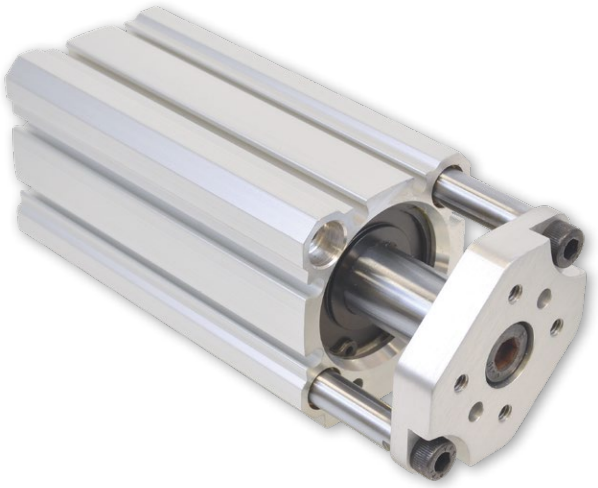
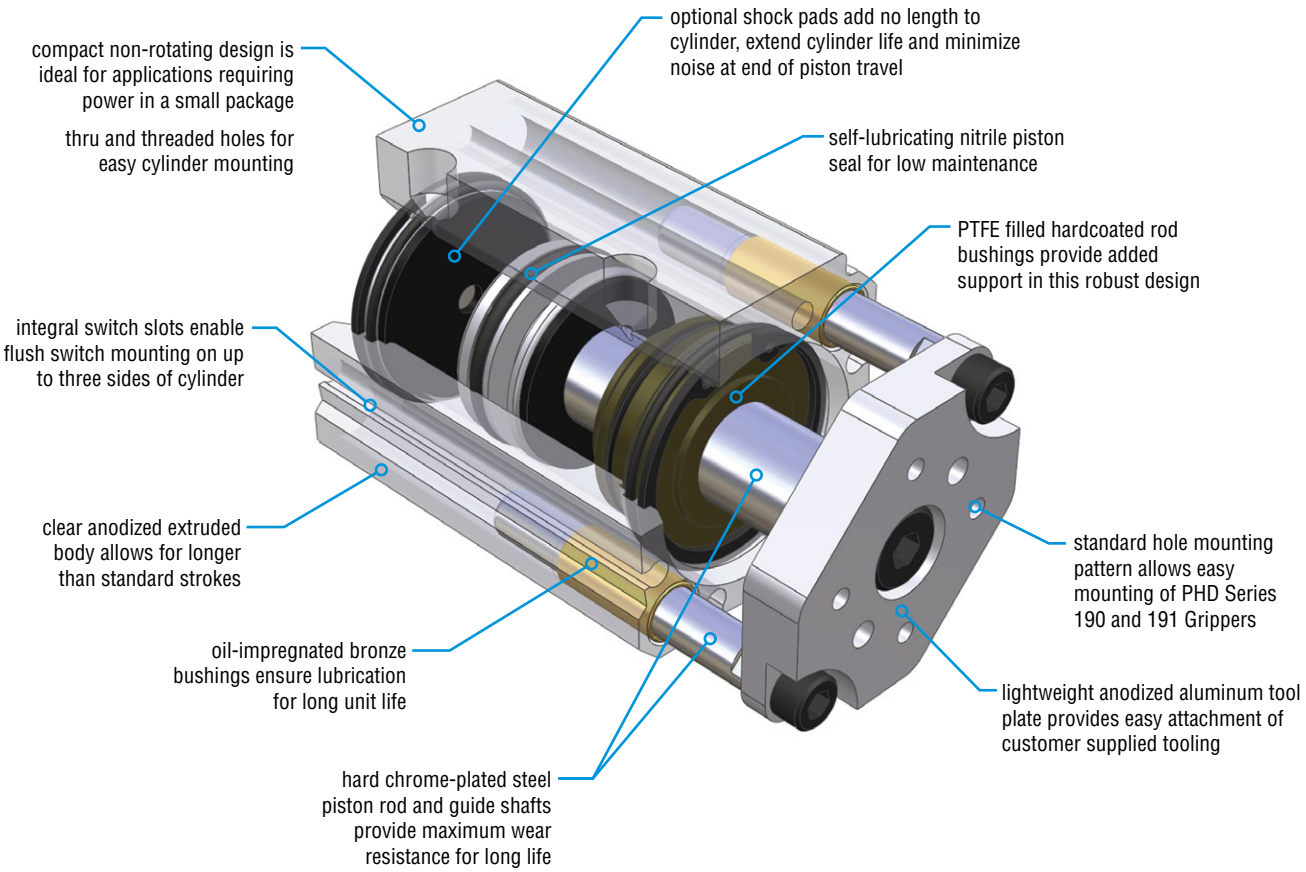
GUIDED PNEUMATIC COMPACT CYLINDER



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 GUIDED COMPACT 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	0.47	113	0.175
16	0.63	201	0.312
20	0.79	314	0.487
25	0.98	490	0.761
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 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 - Fluoroelastomer 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 guide shafts, electroless nickel plated retaining rings, fasteners, and brackets (with J & K mounting)

NOTES:
1) See pages 1-26 and 1-27 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.

JC1 SOLID STATE AND REED SWITCHES

JC1 SWITCH	DESCRIPTION
JC1SDN-5	NPN DC Solid State, 5 meter cable
JC1SDP-5	PNP DC Solid State, 5 meter cable
JC1SDN-K	NPN DC Solid State, Quick Connect
JC1SDP-K	PNP DC Solid State, Quick Connect
JC1RDU-5	PNP or NPN DC Reed, 5 meter cable
JC1RDU-K	PNP or NPN DC Reed, Quick Connect
JC1ADU-K	AC Reed, Quick Connect

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

JC1 SOLID STATE AND REED CORDSETS

PART NO.	DESCRIPTION
63549-02	M8, 3 pin, Straight Female Connector, 2 meter cable
63549-05	M8, 3 pin, Straight Female Connector, 5 meter cable
81284-1-010	M12, 3 pin, Straight Female Connector, 2 meter cable

NOTE: Cordsets are ordered separately.

CAD & Sizing Assistance

Use PHD's free online Product Sizing and CAD Configurator at **www.phdinc.com/myphd**

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 [-29° to +82°C]
VELOCITY	20 in/sec [0.5 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

BORE SIZE		ROD DIAMETER		ROD DIRECTION	EFFECTIVE AREA		BASE WEIGHT		ADDER PER 1" [25 mm] OF STROKE	
mm	in	in	mm		in²	mm²	lb	kg	lb	kg
12	0.472	0.250	6.35	EXTEND	0.175	113	0.17	0.08	0.11	0.05
				RETRACT	0.126	81				
16	0.630	0.250	6.35	EXTEND	0.312	201	0.20	0.09	0.12	0.05
				RETRACT	0.263	169				
20	0.787	0.375	9.53	EXTEND	0.487	314	0.37	0.17	0.19	0.09
				RETRACT	0.376	242				
25	0.984	0.375	9.53	EXTEND	0.761	490	0.43	0.19	0.20	0.09
				RETRACT	0.650	419				
32	1.260	0.625	15.88	EXTEND	1.247	804	0.72	0.33	0.31	0.14
				RETRACT	0.940	606				
40	1.575	0.625	15.88	EXTEND	1.948	1256	0.96	0.44	0.37	0.17
				RETRACT	1.641	1058				
50	1.969	0.750	19.05	EXTEND	3.043	1963	1.65	0.75	0.49	0.22
				RETRACT	2.602	1678				
63	2.480	0.750	19.05	EXTEND	4.832	3117	2.36	1.07	0.58	0.26
				RETRACT	4.390	2832				

NOTE: Use retract figures for calculating double rod 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 1-28.

