Global Pneumatics, Warning, Offer of Sale

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Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

P1M Series

Extra Low Profile Pneumatic Cylinder

Contents

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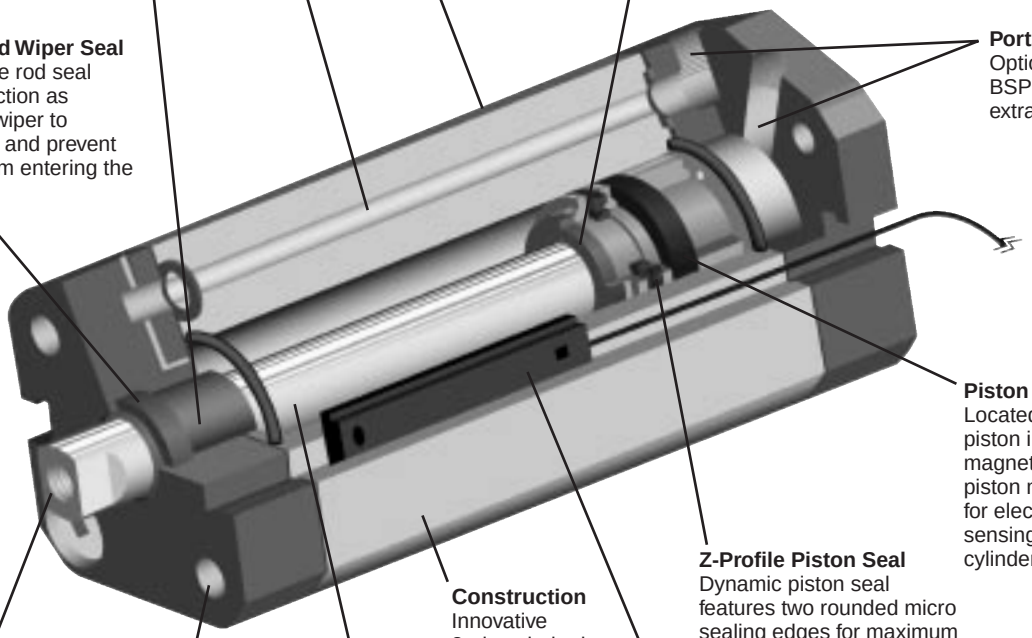


Unique Internal Transfer Tube
Provides a passage that can be used for remote porting.

Bumpers
Optional bumpers provide noise reduction and impact resistance. Urethane for 12-25mm bore sizes, Hytrel® for 32-100mm bore sizes.

Cylinder Body
Smooth anodized aluminum exterior provides wear-resistant surface.

High Strength Rod Bearing
Multilayer PTFE with steel backing.

Rounded Lip Rod Wiper Seal
Non-lube urethane rod seal provides dual function as rod seal and rod wiper to eliminate leakage and prevent contamination from entering the cylinder.

Ports
Optional NPTF or BSPP ports at no extra charge.

Piston Magnet
Located behind the piston in a separate magnet carrier, the piston magnet is used for electronic piston sensing. (Increases cylinder body length.)

Z-Profile Piston Seal
Dynamic piston seal features two rounded micro sealing edges for maximum wear compensation and rounded grooves for retaining lubrication.

Construction
Innovative 3-piece bolted design.

Rod Ends
Four standard piston rod ends to meet a variety of requirements.

Mounting Holes
Counter bored tapped or through holes for mounting.

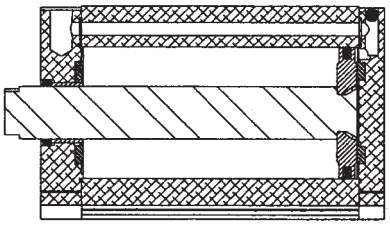
Piston Rod
Stainless steel or hard chrome plated carbon steel piston rods (stainless steel standard on 25mm bore and under).

Sensors
Recessed, flush position sensors available in PNP, NPN or REED styles.

Hytrel® is a registered trademark of DuPont.

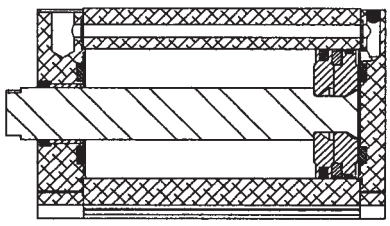
Extra Low Profile Version

The Extra Low Profile Bearing Version allows us to provide the most compact cylinder possible. This bearing version is recommended for applications that require shorter stroke lengths or that are light duty. It is available in stroke lengths up to 50mm in the smaller bore sizes and 150 mm in the larger bore sizes.



Long Bearing Version

The Long Bearing Version provides additional rod bearing and piston bearing support and also includes a magnetic piston with bearing strip for greater piston bearing support. This Long Bearing version is required for stroke lengths beyond the Extra Low Profile maximum stroke length and is recommended for higher duty applications.



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How to Order P1M Series Cylinders

P1M	032	C	/	D	C	P	6	G	012

Bore Size

012	12mm
016	16mm
020	20mm
025	25mm
032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm

Insert "**/**" to denote Special

Stroke in mm

Function

D	Double Acting
K	Double Rod
R	Single Acting Spring Return
E	Single Acting Spring Extend [4]

Cylinder Style

C	Basic No Mtgs.
A	Double Rear Clevis [1,3]
B	Single Rear Clevis [1,3]
F	Foot Mount [1,4]
J	Front Flange [1]
H	Rear Flange [1, 3]

Piston/Seal Material

Without Magnet

C	No Bumpers Class 1 Std. Temp. Seals
G	No Bumpers Class 5 Fluorocarbon Seals
B	With Bumpers Class 1 Std. Temp. Seals

With Magnet [5]
(Not available on Spring Extend Models)

N	No Bumpers Class 1 Std. Temp. Seals
M	With Bumpers Class 1 Std. Temp. Seals

Piston Rod & Bearings

Extra Low Profile Rod Bearing

P	Chrome Plated Steel Rod Not Available on 12-25mm Bores
Y	Stainless Steel Rod Standard on 12-25mm Bores and Spring Extend Models

Long Rod Bearing [2]

C	Chrome Plated Steel Rod Not Available on 12-25mm Bores
A	Stainless Steel Rod Standard on 12-25mm Bores and Spring Extend Models

Rod Threads

Inch

4	Male
9	Female

Metric
(Not available on single acting models)

5	Male
6	Female
3	Special Rod End

Ports

BSPP

G	Ported Each End
H	Both Ports Head
J	Both Ports Cap
K	Both Ports Cap Face [3]

NPTF
(Not available on 12-25mm Bores)

N	Ported Each End
M	Both Ports Head
L	Both Ports Cap
P	Both Ports Cap Face [3]

NOTES:

1 Fitted with Mounting Accessory

2 Magnetic Piston Option must be specified along with Long Rod Bearing option to achieve Long Bearing Version

3 Porting Options 'K' and 'P' (Both ports cap face) not available with rear mountings

4 Single Acting Spring Extend available with stainless steel rod only.

5 For information regarding sensors, please refer to Electronic Sensors section.

Maximum Stroke Lengths

Bore	ELP Bearing Version		Long Bearing Version	
	Min. Stroke*	Max. Stroke	Min. Stroke*	Max. Stroke
12	3	50	4	200
16	3	50	4	200
20	3	50	8	200
25	3	50	8	200
32	3	100	9	320
40	3	100	7	320
50	3	100	13	320
63	3	100	18	500
80	3	150	23	500
100	3	150	18	500

* Minimum Stroke for Double Rod cylinders: 12-63mm Bores is 5mm
80 &100mm Bores is 10mm

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Material Specifications [1]

Piston Rod	12mm to 25mm bores: Stainless Steel 32mm to 100mm bores: Chrome Plated Carbon Steel Std., Optional Stainless Steel (Stainless Steel std. on single-acting spring extend)
Piston Rod Seal	Polyurethane
Piston Rod Bearing [2]	Multilayer PTFE with Steel Backing
End Covers	Anodized Aluminum Alloy
Assembly Cap Screws	Stainless Steel / Zinc-Plated Steel
O-Rings	Nitrile Rubber, NBR
Cylinder Body	Anodized Aluminum Alloy
Piston	Aluminum Alloy
Piston Seal	Nitrile Rubber, NBR
Magnetic Piston Bearing [3]	Brass (12-25mm) Nylon (32-100mm)
Magnet	Plastic Coated Magnetic Material
Bumpers	Polyurethane
Return Spring	Chrome Silicon Wire

1 Dimensions not otherwise noted are listed in millimeters (mm)
2 Excludes 12-25mm bore Rod Style Y
3 Magnetic Piston option is not available on Spring Extend models.

