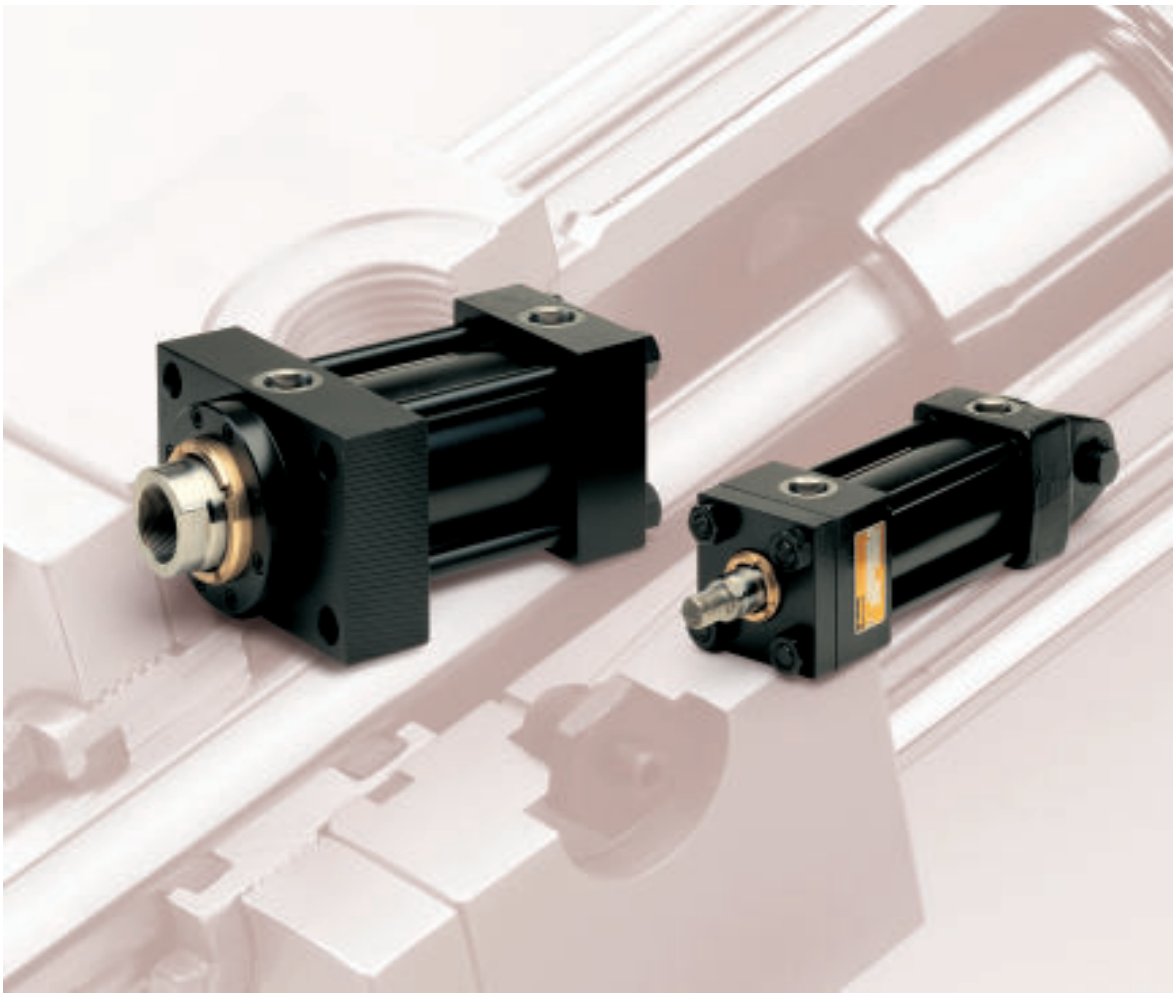
Parker
Hydraulics

HMI/HMD
Tie Rod Cylinders

HMI Metric Cylinders to ISO 6020/2 (1991)
HMD Metric Cylinders to DIN 24 554

For working pressures up to 210 bar

Catalogue 1150/5-GB



ISO and DIN – a Comparison of Features

Parker's HMI and HMD metric cylinders have been designed to meet the requirements of ISO 6020/2 (1991) and DIN 24 554, 160 Bar Compact Series. They may be used for working pressures up to 210 bar.

All the cylinders illustrated below satisfy the ISO standard; the five mounting styles highlighted also meet DIN 24 554. ISO and DIN versions of these five cylinders are interchangeable, differing only in the design of the Style JJ mounting flange.

From the summary of the ISO and DIN ranges below, it will be seen that the ISO range offers a considerably wider choice of standard options than is available under DIN.

For ease of reference, each range is treated separately in this catalogue – see 'How to Use This Catalogue' opposite.

Information about the ISO range starts on page 9, with details of the DIN range beginning on page 18.

DIN 24 554 Cylinder Range

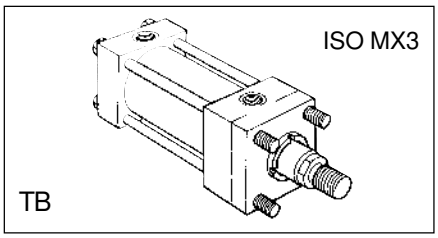
- **5 mounting styles**
- **2 rod sizes per bore size**
- **1 male rod end thread per bore size**

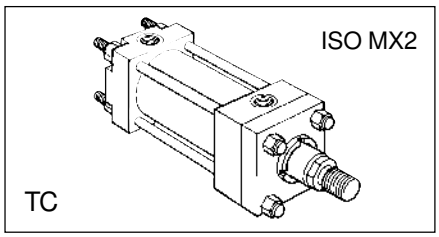
ISO 6020/2 Cylinder Range

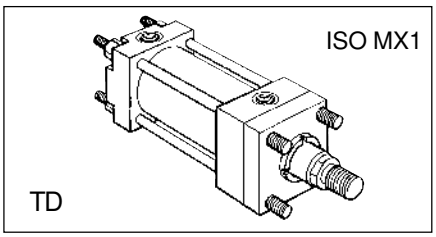
- **12 standard mounting styles**
- **Up to 3 rod sizes per bore**
- **Up to 3 male and 3 female rod end threads per bore**
- **Wider range of mounting and rod end accessories**
- **Wider range of special features**

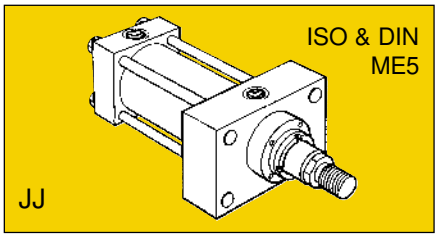
ISO and DIN Ranges

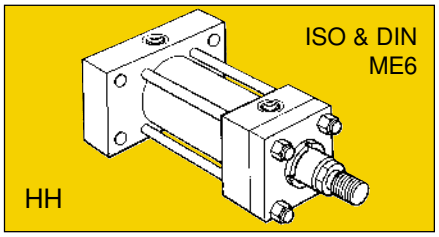
- **Working pressure up to 210 bar**
- **Bore sizes – 25mm to 200mm**
- **Piston rod diameters – 12mm to 140mm**
- **Single and double rod designs available**
- **Strokes – available in any practical stroke length**
- **Cushions – available at either or both ends**
- **Fluids and Seals – five seal types to suit a wide range of fluid specifications**
- **Temperature ranges – -20°C to +150°C depending on fluid and seal types**

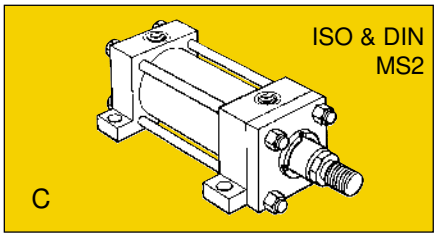


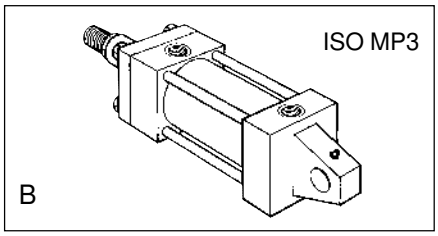


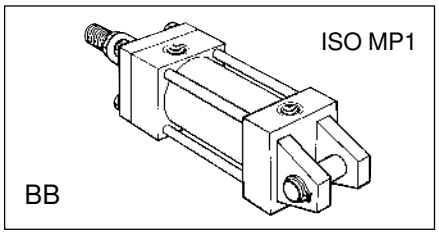


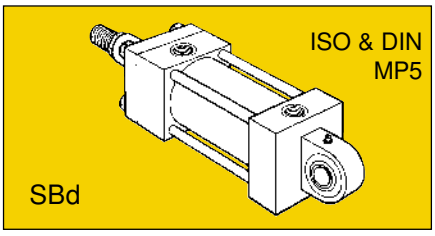


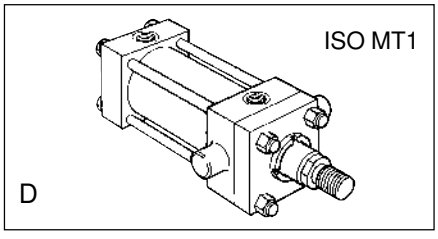


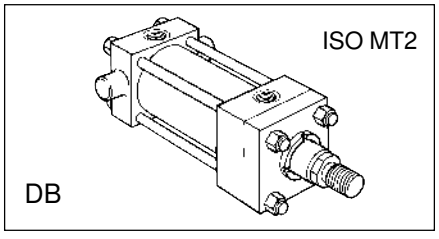


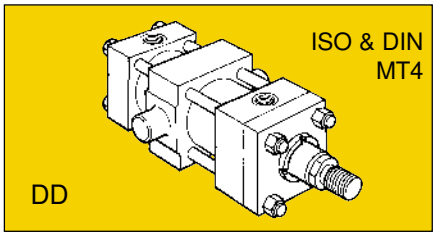






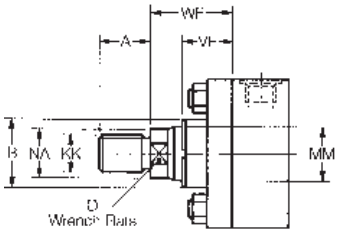




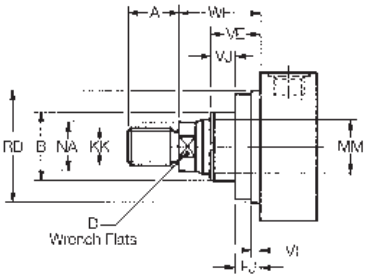


Piston Rod End Data and Threads

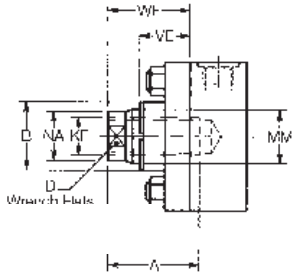
Rod End Styles 4 & 7 – All Except JJ Mount



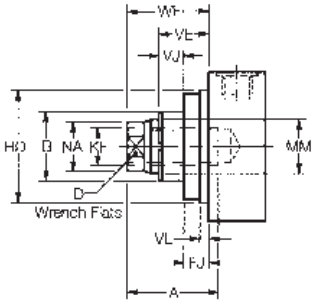
Rod End Styles 4 & 7 – JJ Mount



Rod End Style 9 – All Except JJ Mount



Rod End Style 9 – JJ Mount



Rod End Styles 4 & 7

The smallest diameter rod end thread for each bore size is designated Style 4 when supplied with a No.1 rod. When the same rod end thread is supplied with a No.2 or No.3 rod, it is designated Style 7.

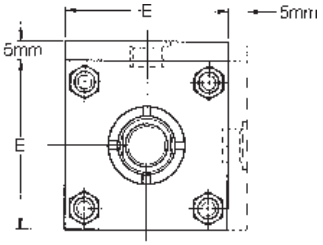
Rod End Style 9 – Short Stroke Cylinders

Style 9 (female) rod ends should not be used on 160mm or 200mm bore cylinders with a stroke of 50mm or less. Please consult the factory, with details of the application.

Rod End Style 3

Non-standard piston rod ends are designated 'Style 3'. A dimensional sketch or description should accompany the order. Please specify dimensions KK or KF, A, rod stand out (WF – VE) and thread form.

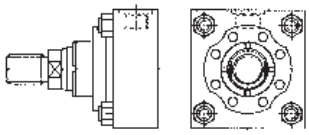
25 & 32mm Bore Cylinders



5mm extra height applies to port face at head end only.

Gland Retainer – 160 and 200mm Bore

On all 160mm and 200mm bore ISO mounting styles except TB and TD, the gland retainer is separately bolted to the head, as shown.



Piston Rod End Dimensions – Check pressure limitations of piston rods on page 31

Bore ϕ	Rod No.	MM Rod ϕ	Style 4 KK	Style 4 A	Style 7 KK	Style 7 A	Style 9 KF	Style 9 A	B f9	D	NA	VE	WF	JJ Mount Only VL min	JJ Mount Only RD f8	JJ Mount Only VJ	JJ Mount Only FJ
25	1	12	M10x1.25	14	-	-	M8x1	14	24	10	11	16	25	3	38	6	10
	2	18	M14x1.5	18	M10x1.25	14	M12x1.25	18	30	15	17	16					
32	1	14	M12x1.25	16	-	-	M10x1.25	16	26	12	13	22	35	3	42	12	10
	2	22	M16x1.5	22	M12x1.25	16	M16x1.5	22	34	18	21	22					
40	1	18	M14x1.5	18	-	-	M12x1.25	18	30	15	17	16	35	3	62	6	10
	2	28	M20x1.5	28	M14x1.5	18	M20x1.5	28	42	22	26	22				12	
50	1	22	M16x1.5	22	-	-	M16x1.5	22	34	18	21	22	41	4	74	6	16
	2	36	M27x2	36	M16x1.5	22	M27x2	36	50	30	34	25				9	
	3	28	M20x1.5	28	M16x1.5	22	M20x1.5	28	42	22	26	22				6	
63	1	28	M20x1.5	28	-	-	M20x1.5	28	42	22	26	22	48	4	75	6	16
	2	45	M33x2	45	M20x1.5	28	M33x2	45	60	39	43	29			88	13	
	3	36	M27x2	36	M20x1.5	28	M27x2	36	50	30	34	25				9	
80	1	36	M27x2	36	-	-	M27x2	36	50	30	34	25	51	4	82	5	20
	2	56	M42x2	56	M27x2	36	M42x2	56	72	48	54	29			105	9	
	3	45	M33x2	45	M27x2	36	M33x2	45	60	39	43	29					
100	1	45	M33x2	45	-	-	M33x2	45	60	39	43	29	57	5	92	7	22
	2	70	M48x2	63	M33x2	45	M48x2	63	88	62	68	32			125	10	
	3	56	M42x2	56	M33x2	45	M42x2	56	72	48	54	29				7	
125	1	56	M42x2	56	-	-	M42x2	56	72	48	54	29	57	5	105	9	20
	2	90	M64x3	85	M42x2	56	M64x3	85	108	80	88	32			150	10	22
	3	70	M48x2	63	M42x2	56	M48x2	63	88	62	68	32					
160	1	70	M48x2	63	-	-	M48x2	63	88	62	68	32	57	5	125	10	22
	2	110	M80x3	95	M48x2	63	M80x3	95	133	100	108	32			170	7	25
	3	90	M64x3	85	M48x2	63	M64x3	85	108	80	88	32					
200	1	90	M64x3	85	-	-	M64x3	85	108	80	88	32	57	5	150	10	22
	2	140	M100x3	112	M64x3	85	M100x3	112	163	128	138	32			210	7	25
	3	110	M80x3	95	M64x3	85	M80x3	95	133	100	108	32					

All dimensions are in millimetres unless otherwise stated.