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 page 1-20.

Proper application of CTS Cylinders in vertical applications is dependent upon both attached load and cylinder speed. Refer to page 1-21.

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 1-28. Stroke tolerance changes to ±0.050 [±1.3 mm] with -BB option.

Application & Sizing Assistance

Use PHD's free online Product Sizing Application at **www.phdinc.com/apps/sizing**

HORIZONTAL APPLICATIONS

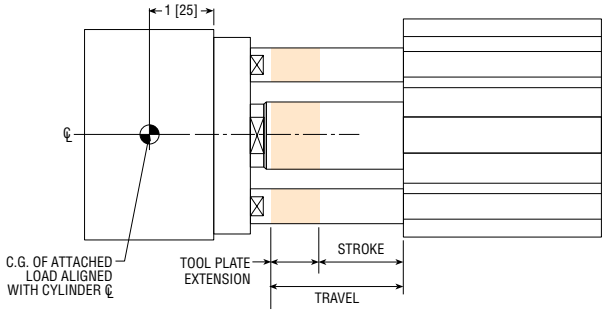
Proper application of CTS Cylinders in horizontal applications is dependent upon travel and attached load. In addition, where there is end-of-stroke impact with an attached load, cylinder speed must be considered.

ATTACHED LOAD WITHOUT END OF STROKE IMPACT

Use the charts below to determine the Maximum Rolling Side Load for a given bore size and travel. Optimum performance will be achieved with positive external stops aligned with the cylinder centerline.

ATTACHED LOAD WITH END OF STROKE IMPACT

Use the charts below to determine the Maximum Rolling Side Load and speed for a given bore size and travel. Optional shock pads are required for end-of-stroke impact with attached load.

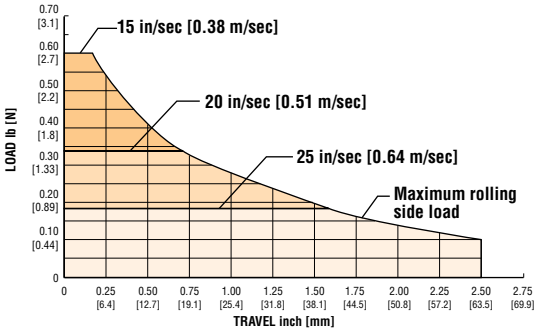


NOTES:

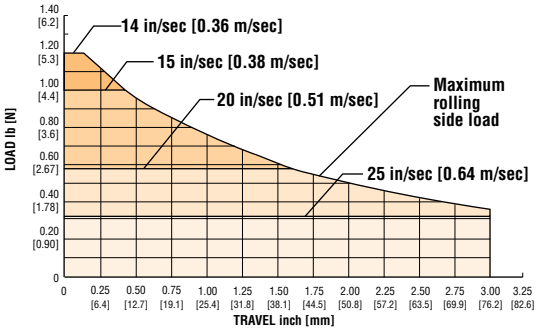
1) HORIZONTAL SIDE LOAD PERFORMANCE DATA IS BASED UPON
   A) THE CENTER OF GRAVITY (C.G.) OF THE ATTACHED LOAD LOCATED AS SHOWN ABOVE. LOCATING THE C.G. BEYOND THE STATED DISTANCE MAY DECREASE THE LIFE OF THE UNIT.
   B) A STANDARD UNIT. USE OF FLUOROELASTOMER SEALS OR THE -Z1 OPTION MAY DECREASE THE SIDE LOADING CAPABILITY OF THE UNIT.
2) SPEEDS ARE BASED ON END-OF-STROKE IMPACT CAPABILITY OF UNITS WITH OPTIONAL SHOCK PADS.

