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Pneumatic ISO Cylinders

P1D-B Series
According to ISO 15552

Catalog 0962

Parker

ENGINEERING YOUR SUCCESS.

Contents, Warnings, Offer of Sale

⚠ Important

Before attempting any external or internal work on the cylinder or any connected components, make sure the cylinder is vented and disconnect the air supply in order to ensure isolation of the air supply.

⚠ Note

All technical data in this catalogue are typical data only.
Air quality is essential for maximum cylinder service life (see ISO 8573).

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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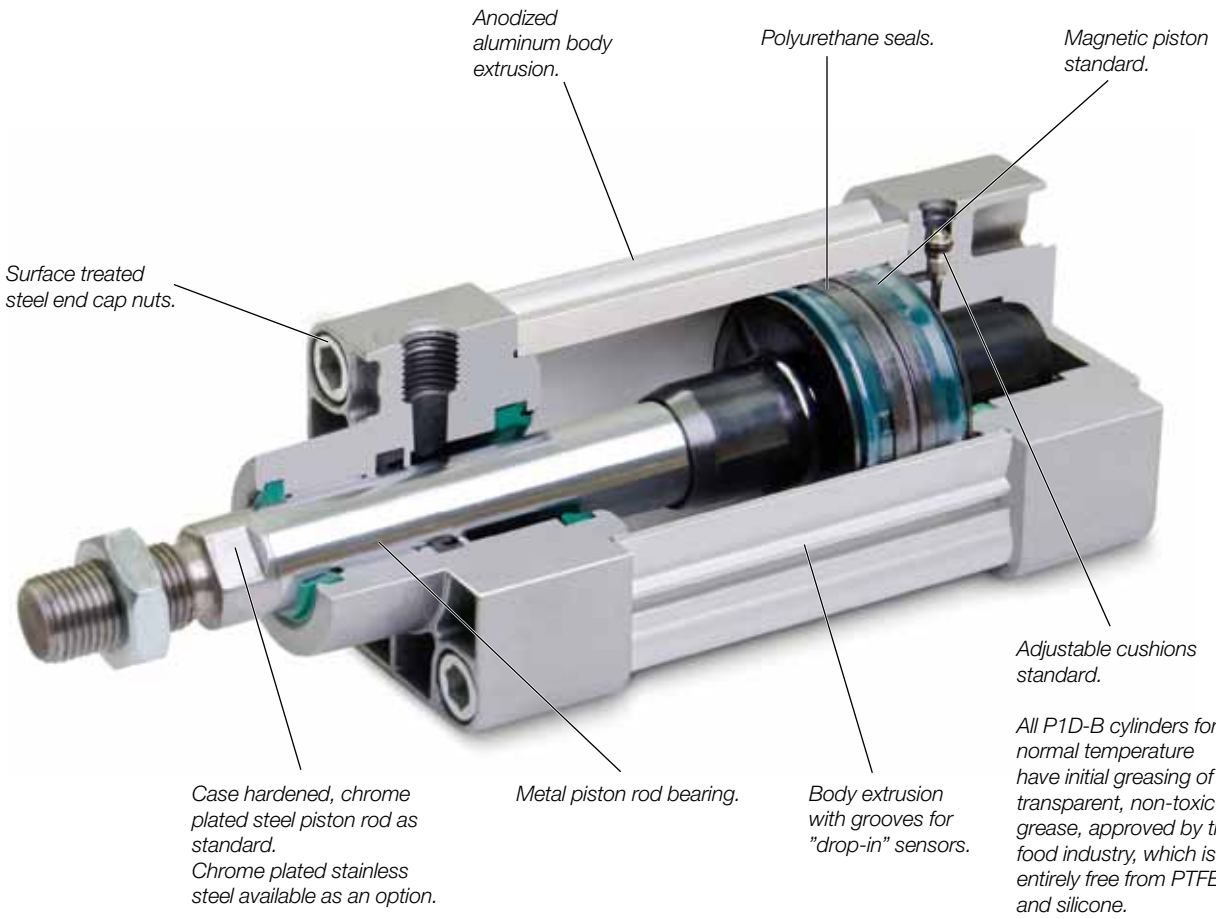
Features

Standard cylinders P1D-B, ISO 15552



Global product range

The P1D-B Series meets the specifications in the ISO 15552 standard. This means full interchangeability to any ISO 15552 cylinder anywhere around the globe. P1D-B will be available throughout the extensive worldwide Parker Hannifin organization.

Features

- ISO 15552 conformity.
- Bore sizes 32-125 mm.
- Corrosion resistant design with barrel in anodized aluminium and optional stainless steel piston rod.
- Polyurethane seal technology.
- Adjustable air cushioning.
- Range of mountings available.
- Drop in global P8S-G sensors.
- Metal piston rod bearing.

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Technical Information

General technical data

Product type		Standard cylinder according to ISO 15552
Bore size		32 - 125 mm
Stroke length		5-2800 mm
Versions	P1D-B...MC	Double acting
Cushioning		Adjustable air cushioning
Position sensing		Proximity sensor
Installation		P1D cylinder and piston rod mountings
Mounting position		Any

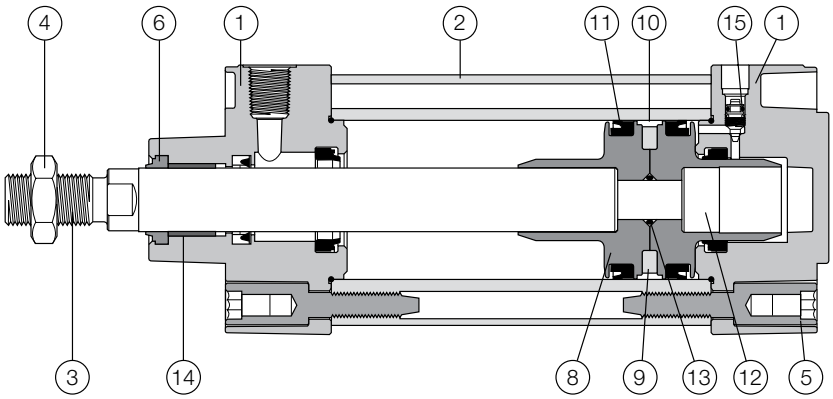
Operating and environmental data

Operating medium

For best possible service life and trouble-free operation dry, filtered compressed air to ISO 8573-1:2010 quality class 3.4.3 should be used. This specifies a dew point of +3°C for indoor operation (a lower dew point should be selected for outdoor operation) and is in line with the air quality from most standard compressors with a standard filter.

Operating pressure	0.5 bar to 10 bar
Ambient temperature Standard version	-20°C to +80°C
Pre-lubricated	Further lubrication is normally not necessary. If additional lubrication is introduced it must be continued.
Corrosion resistance	Resistance to corrosion and chemicals.

Material specifications



Item	Part		Specifications
1	End covers		Aluminium
2	Cylinder barrel		Anodized aluminium
3	Piston rod	Standard	Chrome plated steel
		Option	Chrome plated stainless steel
4	Piston rod nut		Zinc plated steel
5	End cover screws		Zinc plated steel
6	Scraper ring		Polyurethane
7	Piston rod seal		Polyurethane
8	Piston		POM high tech polymer
9	Magnet		Plastic coated magnetic material
10	Piston bearing		POM high tech polymer
11	Piston seals		Polyurethane
12	Piston bolt		Zinc plated steel
13	O-rings		Nitrile rubber
14	Piston rod bearing		Multilayer PTFE /steel
15	Cushioning screws		Stainless steel
16	Cushioning seals		Polyurethane
	Note on materials		RoHS compliant

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Order Key Code

Ordering Information

P1D	-	B	032	M	C	-	0500	N	N	N	N	N

Cylinder version

B	Basic

Bore size

032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm
125	125mm

Scraper function

M	Standard	Double acting

Stroke

Specify whole mm using 4 digits, i.e. 0500

Ports

–	BSPP
E	NPT

	Piston rod material	**Seals**
C	Chrome plated carbon steel	Standard -20°C to +80°C
R	Chrome plated Stainless steel	Standard -20°C to +80°C

Rod mountings

N	None (piston rod nut only)
S	Swivel rod eye
T	Swivel rod eye SS
V	Swivel rod eye with clevis bracket GA
W	Swivel rod eye SS with clevis bracket GA
C	Clevis
D	Clevis SS
F	Flexco coupling
X	One additional piston rod nut
Y	Stainless steel piston rod nut
Z	Acid-resistant nut

Rod end

N	Metric male
6	Metric female
3	Special*

* Please provide desired dimensions for KK, AM and WH or W. If otherwise, please provide dimensioned sketch.