Model Numbers

Each Parker series HMI cylinder is assigned a model number consisting of coded symbols. To develop a model number, select those symbols that represent the cylinder features which you require, and put them down in the sequence indicated by the example below.

Double Rod Cylinders

For double rod cylinders, specify rod number and rod end symbols for both piston rods. A typical model number for a double rod cylinder would be:

100	K	JJ	HMI	R	N	1	4	M	1	4	M	125	A1	11	44

Feature	Description	Page	Symbol
Bore	Millimetres		–
Cushion – Head	If required	29	C
Double Rod	If required	14	K
Mounting Style	Head Tie Rods Extended	10	TB
	Cap Tie Rods Extended	10	TC
	Both Ends Tie Rods Extended	10	TD
	Head Rectangular Flange	11	JJ
	Cap Rectangular Flange	11	HH
	Side Lugs	11	C
	Cap Fixed Eye	12	B
	Cap Fixed Clevis	12	BB
	Cap Fixed Eye with Spherical Bearing	12	SBd
	Head Trunnion	13	D
	Cap Trunnion	13	DB
	Intermediate Fixed Trunnion	13	DD
Mounting Modifications	Thrust Key for Style C mounting only	24	P
Series	Series name		HMI
Ports	BSP (ISO 228) – standard	33	R
	Metric to DIN 3852 Pt. 1– optional	33	M
	Metric to ISO 6149 – optional	33	Y
Piston	Standard Piston	7	N
	LoadMaster – optional	7	Z
	Low Friction (includes gland) – optional	7	PF
Special Features	One or more of the following:		S
	Gland Drain Port	35	
	Oversize Ports	33	
	Rod End Bellows	35	
	Stop Tube	27	
	Stroke Adjuster	35	
	Tie Rod Supports	25	
	Water Service Modifications	34	
	Or to detailed descriptions or drawings supplied by customer		
Piston Rod Number	Rod No.1	3	1
	Rod No.2	3	2
	Rod No.3	3	3
Piston Rod End	Style 4	3	4
	Style 7	3	7
	Style 9	3	9
	Style 3 (Special) Please supply description or drawing	3	3
Rod Thread	Metric (standard)	3	M
Cushion – Cap	If required	29	C
Net Stroke	Millimetres		-
Fluid Medium ISO 6743/4 (1982)	Mineral Oil HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606 Oil, Air, Nitrogen – Group 1	34	M
	Water Glycol HFC – Group 2	34	C
	Fire-resistant fluids based on phosphate esters HFD-R – Group 5	34	D
	Water, Oil in Water emulsion 95/5 HFA – Group 6	34	A1
	Water in Oil emulsion 60/40 HFB – Group 7	34	B
Port Positions	Head position 1-4	33	1
	Cap position 1-4	33	1
Air Bleeds	Head position 1-4	33	4
	Cap position 1-4	33	4
	No Air Bleed	33	00
Accessories [1]	When required, include in order	15, 35	–

Example																	
80	C	K	C	P	HMI	R	N	S	1	4	M	C	230	D	11	44

Key: • Essential information
○ Optional features

[1] Please state on order whether accessories are to be assembled to cylinder or supplied separately.

How to Use This Catalogue

Both the HMD range of cylinders, to DIN 24 554, and the more extensive HMI range of cylinders to ISO 6020/2 (1991), are described in this catalogue. HMD cylinders can be found on the pages with yellow edges; blue-edged pages contain information about the HMI range. Plain pages contain design information which is applicable to both cylinder ranges.

Fold-out sections at the front and rear of the catalogue contain rod end data for ISO and DIN cylinders respectively, and should be used in conjunction with the cylinder dimensions shown on pages 10–13 for ISO and 19–20 for DIN cylinders.

inPHorm

European cylinder inPHorm is Parker Hannifin's new product selection program that helps you to select the correct cylinder for your application. The program prompts for the details of the application, makes the necessary design calculations, and selects a suitable cylinder.

inPHorm can also generate CAD drawings of the selected part, which can be viewed in other software applications, and customised and imported into other CAD packages. Please contact your local Sales Office for further information.

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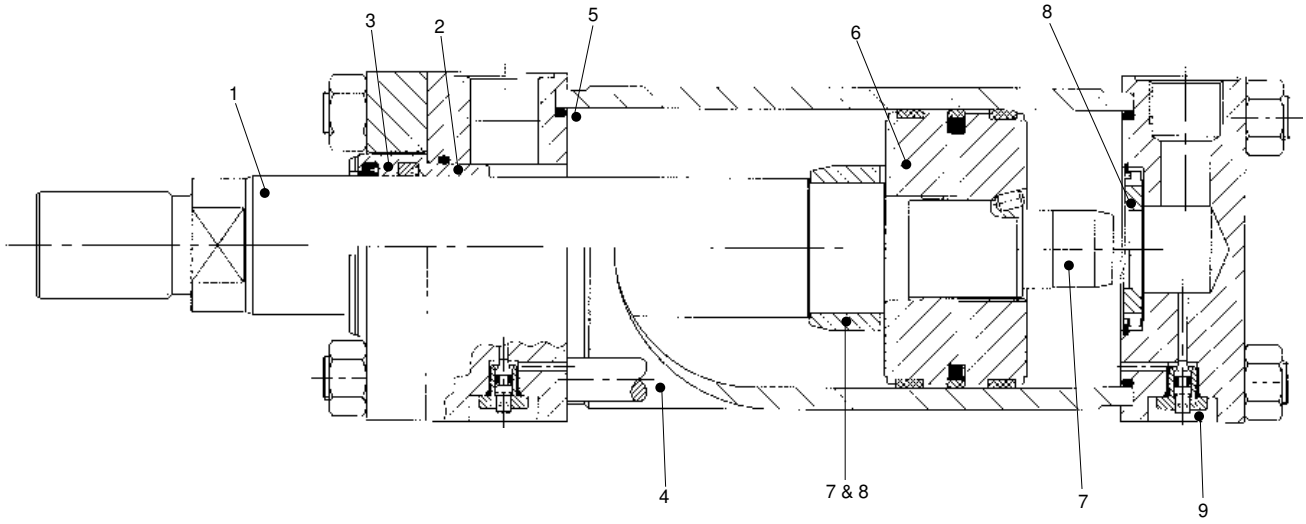
Introduction

Parker Hannifin Corporation is a world leader in the manufacture of components and systems for motion control. Parker has more than 800 product lines for hydraulic, pneumatic and electro-mechanical applications in some 1200 industrial and aerospace markets. With more than 34,000 employees and some 210 manufacturing plants and administrative offices around the world, Parker provides customers with technical excellence and first class customer service. Parker Hannifin's Cylinder Division is the world's largest supplier of hydraulic cylinders for industrial applications.

The HMI and HMD ranges described in this catalogue are 160 bar Compact Series cylinders to ISO 6020/2 and DIN 24 554, rated for use at working pressures up to 210 bar depending on the rod end and type of service. They have been designed to satisfy the requirements of a wide range of industries in which cylinders to ISO or DIN standards are specified.

In addition to the standard cylinders featured in this catalogue, HMI and HMD cylinders can be designed to suit customer requirements. Our engineers will be pleased to advise on unique designs to suit specific applications.

Note: In line with our policy of continuing product improvement, specifications in this catalogue are subject to change without notice.



1 Piston Rod

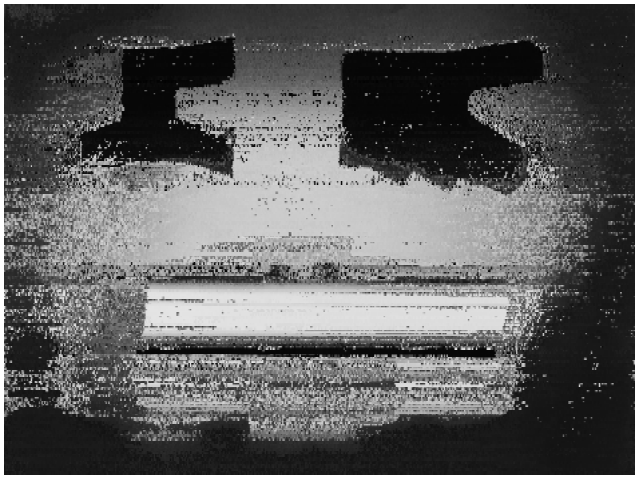
Gland seal life is maximised by manufacturing piston rods from precision ground, high tensile carbon alloy steel, hard chrome plated and polished to 0.2µm max. Piston rods are induction case hardened to Rockwell C54 minimum before chrome plating, resulting in a dent-resistant surface.

2 Parker's 'Jewel' Gland

Continuous lubrication, and therefore longer gland life, are provided by the long bearing surface inboard of the lipseal. The Jewel gland, complete with rod seals, can easily be removed without dismantling the cylinder, so servicing is quicker – and therefore more economical.

3 Rod Seals

The serrated lipseal has a series of sealing edges which take over successively as pressure increases, providing efficient sealing under all operating conditions. On the return stroke the serrations act as a check valve, allowing the oil adhering to the rod to pass back into the cylinder.



The double lip wiperseal acts as a secondary seal, trapping excess lubricating film in the chamber between the wiper and lip seals. Its outer lip prevents the ingress of dirt into the cylinder, extending the life of gland and seals.

Standard lipseals are manufactured from an enhanced polyurethane, giving efficient retention of pressurized fluid and a service life of up to five times that of traditional seal materials. Standard seals are suitable for speeds of up to 0.5m/s – special seal combinations including PTFE are available for higher speed applications.

4 Cylinder Body

Strict quality control standards and precision manufacture ensure that all tubes meet rigid standards of straightness, roundness and surface finish. The steel tubing is surface finished to minimise internal friction and prolong seal life.

5 Cylinder Body Seals

To make sure that the cylinder body remains leaktight, even under pressure shock conditions, Parker fits pressure-energised body seals.

6 One-Piece Piston

Side loading is resisted by the wear rings on the piston. A long thread engagement secures the piston to the piston rod and, as an added safety feature, pistons are secured by both a thread-locking compound and a locking pin. Three standard seal combinations are available to suit different applications – see 'Piston Seals' opposite.

7 Cushioning

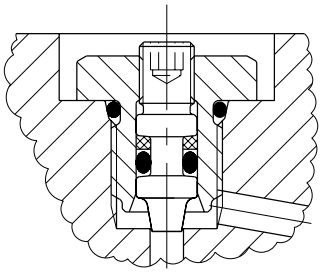
Progressive deceleration is available by using profiled cushions at the head and cap – see page 29 for details. The head end cushion is self centring, while the polished cap end spear is an integral part of the piston rod.

8 Floating Cushion Bushes & Sleeves

Closer tolerances – and therefore more effective cushioning – are permitted by the use of a floating cushion sleeve at the head end of the cylinder, and a floating cushion bush at the cap end. A specially designed cushion sleeve on bore sizes up to 100mm operates as a check valve. On larger bore sizes a conventional ball check valve is used. The use of a check valve in the head and lifting of the bronze cushion bush in the cap, provides minimum fluid restriction to the start of the return stroke. This allows full pressure to be applied over the whole area of the piston, to provide full power and fast cycle times.

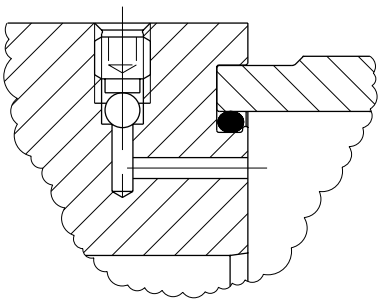
9 Cushion Adjustment

Needle valves are provided at both ends of the cylinder for precise cushion adjustment, and retained within the head and cap so that they cannot be inadvertently removed. The cartridge type needle valve illustrated below is fitted to cylinders of up to 63mm bore – see page 33.



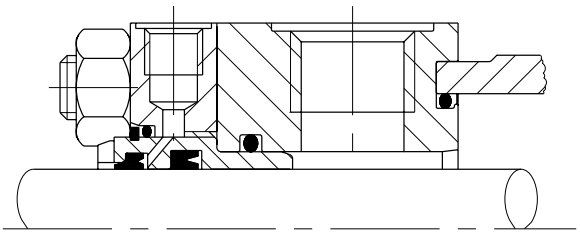
Air Bleeds

Available as an option at both ends, the air bleeds are recessed into the head and cap and retained so that they cannot be inadvertently removed.



Gland Drains

The accumulation of fluid behind the gland wiperseal of long stroke cylinders, or cylinders with constant back pressure, can be relieved by specifying the option of a gland drain. A port between the wiperseal and lipseal allows fluid to be piped back to a reservoir. By fitting a transparent tube between the port and



the reservoir, fluid loss from concealed or inaccessible cylinders can be monitored to provide an early indication of the need for gland servicing. Gland drains are described in greater detail on page 35.

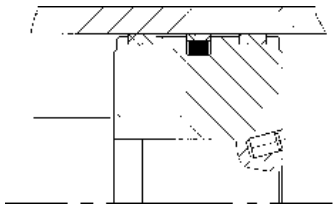
Special Designs

Parker's design and engineering staff are available to produce special designs to meet customer's specific requirements. Alternative sealing arrangements, special mounting styles, different bores and rod sizes are just a few of the custom features which can be supplied.

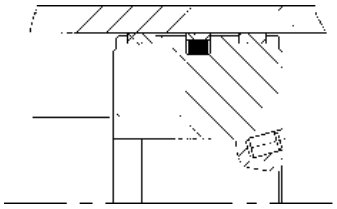
Piston Seals

A variety of piston seal options are available, to suit different applications.

Standard Pistons are suitable for holding a load in position, as the piston seals are leak-tight under normal operating conditions. Wear rings prevent metal-to-metal contact. Standard piston seals are fitted as standard on HMI and HMD series cylinders, and are suitable for piston speeds up to 1 m/s.



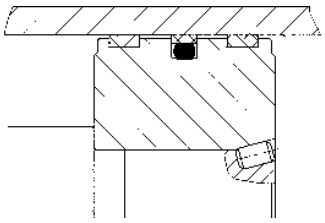
LoadMaster Pistons employ extra heavy duty wear rings to resist side loading and are recommended for long stroke cylinders, especially when pivot mounted.



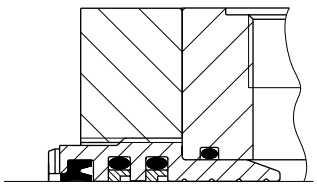
Servo Cylinders

Servo cylinders permit fine control of acceleration, velocity and position in applications where very low friction and an absence of stick-slip are required. They may be used in conjunction with integral or external transducers. Servo cylinders combine low friction piston and gland seals with specially selected tubes and rods.

Low Friction Pistons employ a PTFE seal and PTFE wear rings, and may be used for piston speeds up to 1 m/s. They are not suitable for supporting loads in a fixed position.



Low Friction Gland Seals comprise two low friction PTFE stepped seals and a conventional double lip wiper seal – see page 34.



Seal Classes

To accommodate the many types of fluids and the varying temperature ranges used in industry, Parker offers a range of rod gland, piston and body seals moulded in different profiles and from different materials. These are described in detail on page 34.