MAXIMUM HORIZONTAL LOAD CAPACITY & SPEED

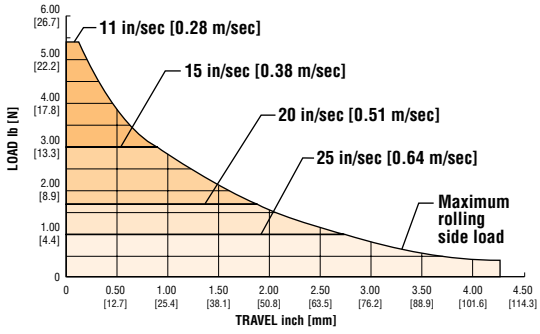
CTx12



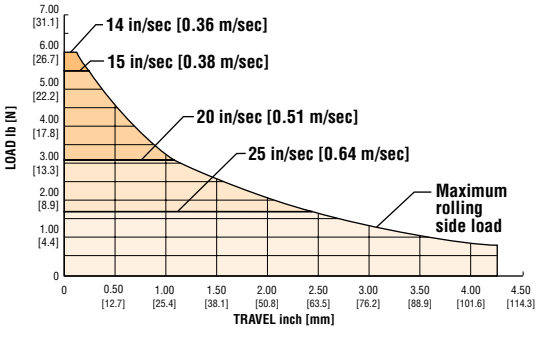
CTx16



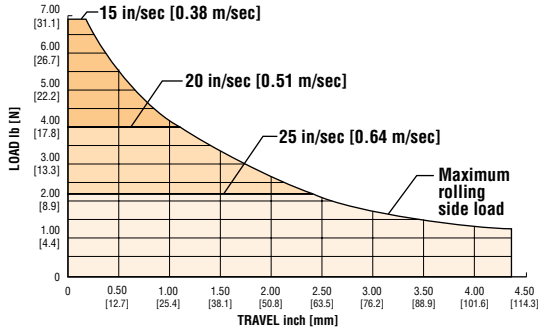
CTx20



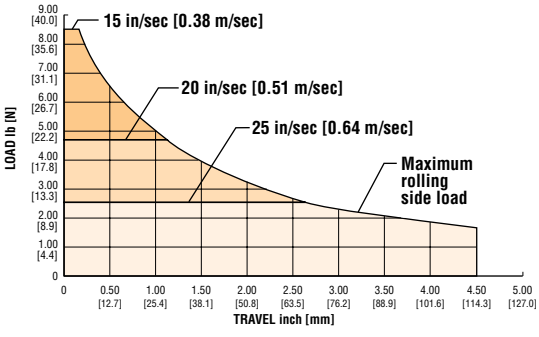
CTx25



CTx32



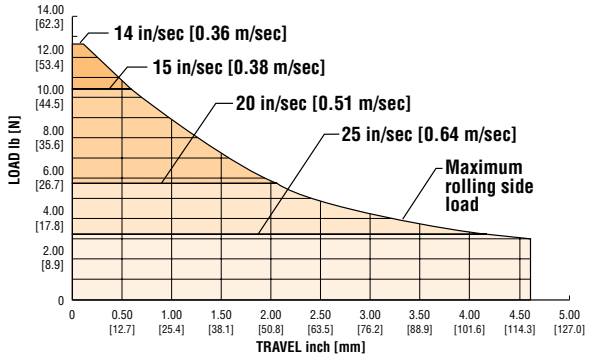
CTx40



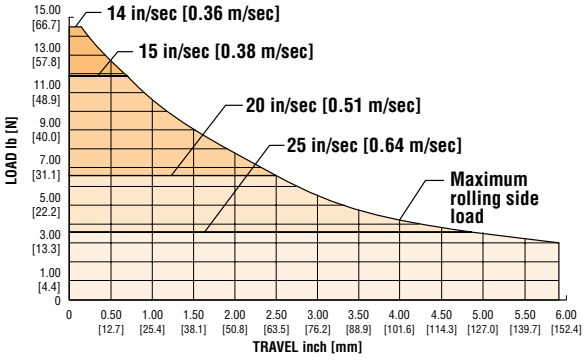
HORIZONTAL APPLICATIONS

MAXIMUM HORIZONTAL LOAD CAPACITY & SPEED

CTx50



CTx63



VERTICAL APPLICATIONS

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

ATTACHED LOAD WITHOUT END OF STROKE IMPACT

See cylinder force calculation on page 1-19. Optimum performance will be achieved with positive external stops aligned with the cylinder centerline.

ATTACHED LOAD WITH END OF STROKE IMPACT

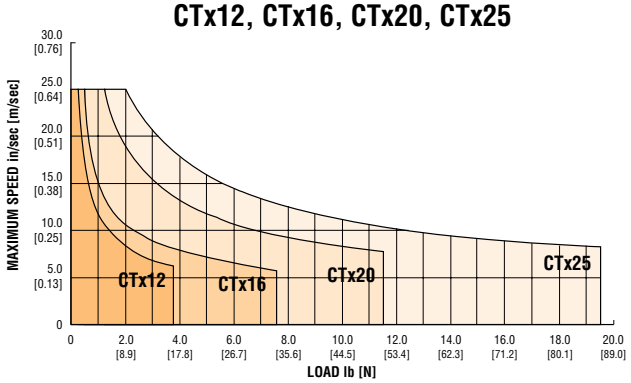
Use the charts below to determine the maximum speed for a given load. Optional shock pads are required for end-of-stroke impact with attached load.

NOTES:

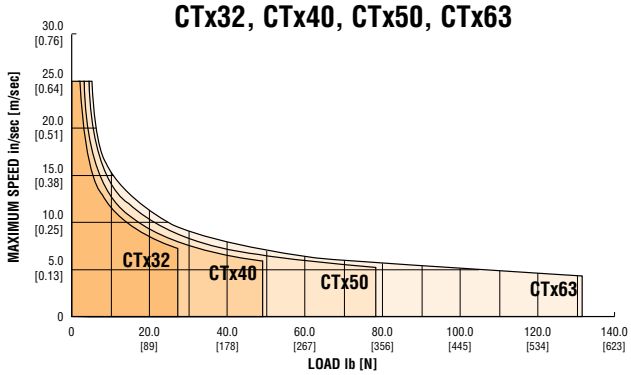
1) VERTICAL PERFORMANCE DATA IS BASED UPON:
   A) THE CENTER OF GRAVITY (C.G.) OF THE ATTACHED LOAD IN LINE WITH THE CYLINDER CENTERLINE. LOCATING THE C.G. OFF OF THE CYLINDER CENTERLINE MAY RESULT IN DECREASED CYLINDER LIFE.
   B) A STANDARD UNIT. USE OF FLUOROELASTOMER SEALS OR THE -Z1 OPTION MAY DECREASE THE LIFE OF THE UNIT.
2) SPEEDS ARE BASED ON END OF STROKE IMPACT CAPABILITY OF UNITS WITH OPTIONAL SHOCK PADS