High Temperature Option

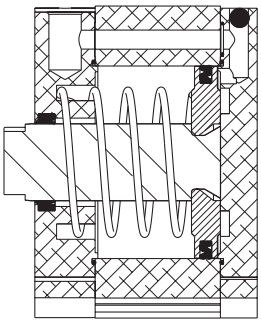
O-Rings	Fluorocarbon, FPM
Piston Rod Seal	Fluorocarbon, FPM
Piston Seal	Fluorocarbon, FPM

Additional Data

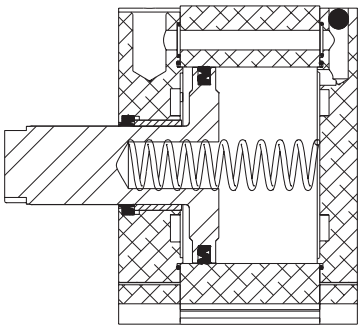
Working Pressure	Max.10 Bar Air
Standard Temperature	-20°C to +80°C -4°F to +176°F
High Temperature Service	-10°C to +121°C +14°F to 250°F

E

Single Acting Cylinders



Spring Return



Spring Extend

Bore (mm)	Return Loads		Extend Loads		Standard Stroke Lengths (mm) [2]
	Max (lbs)	Min (lbs)	Max (lbs)	Min (lbs)	
12	2.8	1.0	2.5	1.1	5,10
16	3.5	1.5	4.0	2.0	5,10
20	3.5	1.5	5.0	2.5	5,10
25	4.7	2.5	6.0	2.5	5,10
32	6.0	3.5	6.5	4.0	5,10
40	7.2	4.7	7.0	4.0	5,10
50	14.3	6.0	18.0	8.0	10, 20, 25
63	14.3	6.0	18.0	8.0	10, 20, 25
80	26.0	14.0	25.0	10.0	10, 20, 25
100	26.0	14.0	25.0	10.0	10, 20, 25

NOTES:

1 Overall Length to be the same as double-acting models with comparable bearing, piston and porting configuration.

2 Single-acting cylinders are available in standard stroke lengths. Custom stroke lengths are available upon request.

3 Spring Extend cylinders available with stainless steel rod only.

4 Magnetic Piston Option is not available on Spring Extend Models.

Additional Length for Bumper Option

Bore	Double Acting*		Single Acting**	
	Single Rod	Double Rod	Spring Return	Spring Extend
12	1.4	2.0	–	1.0
16	1.6	2.0	0.6	1.0
20	2.2	3.0	0.7	1.5
25	2.2	3.0	0.7	1.5
32	1.0	1.0	–	–
40	1.0	1.0	–	–
50	0.8	0.8	–	–
63	1.0	1.0	–	–
80	0.8	0.8	–	–
100	1.0	1.0	–	–

* Bumpers at both ends
** Bumpers at end opposite of spring only.

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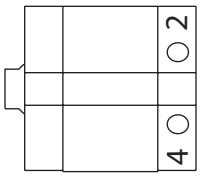
Forces, Weights, Air Consumption

Bore (mm)	Area (cm^2)	Piston Rod		Extend Force* (N)	Retract Force* (N)	Weight		Air Consumption (Liters)**
		Dia. (mm)	Area (cm^2)			Zero Stroke (kg)	Per 10mm Stroke (kg)	
12	1.13	6	0.28	67	50	0.060	0.016	0.0139
16	2.01	8	0.50	120	91	0.090	0.022	0.0246
20	3.14	10	0.78	188	142	0.150	0.032	0.0385
25	4.91	10	0.78	294	247	0.170	0.034	0.0633
32	8.0	12	1.1	482	414	0.260	0.044	0.1050
40	12.6	16	2.0	754	633	0.370	0.060	0.1620
50	19.6	20	3.1	1178	989	0.570	0.085	0.2530
63	31.2	20	3.1	1870	1681	0.860	0.098	0.4140
80	50.3	25	4.9	3016	2721	1.460	0.146	0.6690
100	78.5	25	4.9	4712	4417	2.390	0.155	1.0430

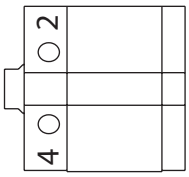
*Theoretical cylinder force at 600 kPa (6 bar).
** Free air consumption per 10mm stroke length for an extend and retract stroke at 600 kPa (6 bar)

Porting Configurations

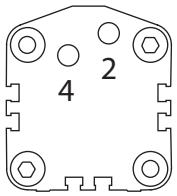
Both Ports Cap



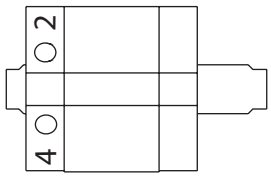
Both Ports Head*



Both Ports Cap Face



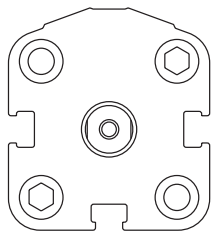
Double Rod Both Ports One End



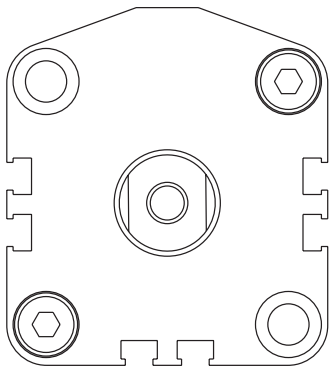
To retract cylinder apply air to port #2
To extend cylinder apply air to port #4
For a double rod cylinder, pressurize port #2 to retract the piston rod into the head containing the ports.

*For 12mm to 16mm bores, although the location of ports #2 and #4 are reversed, porting functions shown above apply.

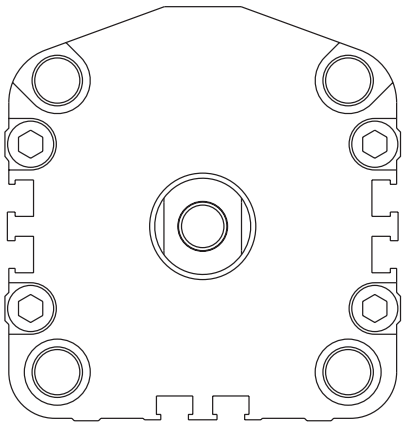
Front Profiles by Bore Size



Bores 12-25mm



Bores 32-50mm



Bores 63-100mm

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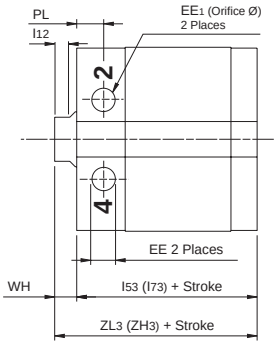
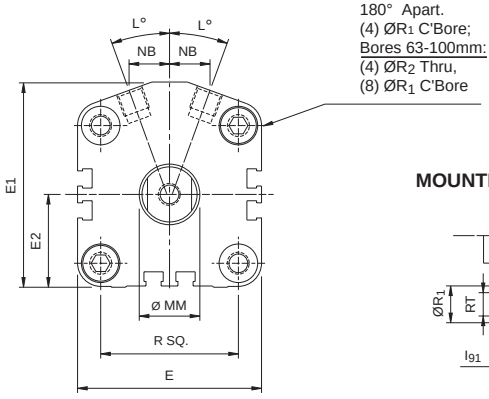
BOTH PORTS HEAD

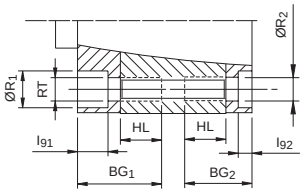


ALL PORTING CONFIGURATIONS



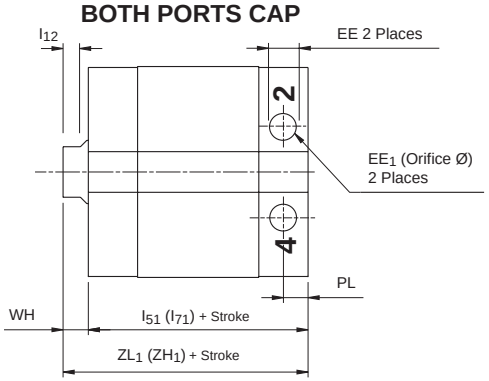
Bores 12-50mm:
(2) ØR_2 Thru,
180° Apart.
(4) ØR_1 C'Bore;
Bores 63-100mm:
(4) ØR_2 Thru,
(8) ØR_1 C'Bore

MOUNTING HOLE CONFIGURATION BOTH PORTS HEAD

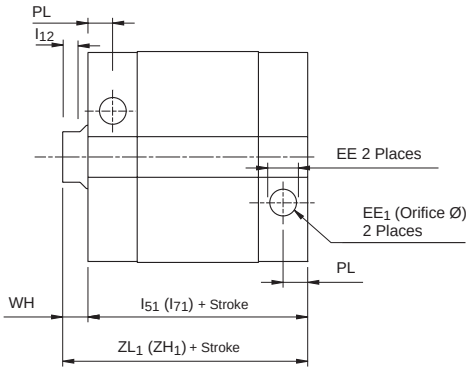


OPTIONAL PORTING CONFIGURATIONS

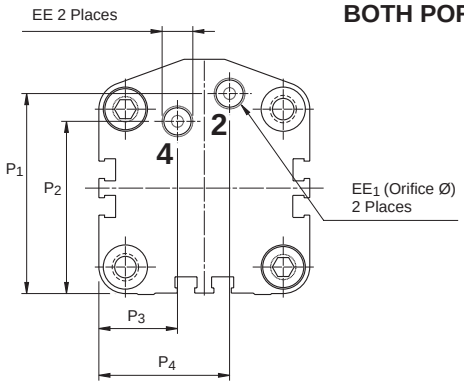
BOTH PORTS CAP

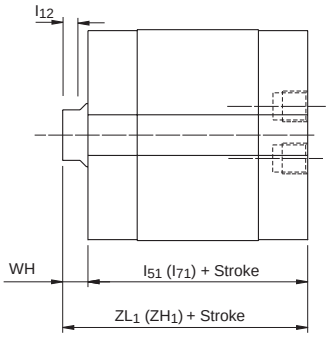


HEAD & CAP PORTED



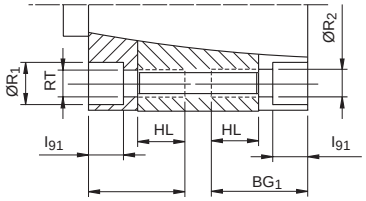
BOTH PORTS CAP FACE





MOUNTING HOLE CONFIGURATION

BOTH PORTS CAP OR CAP FACE, PORTS AT HEAD & CAP



Note: Magnetic Dimensions in Parentheses

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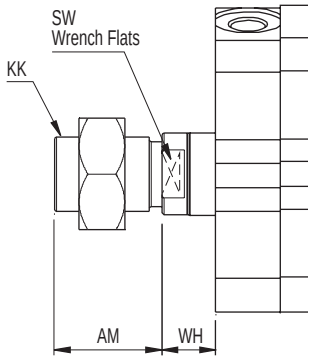
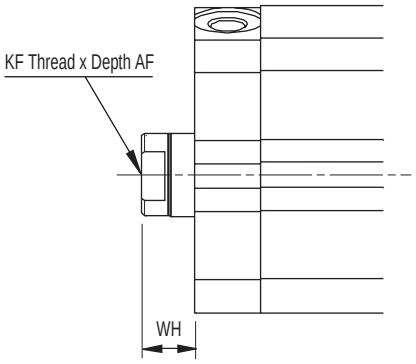
For special rod ends, specify “3” in model number and give desired WH, AM or AF and KK or KF.