Check List

The following check list indicates the principal factors which should be considered when selecting a hydraulic cylinder for a particular application. Further information is available on the pages shown. If more detailed information is required about any aspect of a cylinder's specification, please contact our design engineers who will be happy to assist.

inPHorm

The European cylinder inPHorm program can assist with the selection and specification of an hydraulic cylinder for a particular application. Please ask for 1260/1-Eur.

	Series HMI – ISO	**Series HMD – DIN**
1 Establish System Parameters – Weight to be moved and force required – Nominal operating pressure and range – Distance to be travelled – Average and maximum piston speed – Fluid medium		
	See Pages	See Pages
2 Mounting Style Select the appropriate style for the specific application	9 & 24	18 & 24
3 Cylinder Bore and Operating Pressure Determine the bore and system pressure required to provide the necessary force	26	26
4 Piston Rod		
Single or double rod?	10/14	19/21
Determine the minimum rod diameter required to withstand buckling forces	27	27
Is a stop tube required?	27	27
Select a suitable rod end and rod end thread	3	38
Check pressure rating of selected cylinder and piston rod	31	31
5 Piston		
Does seal type suit application?	7	7
6 Cushioning		
Select cushioning requirements if applicable	29	29
7 Ports		
Select suitable ports Are they capable of the speed required? Are the standard positions acceptable?	33	33
8 Seals		
Select seals to suit the chosen fluid medium and temperature range	6 & 34	6 & 34
9 Rod and Cap End Accessories		
Are rod end and/or cap end accessories required?	15	22
10 Optional Features		
Air bleeds, gland drains, rod end bellows etc.	35	35

Parker Hannifin plc
Cylinder Division
Watford, Herts.

ISO Cylinder Mounting Styles and Where to Find Them

The standard range of Parker HMI cylinders comprises 12 ISO mounting styles, to suit the majority of applications. General guidance for the selection of ISO cylinders is given below, with dimensional information about each mounting style shown on the pages indicated. Application-specific mounting information is shown on page 24.

Where a non-standard mounting style is required to satisfy a particular application, our design engineers will be happy to assist. Please contact the factory for details.

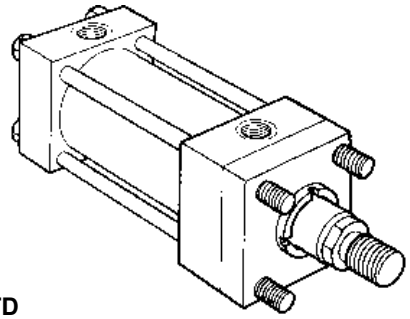
Extended Tie Rods
Cylinders with TB, TC and TD mountings are suitable for straight line force transfer applications, and are particularly useful where space is limited. For compression (push) applications, cap end tie rod mountings are most appropriate; where the major load places the piston rod in tension (pull applications), head end mounting styles should be specified. Cylinders with tie rods extended at both ends may be attached to the machine member from either end, allowing the free end of the cylinder to support a bracket or switch.

Flange Mounted Cylinders
These cylinders are also suitable for use on straight line force transfer applications. Two flange mounting styles are available, offering either a head flange (JJ) or a cap flange (HH). Selection of the correct flange mounting style depends on whether the major force applied to the load will result in compression (push) or tension (pull) stresses on the piston rod. For compression-type applications, the cap mounting style is most appropriate; where the major load places the piston rod in tension, a head mounting should be specified.

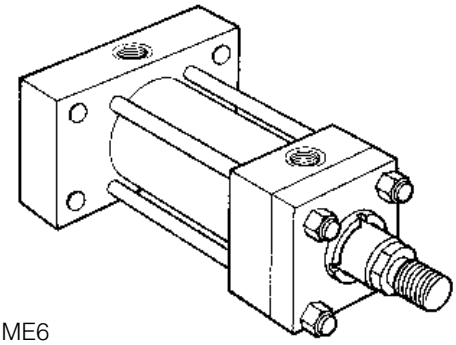
Foot Mounted Cylinders
Style C, foot mounted cylinders do not absorb forces on their centreline. As a result, the application of force by the cylinder produces a turning moment which attempts to rotate the cylinder about its mounting bolts. It is important, therefore, that the cylinder should be firmly secured to the mounting surface and that the load should be effectively guided, to avoid side loads being applied to rod gland and piston bearings. A thrust key modification may be specified to provide positive cylinder location – see page 24.

Pivot Mountings
Cylinders with pivot mountings, which absorb forces on their centrelines, should be used where the machine member to be moved travels in a curved path. Pivot mountings may be used for tension (pull) or compression (push) applications. Cylinders using a fixed clevis, styles BB and B, may be used if the curved path of the piston rod travel is in a single plane; for applications where the piston rod will travel in a path either side of the true plane of motion, a spherical bearing mounting SBd is recommended.

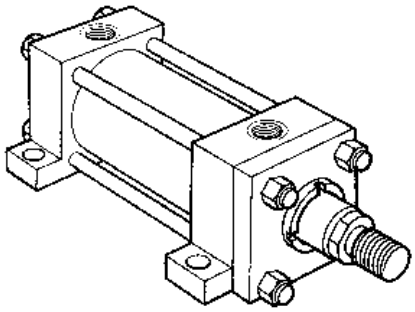
Trunnion Mounted Cylinders
These cylinders, styles D, DB and DD, are designed to absorb force on their centrelines. They are suitable for tension (pull) or compression (push) applications, and may be used where the machine member to be moved travels in a curved path in a single plane. Trunnion pins are designed for shear loads only and should be subjected to minimum bending stresses.



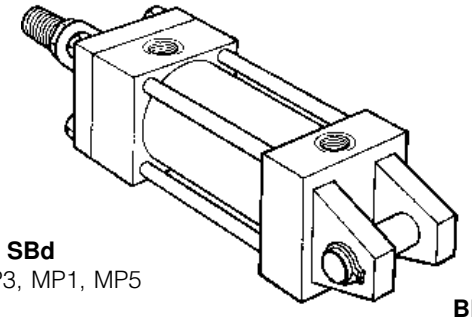
Styles TB, TC, TD
ISO Styles MX3, MX2, MX1
See page 10
TB



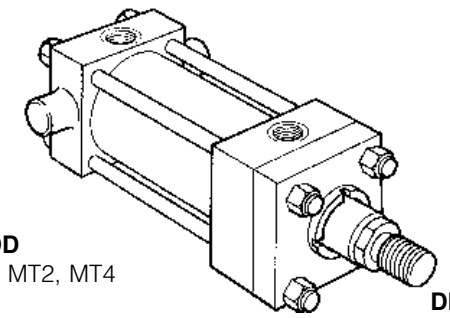
Styles JJ, HH
ISO Styles ME5, ME6
See page 11
HH



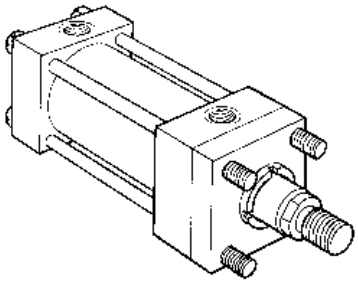
Style C
ISO Style MS2
See page 11
C



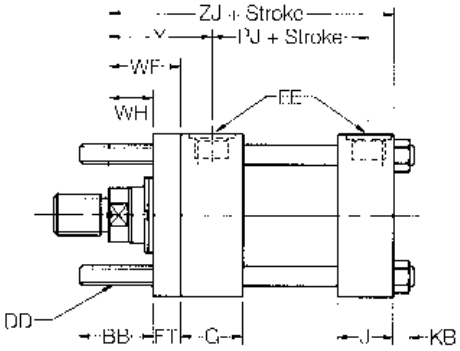
Styles B, BB, SBd
ISO Styles MP3, MP1, MP5
See page 12
BB

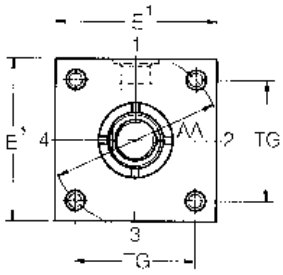


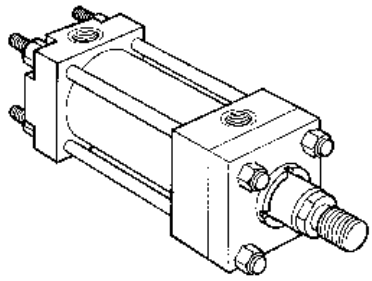
Styles D, DB, DD
ISO Styles MT1, MT2, MT4
See page 13
DB



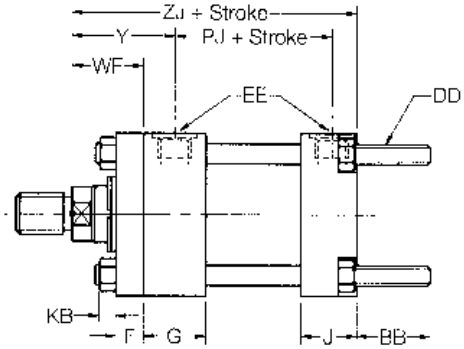
Style TB
Tie Rods Extended Head End
(ISO Style MX3)

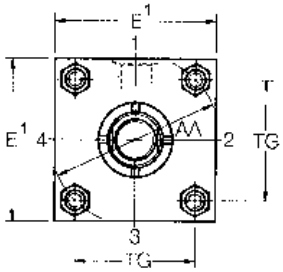


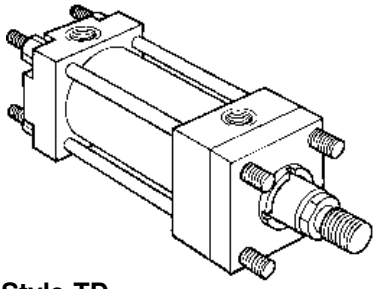




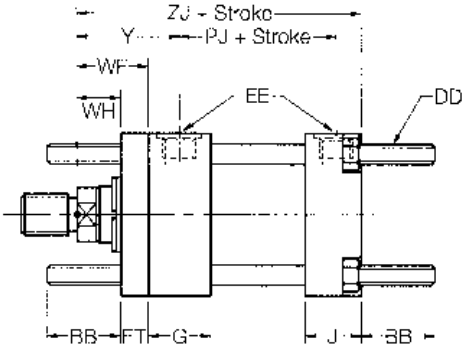
Style TC
Tie Rods Extended Cap End
(ISO Style MX2)

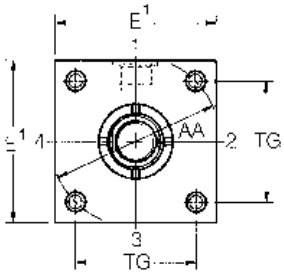






Style TD
Tie Rods Extended Both Ends
(ISO Style MX1)





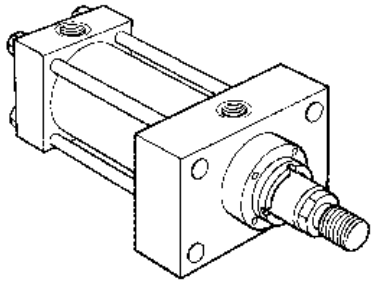
[1] Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders – see page 3

Dimensions – TB, TC & TD

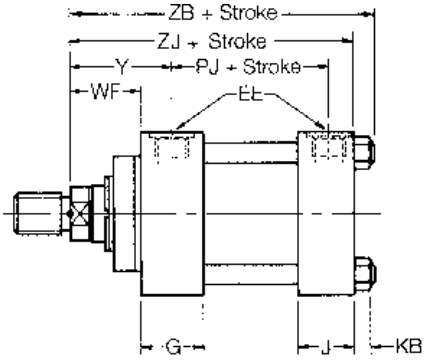
See also Dimensions, page 3 & Mounting Information, page 24

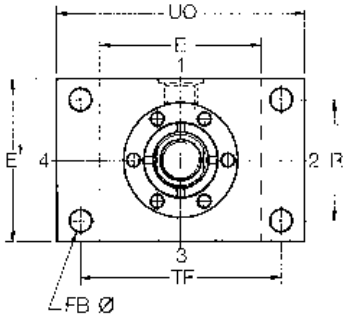
Bore ϕ	AA	BB	DD	E	EE BSP/G inches	F	FT	G	J	KB	TG	WF	WH	Y	+ Stroke	
															PJ	ZJ
25	40	19	M5x0.8	40 [1]	1/4	10	10	40	25	4	28.3	25	15	50	53	114
32	47	24	M6x1	45 [1]	1/4	10	10	40	25	5	33.2	35	25	60	56	128
40	59	35	M8x1	63	3/8	10	10	45	38	6.5	41.7	35	25	62	73	153
50	74	46	M12x1.25	75	1/2	16	16	45	38	10	52.3	41	25	67	74	159
63	91	46	M12x1.25	90	1/2	16	16	45	38	10	64.3	48	32	71	80	168
80	117	59	M16x1.5	115	3/4	20	20	50	45	13	82.7	51	31	77	93	190
100	137	59	M16x1.5	130	3/4	22	22	50	45	13	96.9	57	35	82	101	203
125	178	81	M22x1.5	165	1	22	22	58	58	18	125.9	57	35	86	117	232
160	219	92	M27x2	205	1	25	25	58	58	22	154.9	57	32	86	130	245
200	269	115	M30x2	245	1.1/4	25	25	76	76	24	190.2	57	32	98	165	299

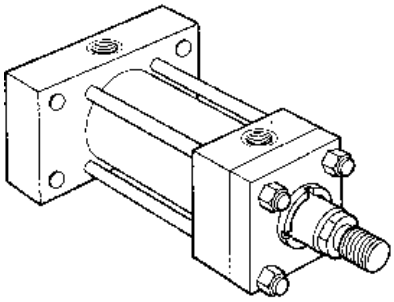
All dimensions are in millimetres unless otherwise stated.



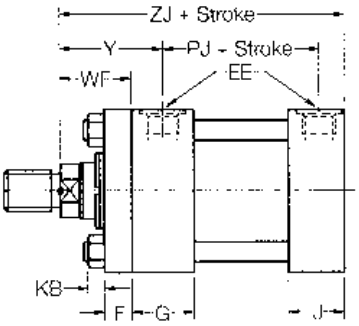
Style JJ
Head Rectangular Flange
(ISO Style ME5)

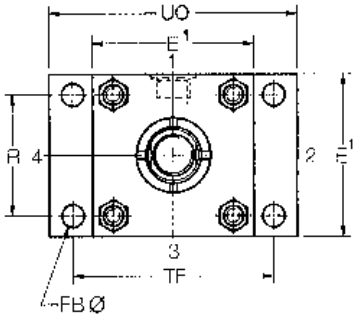


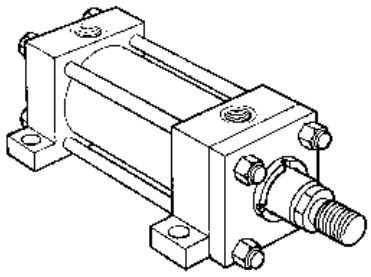




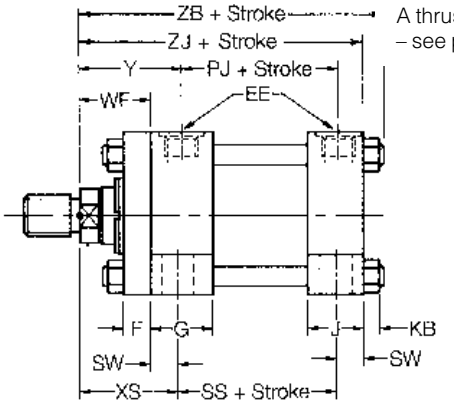
Style HH
Cap Rectangular Flange
(ISO Style ME6)



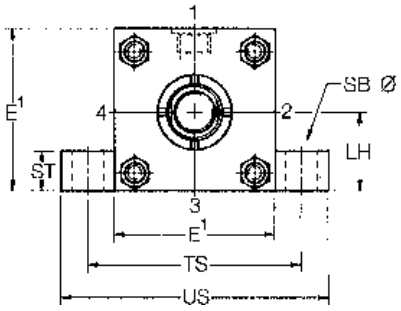




Style C
Side Lugs
(ISO Style MS2)



A thrust key may be used with this mounting style – see page 24.