VERTICAL APPLICATION WITH END OF STROKE IMPACT MAXIMUM SPEED & LOAD

CTx12, CTx16, CTx20, CTx25

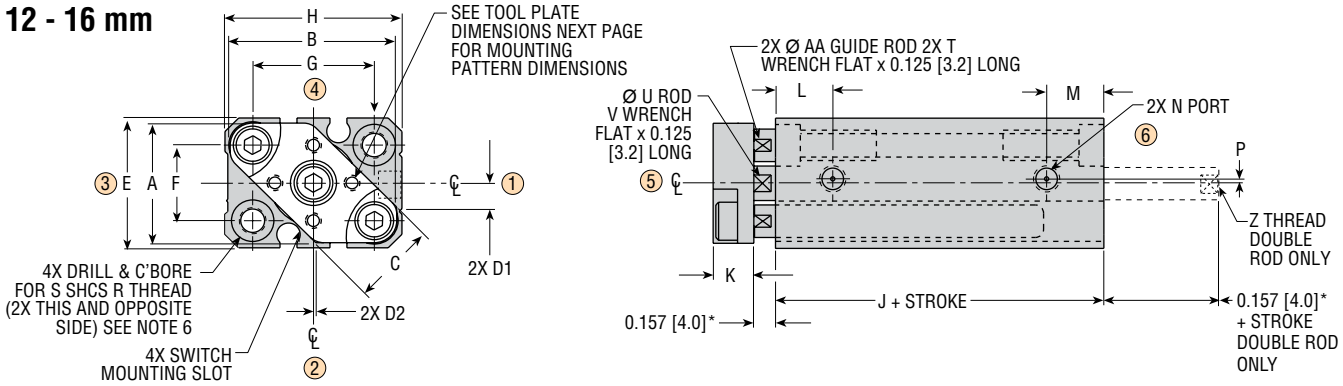


CTx32, CTx40, CTx50, CTx63

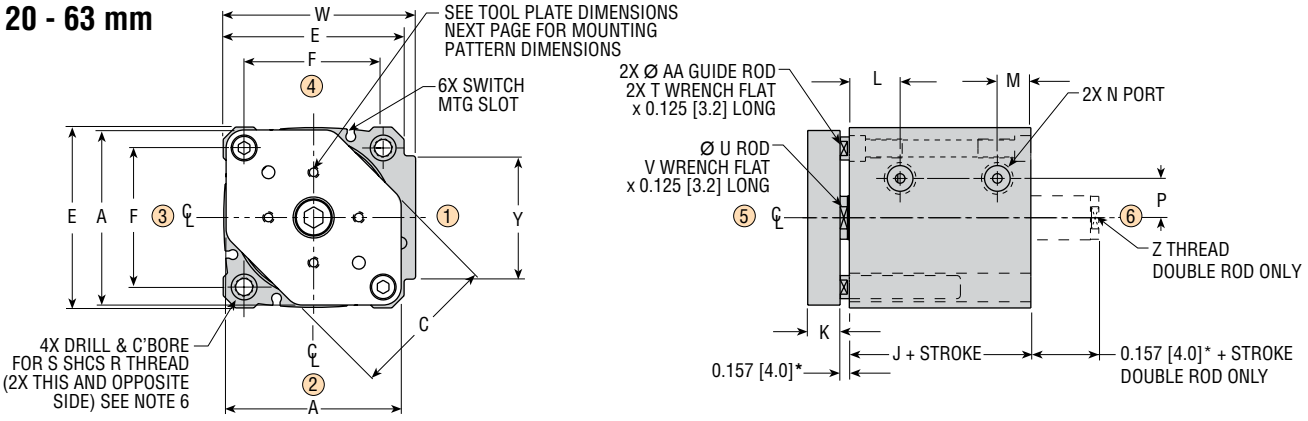


DIMENSIONS: SERIES CTS GUIDED COMPACT CYLINDERS

12 - 16 mm



20 - 63 mm



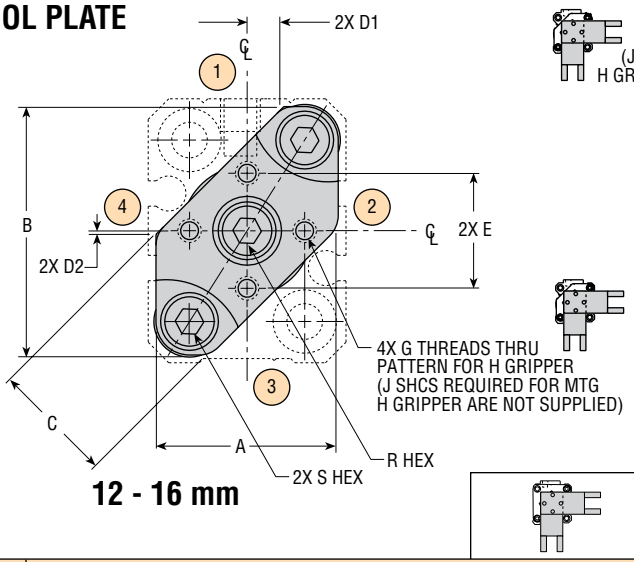
BORE [mm]	LETTER DIMENSION															
	A	B	C	D1	D2	E	F	G	H	J	K	L	M	N	P	R THREAD
12	0.876 [22.25]	1.200 [30.48]	0.591 [15]	0.182 [4.62]	0.020 [0.51]	0.944 [24.0]	0.550 [13.97]	0.866 [22.0]	1.260 [32.0]	1.380 [35.05]	0.295 [7.5]	0.415 [10.5]	0.415 [10.5]	10-32 x 0.15 [M5 x 0.8 x 4]	0.032 [0.8]	10-24 x 0.550 [M5 x 0.8 x 14.5]
16	1.000 [25.40]	1.250 [31.75]	0.710 [18]	0.025 [0.64]	0.075 [1.91]	1.91 [28.0]	0.710 [18.03]	0.946 [24.0]	1.340 [34.0]	1.380 [35.05]	0.295 [7.5]	0.415 [10.5]	0.415 [10.5]	10-32 x 0.15 [M5 x 0.8 x 4]	0.098 [2.5]	10-24 x 0.550 [M5 x 0.8 x 14.5]
20	1.374 [34.90]	—	0.906 [23]	—	—	1.476 [37.5]	1.000 [25.4]	—	—	1.615 [41.02]	0.394 [10.0]	0.670 [17.0]	0.415 [10.5]	10-32 x 0.15 [M5 x 0.8 x 4]	0.207 [5.3]	1/4-20 x 0.875 [M6 x 1.0 x 22.5]
25	1.500 [38.10]	—	1.024 [26]	—	—	1.576 [40.0]	1.100 [28.0]	—	—	1.615 [41.02]	0.394 [10.0]	0.670 [17.0]	0.398 [10.1]	10-32 x 0.15 [M5 x 0.8 x 4]	0.236 [6.0]	1/4-20 x 0.875 [M6 x 1.0 x 22.5]
32	1.744 [44.30]	—	1.378 [35]	—	—	1.870 [47.5]	1.339 [34.0]	—	—	1.790 [45.47]	0.394 [10.0]	0.710 [18.0]	0.450 [11.4]	1/8 NPT [1/8 BSP]	0.324 [8.2]	1/4-20 x 0.875 [M6 x 1.0 x 22.5]
40	2.000 [50.80]	—	1.650 [42]	—	—	2.205 [56.0]	1.574 [40.0]	—	—	1.790 [45.47]	0.394 [10.0]	0.710 [18.0]	0.450 [11.4]	1/8 NPT [1/8 BSP]	0.364 [9.3]	1/4-20 x 0.875 [M6 x 1.0 x 22.5]
50	2.500 [63.50]	—	2.086 [53]	—	—	2.598 [66.0]	1.968 [50.0]	—	—	1.970 [50.04]	0.551 [14.0]	0.790 [20.1]	0.535 [13.6]	1/8 NPT [1/8 BSP]	0.476 [12.1]	5/16-18 x 0.900 [M8 x 1.25 x 22.5]
63	2.974 [75.54]	—	2.560 [65]	—	—	3.070 [78.0]	2.362 [60.0]	—	—	2.090 [53.09]	0.551 [14.0]	0.865 [22.0]	0.570 [14.5]	1/4 NPT [1/4 BSP]	0.670 [17.0]	5/16-18 x 0.900 [M8 x 1.25 x 22.5]

BORE [mm]	LETTER DIMENSION							
	S	T	U	V	W	Y	Z THREAD	AA
12	#6 [M4]	0.219 [5.6]	0.250 [6.35]	0.219 [5.6]	—	—	6-32 x 0.210 [M4 x 0.7 x 7]	0.236 [6.0]
16	#6 [M4]	0.219 [5.6]	0.250 [6.35]	0.219 [5.6]	—	—	6-32 x 0.210 [M4 x 0.7 x 7]	0.236 [6.0]
20	#10 [M5]	0.250 [6.4]	0.375 [9.53]	0.312 [7.9]	1.576 [40.0]	0.788 [20.0]	10-32 x 0.285 [M5 x 0.8 x 7]	0.314 [8.0]
25	#10 [M5]	0.250 [6.4]	0.375 [9.53]	0.312 [7.9]	1.746 [44.4]	1.000 [25.4]	10-32 x 0.285 [M5 x 0.8 x 7]	0.314 [8.0]
32	#10 [M5]	0.250 [6.4]	0.625 [15.88]	0.500 [12.7]	2.037 [52.0]	1.340 [34.0]	1/4-28 x 0.375 [M6 x 1.0 x 9]	0.314 [8.0]
40	#10 [M5]	0.250 [6.4]	0.625 [15.88]	0.500 [12.7]	2.363 [60.0]	1.420 [36.0]	1/4-28 x 0.375 [M6 x 1.0 x 9]	0.314 [8.0]
50	1/4 [M6]	0.312 [7.9]	0.750 [19.05]	0.625 [15.9]	2.795 [71.0]	1.600 [40.6]	5/16-24 x 0.312 [M8 x 1.25 x 8]	0.394 [10.0]
63	1/4 [M6]	0.312 [7.9]	0.750 [19.05]	0.625 [15.9]	3.266 [83.0]	2.094 [53.2]	5/16-24 x 0.312 [M8 x 1.25 x 8]	0.394 [10.0]