Mounting style

Standard	
N	None (MX0)
1	Flange MF1 at head (front) end
B	Flange MF2 at cap (rear) end
2	Flanges MF1 and MF2 at both ends
F	Foot brackets MS1
C	Clevis bracket GA aluminum
E	Rear eye MP4 aluminum
S	Rear swivel eye MP6 aluminum
T	Clevis bracket MP2 aluminum
L	Rear eye + clevis (MP4 + MP2) aluminum
X	Clevis bracket MP2 + pivot hinge aluminum
Q	Clevis bracket GA aluminum + steel swivel hinge
M	Rear swivel eye + clevis bracket GA aluminum
G	Intermediate trunnion MT4 (requires XV dimension)
H	Trunnion flange at head (front) end
J	Trunnion flange at cap (rear) end

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Technical Information

Cylinder forces, double acting variants

Cylinder bore / piston rod mm	Stroke	Piston cm²	Max theoretical force in N (bar) 1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
32/12	+	8.0	80	161	241	322	402	**483**	563	643	724	804
	-	6.9	69	138	207	276	346	**415**	484	553	622	691
40/16	+	12.6	126	251	377	503	628	**754**	880	1005	1131	1257
	-	10.6	106	212	318	424	530	**636**	742	848	954	1060
50/20	+	19.6	196	393	589	785	982	**1178**	1374	1571	1767	1963
	-	16.5	165	330	495	660	825	**990**	1155	1319	1484	1649
63/20	+	31.2	312	623	935	1247	1559	**1870**	2182	2494	2806	3117
	-	28.0	280	561	841	1121	1402	**1682**	1962	2242	2523	2803
80/25	+	50.3	503	1005	1508	2011	2513	**3016**	3519	4021	4524	5027
	-	45.4	454	907	1361	1814	2268	**2721**	3175	3629	4082	4536
100/25	+	78.5	785	1571	2356	3142	3927	**4712**	5498	6283	7069	7854
	-	73.6	736	1473	2209	2945	3682	**4418**	5154	5890	6627	7363
125/32	+	122.7	1227	2454	3682	4909	6136	**7363**	8590	9817	11045	12272
	-	114.7	1147	2294	3440	4587	5734	**6881**	8027	9174	10321	11468

+ = Outward stroke
- = Return stroke

Note!
Select a theoretical force 50-100% larger than the force required

Main data: P1D-B

Cylinder designation	Cylinder bore dia. mm	Cylinder bore area cm²	Piston rod dia. mm	Piston rod area cm²	Piston rod thread	Cushioning length mm	Connection consumption[2] liter
P1D-B032••XXXX[1]	32	8.0	12	1.1	M10x1.25	17	0.105
P1D-B040••XXXX[1]	40	12.6	16	2.0	M12x1.25	19	0.162
P1D-B050••XXXX[1]	50	19.6	20	3.1	M16x1.5	20	0.253
P1D-B063••XXXX[1]	63	31.2	20	3.1	M16x1.5	23	0.414
P1D-B080••XXXX[1]	80	50.3	25	4.9	M20x1.5	23	0.669
P1D-B100••XXXX[1]	100	78.5	25	4.9	M20x1.5	27	1.043
P1D-B125••XXXX[1]	125	122.7	32	8.0	M27x2	30	1.662

Total mass including moving parts

Cylinder designation	Total mass (kg) at 0 mm stroke	Total mass (kg) per 10 mm stroke
P1D-B032••XXXX[1]	0.55	0.023
P1D-B040••XXXX[1]	0.80	0.033
P1D-B050••XXXX[1]	1.20	0.048
P1D-B063••XXXX[1]	1.73	0.051
P1D-B080••XXXX[1]	2.45	0.075
P1D-B100••XXXX[1]	4.00	0.084
P1D-B125••XXXX[1]	6.87	0.138

Mass moving parts only (for cushioning calculation)

Cylinder designation	Mass moving parts (kg) at 0 mm stroke	Supplement per 10 mm stroke
P1D-B032••XXXX[1]	0.13	0.009
P1D-B040••XXXX[1]	0.24	0.016
P1D-B050••XXXX[1]	0.42	0.025
P1D-B063••XXXX[1]	0.50	0.025
P1D-B080••XXXX[1]	0.90	0.039
P1D-B100••XXXX[1]	1.10	0.039
P1D-B125••XXXX[1]	2.34	0.063

1) XXXX = stroke

2) Free air consumption per 10 mm stroke for a double stroke at 6 bar

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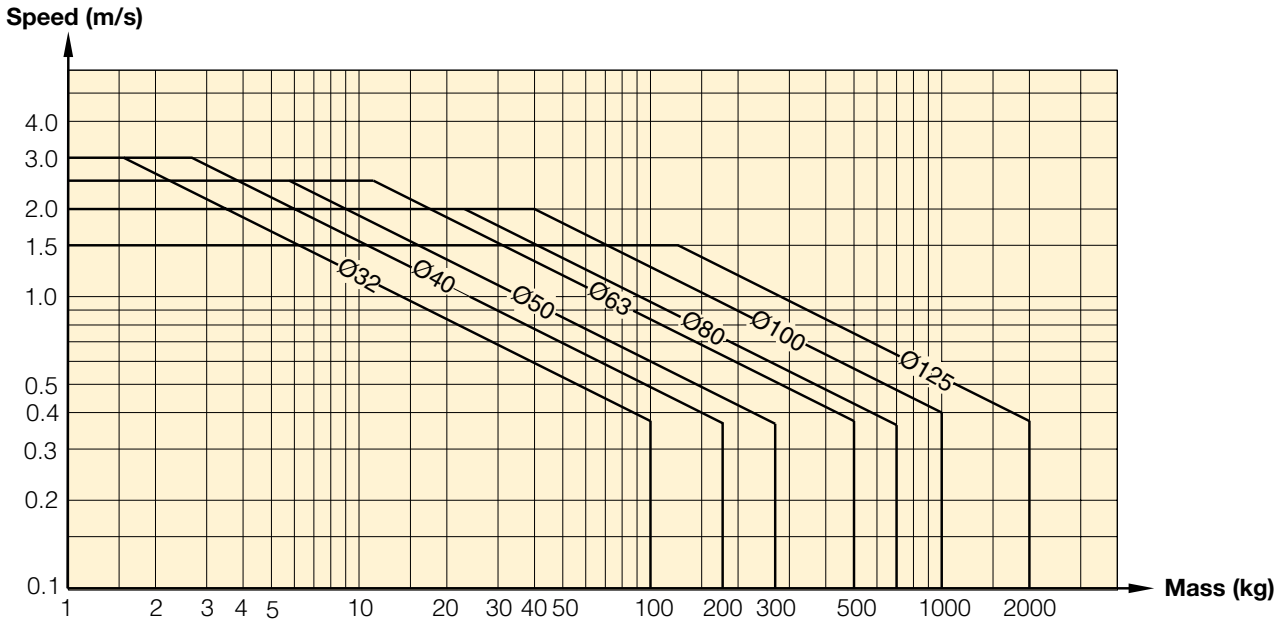
Cushioning characteristics

The diagram below is used for sizing of cylinders related to the cushioning capacity. The maximum cushioning capacity shown in the diagram assumes the following:

- Low load, i.e. low pressure drop across the piston
- Equilibrium speed
- Correctly adjusted cushioning screw
- 6 bar at cylinder port

The load is the sum of internal and external friction, plus any gravitational forces. At high relative load (pressure drop exceeding 1 bar), we recommend that for any given speed, the mass should be reduced by a factor of 2.5, or for a given mass, the speed should be reduced by a factor of 1.5. This is in relation to the maximum performance given in the diagram.



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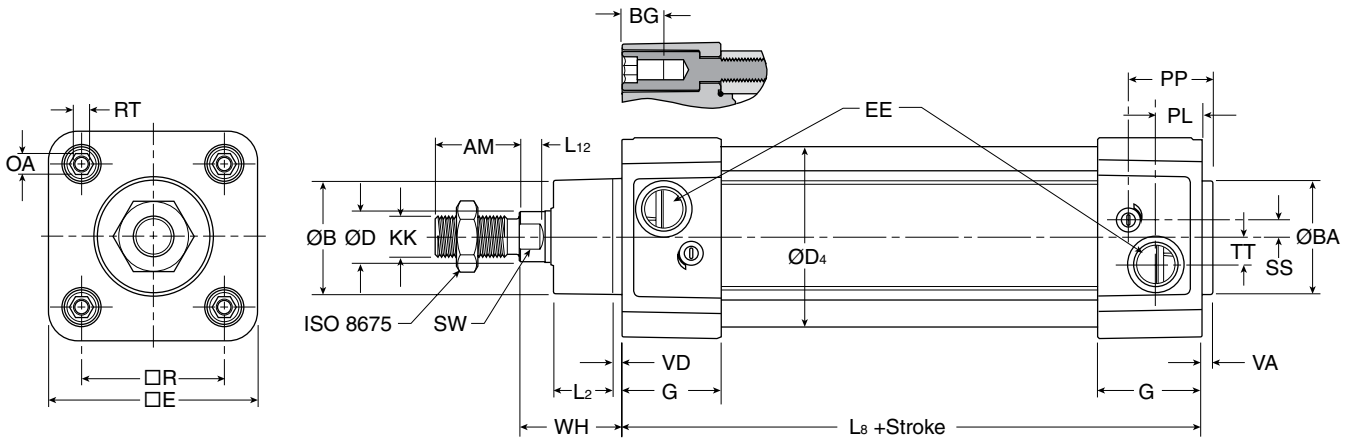
Dimensions