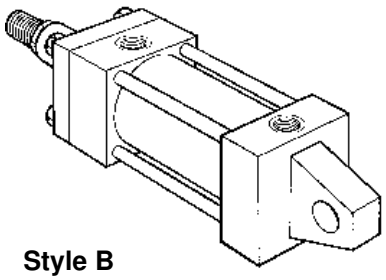


[1] Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders, except Style JJ in port positions 2 and 4 – see pages 3 and 33

Dimensions – JJ, HH & C See also Dimensions, page 3 & Mounting Information, page 24

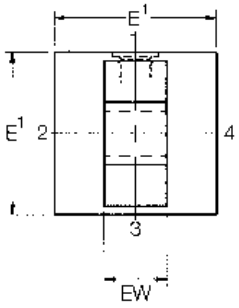
Bore ϕ	E	EE BSP/G inches	F	FB	G	J	KB	LH h10	R	SB	ST	SW	TF	TS	UO	US	WF	XS	Y	+ Stroke PJ	+ Stroke SS	+ Stroke ZB Max	+ Stroke ZJ
25	40 [1]	1/4	10	5.5	40	25	4	19	27	6.6	8.5	8	51	54	65	72	25	33	50	53	73	121	114
32	45 [1]	1/4	10	6.6	40	25	5	22	33	9	12.5	10	58	63	70	84	35	45	60	56	73	137	128
40	63	3/8	10	11	45	38	6.5	31	41	11	12.5	10	87	83	110	103	35	45	62	73	98	166	153
50	75	1/2	16	14	45	38	10	37	52	14	19	13	105	102	130	127	41	54	67	74	92	176	159
63	90	1/2	16	14	45	38	10	44	65	18	26	17	117	124	145	161	48	65	71	80	86	185	168
80	115	3/4	20	18	50	45	13	57	83	18	26	17	149	149	180	186	51	68	77	93	105	212	190
100	130	3/4	22	18	50	45	13	63	97	26	32	22	162	172	200	216	57	79	82	101	102	225	203
125	165	1	22	22	58	58	18	82	126	26	32	22	208	210	250	254	57	79	86	117	131	260	232
160	205	1	25	26	58	58	22	101	155	33	38	29	253	260	300	318	57	86	86	130	130	279	245
200	245	1.1/4	25	33	76	76	24	122	190	39	44	35	300	311	360	381	57	92	98	165	172	336	299

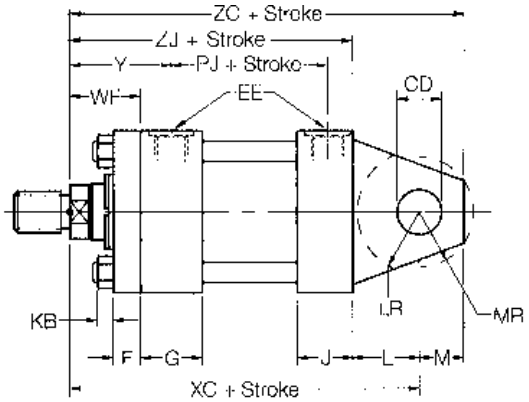
All dimensions are in millimetres unless otherwise stated.

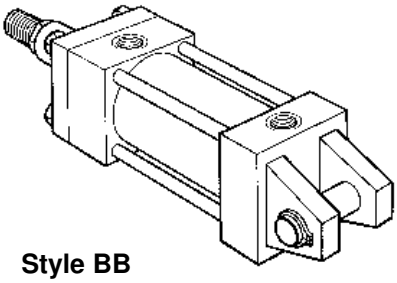


Style B
Cap Fixed Eye
(ISO Style MP3)

Pivot pin not supplied

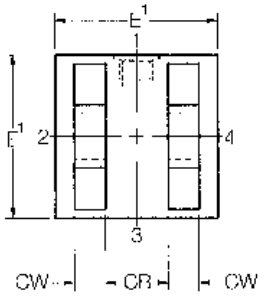


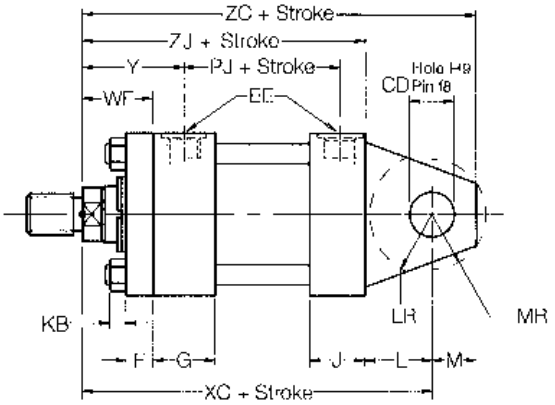


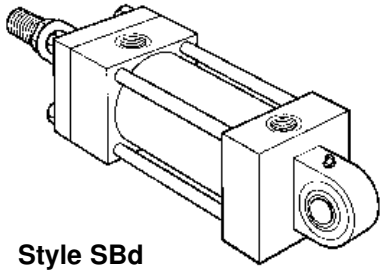


Style BB
Cap Fixed Clevis
(ISO Style MP1)

Supplied complete with pivot pin

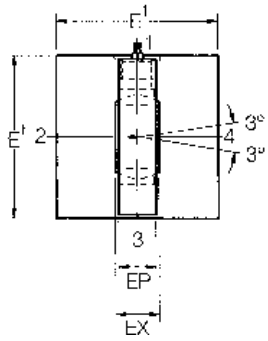


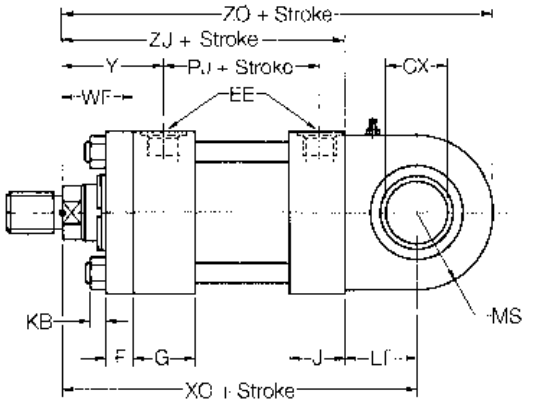




Style SBd
Cap Fixed Eye
with Spherical Bearing
(ISO Style MP5)

Pivot pin not supplied



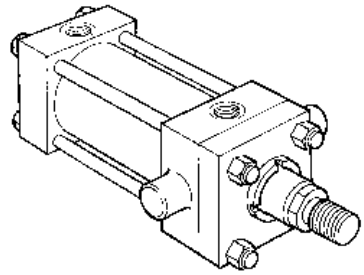


[1] Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders – see page 3

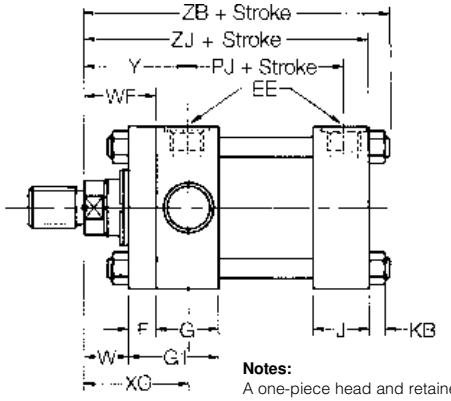
Dimensions – B, BB & SBd See also Dimensions, page 3 & Mounting Information, page 24

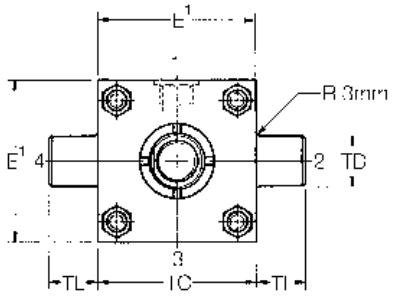
Bore ϕ	CB A16	CD H9	CW	CX	E	EE BSP/G inches	EP	EW h14	EX	F	G	J	KB	L	LR	LT	M	MR	MS max	WF	Y	+ Stroke PJ	XC	XO	ZC	ZJ	ZO
25	12	10	6	12 -0.008	40[1]	1/4	8	12	10	10	40	25	4	13	12	16	10	12	20	25	50	53	127	130	137	114	150
32	16	12	8	16 -0.008	45[1]	1/4	11	16	14	10	40	25	5	19	17	20	12	15	22.5	35	60	56	147	148	159	128	170.5
40	20	14	10	20 -0.012	63	3/8	13	20	16	10	45	38	6.5	19	17	25	14	16	29	35	62	73	172	178	186	153	207
50	30	20	15	25 -0.012	76	1/2	17	30	20	16	45	38	10	32	29	31	20	25	33	41	67	74	191	190	211	159	223
63	30	20	15	30 -0.012	90	1/2	19	30	22	16	45	38	10	32	29	38	20	25	40	48	71	80	200	206	220	168	246
80	40	28	20	40 -0.012	115	3/4	23	40	28	20	50	45	13	39	34	48	28	34	50	51	77	93	229	238	257	190	288
100	50	36	25	50 -0.012	130	3/4	30	50	35	22	50	45	13	54	50	58	36	44	62	57	82	101	257	261	293	203	323
125	60	45	30	60 -0.015	165	1	38	60	44	22	58	58	18	57	53	72	45	53	80	57	86	117	289	304	334	232	384
160	70	56	35	80 -0.015	205	1	47	70	55	25	58	58	22	63	59	92	59	59	100	57	86	130	308	337	367	245	437
200	80	70	40	100 -0.020	245	1.1/4	57	80	70	25	76	76	24	82	78	116	70	76	120	57	98	165	381	415	451	299	535

All dimensions are in millimetres unless otherwise stated.

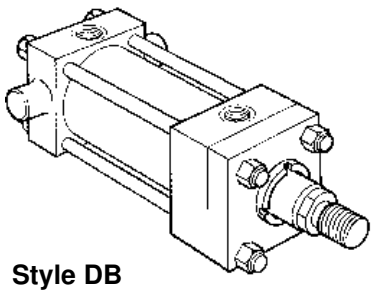


Style D
Head Trunnion
(ISO Style MT1)

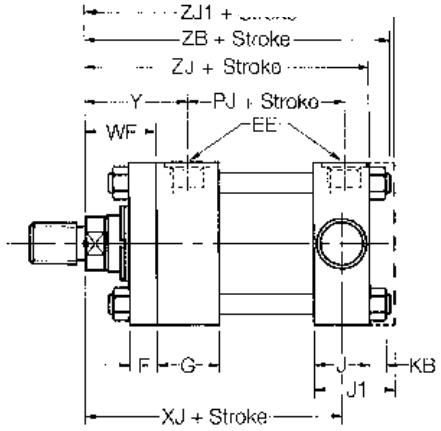




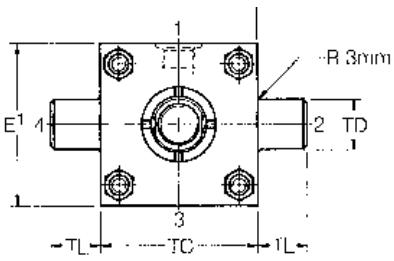
Notes:
A one-piece head and retainer is used on 100mm – 200mm bore sizes – G1 dimension
On 160 and 200mm bores, the bolted gland is recessed, with tie rods screwed into the head

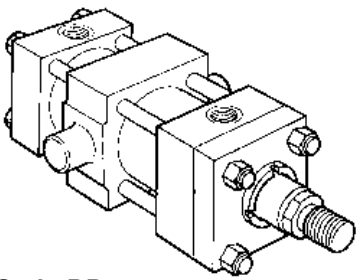


Style DB
Cap Trunnion
(ISO Style MT2)

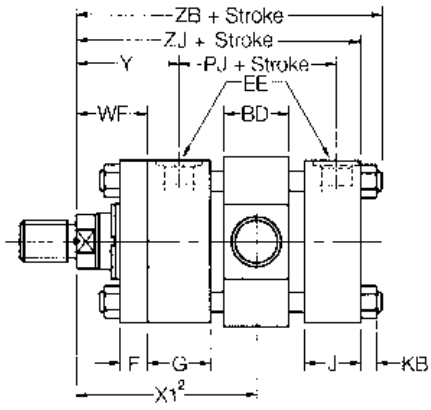


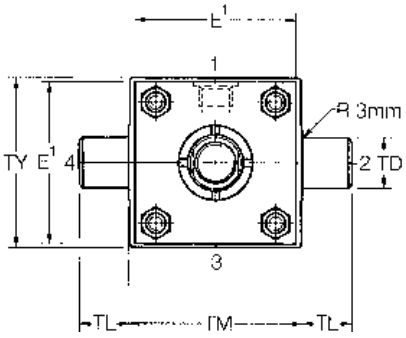
Note:
On 100 – 200mm bore cylinders, dimension J becomes J1, ZJ1 replaces ZB, and tie rods are screwed directly into the cap





Style DD
Intermediate Fixed Trunnion
(ISO Style MT4)





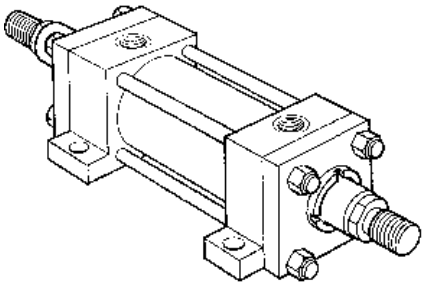
[1] Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders – see page 3
[2] Dimension to be specified by customer

Dimensions – D, DB & DD

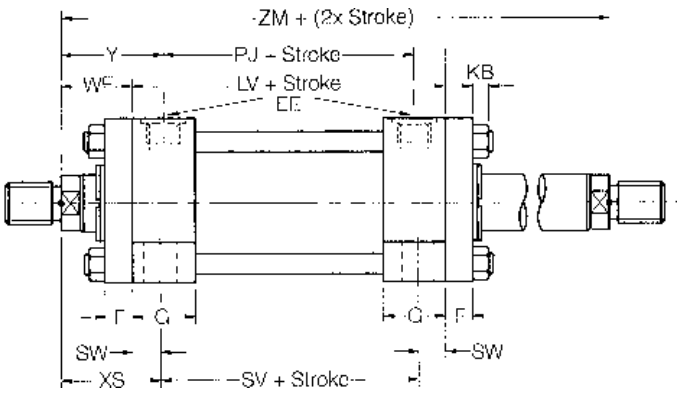
See also Dimensions, page 3 & Mounting Information, page 24

Bore ϕ	BD	E	EE BSP/G inches	F	G	G1	J	J1	KB	TC	TD f8	TL	TM	TY	W	WF	XG	Y	+ Stroke PJ	+ Stroke XJ	+ Stroke ZJ	+ Stroke ZJ1	+ Stroke ZB Max	Style DD min stroke	Min X1 dim'n [2]
25	20	40 [1]	1/4	10	40	-	25	-	4	38	12	10	48	45	-	25	44	50	53	101	114	-	121	10	78
32	25	45 [1]	1/4	10	40	-	25	-	5	44	16	12	55	54	-	35	54	60	56	115	128	-	137	10	90
40	30	63	3/8	10	45	-	38	-	6.5	63	20	16	76	76	-	35	57	62	73	134	153	-	166	15	97
50	40	76	1/2	16	45	-	38	-	10	76	25	20	89	89	-	41	64	67	74	140	159	-	176	15	107
63	40	90	1/2	16	45	-	38	-	10	89	32	25	100	95	-	48	70	71	80	149	168	-	185	15	114
80	50	115	3/4	20	50	-	45	50	13	114	40	32	127	127	-	51	76	77	93	168	190	194	212	20	127
100	60	130	3/4	22	50	72	45	58	13	127	50	40	140	140	35	57	71	82	101	187	203	216	225	20	138
125	73	165	1	22	58	80	58	71	18	165	63	50	178	178	35	57	75	86	117	209	232	245	260	25	153
160	90	205	1	25	58	88	58	88	22	203	80	63	215	216	32	57	75	86	130	230	245	275	279	30	161
200	110	245	1.1/4	25	76	108	76	108	24	241	100	80	279	280	32	57	85	98	165	276	299	330	336	30	190

All dimensions are in millimetres unless otherwise stated.