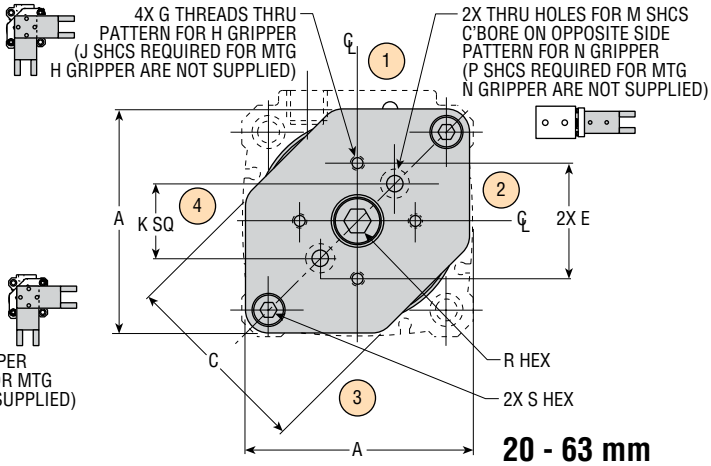
NOTES:
1) DIMENSION SHOWN IN [ ] ARE IN mm FOR METRIC UNITS [CTx6].
2) DESIGNATED CENTERLINE ℄ IS CENTERLINE OF CYLINDER BORE.
3) UNLESS OTHERWISE DIMENSIONED, MOUNTING HOLE PATTERNS AND OTHER FEATURES ARE CENTERED ON DESIGNATED CYLINDER CENTERLINE.
4) 1/8" [5 mm] MINIMUM STROKE REQUIRED
5) *SEE J & 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.

All dimensions are reference only unless specifically toleranced.

TOOL PLATE



12 - 16 mm



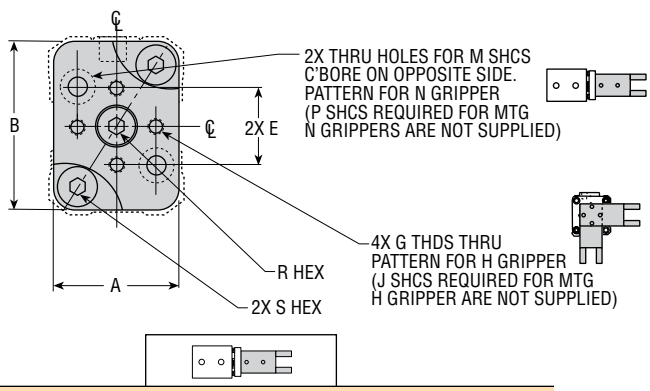
20 - 63 mm

BORE [mm]	LETTER DIMENSION																	
								H (SERIES 190°)					N (SERIES 19x)*					
	A	B	C	D1	D2	E	G	ANGULAR	PARALLEL	J	K	M	ANGULAR	PARALLEL	P	R	S
12	0.876 [22.25]	1.200 [30.48]	0.591 [15.0]	0.182 [4.62]	0.020 [0.51]	0.550 [13.97]	4-40 [M3 x 0.5]	— [19002]	1906x [1906x]	4-40 x 1 [M3 x 0.5 x 20]	—	—	—	—	—	[3.0]	[3.0]
16	1.000 [25.40]	1.250 [31.75]	0.710 [18.0]	0.025 [0.64]	0.075 [1.91]	0.550 [13.97]	4-40 [M3 x 0.5]	— [19002]	1906x [1906x]	4-40 x 1 [M3 x 0.5 x 20]	—	—	—	—	—	[3.0]	[3.0]
20	1.374 [34.90]	—	0.906 [23.0]	—	—	0.710 [18.03]	6-32 [M3 x 0.5]	— [19012]	1907x [1907x]	6-32 x 1-1/4 [M3 x 0.5 x 30]	0.550 [13.97]	#4 [M3]	— [19x02]	19x6x [19x6x]	4-40 x 3/8 [M3 x 0.5 x 10]	[5.0]	[4.0]
25	1.500 [38.10]	—	1.024 [26.0]	—	—	0.710 [18.03]	6-32 [M3 x 0.5]	— [19012]	1907x [1907x]	6-32 x 1-1/4 [M3 x 0.5 x 30]	0.550 [13.97]	#4 [M3]	— [19x02]	19x6x [19x6x]	4-40 x 3/8 [M3 x 0.5 x 10]	[5.0]	[4.0]
32	1.744 [44.30]	—	1.378 [35.0]	—	—	1.100 [27.94]	8-32 [M4 x 0.7]	— [19022]	1908x [1908x]	8-32 x 1-5/8 [M4 x 0.7 x 40]	0.710 [18.03]	#6 [M3]	— [19x12]	19x7x [19x7x]	6-32 x 3/8 [M3 x 0.5 x 8]	[6.0]	[4.0]
40	2.000 [50.80]	—	1.650 [42.0]	—	—	1.100 [27.94]	8-32 [M4 x 0.7]	— [19022]	1908x [1908x]	8-32 x 1-5/8 [M4 x 0.7 x 40]	0.710 [18.03]	#6 [M3]	— [19x12]	19x7x [19x7x]	6-32 x 3/8 [M3 x 0.5 x 8]	[6.0]	[4.0]
50	2.500 [63.5]	—	2.086 [53.0]	—	—	1.535 [38.99]	10-24 [M5 x 0.8]	— [19032]	1909x [1909x]	10-24 x 2-1/4 [M5 x 0.8 x 55]	1.100 [27.94]	#8 [M4]	— [19x22]	19x8x [19x8x]	8-32 x 5/8 [M4 x 0.7 x 12]	[8.0]	[5.0]
63	2.974 [75.54]	—	2.560 [65.0]	—	—	1.535 [38.99]	10-24 [M5 x 0.8]	— [19032]	1909x [1909x]	10-24 x 2-1/4 [M5 x 0.8 x 55]	1.535 [38.99]	#10 [M5]	— [19x32]	19x9x [19x9x]	10-24 x 3/4 [M5 x 0.8 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

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.