P1D-B Basic



Dimensions

Cylinder bore mm	AM mm	B mm	BA mm	BG mm	D mm	D4 mm	E mm	EE BSPP	EE NPTF	G mm	KK mm	L2 mm	L8 mm
32	22	30	30	16	12	45.0	48.0	G1/8	1/8	28.5	M10x1.25	16.8	94
40	24	35	35	16	16	52.0	53.5	G1/4	1/4	33.0	M12x1.25	19.0	105
50	32	40	40	16	20	60.7	65.2	G1/4	1/4	33.5	M16x1.5	24.0	106
63	32	45	45	16	20	71.5	75.5	G3/8	3/8	39.5	M16x1.5	24.3	121
80	40	45	45	17	25	86.7	95.0	G3/8	3/8	39.5	M20x1.5	30.0	128
100	40	55	55	17	25	106.7	114.0	G1/2	1/2	44.5	M20x1.5	34.0	138
125	54	60	60	20	32	134.0	139.0	G1/2	1/2	51.0	M27x2	45.0	160

* ISO 1179-1 with ISO 228-1 threads

Cylinder bore mm	L12	OA mm	PL mm	PP mm	R mm	RT	SS mm	SW mm	TT mm	VA mm	VD mm	WH mm
32	6.0	6.0	14.0	24.2	32.5	M6	5.5	10	4.2	3.5	4.5	26
40	6.5	6.0	16.0	27.5	38.0	M6	8.0	13	5.5	3.5	4.5	30
50	8.0	8.0	14.0	29.3	46.5	M8	9.0	17	7.5	3.5	4.5	37
63	8.0	8.0	16.6	30.8	56.5	M8	6.5	17	10.0	3.5	4.5	37
80	10.0	6.0	16.8	33.5	72.0	M10	0	22	11.5	3.5	4.5	46
100	14.0	6.0	20.5	37.5	89.0	M10	0	22	14.5	3.5	4.5	51
125	18.0	8.0	23.3	45.8	110.0	M12	0	27	15.0	5.5	6.5	65

Tolerances

Cylinder bore mm	B	BA	L_8 mm	R mm	Stroke tolerance up to stroke 500 mm	Stroke tolerance for stroke over 500 mm
32	d11	d11	±0.4	±0.5	+0.3/+2.0	+0.3/+3.0
40	d11	d11	±0.7	±0.5	+0.3/+2.0	+0.3/+3.0
50	d11	d11	±0.7	±0.6	+0.3/+2.0	+0.3/+3.0
63	d11	d11	±0.8	±0.7	+0.3/+2.0	+0.3/+3.0
80	d11	d11	±0.8	±0.7	+0.3/+2.0	+0.3/+3.0
100	d11	d11	±1.0	±0.7	+0.3/+2.0	+0.3/+3.0
125	d11	d11	±1.0	±1.1	+0.3/+2.0	+0.3/+3.0

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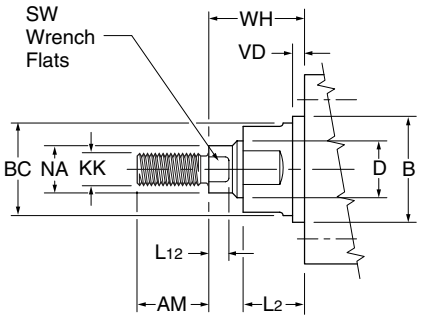
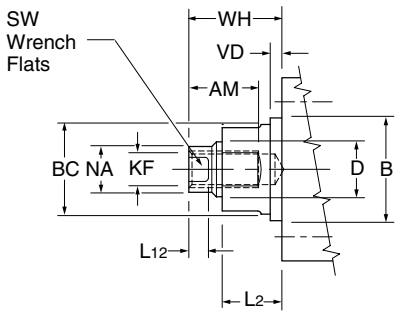
Rod End Dimensions

All Mountings Except MF1

Thread Style N



Thread Style 6

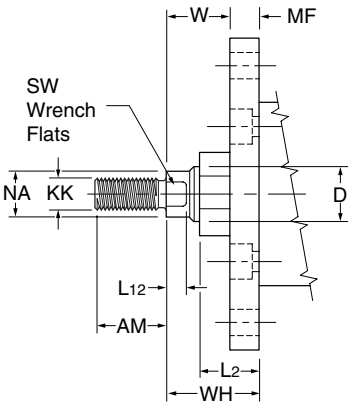


"Special Thread" Style 3
Special thread, extension, rod eye, blank, etc are also available. To order, specify "Style 3" and provide desired dimensions for KF or KK, AM and WH. If otherwise special, furnish dimensioned sketch.

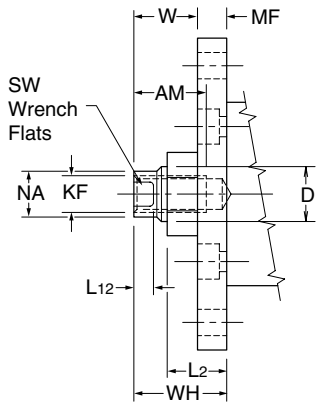
Bore	D	KK	KF	AM	B d11	BC	SW across flats	L12	NA	VD	L2	WH*
32	12	M10x1.25	M8x1	22	30	27	10	6	11	4.5	18	26
40	16	M12x1.25	M10x1.25	24	35	32	13	6.5	15	4.5	20	30
50	20	M16x1.5	M14x1.5	32	40	36	17	6.5	19	4.5	26	37
63	20	M16x1.5	M14x1.5	32	45	36	17	6.5	19	4.5	26	37
80	25	M20x1.5	M18x1.5	40	45	41	22	10	24	4.5	33	46
100	25	M20x1.5	M18x1.5	40	55	41	22	10	24	4.5	33	51
125	32	M27x2	M24x2	54	60	50	27	13	31	6.5	41	65

With MF1 Mounting

Thread Style N



Thread Style 6



"Special Thread" Style 3
Special thread, extension, rod eye, blank, etc are also available. To order, specify "Style 3" and provide desired dimensions for KF or KK, AM and WH. If otherwise special, furnish dimensioned sketch.

Bore	D	KK	KF	AM	SW across flats	L12	MF	NA	L2	W†	WH†
32	12	M10x1.25	M8x1	22	10	6	10	11	18	16	26
40	16	M12x1.25	M10x1.25	24	13	6.5	10	15	20	20	30
50	20	M16x1.5	M14x1.5	32	17	6.5	12	19	26	25	37
63	20	M16x1.5	M14x1.5	32	17	6.5	12	19	26	25	37
80	25	M20x1.5	M18x1.5	40	22	10	16	24	33	30	46
100	25	M20x1.5	M18x1.5	40	22	10	16	24	33	35	51
125	32	M27x2	M24x2	54	27	13	20	31	41	45	65

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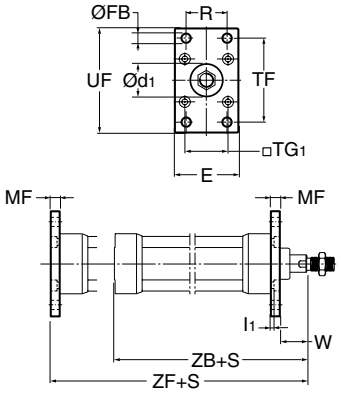
Cylinder Mountings

Flange – MF1, MF2

Intended for fixed mounting of cylinder. Flange can be fitted to front or rear end cover of cylinder.

Materials:
32-100mm bore flange: Surface-treated aluminum, black
125mm bore flange: Steel, black
Mounting screws acc. to DIN 6912: Zinc-plated steel 8.8

Supplied complete with mounting screws for attachment to cylinder.