Double Rod Cylinder
Available with Styles TB, TD, JJ, C, D, DD (Style C Illustrated)



Mounting Styles and Codes

Double rod cylinders are denoted by a 'K' in the ISO cylinder model code, shown on page 4.

Dimensions

To obtain dimensional information for double rod cylinders, first select the desired mounting style by referring to the corresponding single rod models shown on pages 10 to 13. Dimensions for the appropriate single rod model should be supplemented by those from the table opposite to provide a full set of dimensions.

Rod Strength

Double rod cylinders employ two separate piston rods, with one screwed into the end of the other within the piston assembly. As a result, one piston rod is stronger than the other. The stronger rod can be identified by the letter 'K' stamped on its end. The weaker rod should always be used for the lighter duty. Different maximum pressure ratings apply to the stronger and weaker rods of a double rod cylinder – see Pressure Limitations, page 31.

Minimum Stroke Length – Style 9 Rod End

Where a style 9 (female) piston rod end is required on a double rod cylinder with a stroke of 80mm or less, and a bore of 80mm or above, please consult the factory.

Cushioning

Double rod cylinders can be supplied with cushions at either or both ends. Cushioning requirements should be specified by inserting a 'C' in the ordering code – see page 4.

Bore	Rod		Add Stroke			Add 2x Stroke
ϕ	No.	MM ϕ	LV	PJ	SV	ZM
25	1	12	104	53	88	154
	2	18				
32	1	14	108	56	88	178
	2	22				
40	1	18	125	73	105	195
	2	28				
50	1	22	125	74	99	207
	2	36				
	3	28				
63	1	28	127	80	93	223
	2	45				
	3	36				
80	1	36	144	93	110	246
	2	56				
	3	45				
100	1	45	151	101	107	265
	2	70				
	3	56				
125	1	56	175	117	131	289
	2	90				
	3	70				
160	1	70	188	130	130	302
	2	110				
	3	90				
200	1	90	242	160	172	356
	2	140				
	3	110				

All dimensions are in millimetres unless otherwise stated.

Accessory Selection

Accessories for the rod end of a cylinder are selected by reference to the rod end thread, shown on page 3, while the same accessories, when used at the cap end, are selected by cylinder bore size. See tables of part numbers below, and on the following pages.

The rod clevises, plain rod eyes and spherical bearings fitted as accessories to the rod end have the same pin diameters as those used at the cylinder cap ends of the corresponding mounting styles – B, BB and SBd – when fitted with the No.1 rod, or the No.2 or No.3 rods with Style 7 rod end.

The nominal forces shown are based on 210 bar operating pressure on the full bore of the appropriate cylinder size. **Please refer to page 32 for the pressure limitations of the cylinder, particularly the Fatigue Life of Piston Rods under Pull Load Conditions.**

Rod and Cap End Accessories

Accessories for the HMI ISO cylinder comprise:

Rod End
- rod clevis, eye bracket and pivot pin
- plain rod eye, clevis bracket and pivot pin
- rod eye with spherical bearing, mounting bracket/pivot pin assembly

Cap End
- eye bracket for style BB mounting – see page 12
- clevis bracket for style B mounting – see page 12
- pivot pin for eye bracket and clevis bracket
- mounting bracket/pivot pin assembly for style SBd mounting – see page 12

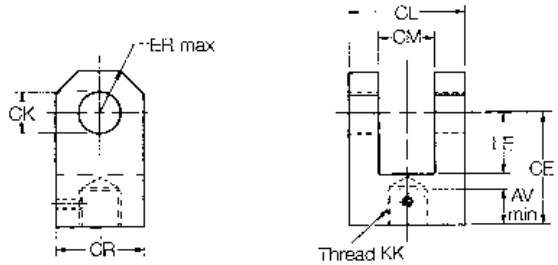
Rod Clevis, Eye Bracket and Pivot Pin

Thread KK	Rod Clevis	Eye Bracket	Pivot Pin	Nominal Force kN	Weight kg
M10x1.25	143447	144808	143477	10.3	0.3
M12x1.25	143448	144809	143478	16.9	0.6
M14x1.5	143449	144810	143479	26.4	0.8
M16x1.5	143450	144811	143480	41.2	2.2
M20x1.5	143451	144812	143480	65.5	2.7
M27x2	143452	144813	143481	106	5.9
M33x2	143453	144814	143482	165	9.4
M42x2	143454	144815	143483	258	17.8
M48x2	143455	144816	143484	422	26.8
M64x3	143456	144817	143485	660	39.0

Pivot Pin for Eye Bracket and Plain Rod Clevis – Dimensions

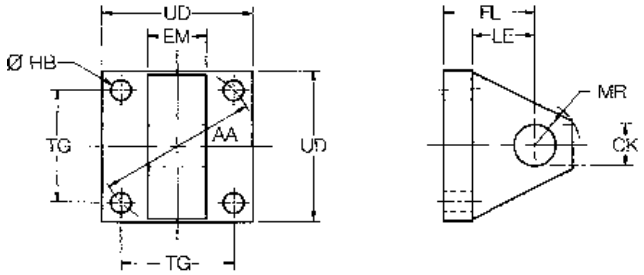
Part No.	EK f8	EL	Weight kg
143477	10	29	0.02
143478	12	37	0.05
143479	14	45	0.08
143480	20	66	0.2
143481	28	87	0.4
143482	36	107	1.0
143483	45	129	1.8
143484	56	149	4.2
143485	70	169	6.0

Rod Clevis Dimensions



Part No.	AV	CE	CK H9	CL	CM A16	CR	ER	KK	LE	Weight kg
143447	14	32	10	25	12	20	12	M10x1.25	14	0.08
143448	16	36	12	32	16	32	17	M12x1.25	19	0.25
143449	18	38	14	40	20	30	17	M14x1.5	19	0.32
143450	22	54	20	60	30	50	29	M16x1.5	32	1.0
143451	28	60	20	60	30	50	29	M20x1.5	32	1.1
143452	36	75	28	83	40	60	34	M27x2	39	2.3
143453	45	99	36	103	50	80	50	M33x2	54	2.6
143454	56	113	45	123	60	102	53	M42x2	57	5.5
143455	63	126	56	143	70	112	59	M48x2	63	7.6
143456	85	168	70	163	80	146	78	M64x3	83	13.0

Eye Bracket Dimensions



Part No.	CK H9	EM h13	FL	MR max	LE min	AA	HB	TG	UD
144808	10	12	23	12	13	40	5.5	28.3	40
144809	12	16	29	17	19	47	6.6	33.2	45
144810	14	20	29	17	19	59	9	41.7	65
144811	20	30	48	29	32	74	13.5	52.3	75
144812	20	30	48	29	32	91	13.5	64.3	90
144813	28	40	59	34	39	117	17.5	82.7	115
144814	36	50	79	50	54	137	17.5	96.9	130
144815	45	60	87	53	57	178	26	125.9	165
144816	56	70	103	59	63	219	30	154.9	205
144817	70	80	132	78	82	269	33	190.2	240

Eye Bracket – Cap End Mounting for Style BB

Bore ϕ	Eye Bracket	Nominal Force kN	Weight kg
25	144808	10.3	0.2
32	144809	16.9	0.3
40	144810	26.4	0.4
50	144811	41.2	1.0
63	144812	65.5	1.4
80	144813	106	3.2
100	144814	165	5.6
125	144815	258	10.5
160	144816	422	15.0
200	144817	660	20.0

All dimensions are in millimetres unless otherwise stated.

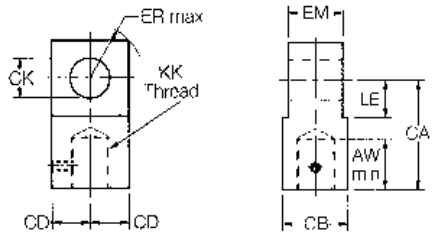
Plain Rod Eye, Clevis Bracket and Pivot Pin

Thread KK	Plain Rod Eye	Clevis Bracket	Pivot Pin	Nominal Force kN	Weight kg
M10x1.25	143457	143646	143477	10.3	0.5
M12x1.25	143458	143647	143478	16.9	1.0
M14x1.5	143459	143648	143479	26.4	1.3
M16x1.5	143460	143649	143480	41.2	3.2
M20x1.5	143461	143649	143480	65.5	3.8
M27x2	143462	143650	143481	106	6.9
M33x2	143463	143651	143482	165	12.5
M42x2	143464	143652	143483	258	26.0
M48x2	143465	143653	143484	422	47.0
M64x3	143466	143654	143485	660	64.0

Plain Rod Eye Dimensions

Part No.	AW	CA	CB	CD	CK H9	EM h13	ER	KK	LE	Weight kg
143457	14	32	18	9	10	12	12	M10x1.25	13	0.08
143458	16	36	22	11	12	16	17	M12x1.25	19	0.15
143459	18	38	20	12.5	14	20	17	M14x1.5	19	0.22
143460	22	54	30	17.5	20	30	29	M16x1.5	32	0.5
143461	28	60	30	20	20	30	29	M20x1.5	32	1.1
143462	36	75	40	25	28	40	34	M27x2	39	1.5
143463	45	99	50	35	36	50	50	M33x2	54	2.5
143464	56	113	65	50	45	60	53	M42x2	57	4.2
143465	63	126	90	56	56	70	59	M48x2	63	11.8
143466	85	168	110	70	70	80	78	M64x3	83	17.0

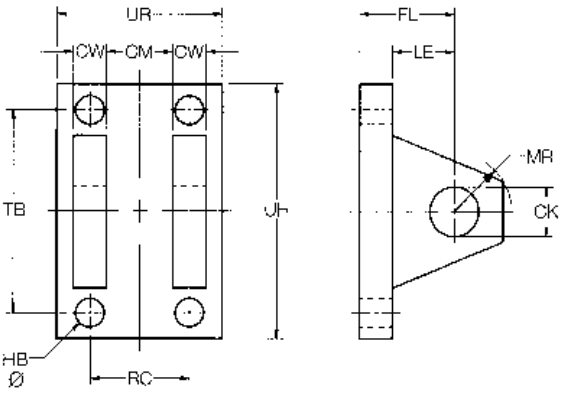
Plain Rod Eye



Clevis Bracket Dimensions

Part No.	CK H9	CM A16	CW	FL	MR max	HB	LE min	RC	TB	UR	UH
143646	10	12	6	23	12	5.5	13	18	47	35	60
143647	12	16	8	29	17	6.6	19	24	57	45	70
143648	14	20	10	29	17	9	19	30	68	55	85
143649	20	30	15	48	29	13.5	32	45	102	80	125
143650	28	40	20	59	34	17.5	39	60	135	100	170
143651	36	50	25	79	50	17.5	54	75	167	130	200
143652	45	60	30	87	53	26	57	90	183	150	230
143653	56	70	35	103	59	30	63	105	242	180	300
143654	70	80	40	132	78	33	82	120	300	200	360

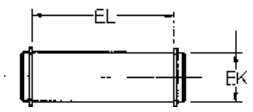
Clevis Bracket



Clevis Bracket – Cap End Mounting for Style B

Bore ϕ	Clevis Bracket	Nominal Force kN	Weight kg
25	143646	10.3	0.4
32	143647	16.9	0.8
40	143648	26.4	1.0
50	143649	41.2	2.5
63	143649	65.5	2.5
80	143650	106	5.0
100	143651	165	9.0
125	143652	258	20.0
160	143653	422	31.0
200	143654	660	41.0

Pivot Pin for Clevis Bracket and Plain Rod Eye – Dimensions

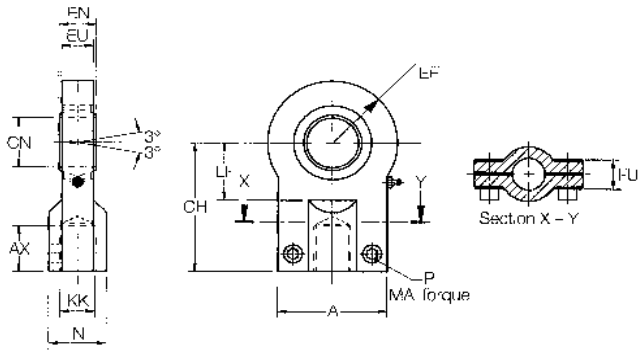


Part No.	EK f8	EL	Weight kg
143477	10	29	0.02
143478	12	37	0.05
143479	14	45	0.08
143480	20	66	0.2
143481	28	87	0.4
143482	36	107	1.0
143483	45	129	1.8
143484	56	149	4.2
143485	70	169	6.0

All dimensions are in millimetres unless otherwise stated.

Rod Eye with Spherical Bearing, Cap End Mounting Bracket and Pivot Pin

Thread KK	Rod Eye with Spherical Bearing	Mounting Bracket and Pivot Pin	Nominal Force kN	Weight kg
M10x1.25	145254	145530	10.3	0.2
M12x1.25	145255	145531	16.9	0.3
M14x1.5	145256	145532	26.4	0.4
M16x1.5	145257	145533	41.2	0.7
M20x1.5	145258	145534	65.5	1.3
M27x2	145259	145535	106	2.3
M33x2	145260	145536	165	4.4
M42x2	145261	145537	258	8.4
M48x2	145262	145538	422	15.6
M64x3	145263	145539	660	28.0



Rod Eye with Spherical Bearing

All spherical bearings should be re-packed with grease after commissioning. In unusual or severe working conditions, consult the factory regarding the suitability of the bearing chosen. If spherical bearings are subjected to the nominal forces shown, frequent lubrication is essential for acceptable bearing life.