Jam nut is supplied when cylinder is ordered with Style 4 or Style 5 rod end.



Style 5/Style 4



Style 6/Style 9

Bore	Rod	AF		AM		KF		KK		WH		l_{12}	SW
		Style 6	Style 9	Style 5	Style 4	Style 6	Style 9	Style 5	Style 4	Style 4, 9 & 6	Style 5		
12	6	6	5.4	9	8	M3x0.5	#8-32	M5x0.8	#8-32	3.5	5	3	5
16	8	8	5.4	10	8	M4x0.7	#8-32	M6x1.0	#8-32	3.5	5.5	3	7
20	10	7	7	12	8	M5x0.8	#10-32	M8x1.25	#10-32	4.5	6.5	4	9
25	10	12	10	15	9.5	M6x1.0	1/4-28	M10x1.25	1/4-28	5	7.5	4	9
32	12	13	13.3	20.5	12.7	M8x1.25	5/16-24	M12x1.25	5/16-24	7	8	5	10
40	16	13	18.3	20.5	16	M8x1.25	3/8-24	M14x1.5	3/8-24	7	8	5.5	13
50	20	15	17.6	26	19.5	M10x1.5	1/2-20	M18x1.5	1/2-20	8	7.5	5.5	16
63	20	15	17.6	26	19.5	M10x1.5	1/2-20	M18x1.5	1/2-20	8	7.5	5.5	16
80	25	21	24.3	32.5	25.5	M16x2.0	5/8-18	M22x1.5	5/8-18	10	11	6	21
100	25	27	27	32.5	28.5	M20x2.5	3/4-16	M22x1,5	3/4-16	12	11	6	21

Bore	BG_1	BG_2	E	E_1	E_2	EE		EE_1	HL	l_{91}	l_{92}	L	NB	P_1	P_2
						BSPP	NPTF								
12	16.5	11.5	27	31	14	M5	–	1	8	3.5	3.5	26	5.5	25	9.5
16	17	12	31.5	35	16	M5	–	1.2	8	4	4	20	7	29.5	9.5
20	19	14,5	38.5	42.5	19,5	M5	–	1.3	10	4.5	4.5	20	8	35	13.5
25	21	15	41.5	45.5	21	M5	–	1.8	10	5	5	20	8.5	38.5	14
32	25	17	48	56	24	G1/8	1/8	2.7	10	4	4	25	9.5	45.5	16.5
40	25.5	17.5	56	62.5	28	G1/8	1/8	3.4	10	4	4	20	11.5	51	12
50	29.5	23.5	67	74.5	33.5	G1/8	1/8	4	14	5	5	20	14.5	63	54.5
63	34	28	82	86	40.5	G1/8	1/8	5	18	6.5	8	20	17.5	73.5	64
80	43	34	98	106.5	48.5	G1/4	1/4	5.5	22	8.5	10	20	25.5	92	79.5
100	44	35.5	119	126.5	59.5	G1/4	1/4	6	22	8.5	10	20	31.5	111.5	97.5

Bore	P_3	P_4	PL	PM	R	R_1	R_2*	RT	Non-Magnetic				Magnetic				ELP Max Stroke
									l_{51}	l_{53}	ZL_1	ZL_3	l_{71}	l_{73}	ZH_1	ZH_3	
12	13.5	13.5	5	8.5	15.5	5.8	3.5	M4	22	17	25.5	20.5	33	28	36.5	31.5	50
16	15.5	18	5	9	20	7.4	3.5	M4	23.5	18.5	27	22	34.5	29.5	38	33	50
20	24.5	21.5	5	9	25.5	9	5.5	M6	24	19.5	28.5	24	34	29.5	38.5	34	50
25	27.5	24.5	7	9	28	9	5.5	M6	28.5	22.5	33.5	27.5	38.5	32.5	43.5	37.5	50
32	31.5	28.5	8	10.5	34	10.5	5.5	M6	36.5	28.5	43.5	35.5	46	37.5	53	44.5	100
40	23	33	7.5	9.5	40	10.5	5.5	M6	37.5	29.5	44.5	36.5	47.5	39.5	54.5	46.5	100
50	25	41.5	8	10	50	13.5	7.5	M8	38.5	32.5	46.5	40.5	47.5	41.5	55.5	49.5	100
63	30	53	8	11	60	13.5	9.5	M10	39.5	34	47.5	42	51.5	46	59.5	54	100
80	33	69.5	11.5	11.5	77	16.5	11	M12	52	43	62	53	62.5	53.5	72.5	63.5	150
100	36.5	87.5	12	12	94	17	11	M12	57	48.5	69	60.5	71.5	63	83.5	75	150

*“R2 thru” not available on 12 and 16mm Bores.

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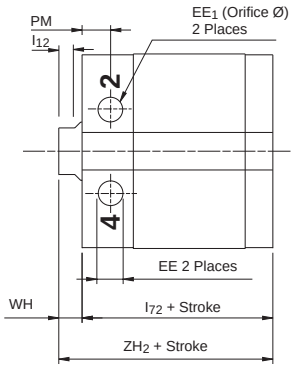
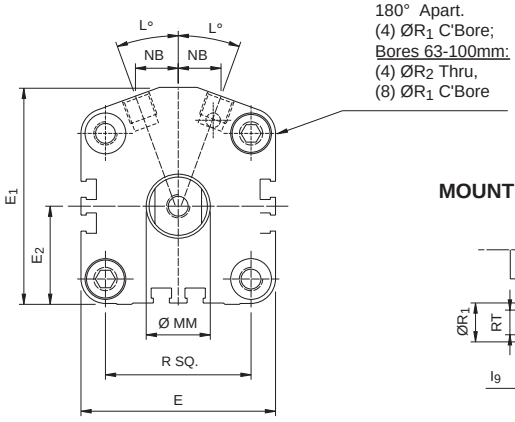
BOTH PORTS HEAD

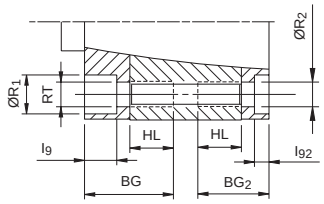


ALL PORTING CONFIGURATIONS



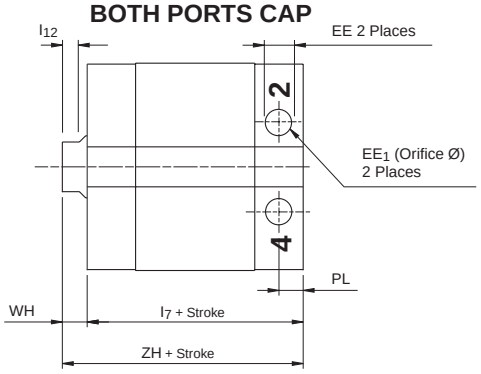
Bores 12-50mm:
(2) ØR2 Thru,
180° Apart.
(4) ØR1 C'Bore;
Bores 63-100mm:
(4) ØR2 Thru,
(8) ØR1 C'Bore

MOUNTING HOLE CONFIGURATION BOTH PORTS HEAD

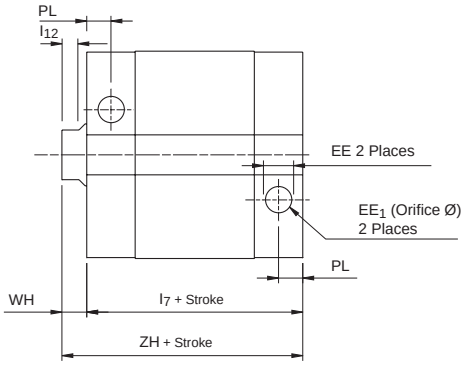


OPTIONAL PORTING CONFIGURATIONS

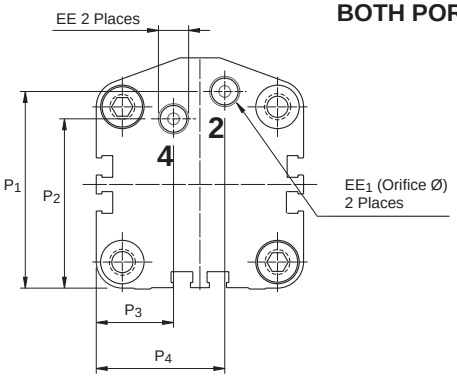
BOTH PORTS CAP

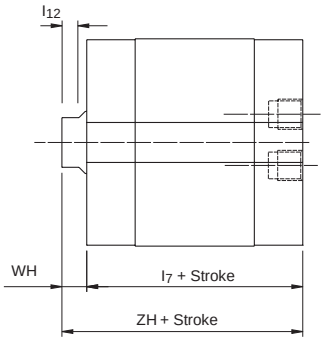


HEAD & CAP PORTED



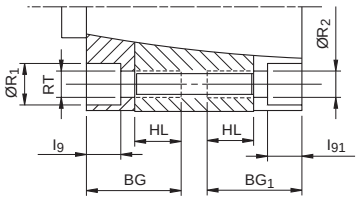
BOTH PORTS CAP FACE





MOUNTING HOLE CONFIGURATION

BOTH PORTS CAP OR CAP FACE, PORTS AT HEAD & CAP



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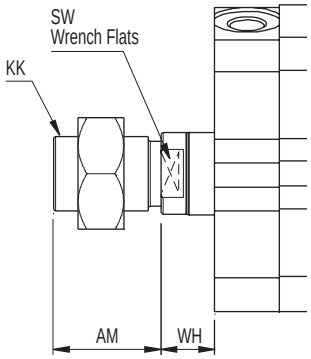
For special rod ends, specify “3” in model number and give desired WH, AM or AF and KK or KF.