According to ISO MF1/MF2, VDMA 24 562, AFNOR

Bore size mm	d1 H11 mm	FB H13 mm	TG1 mm	E mm	R JS14 mm	MF JS14 mm	TF JS14 mm	UF	l1 -0.5 mm	W mm	ZF mm	ZB mm	Weight kg	Part number
32	30	7	32.5	45	32	10	64	80	5.0	16	130	123.5	0.23	**P1C-4KMBA**
40	35	9	38.0	52	36	10	72	90	5.0	20	145	138.5	0.28	**P1C-4LMBA**
50	40	9	46.5	65	45	12	90	110	6.5	25	155	146.5	0.53	**P1C-4MMBA**
63	45	9	56.5	75	50	12	100	120	6.5	25	170	161.5	0.71	**P1C-4NMBA**
80	45	12	72.0	95	63	16	126	150	8.0	30	190	177.5	1.59	**P1C-4PMBA**
100	55	14	89.0	112	75	16	150	185	8.0	35	205	192.5	2.19	**P1C-4QMBA**
125	60	16	110.0	140	90	20	180	220	10.5	45	245	230.5	3.78	**P1C-4RMB**

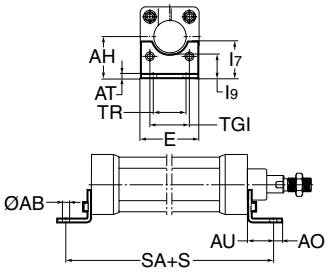
S = Stroke length

Foot Bracket – MS1

Intended for fixed mounting of cylinder. Foot bracket can be fitted to front and rear end covers of cylinder.

Materials:
Foot bracket: Surface-treated steel, black
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8

Supplied in pairs with mounting screws for attachment to cylinder.



According to ISO MS1, VDMA 24 562, AFNOR

Bore size mm	AB H14 mm	TG1 mm	E mm	TR JS14 mm	AO mm	AU mm	AH JS15 mm	l7 mm	AT mm	l9 JS14 mm	SA mm	Weight* kg	Part number
32	7	32.5	45	32	10	24	32	30	4.5	17.0	142	0.06	**P1C-4KMF**
40	9	38.0	52	36	8	28	36	30	4.5	18.5	161	0.08	**P1C-4LMF**
50	9	46.5	65	45	13	32	45	36	5.5	25.0	170	0.16	**P1C-4MMF**
63	9	56.5	75	50	13	32	50	35	5.5	27.5	185	0.25	**P1C-4NMF**
80	12	72.0	95	63	14	41	63	49	6.5	40.5	210	0.50	**P1C-4PMF**
100	14	89.0	115	75	15	41	71	54	6.5	43.5	220	0.85	**P1C-4QMF**
125	16	110.0	140	90	22	45	90	71	8.0	60.0	250	1.48	**P1C-4RMF**

S = Stroke length

*Weight per item

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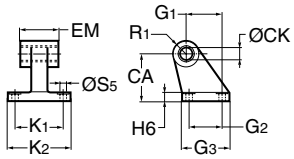
Cylinder Mountings

Pivot Bracket with Rigid Bearing

Intended for flexible mounting of cylinder. The pivot bracket can be combined with clevis bracket MP2.

Materials:
Pivot bracket: Surface-treated aluminium, black
Bearing: Sintered oil-bronze bushing



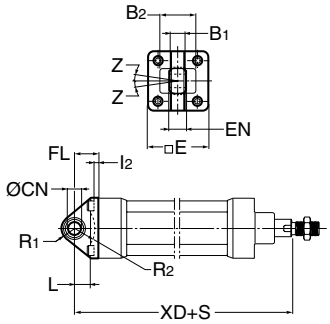
According to CETOP RP 107 P, VDMA 24 562, AFNOR

Bore size mm	CK H9 mm	S5 H13 mm	K1 JS14 mm	K2	G1 JS14 mm	G2 JS14 mm	EM mm	G3 mm	CA JS15 mm	H6 mm	R1 mm	Weight kg	Part number
32	10	6.6	38	51	21	18	25.5	31	32	8	10.0	0.06	**P1C-4KMD**
40	12	6.6	41	54	24	22	27.0	35	36	10	11.0	0.08	**P1C-4LMD**
50	12	9.0	50	65	33	30	31.0	45	45	12	13.0	0.15	**P1C-4MMD**
63	16	9.0	52	67	37	35	39.0	50	50	12	15.0	0.20	**P1C-4NMD**
80	16	11.0	66	86	47	40	49.0	60	63	14	15.0	0.33	**P1C-4PMD**
100	20	11.0	76	96	55	50	59.0	70	71	15	19.0	0.49	**P1C-4QMD**
125	25	14.0	94	124	70	60	69.0	90	90	20	22.5	1.02	**P1C-4RMD**

Swivel Eye Bracket – MP6

Intended for use together with clevis bracket GA

Materials:
Bracket: Surface-treated aluminium, black
Swivel bearing acc. to DIN 648K: Hardened steel
Supplied complete with mounting screws for attachment to cylinder.



According to VDMA 24 562, AFNOR

Bore size mm	E mm	B1 mm	B2 mm	EN mm	R1 mm	R2 mm	FL mm	I2 mm	L mm	CN H7 mm	XD mm	Z	Weight kg	Part number
32	45	10.5	–	14	16	–	22	5.5	12	10	142	4°	0.08	**P1C-4KMSA**
40	52	12.0	–	16	18	–	25	5.5	15	12	160	4°	0.11	**P1C-4LMSA**
50	65	15.0	51	21	21	19	27	6.5	15	16	170	4°	0.20	**P1C-4MMSA**
63	75	15.0	–	21	23	–	32	6.5	20	16	190	4°	0.27	**P1C-4NMSA**
80	95	18.0	–	25	29	–	36	10.0	20	20	210	4°	0.52	**P1C-4PMSA**
100	115	18.0	–	25	31	–	41	10.0	25	20	230	4°	0.72	**P1C-4QMSA**
125	140	25.0	–	37	40	–	50	10.0	30	30	275	4°	1.53	**P1C-4RMSA**

S = Stroke length

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Cylinder Mountings

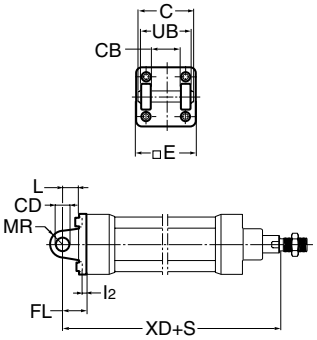
Clevis Bracket – MP2

Intended for flexible mounting of cylinder. Clevis bracket MP2 can be combined with clevis bracket MP4.

Materials:

Clevis bracket: Surface-treated aluminium, black for 32-125mm bores;
Pin: Surface hardened steel
Circlips according to DIN 471: Spring steel
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8

Supplied complete with mounting screws for attachment to cylinder.



According to ISO MP2, VDMA 24 562, AFNOR

Bore size mm	C mm	E mm	UB h14 mm	CB H14 mm	FL ±0.2 mm	L mm	l2 mm	CD H9 mm	MR mm	XD mm	Weight kg	Part number
32	53	45	45	26	22	13	5.5	10	10	142	0.08	**P1C-4KMT**
40	60	52	52	28	25	16	5.5	12	12	160	0.11	**P1C-4LMT**
50	68	65	60	32	27	16	6.5	12	12	170	0.14	**P1C-4MMT**
63	78	75	70	40	32	21	6.5	16	16	190	0.29	**P1C-4NMT**
80	98	95	90	50	36	22	10.0	16	16	210	0.36	**P1C-4PMT**
100	118	115	110	60	41	27	10.0	20	20	230	0.64	**P1C-4QMT**
125	139	140	130	70	50	30	10.0	25	25	275	1.17	**P1C-4RMT**

S = Stroke length

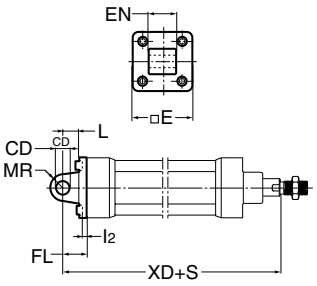
Clevis Bracket – MP4

Intended for flexible mounting of cylinder. Clevis bracket MP4 can be combined with clevis bracket MP2.

Materials:

Clevis bracket: Surface-treated aluminium, black for 32-125mm bores
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8

Supplied complete with mounting screws for attachment to cylinder.



According to ISO MP4, VDMA 24 562, AFNOR

Bore size mm	E mm	EW mm	FL mm	L ±0.2 mm	l2 mm	CD mm	MR H9 mm	XD mm	Weight kg	Part number
32	45	26	22	13	5.5	10	10	142	0.09	**P1C-4KME**
40	52	28	25	16	5.5	12	12	160	0.13	**P1C-4LME**
50	65	32	27	16	6.5	12	12	170	0.17	**P1C-4MME**
63	75	40	32	21	6.5	16	16	190	0.36	**P1C-4NME**
80	95	50	36	22	10.0	16	16	210	0.46	**P1C-4PME**
100	115	60	41	27	10.0	20	20	230	0.83	**P1C-4QME**
125	140	70	50	30	10.0	25	25	275	1.53	**P1C-4RME**

S = Stroke length

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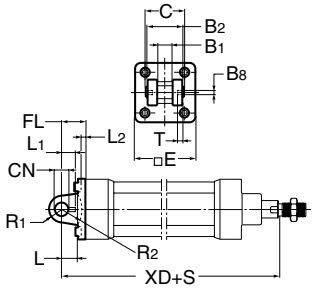
Cylinder Mountings

Clevis Bracket – GA

Intended for flexible mounting of cylinder. Clevis bracket GA can be combined with pivot bracket with swivel bearing, swivel eye bracket and swivel rod eye.