Rod Eye with Spherical Bearing Dimensions

Part No.	A max	AX min	EF max	CH	CN	EN	EU	FU	KK	LF min	N max	MA max Nm	P
145254	40	15	20	42	12 -0.008	10 -0.12	8	13	M10x1.25	16	17	10	M6
145255	45	17	22.5	48	16 -0.008	14 -0.12	11	13	M12x1.25	20	21	10	M6
145256	55	19	27.5	58	20 -0.012	16 -0.12	13	17	M14x1.5	25	25	25	M8
145257	62	23	32.5	68	25 -0.012	20 -0.12	17	17	M16x1.5	30	30	25	M8
145258	80	29	40	85	30 -0.012	22 -0.12	19	19	M20x1.5	35	36	45	M10
145259	90	37	50	105	40 -0.012	28 -0.12	23	23	M27x2	45	45	45	M10
145260	105	46	62.5	130	50 -0.012	35 -0.12	30	30	M33x2	58	55	80	M12
145261	134	57	80	150	60 -0.015	44 -0.15	38	38	M42x2	68	68	160	M16
145262	156	64	102.5	185	80 -0.015	55 -0.15	47	47	M48x2	92	90	310	M20
145263	190	86	120	240	100 -0.020	70 -0.20	57	57	M64x3	116	110	530	M24

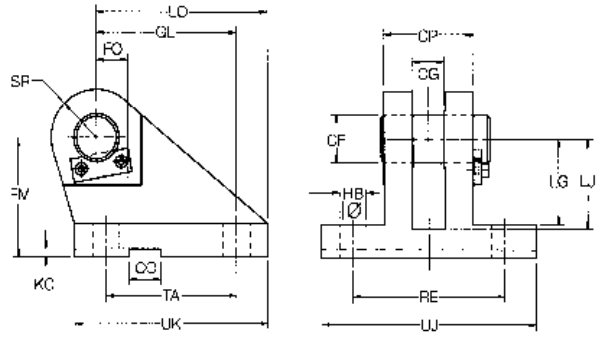
Mounting Bracket and Pivot Pin Dimensions

Part No.	CF K7/h6	CG +0.1, +0.3	CO N9	CP	FM js11	FO js14	GL js13	HB	KC 0, +0.30	LG	LJ	LO	RE js13	SR max	TA js13	UJ	UK
145530	12	10	10	30	40	16	46	9	3.3	28	29	56	55	12	40	75	60
145531	16	14	16	40	50	18	61	11	4.3	37	38	74	70	16	55	95	80
145532	20	16	16	50	55	20	64	14	4.3	39	40	80	85	20	58	120	90
145533	25	20	25	60	65	22	78	16	5.4	48	49	98	100	25	70	140	110
145534	30	22	25	70	85	24	97	18	5.4	62	63	120	115	30	90	160	135
145535	40	28	36	80	100	24	123	22	8.4	72	73	148	135	40	120	190	170
145536	50	35	36	100	125	35	155	30	8.4	90	92	190	170	50	145	240	215
145537	60	44	50	120	150	35	187	39	11.4	108	110	225	200	60	185	270	260
145538	80	55	50	160	190	35	255	45	11.4	140	142	295	240	80	260	320	340
145539	100	70	63	200	210	35	285	48	12.4	150	152	335	300	100	300	400	400

Cap End Mounting Bracket and Pin – for Style SBd

Bore ϕ	Mounting Bracket and Pivot Pin	Nominal Force kN	Weight kg
25	145530	10.3	0.6
32	145531	16.9	1.3
40	145532	26.4	2.1
50	145533	41.2	3.2
63	145534	65.5	6.5
80	145535	106	12.0
100	145536	165	23.0
125	145537	258	37.0
160	145538	422	79.0
200	145539	660	140.0

Mounting Bracket and Pivot Pin



All dimensions are in millimetres unless otherwise stated.

DIN Cylinder Mounting Styles and Where to Find Them

The standard range of Parker HMD cylinders comprises five DIN mounting styles. A wider range of mounting styles and piston rod ends is available in the ISO metric cylinder range – see page 9 of this catalogue. General guidance for mounting style selection is given below, with dimensional information about each style shown on the pages indicated. Additional, application-specific mounting information is shown on page 24.

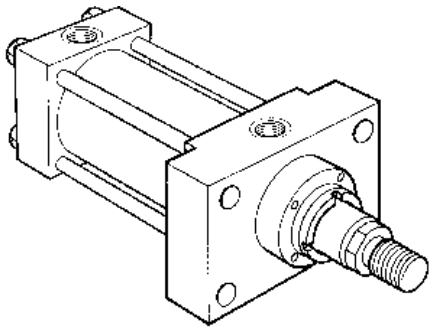
Where a non-standard mounting style is required to satisfy a particular application, our design engineers will be happy to assist. Please contact the factory for details.

Flange Mounted Cylinders
These cylinders are suitable for use on straight line force transfer applications. Two flange mounting styles are available, offering either a head flange (JJ) or a cap flange (HH). Selection of the correct flange mounting style depends on whether the major force applied to the load will result in compression (push) or tension (pull) stresses on the piston rod. For compression-type applications, the cap mounting style is most appropriate; where the major load places the piston rod in tension, a head mounting should be specified.

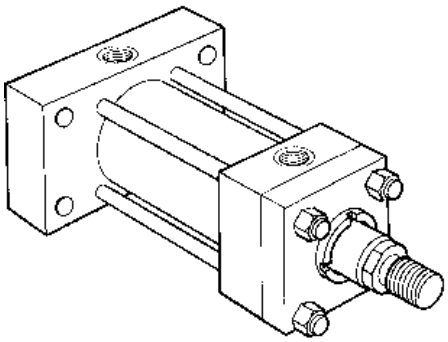
Foot Mounted Cylinders
Style C cylinders do not absorb forces on their centrelines. As a result, the application of force by the cylinder produces a turning moment which attempts to rotate the cylinder about its mounting bolts. It is important, therefore, that the cylinder should be firmly secured to the mounting surface and that the load should be effectively guided, to avoid side loads being applied to the rod gland and piston bearings. A thrust key modification may be specified to provide positive location for the cylinder – see page 24.

Spherical Bearing Mountings
The spherical bearing mounted cylinders SBd, which absorb forces on their centrelines, should be used where the machine member to be moved travels in a curved path. They may be used for tension (pull) or compression (push) applications where the piston rod will travel in a path either side of the true plane of motion.

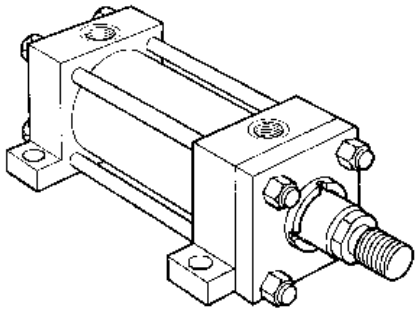
Trunnion Mounted Cylinders
Centre trunnion mounted cylinders, style DD, are designed to absorb force on their centrelines. They are suitable for tension (pull) or compression (push) applications, and may be used where the machine member to be moved travels in a curved path in a single plane. Trunnion pins are designed for shear loads only and should be subjected to minimum bending stresses.



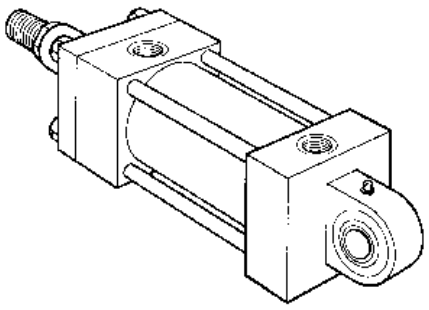
Style JJ
DIN Style ME5
See page 19



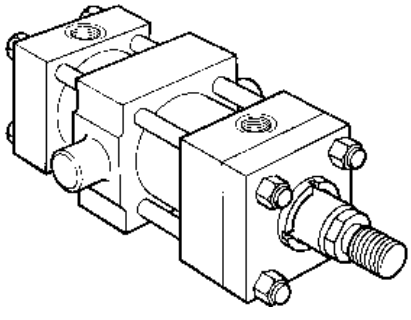
Style HH
DIN Style ME6
See page 19



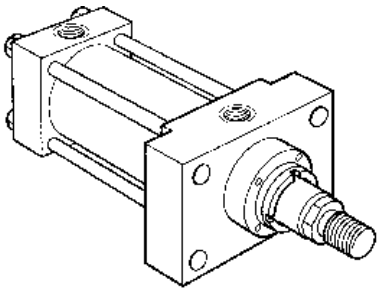
Style C
DIN Style MS2
See page 19



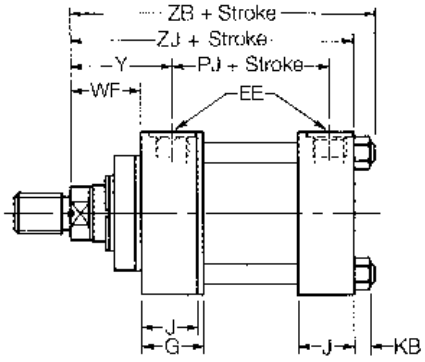
Style SBd
DIN Style MP5
See page 20

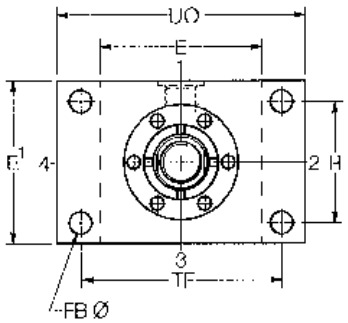


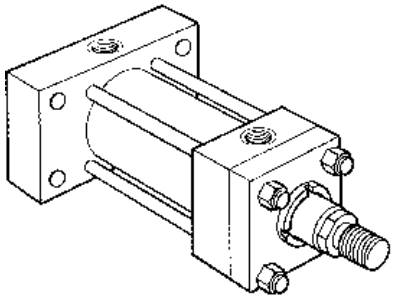
Style DD
DIN Style MT4
See page 20



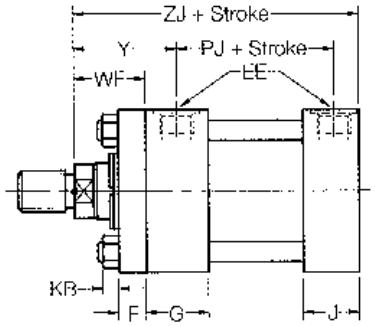
Style JJ
Head Rectangular Flange
(DIN Style ME5)

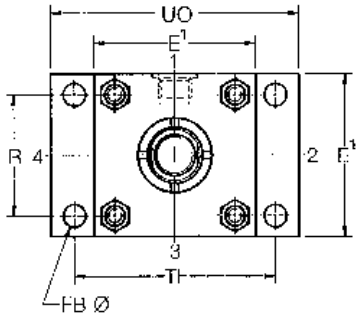


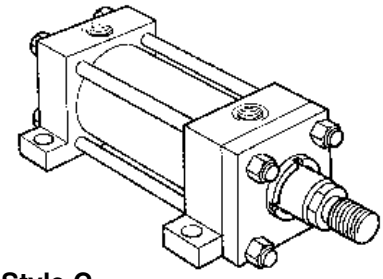




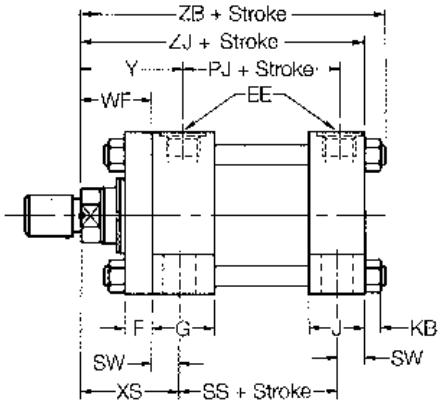
Style HH
Cap Rectangular Flange
(DIN Style ME6)

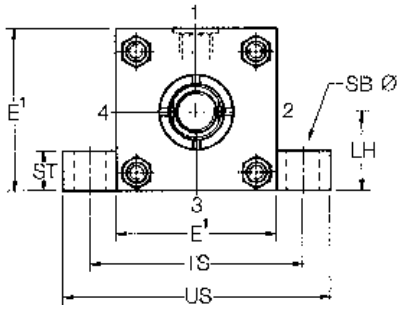






Style C
Side Lugs
(DIN Style MS2)



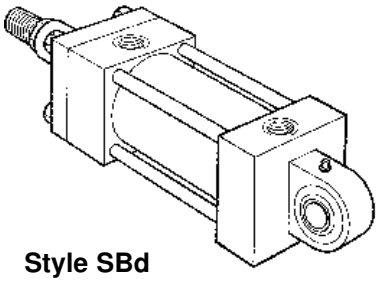


[1] Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders – see page 38

Dimensions – JJ, HH & C See also Dimensions, page 38, and Mounting Information, page 24

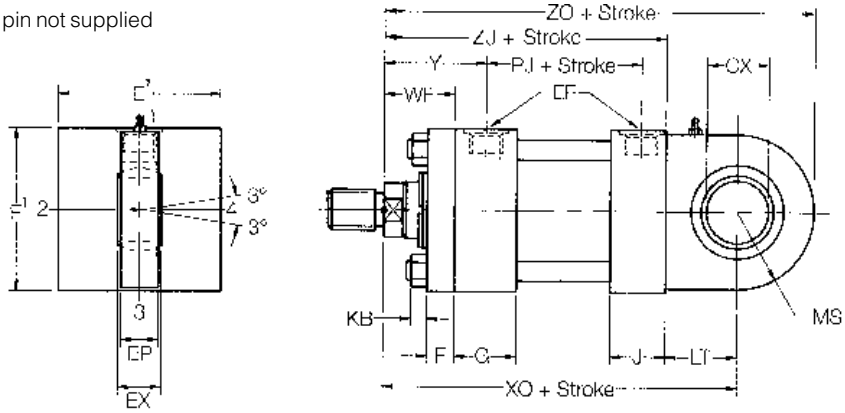
Bore ϕ	E	EE BSP/G inches	F	FB	G	J	KB	LH h10	R	SB	ST	SW	TF	TS	UO	US	WF	XS	Y	+ Stroke			
																				PJ	SS	ZB Max	ZJ
25	40 [1]	1/4	10	5.5	40	25	4	19	27	6.6	8.5	8	51	54	65	72	25	33	50	53	73	121	114
32	45 [1]	1/4	10	6.6	40	25	5	22	33	9	12.5	10	58	63	70	84	35	45	60	56	73	137	128
40	63	3/8	10	11	45	38	6.5	31	41	11	12.5	10	87	83	110	103	35	45	62	73	98	166	153
50	75	1/2	16	14	45	38	10	37	52	14	19	13	105	102	130	127	41	54	67	74	92	176	159
63	90	1/2	16	14	45	38	10	44	65	18	26	17	117	124	145	161	48	65	71	80	86	185	168
80	115	3/4	20	18	50	45	13	57	83	18	26	17	149	149	180	186	51	68	77	93	105	212	190
100	130	3/4	22	18	50	45	13	63	97	26	32	22	162	172	200	216	57	79	82	101	102	225	203
125	165	1	22	22	58	58	18	82	126	26	32	22	208	210	250	254	57	79	86	117	131	260	232
160	205	1	25	26	58	58	22	101	155	33	38	29	253	260	300	318	57	86	86	130	130	279	245
200	245	1.1/4	25	33	76	76	24	122	190	39	44	35	300	311	360	381	57	92	98	165	172	336	299

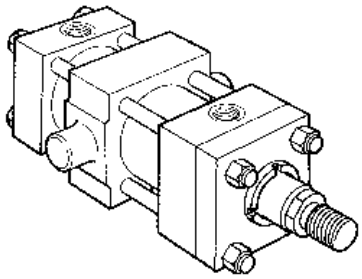
All dimensions are in millimetres unless otherwise stated.