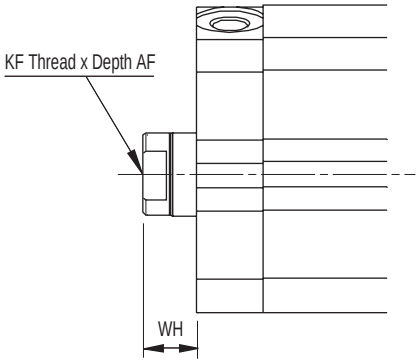
Jam nut is supplied when Style 4 or Style 5 rod end is specified.

Note: Magnetic piston and longer rod bearing are standard with Long Bearing Version.

C086



Style 5/Style 4



Style 6/Style 9

Bore	Rod MM	AF		AM		KF		KK		WH		l_{12}	SW
		Style 6	Style 9	Style 5	Style 4	Style 6	Style 9	Style 5	Style 4	Style 4, 9 & 6	Style 5		
12	6	6	5.4	9	8	M3x0.5	#8-32	M5x0.8	#8-32	3.5	5	3	5
16	8	8	5.4	10	8	M4x0.7	#8-32	M6x1.0	#8-32	3.5	5.5	3	7
20	10	7	7	12	8	M5x0.8	#10-32	M8x1.25	#10-32	4.5	6.5	4	9
25	10	12	10	15	9.5	M6x1.0	1/4-28	M10x1.25	1/4-28	5	7.5	4	9
32	12	13	13.3	20.5	12.7	M8x1.25	5/16-24	M12x1.25	5/16-24	7	8	5	10
40	16	13	18.3	20.5	16	M8x1.25	3/8-24	M14x1.5	3/8-24	7	8	5.5	13
50	20	15	17.6	26	19.5	M10x1.5	1/2-20	M18x1.5	1/2-20	8	7.5	5.5	16
63	20	15	17.6	26	19.5	M10x1.5	1/2-20	M18x1.5	1/2-20	8	7.5	5.5	16
80	25	21	24.3	32.5	25.5	M16x2.0	5/8-18	M22x1.5	5/8-18	10	11	6	21
100	25	27	27	32.5	28.5	M20x2.5	3/4-16	M22x1.5	3/4-16	12	11	6	21

Bore	BG	BG_1	BG_2	E	E_1	E_2	EE		EE_1	HL	l_7	l_{72}	l_9	l_{91}	l_{92}	L
							BSPP	NPTF								
12	21.5	16.5	11.5	27	31	14	M5	–	1	8	38.5	33.5	3.5	3.5	3.5	26
16	22	17	12	31.5	35	16	M5	–	1.2	8	40.5	35.5	5.5	4	4	20
20	24.5	19	14.5	38.5	42.5	19.5	M5	–	1.3	10	40	35.5	10.5	4.5	4.5	20
25	24.5	21	15	41.5	45.5	21	M5	–	1.8	10	42.5	36.5	10.5	5	5	20
32	27.5	25	17	48	56	24	G1/8	1 8	2.7	10	48	40	14	4	4	25
40	27.5	25.5	17.5	56	62.5	28	G1/8	1/8	3.4	10	49.5	41.5	14	4	4	20
50	31.5	29.5	23.5	67	74.5	33.5	G1/8	1/8	4	14	49.5	43.5	13	5	5	20
63	37	34	28	82	86	40.5	G1/8	1/8	5	18	54.5	49	6.5	6.5	8	20
80	43	43	34	98	106.5	48.5	G1/4	1/4	5.5	22	62.5	53.5	9.5	8.5	10	20
100	44	44	35.5	119	126.5	59.5	G1/4	1/4	6	22	71.5	63	9.5	8.5	10	20

Bore	NB	P_1	P_2	P_3	P_4	PM	R	R_1	R_2*	RT	ZH	ZH_2	Min Stroke	Max Stroke
12	5.5	25	9.5	13.5	13.5	8.5	15.5	5.8	3.5	M4	42	37	4	200
16	7	29.5	9.5	15.5	18	9	20	7.4	3.5	M4	44	39	4	200
20	8	35	13.5	24.5	21.5	9	25.5	9	5.5	M6	44.5	40	8	200
25	8.5	38.5	14	27.5	24.5	9	28	9	5.5	M6	47.5	41.5	8	200
32	9.5	45.5	16.5	31.5	28.5	10.5	34	10.5	5.5	M6	55	47	9	320
40	11.5	51	12	23	33	9.5	40	10.5	5.5	M6	56.5	48.5	7	320
50	14.5	63	54.5	25	41.5	10	50	13.5	7.5	M8	57.5	51.5	13	320
63	17.5	73.5	64	30	53	11	60	13.5	9.5	M10	62.5	57	18	500
80	25.5	92	79.5	33	69.5	11.5	77	16.5	11	M12	72.5	62.5	23	500
100	31.5	111.5	97.5	36.5	87.5	12	94	17	11	M12	83.5	75	18	500

* **“**R2 thru” not available on 12 and 16mm Bores.

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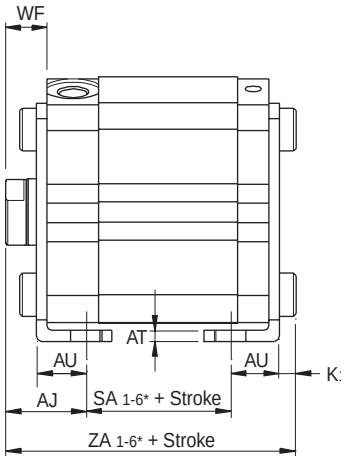
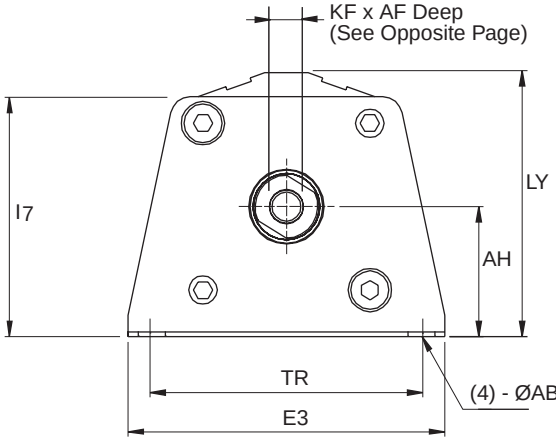
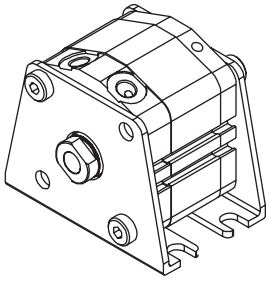
Foot Mounting – Style F







Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Kit Part Number	AB	AH	AJ	AT	AU	E_3	l_7	K_1	LY	TR
12	P1M-4DMF	4.5	17	19.5	2	8	44	29.5	2.8	34	35
16	P1M-4FMF	4.5	19	19.5	2	8	48	33.5	2.8	38	39
20	P1M-4HMF	6.5	24	20.5	3.2	9.2	62	42	4	47	50
25	P1M-4JMF	6.5	26	22.5	3.2	10.7	66	46	4	50.5	52
32	P1M-4KMF	6.5	30	25	3.2	11.2	71	54	4	62	60
40	P1M-4LMF	6.5	33	25	3.2	11.2	78	61	4	67.5	67
50	P1M-4MMF	9	39	29.5	3.2	14.7	95	72.5	5	80	82
63	P1M-4NMF	11	46	31	3.2	16.2	113	32	5	91.5	100
80	P1M-4PMF	13	59	35	4.5	19.5	140	42	7	117	118
100	P1M-4QMF	13	71	39	6	23	162	53	7	138	139

Bore	ELP Version Non-Magnetic					ELP Version Magnetic					Long Bearing Version					Style 5 End Length Adjustment
	Both Ports Head		Optional Porting		Min. ** Stroke	Both Ports Head		Optional Porting		Min.** Stroke	Both Ports Head		Optional Porting		Min.** Stroke	
	SA_1	ZA_1*	SA_2*	ZA_2*		SA_3	ZA_3*	SA_4	ZA_4*		SA_5	ZA_5*	SA_6	ZA_6*		
12	5	35.3	10	40.3	15	16	46.3	21	51.3	4	21.5	51.8	26.5	56.8	4	1.5
16	6.5	36.8	11.5	41.8	14	17.5	47.8	22.5	52.8	4	23.5	53.8	28.5	58.8	4	2
20	7.5	41.2	12	45.7	18	17.5	51.2	22	55.7	8	23.5	57.2	28	61.9	8	2
25	7.5	44.7	13.5	50.7	18	17.5	54.7	23.5	60.7	8	21.5	58.7	27.5	64.7	8	2.5
32	12.5	52.5	20.5	60.7	18	21.5	61.7	29.5	69.9	9	24	64	32	72.2	9	1
40	13.5	53.7	21.5	61.9	17	23.5	63.7	31.5	71.9	7	25.5	65.7	33.5	73.9	7	1
50	9.5	58.7	15.5	64.9	22	18.5	67.7	24.5	73.9	13	20.5	69.7	26.5	75.9	13	-0.5
63	8	60.2	13.5	65.7	30	20	72.2	25.5	77.7	18	23	75.2	28.5	80.7	18	-0.5
80	13	74.5	22	83.5	33	23.5	85	32.5	94	23	23.5	85	32.5	94	23	1
100	14.5	83.5	23	92	33	29	98	37.5	106.5	18	29	98	37.5	106.5	18	-1

* For strokes less than 'Min. Stroke', only one bracket will be supplied at rod end.
** Dimensions shown apply only for Rod End Styles 4, 6 and 9. For Rod End Style 5, please include the above length adjustment.
Note: Foot Bracket mounting is not available with cap face porting