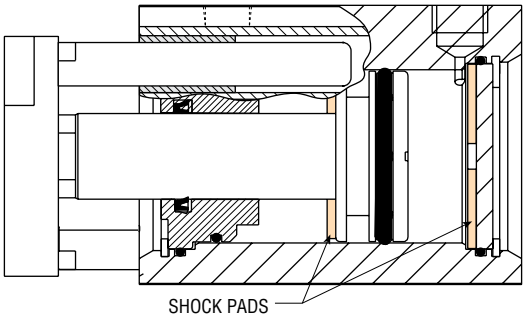


BORE [mm]	LETTER DIMENSION												
					H (SERIES 190°)				N (SERIES 19x)*				
	A	B	E	G	ANGULAR	PARALLEL	J	M	ANGULAR	PARALLEL	P	R	S
12	0.876 [22.25]	1.200 [30.5]	0.550 [13.97]	4-40 [M3 x 0.5]	— [19002]	1906x [1906x]	4-40 x 1 [M3 x 0.5 x 20]	#4 [M3]	— [19x02]	19x6x [19x6x]	4-40 x 3/8 [M5 x 0.5 x 8]	[3.0]	[3.0]
16	1.000 [25.5]	1.250 [31.75]	0.550 [13.97]	4-40 [M3 x 0.5]	— [19002]	1906x [1906x]	4-40 x 1 [M3 x 0.5 x 20]	#4 [M3]	— [19x02]	19x6x [19x6x]	4-40 x 3/8 [M3 x 0.5 x 8]	[3.0]	[3.0]

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.

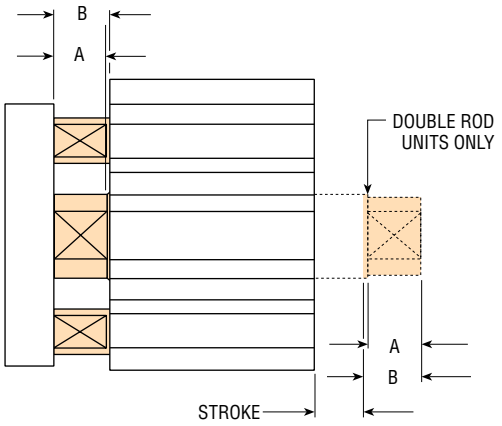


F11 EXTENDED LENGTH WRENCH FLATS

The design of a compact guide rod cylinder requires the length to be as short as possible. The standard wrench flat length is 0.125" [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	0.200	[5.08]	0.250	[6.5]
20/25	0.200	[5.08]	0.250	[6.5]
32/40	0.315	[8.00]	0.344	[9.0]
50/63	0.315	[8.00]	0.344	[9.0]

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



K_ EXTRA TOOL PLATE EXTENSION

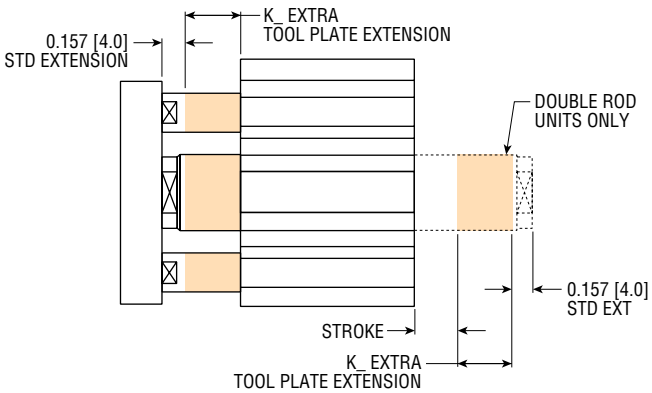
Extra rod extension can be achieved by specifying the option -K followed by the length code.

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.

0.157" [4 mm] of tool plate extension is standard. Available in 1/8" [5 mm] increments only. Maximum extension is 1" [25 mm].

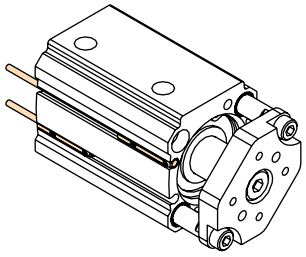
NOTE: On double rod units, rear rod receives same extension as tool plate (tool plate on front end only).

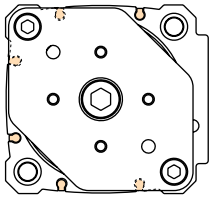


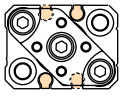
All dimensions are reference only unless specifically toleranced.

M MAGNET FOR PHD SERIES JC1 SWITCHES

This option equips the cylinder with a magnetic band on the piston for use with PHD Series JC1 Switches. These switches mount easily into the integral slots in the body and are locked into place with a setscrew. **Hand tighten the setscrew until the switch is securely retained. Do not overtighten.** 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.







JC1 SOLID STATE AND REED SWITCHES

JC1 SWITCH	DESCRIPTION
JC1SDN-5	NPN DC Solid State, 5 meter cable
JC1SDP-5	PNP DC Solid State, 5 meter cable
JC1SDN-K	NPN DC Solid State, Quick Connect
JC1SDP-K	PNP DC Solid State, Quick Connect
JC1RDU-5	PNP or NPN DC Reed, 5 meter cable
JC1RDU-K	PNP or NPN DC Reed, Quick Connect
JC1ADU-K	AC Reed, Quick Connect

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

JC1 SOLID STATE AND REED CORDSETS

PART NO.	DESCRIPTION
63549-02	M8, 3 pin, Straight Female Connector, 2 meter cable
63549-05	M8, 3 pin, Straight Female Connector, 5 meter cable
81284-1-010	M12, 3 pin, Straight Female Connector, 2 meter cable

NOTE: Cordsets are ordered separately.

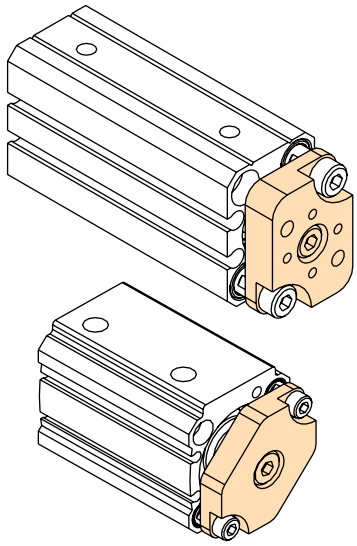
WR RECTANGULAR TOOL PLATE

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 K mounting affects tool plate extension. See next page.

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 next page.



NOTE: Blank tool plates are shipped unassembled.

V1 FLUOROELASTOMER SEALS

Fluoroelastomer 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.