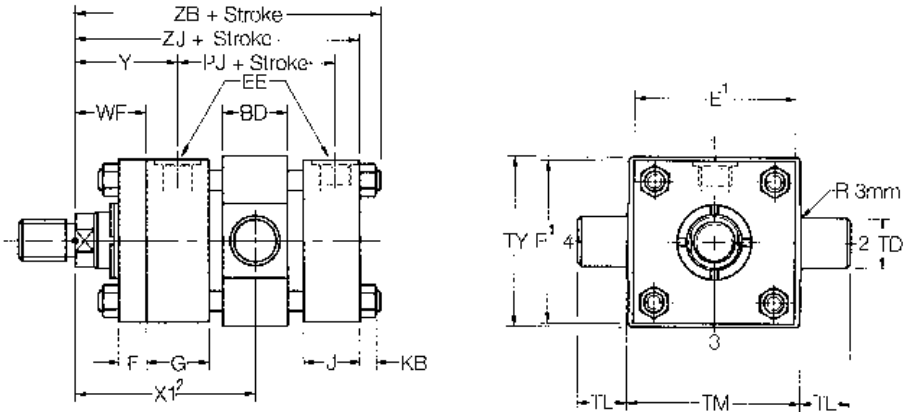
Style SBd
Cap Fixed Eye
with Spherical Bearing
(DIN Style MP5)

Pivot pin not supplied





Style DD
Intermediate Fixed Trunnion
(DIN Style MT4)

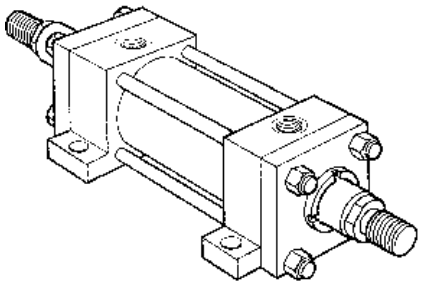


[1] Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders – see page 38
[2] Dimension to be specified by customer

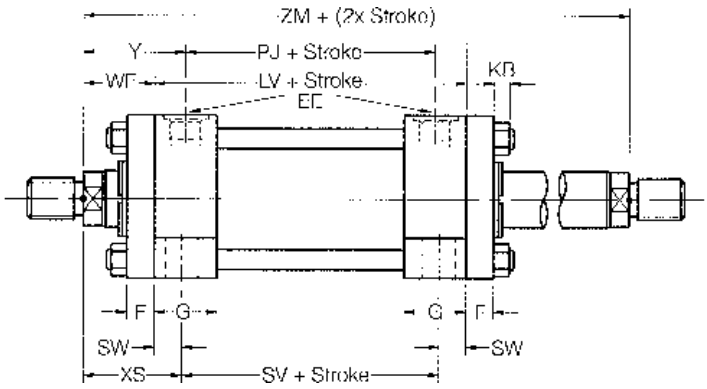
Dimensions – SBd & DD See Dimensions, page 38, and Mounting Information, page 24

Bore ϕ	BD	CX	E	EE BSP/G inches	EP	EX	F	G	J	KB	LT	MS	TD f8	TL	TM	TY	WF	Y	Style DD min. stroke	Min. X1 Dim'n [2]	+ Stroke PJ	XO	ZB Max	ZJ	ZO
25	20	12 -0.008	40 [1]	1/4	8	10	10	40	25	4	16	20	12	10	48	45	25	50	10	78	53	130	121	114	150
32	25	16 -0.008	45 [1]	1/4	11	14	10	40	25	5	20	22.5	16	12	55	54	35	60	10	90	56	148	137	128	170.5
40	30	20 -0.012	63	3/8	13	16	10	45	38	6.5	25	29	20	16	76	76	35	62	15	97	73	178	166	153	207
50	40	25 -0.012	75	1/2	17	20	16	45	38	10	31	33	25	20	89	89	41	67	15	107	74	190	176	159	223
63	40	30 -0.012	90	1/2	19	22	16	45	38	10	38	40	32	25	100	95	48	71	15	114	80	206	185	168	246
80	50	40 -0.012	115	3/4	23	28	20	50	45	13	48	50	40	32	127	127	51	77	20	127	93	238	212	190	288
100	60	50 -0.012	130	3/4	30	35	22	50	45	13	58	62	50	40	140	140	57	82	20	138	101	261	225	203	323
125	73	60 -0.015	165	1	38	44	22	58	58	18	72	80	63	50	178	178	57	86	25	153	117	304	260	232	379
160	90	80 -0.015	205	1	47	55	25	58	58	22	92	100	80	63	215	216	57	86	30	161	130	337	279	245	437
200	110	100 -0.020	245	1.1/4	57	70	25	76	76	24	116	120	100	80	279	280	57	98	30	190	165	415	336	299	535

All dimensions are in millimetres unless otherwise stated.



Double
Rod Cylinder – not to DIN
Available with Styles JJ, C, DD
(Style C Illustrated)



Mounting Styles and Codes

Double rod cylinders are denoted by a 'K' in the model code, shown on page 39. Note that, while there is no double rod option within the DIN standard, these cylinders correspond to the mounting dimensions specified in DIN 24 554 for the ME5, MS2 and MT4 cylinders – Parker styles JJ, C and DD.

Dimensions

To obtain dimensional information for double rod cylinders, first select the desired mounting style by referring to the corresponding single rod models shown on pages 19 and 20. Dimensions for the appropriate single rod model should be supplemented by those from the table opposite to provide a full set of dimensions.

Rod Strength

Double rod cylinders employ two separate piston rods, with one screwed into the end of the other within the piston assembly. As a result, one piston rod is stronger than the other. The stronger rod can be identified by the letter 'K' stamped on its end. The weaker rod should always be used for the lighter duty. Different maximum pressure ratings apply to the stronger and weaker rods of a double rod cylinder – see Pressure Limitations, page 31.

Cushioning

Double rod cylinders can be supplied with cushions at either or both ends. Cushioning requirements should be specified by inserting a 'C' in the ordering code – see page 39.

Bore	Rod		Add Stroke			Add 2x Stroke
ϕ	No.	MM ϕ	LV	PJ	SV	ZM
25	1	12	104	53	88	154
	2	18				
32	1	14	108	56	88	178
	2	22				
40	1	18	125	73	105	195
	2	28				
50	1	22	125	74	99	207
	2	36				
63	1	28	127	80	93	223
	2	45				
80	1	36	144	93	110	246
	2	56				
100	1	45	151	101	107	265
	2	70				
125	1	56	175	117	131	289
	2	90				
160	1	70	188	130	130	302
	2	110				
200	1	90	242	160	172	356
	2	140				

All dimensions are in millimetres unless otherwise stated.

Accessory Selection

Accessories for the rod end of a cylinder are selected by reference to the rod end thread, shown on page 38, while the same accessories, when used at the cap end, are selected by cylinder bore size. See tables of part numbers below and opposite.

Because of the relationship between rod end thread and bore size, the spherical bearings fitted as accessories to the rod ends of cylinders have the same pin diameters as those used at the cap ends of the SBd cylinder.

The nominal forces shown are based on 210 bar operating pressure on the full bore of the appropriate cylinder size. **Please refer to page 32 for the pressure limitations of the cylinder, particularly the Fatigue Life of Piston Rods under Pull Load Conditions.**

Rod and Cap End Accessories

Accessories for the HMD DIN cylinder comprise:

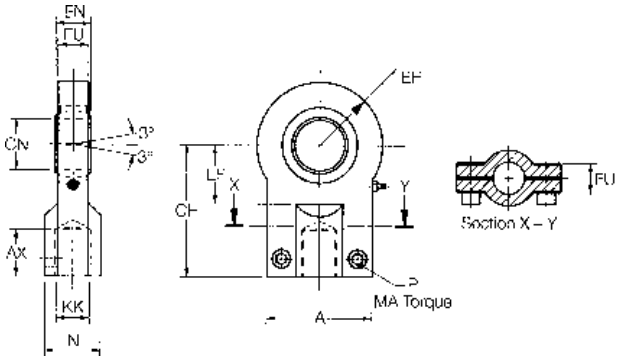
Rod End – rod eye with spherical bearing, mounting bracket/pivot pin assembly

Cap End – mounting bracket/pivot pin assembly for the spherical bearing mounted cylinder SBd (illustrated opposite)

A wider range of accessories is offered in the ISO cylinder range – see page 15 of this catalogue.

Rod Eye with Spherical Bearing, Mounting Bracket and Pivot Pin

Thread KK	Rod Eye with Spherical Bearing	Mounting Bracket and Pivot Pin	Nominal Force kN	Weight kg
M10x1.25	145254	145530	10.3	0.2
M12x1.25	145255	145531	16.9	0.3
M14x1.5	145256	145532	26.4	0.4
M16x1.5	145257	145533	41.2	0.7
M20x1.5	145258	145534	65.5	1.3
M27x2	145259	145535	106	2.3
M33x2	145260	145536	165	4.4
M42x2	145261	145537	258	8.4
M48x2	145262	145538	422	15.6
M64x3	145263	145539	660	28.0



Rod Eye with Spherical Bearing

All spherical bearings should be re-packed with grease after commissioning. In unusual or severe working conditions, consult the factory regarding the suitability of the bearing chosen. If spherical bearings are subjected to the nominal forces shown, frequent lubrication is essential for acceptable bearing life.

Rod Eye with Spherical Bearing Dimensions

Part No.	A max	AX min	EF max	CH	CN	EN	EU	FU	KK	LF min	N max	MA max Nm	P
145254	40	15	20	42	12 -0.008	10 -0.12	8	13	M10x1.25	16	17	10	M6
145255	45	17	22.5	48	16 -0.008	14 -0.12	11	13	M12x1.25	20	21	10	M6
145256	55	19	27.5	58	20 -0.012	16 -0.12	13	17	M14x1.5	25	25	25	M8
145257	62	23	32.5	68	25 -0.012	20 -0.12	17	17	M16x1.5	30	30	25	M8
145258	80	29	40	85	30 -0.012	22 -0.12	19	19	M20x1.5	35	36	45	M10
145259	90	37	50	105	40 -0.012	28 -0.12	23	23	M27x2	45	45	45	M10
145260	105	46	62.5	130	50 -0.012	35 -0.12	30	30	M33x2	58	55	80	M12
145261	134	57	80	150	60 -0.015	44 -0.15	38	38	M42x2	68	68	160	M16
145262	156	64	102.5	185	80 -0.015	55 -0.15	47	47	M48x2	92	90	310	M20
145263	190	86	120	240	100 -0.020	70 -0.20	57	57	M64x3	116	110	530	M24

All dimensions are in millimetres unless otherwise stated.

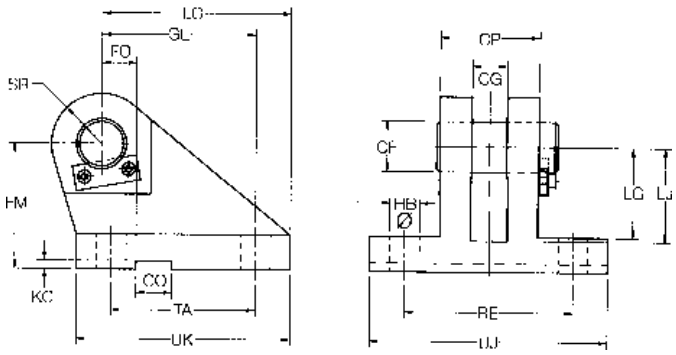
Mounting Bracket for Spherical Bearings

The mounting bracket and pivot pin assembly illustrated below is suitable for use with both the rod end spherical bearing, and the spherical bearing used at the cap end of the style SBd cylinder.

The table below identifies the correct mounting bracket for each cylinder bore size when used with the Style SBd cap end bearing. When used to support a rod end spherical bearing, the correct mounting bracket can be identified by referring to the table of part numbers on page 22.

Cap End Mounting Bracket and Pin – for Spherical Bearing Style SBd

Bore ϕ	Mounting Bracket and Pivot Pin	Nominal Force kN	Weight kg
25	145530	10.3	0.6
32	145531	16.9	1.3
40	145532	26.4	2.1
50	145533	41.2	3.2
63	145534	65.5	6.5
80	145535	106	12.0
100	145536	165	23.0
125	145537	258	37.0
160	145538	422	79.0
200	145539	660	140.0



Mounting Bracket and Pin Assembly

Mounting Bracket and Pivot Pin Dimensions

Part No.	CF K7/h6	CG +0.1, +0.3	CO N9	CP	FM js11	FO js14	GL js13	HB	KC 0, +0.30	LG	LJ	LO	RE js13	SR max	TA js13	UJ	UK
145530	12	10	10	30	40	16	46	9	3.3	28	29	56	55	12	40	75	60
145531	16	14	16	40	50	18	61	11	4.3	37	38	74	70	16	55	95	80
145532	20	16	16	50	55	20	64	14	4.3	39	40	80	85	20	58	120	90
145533	25	20	25	60	65	22	78	16	5.4	48	49	98	100	25	70	140	110
145534	30	22	25	70	85	24	97	18	5.4	62	63	120	115	30	90	160	135
145535	40	28	36	80	100	24	123	22	8.4	72	73	148	135	40	120	190	170
145536	50	35	36	100	125	35	155	30	8.4	90	92	190	170	50	145	240	215
145537	60	44	50	120	150	35	187	39	11.4	108	110	225	200	60	185	270	260
145538	80	55	50	160	190	35	255	45	11.4	140	142	295	240	80	260	320	340
145539	100	70	63	200	210	35	285	48	12.4	150	152	335	300	100	300	400	400

All dimensions are in millimetres unless otherwise stated.

Mounting Styles

General guidance for the selection of ISO and DIN mounting styles is given on pages 9 and 18 respectively. The notes which follow provide information for use in specific applications and should be read in conjunction with the information on these pages.

Trunnions

Trunnions require lubricated pillow blocks with minimum bearing clearances. Blocks should be aligned and mounted to eliminate bending moments on the trunnion pins. Self-aligning mounts must not be used to support the trunnions as bending forces can be set up.

Intermediate trunnions may be positioned at any point on the cylinder body. This position, dimension XI, should be specified at the time of order, as any subsequent change will require new tie rods.

Flange Mountings

Front flange-mounted (style JJ) cylinders incorporate a location diameter for accurate alignment on the mounting surface – see page 3 for HMI and page 38 for HMD cylinders. The gland retainer is integral with the head on 25, 32 and 40mm bore cylinders, while on 50mm bores and above, the circular retainer is bolted to the head.

Extended Tie Rods

Cylinders with extended tie rod mountings TB and TC are supplied with an additional set of mounting nuts of the appropriate grade, for securing the cylinder to the machine member. For style TD, Tie Rods Extended Both Ends, two additional sets of mounting nuts are supplied.

Cylinders may be ordered with extended tie rods in addition to another mounting style. The extended tie rods may then be used for mounting other systems or machine components.

Pivot Mountings

Pivot pins are supplied with style BB cap fixed clevis mounted cylinders. Pivot pins are not supplied with the cap fixed eye mounting, style B, or the cap with spherical bearing, style SBd, as their pin length will be determined by customer's equipment.

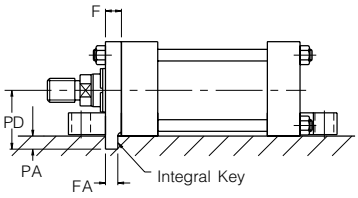
Spherical Bearings

The service life of a spherical bearing is influenced by such factors as bearing pressure, load direction, sliding velocity and frequency of lubrication. When considering severe or unusual working conditions, please consult the factory.