Materials:
Clevis bracket: Surface-treated aluminium
Pin: Surface hardened steel
Locking pin: Spring steel
Circlips according to DIN 471: Spring steel
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8

Supplied complete with mounting screws for attachment to cylinder.

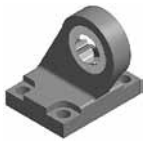


According to VDMA 24 562, AFNOR

Bore size mm	C mm	E mm	B2 d12 mm	B1 H14 mm	T mm	B3 mm	R2 mm	L1 mm	FL ±0.2 mm	I2 mm	L mm	CN F7 mm	R1 mm	XD mm	Weight kg	Part number
32	41	45	34	14	3	3.3	17	11.5	22	5.5	12	10	11	142	0.09	**P1C-4KMCA**
40	48	52	40	16	4	4.3	20	12.0	25	5.5	15	12	13	160	0.13	**P1C-4LMCA**
50	54	65	45	21	4	4.3	22	14.0	27	6.5	17	16	18	170	0.17	**P1C-4MMCA**
63	60	75	51	21	4	4.3	25	14.0	32	6.5	20	16	18	190	0.36	**P1C-4NMCA**
80	75	95	65	25	4	4.3	30	16.0	36	10.0	20	20	22	210	0.58	**P1C-4PMCA**
100	85	115	75	25	4	4.3	32	16.0	41	10.0	25	20	22	230	0.89	**P1C-4QMCA**
125	110	140	97	37	6	6.3	42	24.0	50	10.0	30	30	30	275	1.75	**P1C-4RMCA**

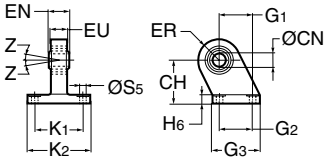
S = Stroke length

Pivot Bracket with Swivel Bearing



Intended for use together with clevis bracket GA.

Materials:
Pivot bracket: Surface-treated steel, black
Swivel bearing acc. to DIN 648K: Hardened steel



According to VDMA 24 562, AFNOR

Bore size mm	CN H7 mm	S5 H13 mm	K1 JS14 mm	K2 mm	EU mm	G1 JS14 mm	G2 JS14 mm	EN mm	G3 mm	CH JS15 mm	H6 mm	ER mm	Z	Weight kg	Part number
32	10	6.6	38	51	10.5	21	18	14	31	32	10	16	4°	0.18	**P1C-4KMA**
40	12	6.6	41	54	12.0	24	22	16	35	36	10	18	4°	0.25	**P1C-4LMA**
50	16	9.0	50	65	15.0	33	30	21	45	45	12	21	4°	0.47	**P1C-4MMA**
63	16	9.0	52	67	15.0	37	35	21	50	50	12	23	4°	0.57	**P1C-4NMA**
80	20	11.0	66	86	18.0	47	40	25	60	63	14	28	4°	1.05	**P1C-4PMA**
100	20	11.0	76	96	18.0	55	50	25	70	71	15	30	4°	1.42	**P1C-4QMA**
125	30	14.0	94	124	25.0	70	60	37	90	90	20	40	4°	3.10	**P1C-4RMA**

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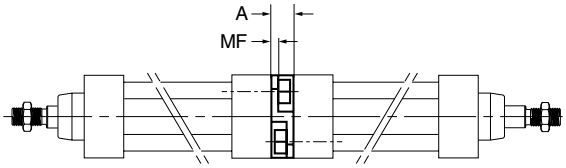
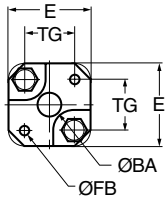
Cylinder Mountings

Mounting Kit

Mounting kit for back to back mounted cylinders, 3 and 4 position duplex cylinders.

Materials:
Mounting: Aluminium
Mounting screws: Zinc-plated steel 8.8





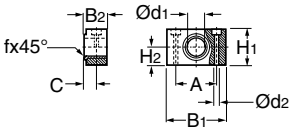
Bore size mm	E mm	TG mm	ØFB mm	MF mm	A mm	ØBA mm	Weight kg	Part number
32	50	32.5	6.5	5	16	30	0.060	**P1E-6KB0**
40	60	38.0	6.5	5	16	35	0.078	**P1E-6LB0**
50	66	46.5	8.5	6	20	40	0.162	**P1E-6MB0**
63	80	56.5	8.5	6	20	45	0.194	**P1E-6NB0**
80	100	72.0	10.5	8	25	45	0.450	**P1E-6PB0**
100	118	89.0	10.5	8	25	55	0.672	**P1E-6QB0**

Pivot Bracket – MT4

Intended for use together with central trunnion MT4.

Materials:
Pivot bracket: Surface-treated aluminium
Bearing acc. to DIN 1850 C: Sintered oil-bronze bushing

Supplied in pairs.



According to ISO, VDMA 24 562, AFNOR

Bore size mm	B1 mm	B2 mm	A mm	C mm	d1 mm	d2 H13 mm	H1 mm	H2 mm	fx45° min mm	Weight* kg	Part number
32	46	18.0	32	10.5	12	6.6	30	15	1.0	0.04	**9301054261**
40	55	21.0	36	12.0	16	9.0	36	18	1.6	0.07	**9301054262**
50	55	21.0	36	12.0	16	9.0	36	18	1.6	0.07	
63	65	23.0	42	13.0	20	11.0	40	20	1.6	0.12	**9301054264**
80	65	23.0	42	13.0	20	11.0	40	20	1.6	0.12	
100	75	28.5	50	16.0	25	14.0	50	25	2.0	0.21	**9301054266**
125	75	28.5	50	16.0	25	14.0	50	25	2.0	0.21	

* Weight per item

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Cylinder Mountings

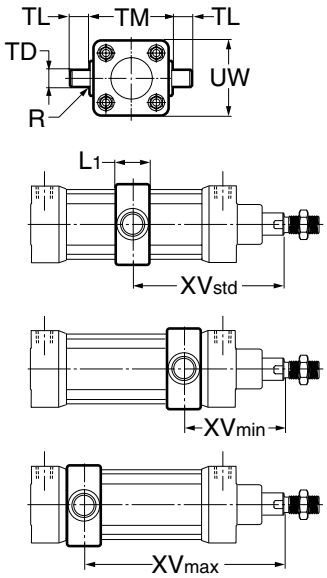
Intermediate Trunnion – MT4

Standard*

Intended for articulated mounting of cylinder. The trunnion is factory-fitted at an optional location. Order by specifying Mounting Style G or 7 and providing the desired XV dimension (3-digit measure in mm). See page 3 for ordering information. Combined with pivot bracket for MT4 for 32-125mm bores.

Materials:
Trunnion: Zinc plated steel

* Standard mounting is for the Standard cylinder body and is permanently affixed by the factory.



According to ISO MT4, VDMA 24 562, AFNOR

Bore size mm	TM h14 mm	TL h14 mm	TD e9 mm	R mm	UW mm	L1 mm	X1 mm	XVmin mm	X2 mm	Weight kg
32	50	12	12	1.0	46	15	73.0	70.0	84.0	0.13
40	63	16	16	1.6	59	20	82.5	83.0	92.0	0.31
50	75	16	16	1.6	69	20	90.0	90.5	99.5	0.37
63	90	20	20	1.6	84	25	97.5	101.5	106.0	0.69
80	110	20	20	1.6	102	25	110.0	110.5	122.0	0.89
100	132	25	25	2.0	125	30	120.0	125.5	129.5	1.58
125	160	25	25	2.0	155	32	145.0	148.0	158.0	2.60

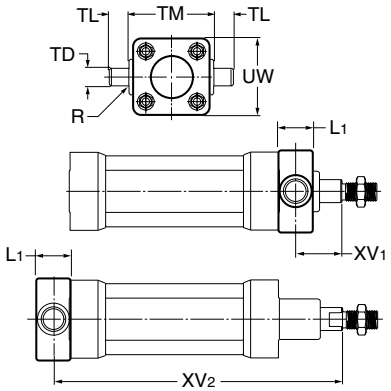
XVstd = X1 + Stroke length/2 XVmax = X2 + Stroke length

Flange Mounted Trunnion

Intended for articulated mounting of cylinder. This trunnion can be flange mounted on the front or rear end cover of all P1D cylinders. If you choose, you can order a complete cylinder with factory-fitted flange mounted trunnion – see the ordering information on page 3 Individual trunnions have part numbers as shown below.