MOUNTINGS: SERIES CTS GUIDED COMPACT CYLINDERS

J MOUNTS

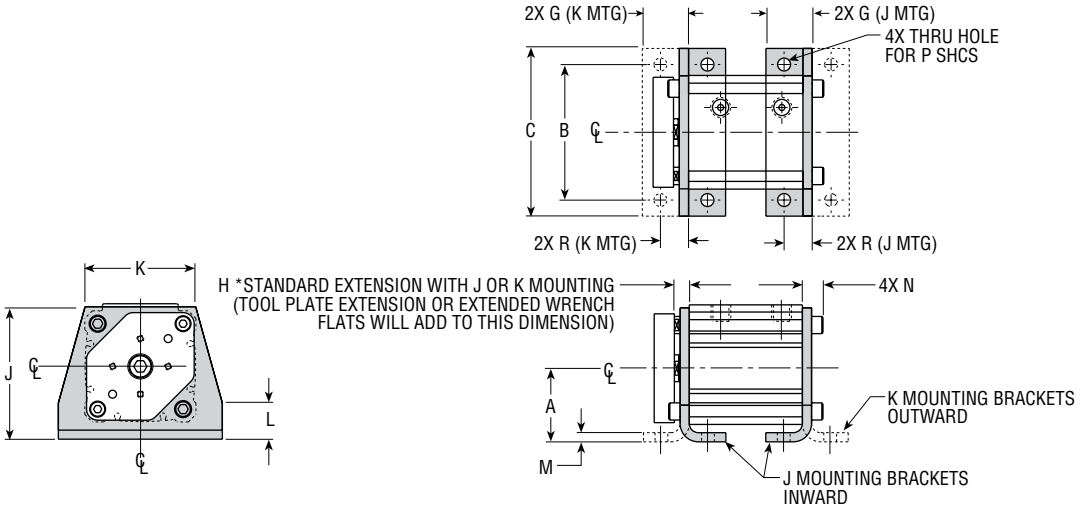
J mounting provides foot brackets (with mounting feet under the cylinder) with minimal distance between the cylinder and mounting surface. This mounting comes preassembled by PHD with proper tool plate extension.

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.



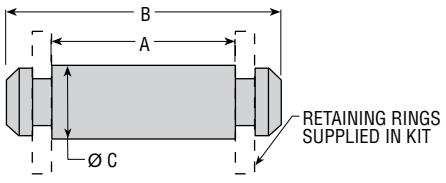
BORE [mm]	LETTER DIMENSION											
	A	B	C	G	H	J	K	L	M	N	P	R
12	0.830 [21.1]	1.380 [35.1]	1.810 [46.0]	0.600 [15.2]	0.282 [9.0]	1.510 [38.4]	0.945 [24.0]	0.390 [9.9]	0.105 [2.67]	0.295 [7.5]	#10 [M5]	0.380 [9.7]
16	0.870 [22.1]	1.535 [39.0]	1.970 [50.0]	0.610 [15.5]	0.282 [9.0]	1.620 [41.2]	1.122 [28.5]	0.450 [11.4]	0.120 [3.05]	0.310 [7.9]	#10 [M5]	0.395 [10.0]
20	0.945 [24.0]	1.969 [50.0]	2.520 [64.0]	0.710 [18.0]	0.282 [9.0]	1.750 [44.5]	1.470 [37.4]	0.450 [11.4]	0.120 [3.05]	0.370 [9.4]	1/4 [M6]	0.435 [11.1]
25	1.005 [25.5]	2.047 [52.0]	2.600 [66.0]	0.725 [18.4]	0.282 [9.0]	1.890 [48.0]	1.581 [40.2]	0.490 [12.5]	0.135 [3.43]	0.390 [9.9]	1/4 [M6]	0.450 [11.4]
32	1.221 [31.0]	2.362 [60.0]	2.950 [74.9]	0.834 [21.2]	0.282 [9.0]	2.240 [57.0]	1.873 [47.6]	0.630 [16.0]	0.179 [4.55]	0.414 [10.5]	1/4 [M6]	0.519 [13.2]
40	1.400 [35.6]	2.677 [68.0]	3.310 [84.1]	0.885 [22.5]	0.282 [9.0]	2.560 [65.0]	2.190 [55.7]	0.670 [17.0]	0.179 [4.55]	0.429 [10.9]	1/4 [M6]	0.534 [13.6]
50	1.730 [44.0]	3.189 [81.0]	3.940 [100.1]	1.110 [28.2]	0.407 [11.0]	3.150 [80.0]	2.577 [65.5]	0.850 [21.6]	0.199 [5.05]	0.531 [13.5]	5/16 [M8]	0.699 [17.8]
63	2.010 [51.1]	3.661 [93.0]	4.530 [115.1]	1.250 [31.8]	0.407 [11.0]	3.660 [93.0]	3.055 [77.6]	1.000 [25.4]	0.250 [6.35]	0.570 [14.5]	5/16 [M8]	0.760 [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 0.407 [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.

ACCESSORIES: SERIES CTS GUIDED COMPACT CYLINDERS

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.

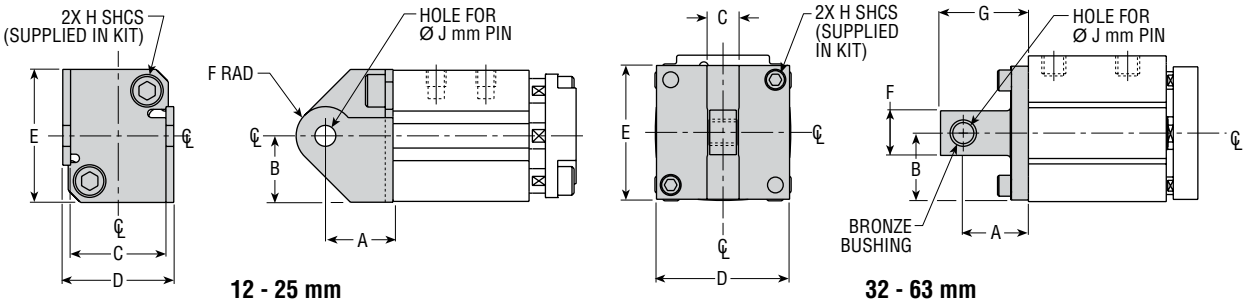


BORE [mm]	DIMENSIONS			KIT: CTx2x, CTx6x IMPERIAL/METRIC
	A	B	Ø C	
12/16	1.120 [28.5]	1.300 [33.0]	0.197 [5.0]	60330-1
20/25	1.550 [39.4]	1.730 [44.0]	0.236 [6.0]	60331-1
32/40	1.240 [31.5]	1.490 [37.9]	0.394 [10.0]	60332-1
50/63	1.690 [42.9]	1.970 [50.0]	0.472 [12.0]	60333-1

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

All dimensions are reference only unless specifically toleranced.