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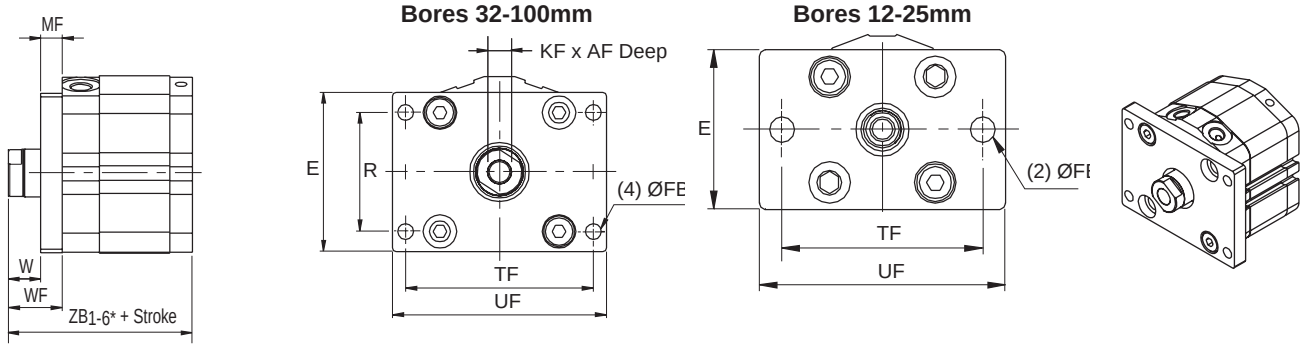
Front Flange Mounting – Style J



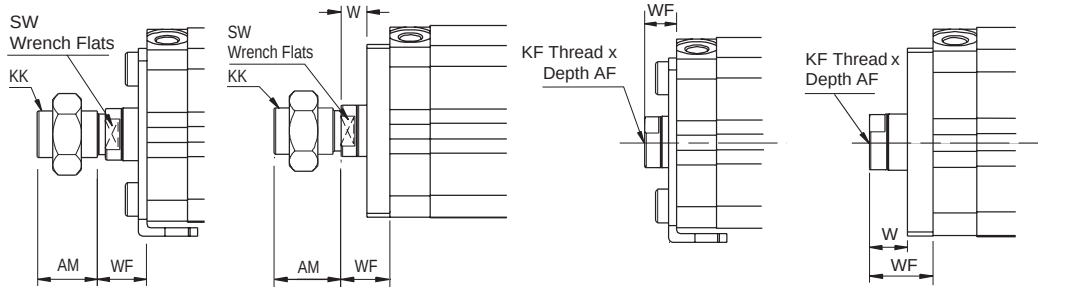
Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Kit Part Number	E	FB	MF	R	TF	UF	ELP Version Non-Magnetic		ELP Version Magnetic		Long Bearing Version		Style 5 Rod End Length Adjustment
								Both Ports Head	Optional Porting	Both Ports Head	Optional Porting	Both Ports Head	Optional Porting	
								ZB_1*	ZB_2*	ZB_3*	ZB_4*	ZB_5*	ZB_6*	
12	P1M-4DMB	25	4.5	5.5	–	45	55	30.5	35.5	41.5	46.5	47	52	1.5
16	P1M-4FMB	30	4.5	5.5	–	45	55	32	37	43	48	49	54	2
20	P1M-4HMB	39	6.5	8	–	50.5	62	34	38.5	44	48.5	50	54.5	2
25	P1M-4JMB	42	6.5	8	–	53	65	37.5	43.5	47.5	53.5	51.5	57.5	2.5
32	P1M-4KMB	48	5.5	8	34	58	68	45.5	53.5	54.5	62.5	57	65	1
40	P1M-4LMB	54	5.5	8	40	66	76	46.5	54.5	56.5	64.5	58.5	66.5	1
50	P1M-4MMB	67	6.5	9	50	79	90	50.5	56.5	59.5	65.5	61.5	67.5	-0.5
63	P1M-4NMB	80	9	9	60	97	112	52	57.5	64	69.5	67	72.5	-0.5
80	P1M-4PMB	99	11	11	77	116	134	63	72	73.5	82.5	73.5	82.5	1
100	P1M-4QMB	117	11	11	94	137	154	70.5	79	85	93.5	85	93.5	-1

* Dimensions shown apply only for Rod End Styles 4, 6 and 9. For Rod End Style 5, please include the above length adjustment.

Rod End Dimensions Front Mounts F & J

For special rod threads, specify "3" in model number and give desired AM or AF, WF and KK or KF.



Bore	AF		AM		KF		KK		W		WF		SW
	Style 9	Style 6	Style 4	Style 5	Style 9	Style 6	Style 4	Style 5	Styles 9, 6, 4	Style 5	Styles 9, 6, 4	Style 5	
12	5.4	6	8	9	#8-32	M3X0.5	#8-32	M5X0.8	8	9.5	13.5	15	5
16	5.4	8	8	10	#8-32	M4x0.7	#8-32	M6x1.0	8	10	13.5	15.5	7
20	7	7	8	12	#10-32	M5x0.8	#10-32	M8x1.25	6.5	8.5	14.5	16.5	9
25	10	12	9.5	15	1/4-28	M6x1.0	1/4-28	M10x1.25	7	9.5	15	17.5	9
32	13.3	13	12.7	20.5	5/16-24	M8x1.25	5/16-24	M12x1.25	9	10	17	18	10
40	18.3	13	16	20.5	3/8-24	M8x1.25	3/8-24	M14x1.5	9	10	17	18	13
50	17.6	15	19.5	26	1/2-20	M10x1.5	1/2-20	M18x1.5	9	8.5	18	17.5	16
63	17.6	15	19.5	26	1/2-20	M10x1.5	1/2-20	M18x1.5	9	8.5	18	17.5	16
80	24.3	21	25.5	32.5	5/8-18	M16x2.0	5/8-18	M22x1.5	9	10	20	21	21
100	27	27	28.5	32.5	3/4-16	M20x2.5	3/4-16	M22x1.5	11	10	22	21	21

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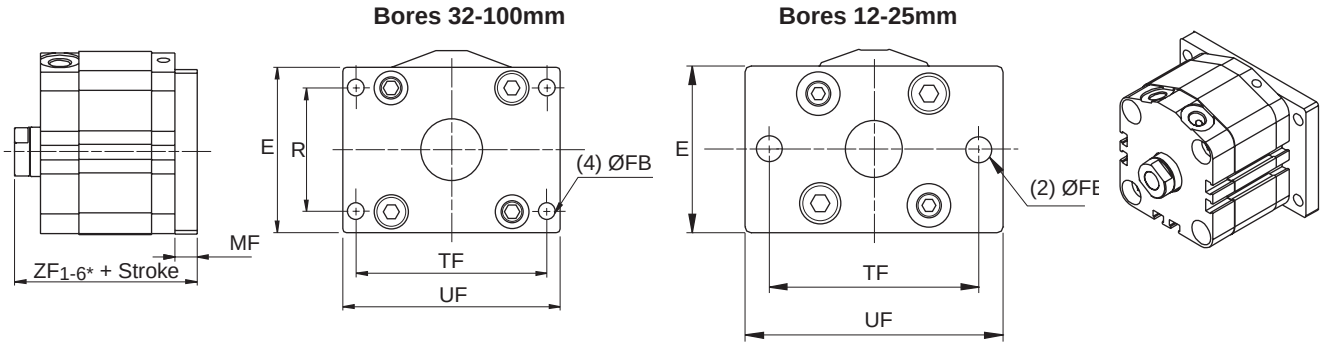
Rear Flange Mounting – Style H



E

Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Kit Part Number	E	FB	MF	R	TF	UF
12	P1M-4DMB	25	4.5	5.5	–	45	55
16	P1M-4FMB	30	4.5	5.5	–	45	55
20	P1M-4HMB	39	6.5	8	–	50.5	62
25	P1M-4JMB	42	6.5	8	–	53	65
32	P1M-4KMB	48	5.5	8	34	58	68
40	P1M-4LMB	54	5.5	8	40	66	76
50	P1M-4MMB	67	6.5	9	50	79	90
63	P1M-4NMB	80	9	9	60	97	112
80	P1M-4PMB	99	11	11	77	116	134
100	P1M-4QMB	117	11	11	94	137	154

Bore	ELP Version Non-Magnetic		ELP Version Magnetic		Long Bearing Version		Style 5 Rod End Length Adjustment
	Both Ports Head ZF_1*	Optional Porting ZF_2*	Both Ports Head ZF_3*	Optional Porting ZF_4*	Both Ports Head ZF_5*	Optional Porting ZF_6*	
12	26	31	37	42	42.5	47.5	1.5
16	27.5	32.5	38.5	43.5	44.5	49.5	2
20	32	36.5	42	46.5	48	52.5	2
25	35.5	41.5	45.5	51.5	49.5	55.5	2.5
32	43.5	51.5	52.5	60.5	55	63	1
40	44.5	52.5	54.5	62.5	56.5	64.5	1
50	49.5	55.5	58.5	64.5	60.5	66.5	-0.5
63	51	57.5	63	68.5	66	71.5	-0.5
80	64	73	74.5	83.5	74.5	83.5	1
100	71.5	80	86	94.5	86	94.5	-1

Note: Rear Flange mounting is not available with cap face porting.
* Dimensions shown apply only for Rod End Styles 4, 6 and 9.
For Rod End Style 5, please include the above length adjustment.