Materials:
Trunnion: zinc plated steel
Screws: zinc plated steel, 8.8

Delivered complete with mounting screws for attachment to the cylinder



According to ISO MT4, VDMA 24 562, AFNOR

Bore size mm	TM h14 mm	TL h14 mm	TD e9 mm	R mm	UW mm	L1 mm	XV_1 mm	X mm	Weight kg	Part number
32	50	12	12	1.0	46	14	19.0	127.0	0.17	**P1D-4KMYF**
40	63	16	16	1.6	59	19	20.5	144.5	0.43	**P1D-4LMYF**
50	75	16	16	1.6	69	19	27.5	152.5	0.55	**P1D-4MMYF**
63	90	20	20	1.6	84	24	25.0	170.0	1.10	**P1D-4NMYF**
80	110	20	20	1.6	102	24	34.0	186.0	1.66	**P1D-4PMYF**
100	132	25	25	2.0	155	29	36.5	203.5	3.00	**P1D-4QMYF**

XV_2 = X + Stroke length

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Cylinder Mountings

Swivel Rod Eye

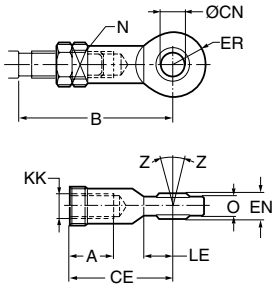
Stainless Steel
Swivel Rod Eye

Swivel rod eye for articulated mounting of cylinder.
Swivel rod eye can be combined with clevis bracket GA.
Maintenance-free.

Materials:
Swivel rod eye: Zinc-plated steel
Swivel bearing according to DIN 648K: Hardened steel

Swivel rod eye: Stainless steel
Swivel bearing according to DIN 648K: Stainless steel

Use stainless steel nut (see next page) with stainless steel swivel rod eye.



According to ISO 8139

Bore size mm	A mm	B min mm	B max mm	CE mm	CN H9 mm	EN h12 mm	ER mm	KK	LE min mm	N mm	O mm	Z	Weight kg	Part number	Stainless steel part number
32	20	48.0	55	43	10	14	14	M10x1.25	15	17	10.5	12°	0.08	**P1C-4KRS**	**P1S-4JRT**
40	22	56.0	62	50	12	16	16	M12x1.25	17	19	12.0	12°	0.12	**P1C-4LRS**	**P1S-4LRT**
50	28	72.0	80	64	16	21	21	M16x1.5	22	22	15.0	15°	0.25	**P1C-4MRS**	**P1S-4MRT**
63	28	72.0	80	64	16	21	21	M16x1.5	22	22	15.0	15°	0.25		
80	33	87.0	97	77	20	25	25	M20x1.5	26	32	18.0	15°	0.46	**P1C-4PRS**	**P1S-4PRT**
100	33	87.0	97	77	20	25	25	M20x1.5	26	32	18.0	15°	0.46		
125	51	123.5	137	110	30	37	35	M27x2	36	41	25.0	15°	1.28	**P1C-4RRS**	**P1S-4RRT**

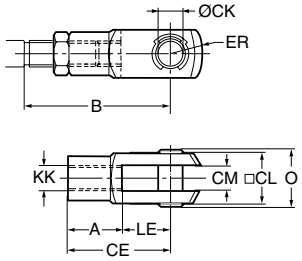
Clevis

Stainless Steel
Clevis

Clevis for articulated mounting of cylinder.

Materials:
Clevis, clip: Galvanized steel
Pin: Hardened steel

Clevis: Stainless steel
Pin: Stainless steel
Circlips according to DIN 471: Stainless steel



According to ISO 8140

Bore size mm	A mm	B min mm	B max mm	CE mm	CK h11/E9 mm	CL mm	CM mm	ER mm	KK	LE mm	O mm	Weight kg	Part number	Stainless steel part number
32	20	45.0	52	40	10	20	10	16	M10x1.25	20	28.0	0.09	**P1C-4KRC**	**P1S-4JRD**
40	24	54.0	60	48	12	24	12	19	M12x1.25	24	32.0	0.15	**P1C-4LRC**	**P1S-4LRD**
50	32	72.0	80	64	16	32	16	25	M16x1.5	32	41.5	0.35	**P1C-4MRC**	**P1S-4MRD**
63	32	72.0	80	64	16	32	16	25	M16x1.5	32	41.5	0.35		
80	40	90.0	100	80	20	40	20	32	M20x1.5	40	50.0	0.75	**P1C-4PRC**	**P1S-4PRD**
100	40	90.0	100	80	20	40	20	32	M20x1.5	40	50.0	0.75		
125	56	123.5	137	110	30	55	30	45	M27x2	54	72.0	2.10	**P1C-4RRC**	**P1S-4RRD**

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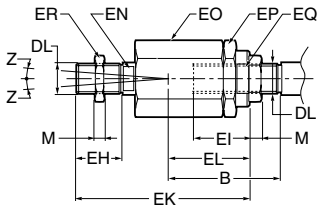
Cylinder Mountings

Flexo Coupling

Flexo coupling for articulated mounting of piston rod. Flexo fitting is intended to take up axial angle errors within a range of ±4°.

Materials:
Flexo coupling, nut: Zinc-plated steel
Socket: Hardened steel

Supplied complete with galvanized adjustment nut.



Bore size mm	B min mm	B max mm	DL	EH mm	EI mm	EK mm	EL mm	EN mm	EO mm	EP mm	EQ mm	ER mm	M mm	Z	Weight kg	Part number
32	36.0	43	M10x1.25	20	23	70	31	12	30	30	19	30	5.0	4°	0.21	**P1C-4KRF**
40	37.0	43	M12x1.25	23	23	67	31	12	30	30	19	30	6.0	4°	0.22	**P1C-4LRF**
50	53.0	61	M16x1.5	40	32	112	45	19	41	41	30	41	8.0	4°	0.67	**P1C-4MRF**
63	53.0	61	M16x1.5	40	32	112	45	19	41	41	30	41	8.0	4°	0.67	
80	57.0	67	M20x1.5	39	42	122	56	19	41	41	30	41	10.0	4°	0.72	**P1C-4PRF**
100	57.0	67	M20x1.5	39	42	122	56	19	41	41	30	41	10.0	4°	0.72	
125	75.5	89	M27x2	48	48	145	60	24	55	55	32	55	13.5	4°	1.80	**P1C-4RRF**

Nuts

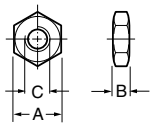
Intended for fixed mounting of accessories to the piston rod.

Materials:
Zinc plated steel

All P1D-B cylinders are delivered with a zinc-plated steel piston rod nut.

Stainless Steel Nut

Material:
Stainless steel A2



According to DIN 439 B

Bore size mm	A mm	B mm	C	Weight kg	Part numbers	
					Steel	Stainless steel
32	17	5.0	M10x1.25	0.007	**9128985601**	**9126725404**
40	19	6.0	M12x1.25	0.010	**0261109910**	**9126725405**
50	24	8.0	M16x1.5	0.021	**9128985603**	**9126725406**
63	24	8.0	M16x1.5	0.021		
80	30	10.0	M20x1.5	0.040	**0261109911**	**0261109921**
100	30	10.0	M20x1.5	0.040		
125	41	13.5	M27x2	0.100	**0261109912**	**0261109922**

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Sensors

New drop-in sensors

The P1D sensors can easily be installed from the side in the sensor groove, at any position along the piston stroke.

The sensors are completely recessed and thus mechanically protected. Choose between electronic or reed sensors and several cable lengths and 8 mm and M12 connectors.

The same standard sensors are used for all P1D versions.

Electronic sensors

The new electronic sensors are “Solid State”, i.e. they have no moving parts at all. They are provided with short-circuit protection and transient protection as standard. The built-in electronics make the sensors suitable for applications with high on and off switching frequency, and where very long service life is required.

Technical data

Design	GMR (Giant Magnetic Resistance) magneto-resistive function
Installation	From side, down into the sensor groove, so-called drop-in
Outputs	PNP, normally open (also available in NPN design, normally closed, on request)
Voltage range	10-30 VDC
Ripple	max 10%
Voltage drop	max 2.5 V
Load current	max 100 mA
Internal consumption	max 10 mA
Actuating distance	min 9 mm
Hysteresis	max 1.5 mm
Repeatability accuracy	max 0.2 mm
On/off switching frequency	max 5 kHz
On switching time	max 2 ms
Off switching time	max 2 ms
Encapsulation	IP 67 (EN 60529)
Temperature range	–25°C to +75°C
Indication	LED, yellow
Material housing	PA 12
Material screw	Stainless steel
Cable	PVC or PUR 3x0.25 mm^2 see order code respectively

Reed sensors

The sensors are based on proven reed switches, which offer reliable function in many applications. Simple installation, a protected position on the cylinder and clear LED indication are important advantages of this range of sensors.