CYLINDER PIVOT KIT

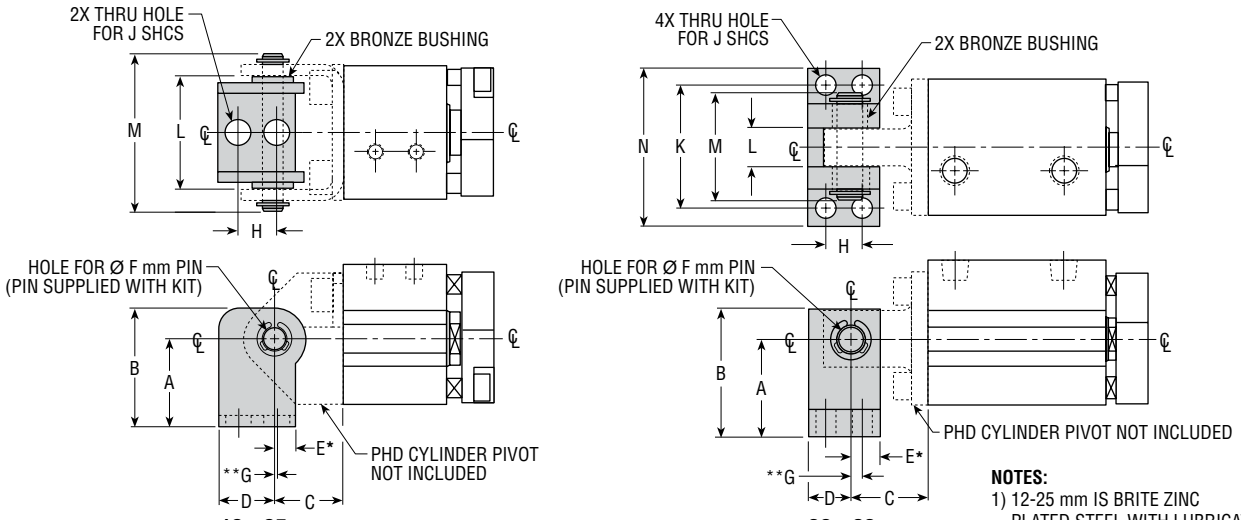


BORE [mm]	DIMENSIONS									KIT NO. IMPERIAL CTx2	KIT NO. METRIC CTx6
	A	B	C	D	E	F	G	H	J		
12	0.650 [16.5]	0.638 [16.2]	0.905 [23.00]	1.064 [27.0]	1.276 [32.9]	0.281 [7.1]	—	10-24 [M5 x 0.8]	0.197 [5.0]	60278-1	60286-1
16	0.650 [16.5]	0.678 [17.2]	0.905 [23.00]	1.064 [27.0]	1.356 [34.9]	0.281 [7.1]	—	10-24 [M5 x 0.8]	0.197 [5.0]	60279-1	60287-1
20	0.790 [20.1]	0.750 [19.1]	1.250 [31.75]	1.500 [38.1]	1.500 [38.1]	0.355 [9.0]	—	1/4-20 [M6 x 1.0]	0.236 [6.0]	60280-1	60288-1
25	0.790 [20.1]	0.800 [20.3]	1.250 [31.75]	1.500 [38.1]	1.600 [40.6]	0.355 [9.0]	—	1/4-20 [M6 x 1.0]	0.236 [6.0]	60281-1	60289-1
32	1.065 [27.0]	0.935 [23.8]	0.490 [12.45]	1.870 [47.5]	1.870 [47.5]	0.820 [21.0]	1.475 [37.5]	1/4-20 [M6 x 1.0]	0.394 [10.0]	60282-1	60290-1
40	1.065 [27.0]	1.105 [28.1]	0.490 [12.45]	2.210 [56.1]	2.210 [56.1]	0.820 [21.0]	1.475 [37.5]	1/4-20 [M6 x 1.0]	0.394 [10.0]	60283-1	60291-1
50	1.460 [37.1]	1.300 [33.0]	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]	0.472 [12.0]	60284-1	60292-1
63	1.460 [37.1]	1.500 [38.1]	0.600 [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]	0.472 [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



BORE [mm]	DIMENSIONS													KIT: CTx2x, CTx6x IMPERIAL/METRIC
	A	B	C	D	E	Ø F	G	H	J	K	L	M	N	
12/16	0.865 [22.0]	1.145 [29.0]	0.650 [16.5]	0.490 [12.5]	0.220 [5.6]	0.197 [5.0]	0.060 [1.5]	0.375 [9.5]	#10 [M5]	N/A	0.877 [22.3]	1.300 [33.0]	N/A	60294-1
20/25	1.000 [25.4]	1.355 [34.4]	0.790 [20.1]	0.630 [16.0]	0.260 [6.5]	0.237 [6.0]	0.040 [1.0]	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]	0.600 [15.2]	0.400 [10.2]	0.394 [10.0]	0.156 [4.0]	0.510 [13.0]	1/4 [M6]	1.695 [43.0]	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]	0.755 [19.2]	0.508 [12.9]	0.472 [12.0]	0.236 [6.0]	0.709 [18.0]	5/16 [M8]	2.265 [57.5]	0.659 [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.

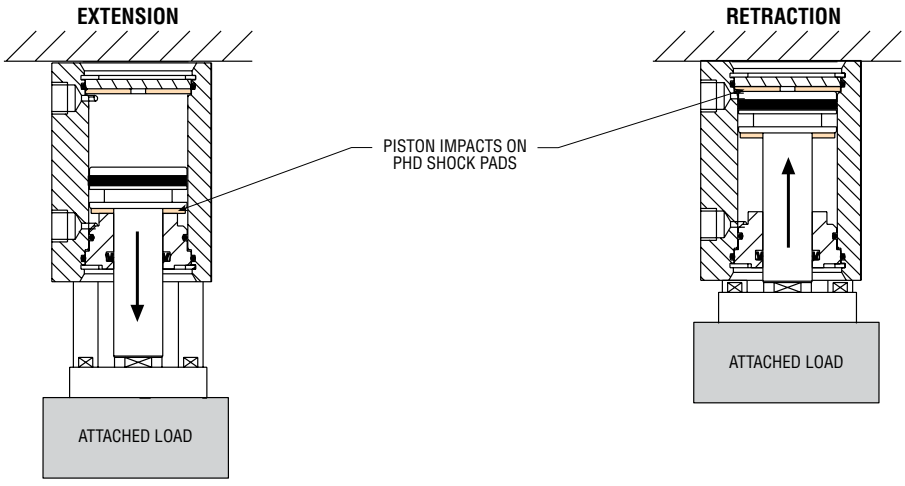
All dimensions are reference only unless specifically toleranced.

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.

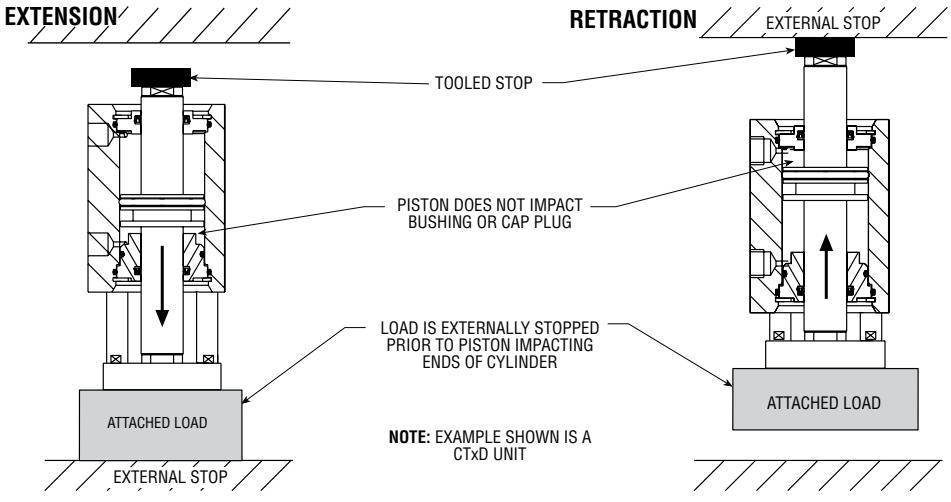
APPLICATION #1 - ATTACHED LOAD (WITH INTERNAL SHOCK PADS)

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.