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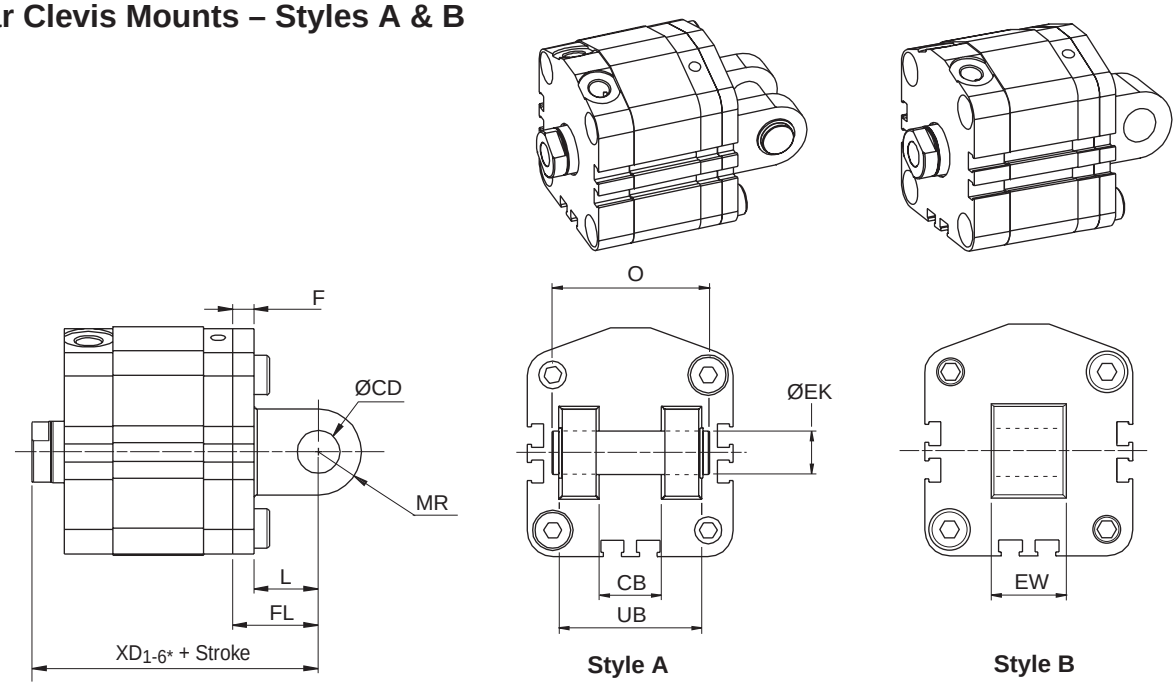
C086

Rear Clevis Mounts – Styles A & B



Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Double Clevis Kit Part Number	Single Clevis Kit Part Number**	CB	CD/EK	EW	F	FL	L	MR	O	UB
12	P1M-4DMT	P1M-4DME	5	5	5	4	14	10	6.5	14.5	10
16	P1M-4FMT	P1M-4FME	6.5	5	6.5	4	15	11	6.5	16.5	12
20	P1M-4HMT	P1M-4HME	8	8	8	5	18	13	10	21	16
25	P1M-4JMT	P1M-4JME	10	10	10	5	20	15	11	25.5	20
32	P1M-4KMT	P1M-4KME	18	10	18	5	20	15	10	41.5	36
40	P1M-4LMT	P1M-4LME	18	10	18	6	22	16	10	41.5	36
50	P1M-4MMT	P1M-4MME	22	14	22	7	28	21	14	50.5	44
63	P1M-4NMT	P1M-4NME	22	14	22	8	30	22	14	50.5	44
80	P1M-4PMT	P1M-4PME	28	18	28	10	38	28	18	64	56
100	P1M-4QMT	P1M-4QME	32	22	32	13	45	32	22	72	64

Bore	ELP Version Non-Magnetic		ELP Version Magnetic		Long Bearing Version		Style 5 Rod End Length Adjustment
	Both Ports Head XD_1*	Optional Porting XD_2*	Both Ports Head XD_3*	Optional Porting XD_4*	Both Ports Head XD_5*	Optional Porting XD_6*	
12	34.5	39.5	45.5	50.5	51	56	1.5
16	37	42	48	53	54	59	2
20	42	46.5	52	56.5	58	62.5	2
25	47.5	53.5	57.5	63.5	61.5	67.5	2.5
32	55.5	63.5	64.5	72.5	67	75	1
40	58.5	66.5	68.5	76.5	70.5	78.5	1
50	68.5	74.5	77.5	83.5	79.5	85.5	-0.5
63	72	78.5	84	89.5	87	92.5	-0.5
80	91	100	101.5	110.5	101.5	110.5	1
100	105.5	114	120	128.5	120	128.5	-1

* Dimensions shown apply only for Rod End Styles 4, 6 and 9. For Rod End Style 5, please include the above length adjustment.
** Single Clevis Kit can be used as mounting bracket for double clevis cylinders. Double Clevis Kit can be used as mounting kit for single clevis cylinders.
Note: Rear Clevis mounts are not available with cap face port.

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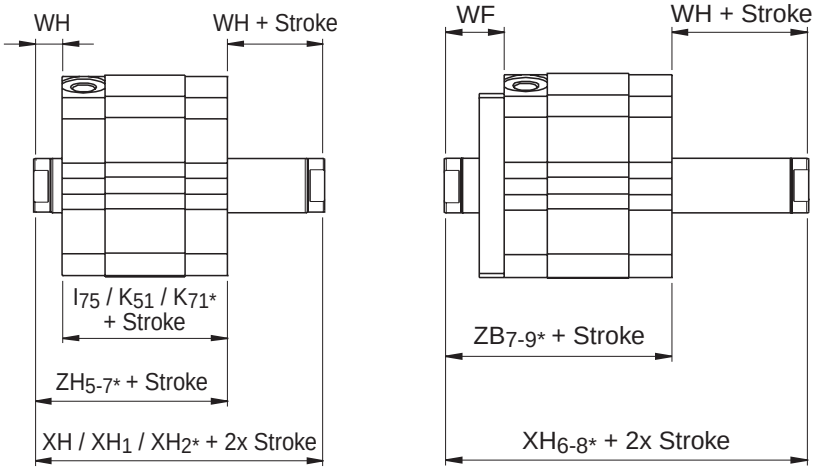
Basic Cylinder – Style C
Flange Mounting – Style J

Heads Ported at Each End or One End

Refer to “Single Rod” (pages E6-E9) for dimensions not listed below. Both rods will be supplied with same rod ends unless called out as special.



Style C **Style J**

E

Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Basic Cylinder – Style C											
	ELP Version Non-Magnetic				ELP Version Magnetic				Long Bearing Version			
	K_{51}	XH_2	ZH_7	Min. Stroke	K_{71}	XH_1	ZH_6	Min. Stroke	I_{75}	XH	ZH_5	Min. Stroke
12	22	29	25.5	15	40	47	43.5	5	45.5	52.5	49	5
16	23.5	30.5	27	14	40	47	43.5	5	46.5	53.5	50	5
20	24	33	28.5	18	38	47	42.5	8	46.5	55.5	51	8
25	28.5	38.5	33.5	18	38.5	48.5	43.5	8	46.5	56.5	51.5	8
32	36.5	50.5	43.5	18	46	60	53	9	50.5	64.5	57.5	9
40	37.5	51.5	44.5	17	47.5	61.5	54.5	14	51.5	65.5	58.5	12
50	38.5	54.5	46.5	22	47.5	63.5	55.5	20	51.5	67.5	59.5	20
63	39.5	55.5	47.5	30	51.5	67.5	59.5	20	57.5	73.5	65.5	20
80	52	72	62	33	62.5	82.5	72.5	25	62.5	82.5	72.5	25
100	57	81	69	33	71.5	95.5	83.5	25	71.5	95.5	83.5	25

Bore	Flange Mounting – Style J									Rod End Dimensions			
	ELP Version Non-Magnetic			ELP Version Magnetic			Long Bearing Version			WF		WH	
	XH_6	ZB_7	Min.* Stroke	XH_7	ZB_8	Min.* Stroke	XH_8	ZB_9	Min.* Stroke	Styles 4, 6, 9	Style 5	Styles 4, 6, 9	Style 5
12	39	35.5	5	57	53.5	5	62.5	59	5	13.5	15	3.5	5
16	40.5	37	5	57	53.5	5	63.5	60	5	13.5	15.5	3.5	5.5
20	43	38.5	8	57	52.5	8	65.5	61	8	14.5	16.5	4.5	6.5
25	48.5	43.5	18	58.5	53.5	8	66.5	61.5	8	15	17.5	5	7.5
32	60.5	53.5	18	70	62.5	9	74.5	67.5	9	17	18	7	8
40	61.5	54.5	17	71,5	64.5	14	75.5	68.5	12	17	18	7	8
50	64.5	56.5	22	73.5	65.5	20	77.5	69.5	20	18	17.5	8	7.5
63	65.5	57.5	30	77.5	69.5	20	83.5	75.5	20	18	17.5	8	7.5
80	82	72	33	92.5	82.5	25	92.5	82.5	25	20	21	10	11
100	91	79	33	105.5	93.5	25	105.5	93.5	25	22	21	12	11

*** Note:** Please consult factory for cylinders that require shorter than minimum stroke length listed above.

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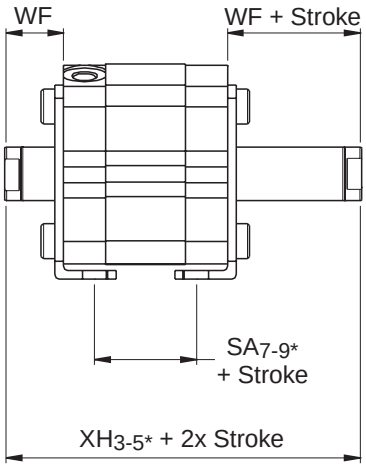
Foot Mounting – Style F

Heads Ported at Each End or One End

Refer to “Single Rod” (pages E6-E9) for dimensions not listed below. Both rods will be supplied with same rod ends unless called out as special.