Technical data

Design	Reed element
Mounting	From side, down into the sensor groove, so-called drop-in
Output	Normally open, or normally closed
Voltage range	10-30 VDC or 10-120 VAC
Load current	max 500 mA for 10-30 V or max 100 mA for 10-120 V
Breaking power (resistive)	max 6 W/VA
Actuating distance	min 9 mm
Hysteresis	max 1.5 mm
Repeatability accuracy	0.2 mm
On/off switching frequency	max 400 Hz
On switching time	max 1.5 ms
Off switching time	max 0.5 ms
Encapsulation	IP 67 (EN 60529)
Temperature range	–25°C to +75°C
Indication	LED, yellow
Material housing	PA12
Material screw	Stainless steel
Cable	PVC or PUR 3x0.14 mm^2 see order code respectively

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Sensors

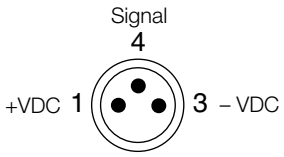
Ordering data

Output / function	Cable / connector	Weight (kg)	Part number
Electronic sensors, 10-30 VDC			
PNP type, normally open	0.27 m PUR-cable and 8 mm snap-in male connector	0.007	**P8S-GPSHX**
PNP type, normally open	0.27 m PUR-cable and M12 screw male connector	0.015	**P8S-GPMHX**
PNP type, normally open	3 m PVC-cable without connector	0.030	**P8S-GPFLX**
PNP type, normally open	10 m PVC-cable without connector	0.110	**P8S-GPFTX**
Reed sensors, 10-30 VDC / 10-120 VAC			
Normally open	0.27 m PUR-cable and 8 mm snap-in male connector	0.007	**P8S-GRSHX**
Normally open	0.27 m PUR-cable and M12 screw male connector	0.015	**P8S-GRMHX**
Normally open	3 m PVC-cable without connector	0.030	**P8S-GRFLX**
Normally open	10 m PVC-cable without connector	0.110	**P8S-GRFTX**

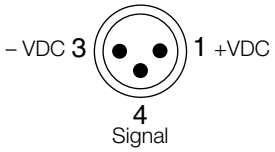
Note: For NPN sensors, see catalog PDN1000US-2

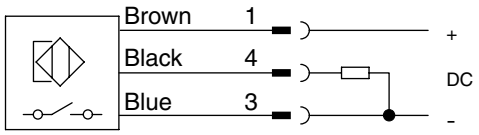
Electronic sensors

M8



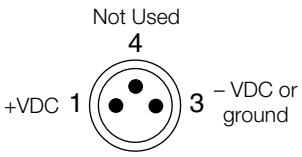
M12



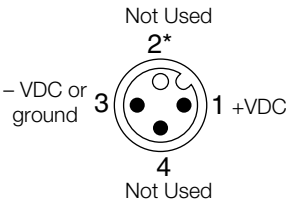


Reed sensors

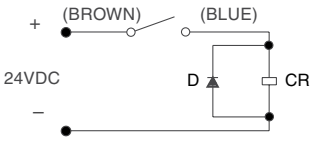
M8



M12

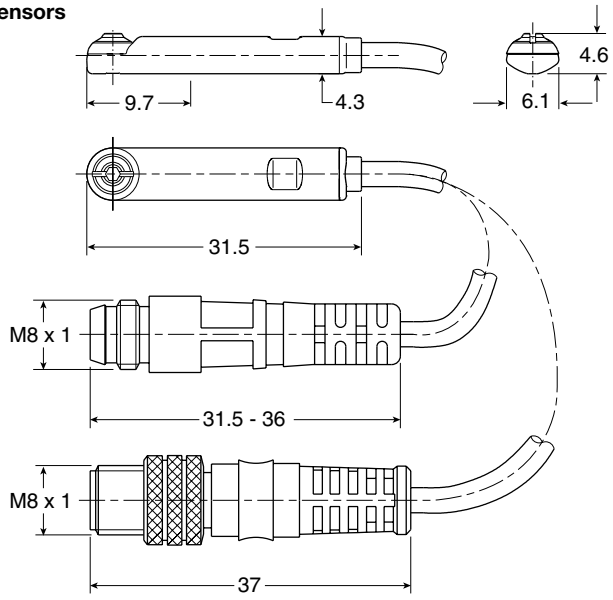


* Pin not present

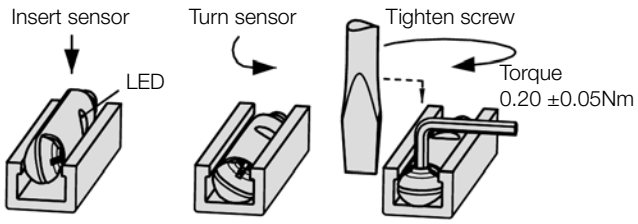


Dimensions

Sensors



Sensor Installation



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P1D-B Seal Kits

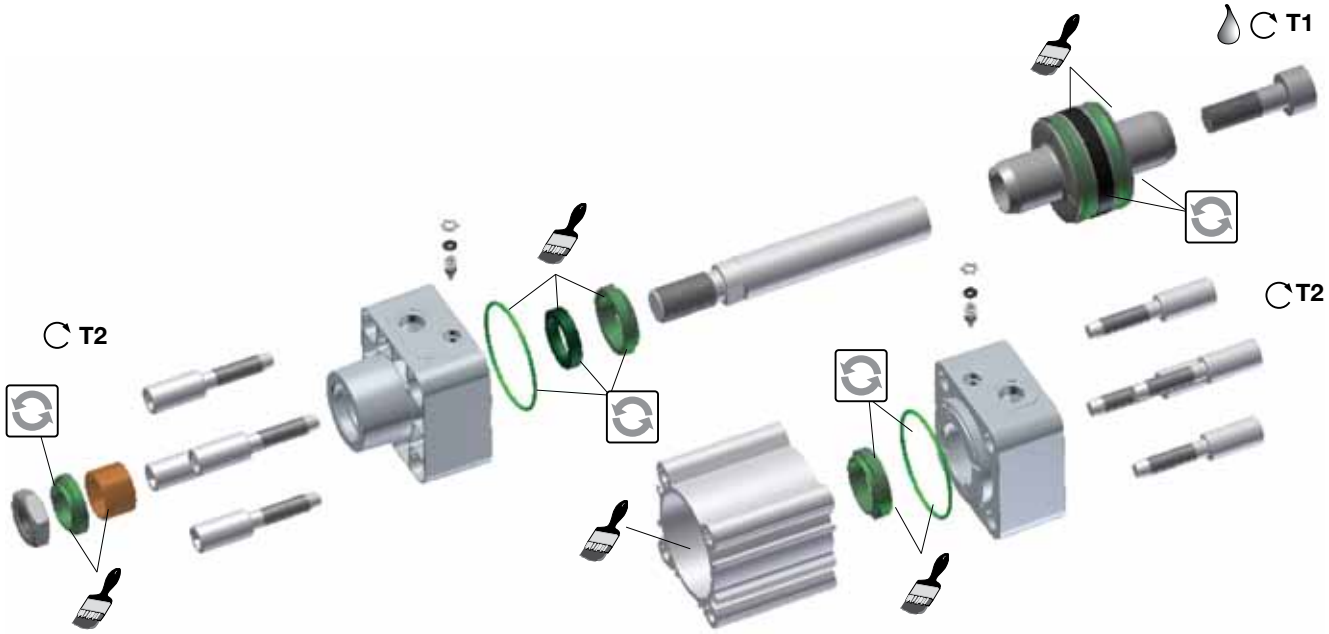
Order codes

Cylinder bore mm	P1D cylinder version Standard P1D-B
32	**P1D-6KRNB**
40	**P1D-6LRNB**
50	**P1D-6MRNB**
63	**P1D-6NRNB**
80	**P1D-6PRNB**
100	**P1D-6QRNB**
125	**P1D-6RRNB**

Grease

Standard	30g	**9127394541**

Seal kit



= Included in seal kit

= Socket head

= Tightening torque

= Lubricated with grease

= Locking fluid

Loctite 270 or Loctite 2701 locking fluid must be used

Cylinder dia. mm	Plastic piston T1 Nm	NV mm	T2 Nm	NV mm
32	4.5	6	8	6
40	11	8	8	6
50	20	10	20	8
63	20	10	20	8
80	40	14	20	6
100	120	14	20	6
125	120	14	70	8

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Selecting pneumatic system components

Cylinder to valve: The below chart contains recommendations for selecting air valve products based on 5.5 bar (80 psi) with a 0.35 bar (5 psi) pressure drop. The values within the chart show the corresponding Cv values.