Style F

Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	ELP Version Non-Magnetic			ELP Version Magnetic			Long Bearing Version		
	SA_7	XH_3	Min.* Stroke	SA_8	XH_4	Min.* Stroke	SA_9	XH_5	Min.* Stroke
12	10	49	5	28	67	5	33.5	72.5	5
16	11.5	50.5	5	28	67	5	34.5	73.5	5
20	12	53	8	26	67	8	34.5	75.5	8
25	13.5	58.5	8	23.5	68.5	5	31.5	76.5	8
32	20.5	70.5	8	29.5	80	5	34.5	84.5	9
40	21.5	71.5	7	31.5	81.5	5	35.5	85.5	12
50	15.5	74.5	12	24.5	83.5	10	28.5	87.5	20
63	13.5	75.5	20	25.5	87.5	10	31.5	93.5	20
80	22	92	23	32.5	102.5	15	32.5	102.5	25
100	23	101	23	37.5	115.5	15	37.5	115.5	25

Bore	Rod End Dimensions			
	WF		WH	
	Styles 4, 6, 9	Style 5	Styles 4, 6, 9	Style 5
12	13.5	15	3.5	5
16	13.5	15.5	3.5	5.5
20	14.5	16.5	4.5	6.5
25	15	17.5	5	7.5
32	17	18	7	8
40	17	18	7	8
50	18	17.5	8	7.5
63	18	17.5	8	7.5
80	20	21	10	11
100	22	21	12	11

*** Note:** Please consult factory for cylinders that require shorter than minimum stroke length listed above.

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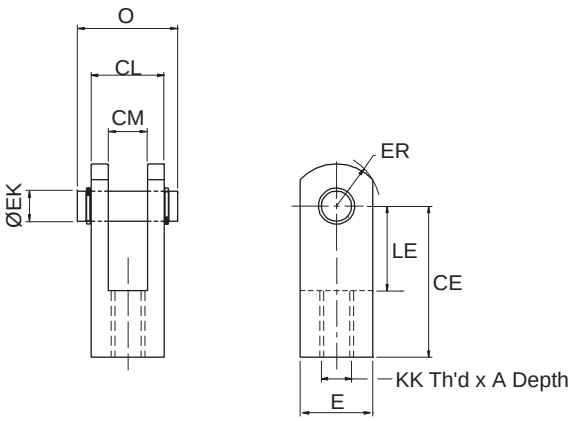
Rod Clevis



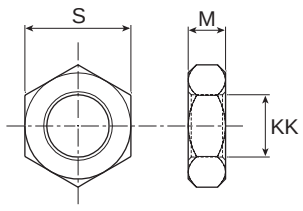
Rod Clevis – Metric

Bore	Kit Part Number	A	E	CE	KK	ER	LE	EK (h9)	CM	CL	O
12	**P1M-4DRC**	7	9.5	16	M5x0.8	6.5	7	5	5	9.5	14.5
16	**P1M-4FRC**	11	11	21	M6x1.0	8	10	5	6.5	11	16.5
20	**P1M-4HRC**	8.5	16	25	M8x1.25	10.5	11.5	8	8	16	21
25	**P1M-4JRC**	10.5	19	30	M10x1.25	13	14	10	10	19	25.5
32	**P1M-4KRC**	16	22 Dia.	30	M12x1.25	12	14	10	18	36	41.5
40	**P1M-4LRC**	16	22 Dia.	30	M14x1.5	12	14	10	18	36	41.5
50/63	**P1M-4MRC**	20	28 Dia.	40	M18x1.5	16	20	14	22	44	50.5
80	**P1M-4PRC**	23	38 Dia.	50	M22x1.5	21	27	18	28	56	64
100	**P1M-4QRC**	24	44 Dia.	55	M22x1.5	24	31	22	32	64	72

Rod Clevis – Inch

Bore	Kit Part Number	A	E	CE	KK	ER	LE	EK (inch) +0, -0.002	CM	CL (inch)	O (inch)
12	**P1M-4DRC-T**	6	9.5	16	#8-32	6.5	7	3/16	5	0.375	0.563
16	**P1M-4FRC-T**	6	11	21	#8-32	8	10	3/16	6.5	0.437	0.625
20	**P1M-4HRC-T**	6	16	25	#10-32	10.5	11.5	5/16	8	0.625	0.875
25	**P1M-4JRC-T**	8	19	30	1/4-28	13	14	3/8	10	0.750	1.031
32	**P1M-4KRC-T**	16	22 Dia.	30	5/16-24	12	14	3/8	18	1.437	1.687
40	**P1M-4LRC-T**	16	22 Dia.	30	3/8-24	12	14	3/8	18	1.437	1.687
50/63	**P1M-4MRC-T**	20	28 Dia.	40	1/2-20	16	20	1/2	22	1.750	2.125
80	**P1M-4PRC-T**	23	38 Dia.	50	5/8-18	21	27	3/4	28	2.250	2.625
100	**P1M-4QRC-T**	24	44 Dia.	55	3/4-16	24	31	7/8	32	2.500	2.875

Jam Nuts



Jam Nut for Style 4

Bore Size	Part Number	KK	M	S
12	**L073800080**	#8-32	1/8	11/32
16	**L073800080**	#8-32	1/8	11/32
20	**L073800100**	#10-32	1/8	3/8
25	**L073800200**	1/4-28	5/32	7/16
32	**L073800300**	5/16-24	3/16	1/2
40	**L073800400**	3/8-24	7/32	9/16
50	**L073800600**	1/2-20	5/16	3/4
63	**L073800600**	1/2-20	5/16	3/4
80	**L073800800**	5/8-18	3/8	15/16
100	**L073800900**	3/4-16	27/64	1-1/8

Dimensions in inches

Jam Nut for Style 5

Bore Size	Part Number	KK	M	S
12	**L075540005**	M5x0.8	2.7	18
16	**L075540006**	M6x1.0	3.2	10
20	**L075540008**	M8x1.25	4	13
25	**L075540010**	M10x1.25	5	17
32	**L075540012**	M12x1.25	6	19
40	**L075540014**	M14x1.5	7	22
50	**L075540018**	M18x1.5	8	27
63	**L075540018**	M18x1.5	8	27
80	**L075540022**	M22x1.5	11	32
100	**L075540022**	M22x1.5	11	32

Dimensions in mm

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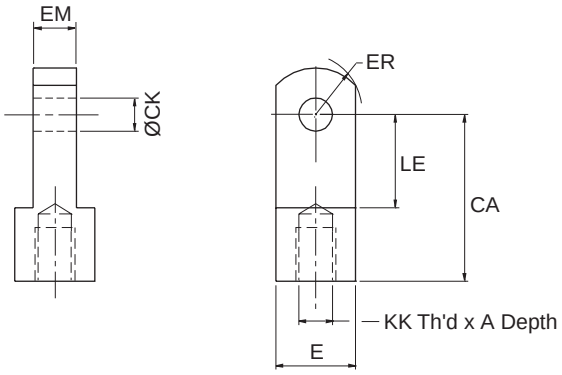
Rod Eye



Rod Eye – Metric

Bore	Kit Part Number	A	E	CA	KK	ER	LE	CK	EM
12	**P1M-4DRE**	7	9.5 Sq.	16	M5x0.8	6.5	7	5	5
16	**P1M-4FRE**	8	11 Sq.	25	M6x1.0	8	14	5	6.5
20	**P1M-4HRE**	8.5	16 Sq.	25	M8x1.25	10.5	11.5	8	8
25	**P1M-4JRE**	10.5	19 Sq.	30	M10x1.25	13	14	10	10
32	**P1M-4KRE**	15	22 Dia.	30	M12x1.25	12	14	10	18
40	**P1M-4LRE**	14	22 Dia.	30	M14x1.5	12	14	10	18
50/63	**P1M-4MRE**	18.5	28 Dia.	40	M18x1.5	16	20	14	22
80	**P1M-4PRE**	22	38 Dia.	50	M22x1.5	21	27	18	28
100	**P1M-4QRE**	22	44 Dia.	55	M22x1.5	24	31	22	32

Rod Eye – Inch

Bore	Kit Part Number	A	E	CA	KK	ER	LE	CK (inch)	EM
12	**P1M-4DRE-T**	6	9.5 Sq.	16	#8-32	6.5	7	3/16	5
16	**P1M-4FRE-T**	6	11 Sq.	25	#8-32	8	14	3/16	6.5
20	**P1M-4HRE-T**	6	16 Sq.	25	#10-32	10.5	11.5	5/16	8
25	**P1M-4JRE-T**	8	19 Sq.	30	1/4-28	13	14	3/8	10
32	**P1M-4KRE-T**	12	22 Dia.	30	5/16-24	12	14	3/8	18
40	**P1M-4LRE-T**	11	22 Dia.	30	3/8-24	12	14	3/8	18
50/63	**P1M-4MRE-T**	18	28 Dia.	40	1/2-20	16	20	1/2	22
80	**P1M-4PRE-T**	21	38 Dia.	50	5/8-18	21	27	3/4	28
100	**P1M-4QRE-T**	21	44 Dia.	55	3/4-16	24	31	7/8	32

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Bore	Single Rod Cylinders		Double Rod Cylinders	
	Class 1 Seals	**Class 5 Seals***	**Class 1 Seals**	**Class 5 Seals***
12	P1M-6DRN	P1M-6DRV	P1M-6DRT	P1M-6DRP
16	P1M-6FRN	P1M-6FRV	P1M-6FRT	P1M-6FRP
20	P1M-6HRN	P1M-6HRV	P1M-6HRT	P1M-6HRP
25	P1M-6JRN	P1M-6JRV	P1M-6JRT	P1M-6JRP
32	P1M-6KRN	P1M-6KRV	P1M-6KRT	P1M-6KRP
40	P1M-6LRN	P1M-6LRV	P1M-6LRT	P1M-6LRP
50	P1M-6MRN	P1M-6MRV	P1M-6MRT	P1M-6MRP
63	P1M-6NRN	P1M-6NRV	P1M-6NRT	P1M-6NRP
80	P1M-6PRN	P1M-6PRV	P1M-6PRT	P1M-6PRP
100	P1M-6QRN	P1M-6QRV	P1M-6QRT	P1M-6QRP

* No Bumpers Included

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Safety Guide for Selecting and Using Hydraulic, Pneumatic Cylinders and Their Accessories

WARNING: ⚠ FAILURE OF THE CYLINDER, ITS PARTS, ITS MOUNTING, ITS CONNECTIONS TO OTHER OBJECTS, OR ITS CONTROLS CAN RESULT IN:

- **Unanticipated or uncontrolled movement of the cylinder or objects connected to it.**
- **Falling of the cylinder or objects held up by it.**
- **Fluid escaping from the cylinder, potentially at high velocity.**

THESE EVENTS COULD CAUSE DEATH OR PERSONAL INJURY BY, FOR EXAMPLE, PERSONS FALLING FROM HIGH LOCATIONS, BEING CRUSHED OR STRUCK BY HEAVY OR FAST MOVING OBJECTS, BEING PUSHED INTO DANGEROUS EQUIPMENT OR SITUATIONS, OR SLIPPING ON ESCAPED FLUID.

Before selecting or using Parker (The Company) cylinders or related accessories, it is important that you read, understand and follow the following safety information. Training is advised before selecting and using The Company's products.

1.0 General Instructions

1.1 Scope – This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) cylinder products. This safety guide is a supplement to and is to be used with the specific Company publications for the specific cylinder products that are being considered for use.

1.2 Fail Safe – Cylinder products can and do fail without warning for many reasons. All systems and equipment should be designed in a fail-safe mode so that if the failure of a cylinder product occurs people and property won't be endangered.

1.3 Distribution – Provide a free copy of this safety guide to each person responsible for selecting or using cylinder products. Do not select or use The Company's cylinders without thoroughly reading and understanding this safety guide as well as the specific Company publications for the products considered or selected.

1.4 User Responsibility – Due to very wide variety of cylinder applications and cylinder operating conditions, The Company does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The hydraulic and pneumatic cylinders outlined in this catalog are designed to The Company's design guidelines and do not necessarily meet the design guideline of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own
analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

1.5 Additional Questions – Call the appropriate Company technical service department if you have any questions or require any additional information. See the Company publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2.0 Cylinder and Accessories Selection

2.1 Seals – Part of the process of selecting a cylinder is the selection of seal compounds. Before making this selection, consult the "seal information page(s)" of the publication for the series of cylinders of interest.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is mis-aligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

2.2 Piston Rods – Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.
- Failure of the pressurized fluid delivery system (hoses, fittings, valves, pumps, compressors) which maintain cylinder position.
- Catastrophic cylinder seal failure leading to sudden loss of pressurized fluid.
- Failure of the machine control system.

Follow the recommendations of the "Piston Rod Selection Chart and Data" in the publication for the series of cylinders of interest. The suggested piston rod diameter in these charts must be followed in order to avoid piston rod buckling.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods (a piston rod extended from both ends of the cylinder). In some cases a stop is threaded on to one of the piston rods and used as an external stroke adjuster. On occasions spacers are attached to the machine member connected to the piston rod and also used as a stroke adjuster. In both cases the stops will create a pinch point and the user should consider appropriate use of guards. If these external stops are not perpendicular to the mating contact surface, or if debris is trapped between the contact surfaces, a bending moment will be placed on the piston rod, which can lead to piston rod failure. An external stop will also negate the effect of cushioning and will subject the piston rod to impact loading. Those two (2) conditions can cause piston rod failure. Internal stroke adjusters are available with and without cushions. The use of external stroke adjusters should be reviewed with our engineering department.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinders which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

2.3 Cushions – Cushions should be considered for cylinder applications when the piston velocity is expected to be over 4 inches/second.

Cylinder cushions are normally designed to absorb the energy of a linear applied load. A rotating mass has considerably more energy than the same mass moving in a linear mode. Cushioning for a rotating mass application should be review by our engineering department.

2.4 Cylinder Mountings – Some cylinder mounting configurations may have certain limitations such as but not limited to minimum stroke for side or foot mounting cylinders or pressure de-ratings for certain mounts. Carefully review the catalog for these types of restrictions.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

2.5 Port Fittings – Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at piston rod end.

The rod end pressure is approximately equal to:

$$\frac{\text{operating pressure x effective cap end area}}{\text{effective rod end piston area}}$$

Contact your connector supplier for the pressure rating of individual connectors.

3.0 Cylinder and Accessories Installation and Mounting

3.1 Installation

3.1.1 – Cleanliness is an important consideration, and cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.

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3.1.2 – Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

3.1.3 – Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

3.1.4 – Sometimes it may be necessary to rotate the piston rod in order to thread the piston rod into the machine member. This operation must always be done with zero pressure being applied to either side of the piston. Failure to follow this procedure may result in loosening the piston to rod-threaded connection. In some rare cases the turning of the piston rod may rotate a threaded piston rod gland and loosen it from the
cylinder head. Confirm that this condition is not occurring. If it does, re-tighten the piston rod gland firmly against the cylinder head.

For double rod cylinders it is also important that when attaching or detaching the piston rod from the machine member that the torque be applied to the piston rod end of the cylinder that is directly attaching to the machine member with the opposite end unrestrained. If the design of the machine is such that only the rod end of the cylinder opposite to where the rod attaches to the machine member can be rotated, consult the factory for further instructions.

3.2 Mounting Recommendations

3.2.1 – Always mount cylinders using the largest possible high tensile alloy steel socket head screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

3.2.2 – Side-Mounted Cylinders – In addition to the mounting bolts, cylinders of this type should be equipped with thrust keys or dowel pins located so as to resist the major load.

3.2.3 – Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in dimension tables. Longer or shorter extensions can be supplied. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

3.2.4 – Flange Mount Cylinders – The controlled diameter of the rod gland extension on head end flange mount cylinders can be used as a pilot to locate the cylinders in relation to the machine. After alignment has been obtained, the flanges may be drilled for pins or dowels to prevent shifting.

3.2.5 – Trunnion Mountings – Cylinders require lubricated bearing blocks with minimum bearing clearances. Bearing blocks should be carefully aligned and rigidly mounted so the trunnions will not be subjected to bending moments. The rod end should also be pivoted with the pivot pin in line and parallel to axis of the trunnion pins.

3.2.6 – Clevis Mountings – Cylinders should be pivoted at both ends with centerline of pins parallel to each other. After cylinder is mounted, be sure to check to assure that the cylinder is free to swing through its working arc without interference from other machine parts.

4.0 Cylinder and Accessories Maintenance, Troubleshooting and Replacement

4.1 Storage – At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

4.1.1 – Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

4.1.2 – Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

4.1.3 – Port protector plugs should be left in the cylinder until the time of installation.

4.1.4 – If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

4.1.5 – When cylinders are mounted on equipment that is stored outside for extended periods, exposed unpainted surfaces, e.g. piston rod, must be coated with a rust-inhibiting compound to prevent corrosion.

4.2 Cylinder Trouble Shooting

4.2.1 – **External Leakage**

4.2.1.1 – Rod seal leakage can generally be traced to worn or damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

Rod seal leakage could also be traced to gland wear. If clearance is excessive, replace rod bushing and seal. Rod seal leakage can also be traced to seal deterioration. If seals are soft or gummy or brittle, check compatibility of seal material with lubricant used if air cylinder, or operating fluid if hydraulic cylinder. Replace with seal material, which is compatible with these fluids. If the seals are hard or have lost elasticity, it is usually due to exposure to temperatures in excess of 165°F. (+74°C). Shield the cylinder from the heat source to limit temperature to 350°F. (+177°C.) and replace with fluorocarbon seals.

4.2.1.2 – Cylinder body seal leak can generally be traced to loose tie rods. Torque the tie rods to manufacturer's recommendation for that bore size.

Excessive pressure can also result in cylinder body seal leak. Determine maximum pressure to rated limits. Replace seals and retorque tie rods as in paragraph above. Excessive pressure can also result in cylinder body seal leak. Determine if the pressure rating of the cylinder has been exceeded. If so, bring the operating pressure down to the rating of the cylinder and have the tie rods replaced.

Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Cylinder body seal leakage due to loss of radial squeeze which shows up in the form of flat spots or due to wear on the O.D. or I.D. – Either of these are symptoms of normal wear due to high cycle rate or length of service. Replace seals as per paragraph above.

4.2.2 – **Internal Leakage**

4.2.2.1 – Piston seal leak (by-pass) 1 to 3 cubic inches per minute leakage is considered normal for piston ring construction. Virtually no static leak with lipseal type seals on piston should be expected. Piston seal wear is a usual cause of piston seal leakage. Replace seals as required.

4.2.2.2 – With lipseal type piston seals excessive back pressure due to over-adjustment of speed control valves could be a direct cause of rapid seal wear. Contamination in a hydraulic system can result in a scored cylinder bore, resulting in rapid seal wear. In either case, replace piston seals as required.

4.2.2.3 – What appears to be piston seal leak, evidenced by the fact that the cylinder drifts, is not always traceable to the piston. To make sure, it is suggested that one side of the cylinder piston be pressurized and the fluid line at the opposite port be disconnected. Observe leakage. If none is evident, seek the cause of cylinder drift in other component parts in the circuit.

4.2.3 – **Cylinder Fails to Move the Load**

4.2.3.1 – Pneumatic or hydraulic pressure is too low. Check the pressure at the cylinder to make sure it is to circuit requirements.

4.2.3.2 – Piston Seal Leak – Operate the valve to cycle the cylinder and observe fluid flow at valve exhaust ports at end of cylinder stroke. Replace piston seals if flow is excessive.

4.2.3.3 – Cylinder is undersized for the load – Replace cylinder with one of a larger bore size.

4.3 Erratic or Chatter Operation

4.3.1 – Excessive friction at rod gland or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

4.3.2 – Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

4.3.3 – Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.

4.4 Cylinder Modifications, Repairs, or Failed Component – Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at company locations or by The Company's certified facilities. The Cylinder Division Engineering Department must be notified in the event of a mechanical fracture or permanent deformation of any cylinder component (excluding seals). This includes a broken piston rod, tie rod, mounting accessory or any other cylinder component. The notification should include all operation and application details. This information will be used to provide an engineered repair that will prevent recurrence of the failure.

It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.

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Printed in U.S.A.
May, 2008

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