Moduflex valve system

- Stand-alone valves, short-build valve manifold, or large valve manifold configurations available
- Cv range from 0.18 – 0.80
- Peripheral modules available— flow control, pressure regulation, P.O. check valves and vacuum generators

Cylinder speed (mm/s)	Cylinder bore size							
		32	40	50	63	80	100	125
	50	0.03	0.04	0.06	0.10	0.16	0.26	0.40
	100	0.05	0.08	0.13	0.20	0.33	0.51	0.80
	150	0.08	0.12	0.19	0.30	0.49	0.77	1.20
	200	0.10	0.16	0.26	0.41	0.65	1.02	1.60
	250	0.13	0.20	0.32	0.51	0.82	1.28	2.00
	300	0.16	0.25	0.38	0.61	0.98	1.53	2.40
	350	0.18	0.29	0.45	0.71	1.15	1.79	2.80
	400	0.21	0.33	0.51	0.81	1.31	2.04	3.20
	450	0.24	0.37	0.58	0.91	1.47	2.30	3.59
	500	0.26	0.41	0.64	1.01	1.64	2.56	3.99
		Size 1	Size 2		See larger valve system			

Isys Micro / ISO valve system

- Isys Micro Cv range 0.30 – 0.35
- IsysNet system fieldbus, Turck system fieldbus, 25 pin D-sub, or low cost Moduflex fieldbus options available
- Isys ISO offers 5 sizes with Cv range 0.55 – 6.0

Cylinder speed (mm/s)	Cylinder bore size							
		32	40	50	63	80	100	125
	50	0.03	0.04	0.06	0.10	0.16	0.26	0.40
	100	0.05	0.08	0.13	0.20	0.33	0.51	0.80
	150	0.08	0.12	0.19	0.30	0.49	0.77	1.20
	200	0.10	0.16	0.26	0.41	0.65	1.02	1.60
	250	0.13	0.20	0.32	0.51	0.82	1.28	2.00
	300	0.16	0.25	0.38	0.61	0.98	1.53	2.40
	350	0.18	0.29	0.45	0.71	1.15	1.79	2.80
	400	0.21	0.33	0.51	0.81	1.31	2.04	3.20
	450	0.24	0.37	0.58	0.91	1.47	2.30	3.59
	500	0.26	0.41	0.64	1.01	1.64	2.56	3.99
		Isys Micro	HB	HA		H1	H2	H3

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Application Guide

FRL to Valve: The chart below contains recommendations for the correct selection of Global Air Preparation units to suit the number and size of valves in a typical application.

	P31 Mini Series					P32 Compact Series						P33 Standard Series				
																
	Number of valves that would actuate at once															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Moduflex 1																
Isys Micro																
HB / Viking Xtreme																
Moduflex 2																
HA / Global ISO																
							See larger Parker FRL offering									

Actuator to FRL: The chart below contains recommendations for the correct selection of Global Air Preparation units suitable for each cylinder size.If you have a tube length over 2 m, choose one tube size larger than the chart. The table is based on a Maximum cylinder speed of 0.5m/s

Cyl Ø mm Cyl Ø inches		Cylinder bore size							
		32	40	45	50	63	75	80	100
Tube Ø mm Tube Ø inches		Tube diameter external							
		6 (1/4)	8 (5/16)	8 (5/16)	8 (5/16)	10 (3/8)	10 (3/8)	12 (1/2)	12 (1/2)
Number of cylinders actuating at once	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
		P32 Compact Series 		P33 Standard Series 			See larger Parker FRL offering		

Note: Data listed above is simply a guideline for a typical application only. Proper sizing and correct flow requirements must be taken into account.

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Fittings

P1D Fitting selection chart

P1D Bore size	32mm		40mm - 50mm		63mm - 80mm		100mm - 125mm	
Port size	1/8" BSPP		1/4" BSPP		3/8" BSPP		1/2" BSPP	
Tube size	4mm	6mm	6mm	8mm	8mm	10mm	10mm	12mm
Straight	F4PB4-1/8	F4PB6-1/8	F4PB6-1/4	F4PB8-1/4	F4PB8-3/8	F4PB10-3/8	F4PB10-1/2	F4PB12-1/2
Elbow	369PLP-4M-2G	369PLP-6M-2G	369PLP-6M-4G	369PLP-8M-4G	369PLP-8M-6G	369PLP-10M-6G	369PLP-10M-8G	369PLP12M-8G
Flow control	FCM731-4M-2G	FC731-6M-2G	FC731-6M-4G	FC731-8M-4G	FC731-8M-6G	FC731-10M-6G	–	FC6731-12M-8G
Port size	1/8" NPT		1/4" NPT		3/8" NPT		1/2" NPT	
Tube size	1/8"	1/4"	1/4"	3/8"	3/8"	1/2"	3/8"	1/2"
Straight	W68PLP-2-2	W68PLP-4-2	W68PLP-4-4	W68PLP-6-4	W68PLP-6-6	W68PLP-8-6	W68PLP-6-8	W68PLP-8-8
Elbow	W369PLP-2-2	W369PLP-4-2	W369PLP-4-4	W369PLP-6-4	W369PLP-6-6	W369PLP-8-6	W369PLP-6-8	W369PLP-8-8
Flow control	FCM731-2-2	FCC731-4-2	FCC731-4-4	FCC731-6-4	FCC731-6-6	–	–	FCC731-8-8

F4PB
Compact male connector BSPP

Tube size (mm)	BSPP	Part number
4	1/8	**F4PB4-1/8**
6	1/8	**F4PB6-1/8**
6	1/4	**F4PB6-1/4**
8	1/4	**F4PB8-1/4**
8	3/8	**F4PB8-3/8**
10	3/8	**F4PB10-3/8**
10	1/2	**F4PB10-1/2**
12	1/2	**F4PB12-1/2**

W68PLP
Male connector

Tube size	Pipe thd (NPTF)	Part number
1/8 inch	1/8	**W68PLP-2-2**
1/4 inch	1/8	**W68PLP-4-2**
1/4 inch	1/4	**W68PLP-4-4**
3/8 inch	1/4	**W68PLP-6-4**
3/8 inch	3/8	**W68PLP-6-6**
1/2 Inch	3/8	**W68PLP-8-6**
3/8 inch	1/2	**W68PLP-6-8**
1/2 Inch	1/2	**W68PLP-8-8**

369PLP
Male elbow - BSPP

Tube size (mm)	BSPP	Part number
4	1/8	**369PLP-4M-2G**
6	1/8	**369PLP-6M-2G**
6	1/4	**369PLP-6M-4G**
8	1/4	**369PLP-8M-4G**
8	3/8	**369PLP-8M-6G**
10	3/8	**369PLP-10M-6G**
10	1/2	**369PLP-10M-8G**
12	1/2	**369PLP-12M-8G**

W369PLP
Male elbow swivel 90°

Tube size	Thread NPT / UNF	Part number
1/8 inch	1/8	**W369PLP-2-2**
1/4 inch	1/8	**W369PLP-4-2**
1/4 inch	1/4	**W369PLP-4-4**
3/8 inch	1/4	**W369PLP-6-4**
3/8 inch	3/8	**W369PLP-6-6**
1/2 Inch	3/8	**W369PLP-8-6**
3/8 inch	1/2	**W369PLP-6-8**
1/2 Inch	1/2	**W369PLP-8-8**

FCM731
Miniature flow control - BSPP

Tube size (mm)	BSPP	Part number
4	1/8	**FCM731-4M-2G**
6	1/8	**FCM731-6M-2G**
6	1/4	**FCM731-6M-4G**
8	1/4	**FCM731-8M-4G**
8	3/8	**FCM731-8M-6G**
10	3/8	**FCM731-10M-6G**
12	1/2	**FCM731-12M-8G**

FCC / FCM 731
Miniature flow control

Tube size	NPT	Part number
1/4 inch	1/8	**FCC731-4-2**
1/4 inch	1/4	**FCC731-4-4**
3/8 inch	1/4	**FCC731-6-4**
3/8 inch	3/8	**FCC731-6-6**
1/2 inch	1/2	**FCC731-8-8**
1/8 inch	1/8	**FCM731-2-2**

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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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6. LIMITATION OF LIABILITY. UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. **IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**

7. User Responsibility. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

8. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Special Tooling. A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

10. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. Improper use and Indemnity. Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

12. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

13. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

14. Force Majeure. Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure") Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

15. Waiver and Severability. Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

16. Termination. Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appointments a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) the dissolves or liquidates all or a majority of its assets.

17. Governing Law. This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.

18. Indemnity for Infringement of Intellectual Property Rights. Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

19. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

20. Compliance with Law, U. K. Bribery Act and U.S. Foreign Corrupt Practices Act. Buyer agrees to comply with all applicable laws and regulations, including both those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which the Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.

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