Foot Mountings and Thrust Keys

The turning moment which results from the application of force by a foot mounted cylinder must be resisted by secure mounting and effective guidance of the load. A thrust key modification is recommended to provide positive cylinder location.

Thrust key mountings eliminate the need for fitted bolts or external keys on style C side mounted cylinders. The gland retainer plate is extended below the nominal mounting surface to fit into a keyway milled into the mounting surface of the machine member. See 'Mounting Modifications' in the ISO order code, page 4.



Bore ϕ	F nom.	FA -0.075	PA -0.2
25	10	8	5
32	10	8	5
40	10	8	5
50	16	14	8
63	16	14	8
80	20	18	10
100	22	22	11
125	22	22	11
160	25	25	13
200	25	25	13

Mounting Bolts

Parker recommends that mounting bolts with a minimum strength of ISO 898/1 grade 10.9 should be used for fixing cylinders to the machine or base. This recommendation is of particular importance where bolts are placed in tension or subjected to shear forces. Mounting bolts should be torque loaded to their manufacturer's recommended figures.

Tie Rod Nuts

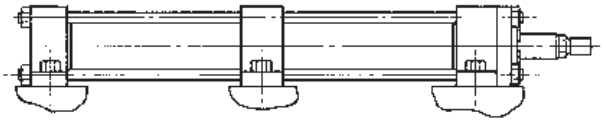
Tie rod mounting nuts, with lubricated threads, should be to a minimum strength of ISO 898/2 grade 10, torque loaded to the figures shown.

Bore ϕ	Tie Rod Nut Torque Nm
25	4.5-5.0
32	7.6-9.0
40	19.0-20.5
50	68-71
63	68-71
80	160-165
100	160-165
125	450-455
160	815-830
200	1140-1155

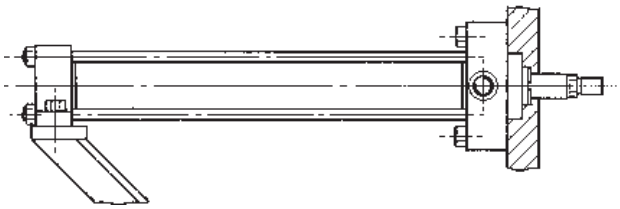
All dimensions are in millimetres unless otherwise stated.

Intermediate or Additional Mountings

Long cylinders with fixed mountings such as extended tie rods may require additional support to counter sagging or the effects of vibration. This may be provided mid-way along the cylinder body in the form of an intermediate mounting or, with end-mounted cylinders, as an additional mounting supporting the free end of the cylinder. Please contact the factory for further information. The maximum unsupported stroke lengths which Parker recommends for each bore size are shown in the table below.



Intermediate Foot Mounting



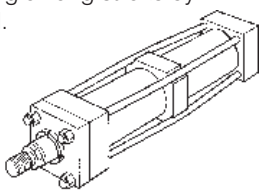
End Support Mounting

Maximum Stroke Lengths of Unsupported Cylinders

Bore ϕ	Intermediate Mounting	End Support Mounting
25	1500	1000
32		
40		
50	2000	1500
63		
80		
100	3000	2000
125		
160	3500	2500
200		

Tie Rod Supports

To increase the resistance to buckling of long stroke cylinders, tie rod supports may be fitted. These move the tie rods radially outwards and allow longer than normal strokes to be used without the need for an additional mounting.



Bore ϕ	Stroke (metres)												No. of Supports Req'd.
	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	
25	1	1	2	Consult Factory									
32	-	1	1	2									
40	-	-	1	1	1	2	2						
50	-	-	-	1	1	1	1	2	2	2	2	3	
63	-	-	-	-	-	1	1	1	1	1	2	2	
80	-	-	-	-	-	-	-	1	1	1	1	1	
100	-	-	-	-	-	-	-	-	-	1	1	1	

Stroke Tolerances

Stroke length tolerances are required due to the build-up of tolerances of piston, head, cap and cylinder body. Standard production stroke tolerances are 0 to +2mm on all bore sizes and stroke lengths. For closer tolerances, please specify the required tolerance plus the operating temperature and pressure. Stroke tolerances of less than 0.4mm are generally impracticable due to the elasticity of cylinders and, in these cases, the use of a stroke adjuster should be considered – see page 35. Tolerances of stroke dependent dimensions for each mounting style are shown in the table below.

Stroke Dependent Tolerances

Mounting Style	Dimensions	Tolerance - for strokes up to 3m
All styles - port dimensions	Y	±2
	PJ	±1.25
JJ (ME5)	ZB	max
HH (ME6)	ZJ	±1
BB (MP1) B (MP3)	XC	±1.25
SBd (MP5)	XO	±1.25
C (MS2)	XS ZB SS	±2 max ±1.25
D (MT1)	XG ZB	±2 max
DB (MT2)	XJ ZB	±1.25 max
DD (MT4)	X1 ZB	±2 max
TD (MX1) TC (MX2) TB (MX3)	BB	+3 0
TB (MX3)	ZB	max
TD (MX1) TB (MX3)	WH	±2
TD (MX1) TC (MX2) TB (MX3)	ZJ	±1

All dimensions are in millimetres unless otherwise stated.

Calculation of Cylinder Diameter

Given that the force and operating pressure of the system are known, and that a piston rod size has been estimated taking account of whether the rod is in tension (pull) or compression (push), then the cylinder bore can be selected.

If the piston rod is in compression, use the 'Push Force' table below, as follows:

1. Identify the operating pressure closest to that required.
2. In the same column, identify the force required to move the load (always rounding up).
3. In the same row, look along to the cylinder bore required.

If the cylinder envelope dimensions are too large for the application, increase the operating pressure, if possible, and repeat the exercise.

If the piston rod is in tension, use the 'Deduction for Pull Force' table. The procedure is the same but, due to the reduced area caused by the piston rod, the force available on the 'pull' stroke will be smaller. To determine the pull force:

1. Follow the procedure for 'push' applications as described above.
2. Using the 'pull' table, identify the force indicated according to the rod and pressure selected.
3. Deduct this from the original 'push' force. The resultant is the net force available to move the load.

If this force is not large enough, go through the process again but increase the system operating pressure or cylinder diameter if possible. If in doubt, our design engineers will be pleased to assist.

Push Force

Bore ϕ	Bore Area	Cylinder Push Force in kN						
		10 bar	40 bar	63 bar	100 bar	125 bar	160 bar	210 bar
mm	sq.mm							
25	491	0.5	2.0	3.1	4.9	6.1	7.9	10.3
32	804	0.8	3.2	5.1	8.0	10.1	12.9	16.9
40	1257	1.3	5.0	7.9	12.6	15.7	20.1	26.4
50	1964	2.0	7.9	12.4	19.6	24.6	31.4	41.2
63	3118	3.1	12.5	19.6	31.2	39.0	49.9	65.5
80	5027	5.0	20.1	31.7	50.3	62.8	80.4	105.6
100	7855	7.9	31.4	49.5	78.6	98.2	125.7	165.0
125	12272	12.3	49.1	77.3	122.7	153.4	196.4	257.7
160	20106	20.1	80.4	126.7	201.1	251.3	321.7	422.2
200	31416	31.4	125.7	197.9	314.2	392.7	502.7	659.7

Deduction for Pull Force

Piston Rod ϕ	Piston Rod Area	Reduction in Force in kN						
		10 bar	40 bar	63 bar	100 bar	125 bar	160 bar	210 bar
mm	sq.mm							
12	113	0.1	0.5	0.7	1.1	1.4	1.8	2.4
14	154	0.2	0.6	1.0	1.5	1.9	2.5	3.2
18	255	0.3	1.0	1.6	2.6	3.2	4.1	5.4
22	380	0.4	1.5	2.4	3.8	4.8	6.1	8.0
28	616	0.6	2.5	3.9	6.2	7.7	9.9	12.9
36	1018	1.0	4.1	6.4	10.2	12.7	16.3	21.4
45	1591	1.6	6.4	10.0	15.9	19.9	25.5	33.4
56	2463	2.5	9.9	15.6	24.6	30.8	39.4	51.7
70	3849	3.8	15.4	24.2	38.5	48.1	61.6	80.8
90	6363	6.4	25.5	40.1	63.6	79.6	101.8	133.6
110	9505	9.5	38.0	59.9	95.1	118.8	152.1	199.6
140	15396	15.4	61.6	97.0	154.0	192.5	246.3	323.3

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For more comprehensive information on the calculation of cylinder bore size required, please refer to the European cylinder inPHorm selection program 1260/1-Eur.

Piston Rod Size Selection

The selection of a piston rod for thrust (push) conditions requires the following steps to be carried out:

1. Determine the type of cylinder mounting style and rod end connection to be used. Consult the Stroke Factor table on page 28 and determine which factor corresponds to the application.

2. Using the appropriate stroke factor from page 28, determine the 'basic length' from the equation:

   Basic Length = Net Stroke x Stroke Factor

   (The graph is prepared for standard rod extensions beyond the face of the gland retainers. For rod extensions greater than standard, add the increases to the net stroke to arrive at the 'basic length'.)

3. Calculate the load imposed for the thrust application by multiplying the full bore area of the cylinder by the system pressure, or by referring to the Push and Pull Force charts on page 26.

4. Using the graph below, look along the values of 'basic length' and 'thrust' as found in 2 and 3 above, and note the point of intersection.

The correct piston rod size is read from the diagonally curved line labelled 'Rod Diameter' above the point of intersection.

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For accurate sizing, please refer to the European cylinder inPHorm selection program (1260/1-Eur).

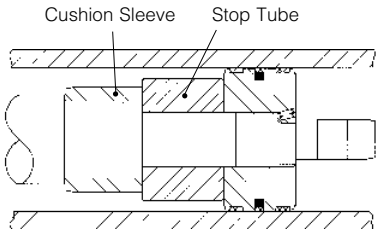
Stop Tubes

The required length of stop tube, where necessary, is read from the vertical columns on the right of the graph by following the horizontal band within which the point of intersection lies. Note that stop tube requirements differ for fixed and pivot mounted cylinders.

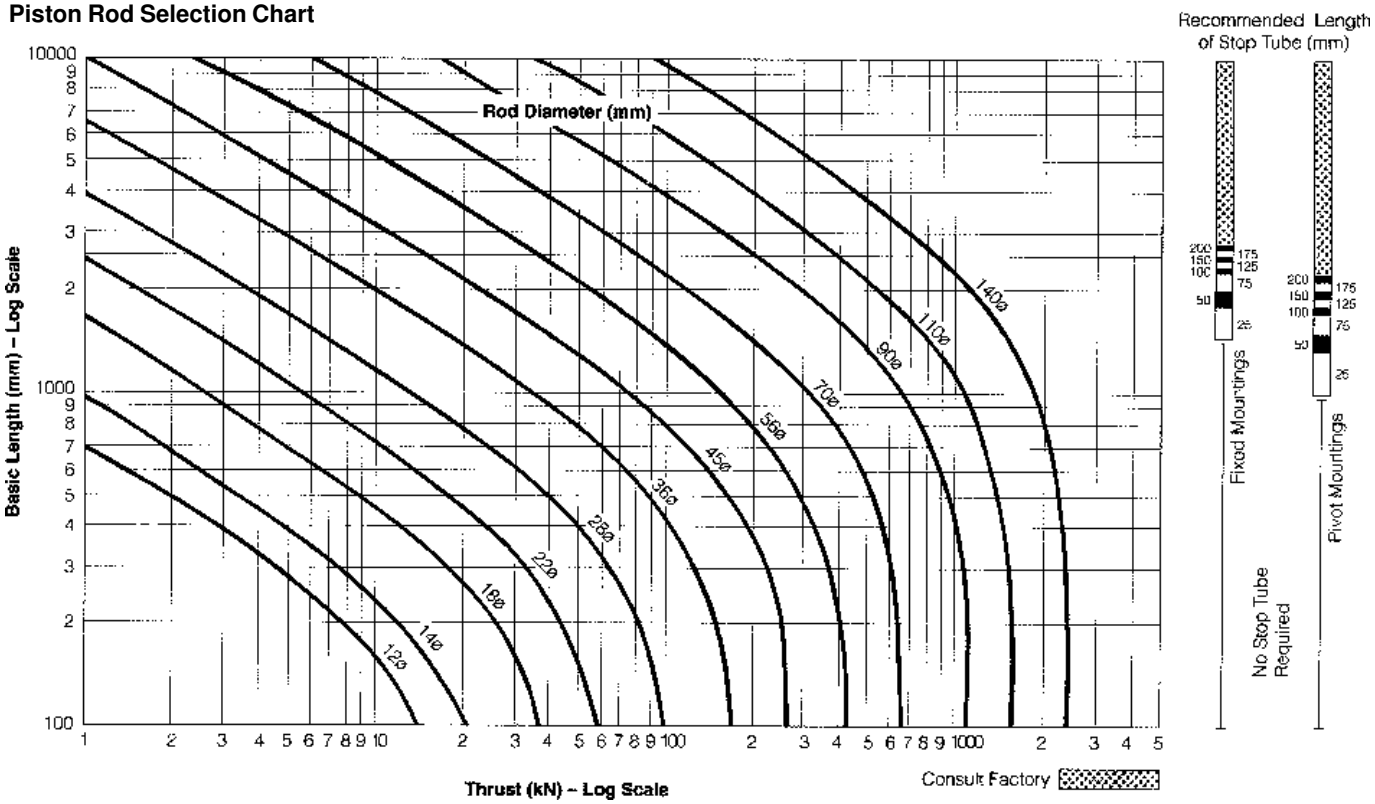
If the required length of stop tube is in the region labelled 'consult factory', please submit the following information:

1. Cylinder mounting style.
2. Rod end connection and method of guiding load.
3. Bore required, stroke, length of rod extension (dimensions WF – VE) if greater than standard.
4. Mounting position of cylinder. (Note if at an angle or vertical, specify the direction of the piston rod.)
5. Operating pressure of cylinder, if limited to less than the standard pressure for the cylinder selected.

When specifying a cylinder with a stop tube, please insert an S (Special) and the net stroke of the cylinder in the order code and state the length of the stop tube. Note that net stroke is equal to the gross stroke of the cylinder less the length of the stop tube. The gross stroke determines the envelope dimensions of the cylinder.

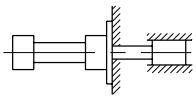
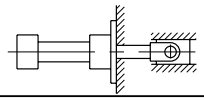
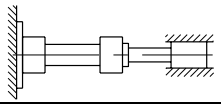
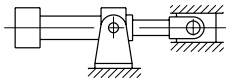
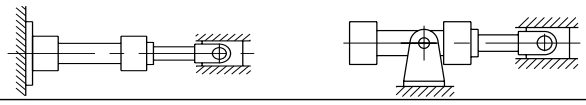
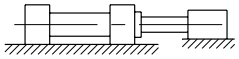
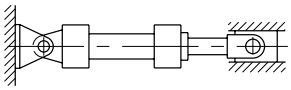
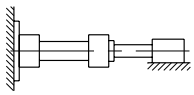
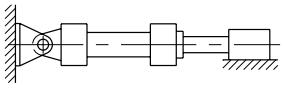


Piston Rod Selection Chart



Stroke Factors

The stroke factors which follow are used in the calculation of cylinder 'basic length' – see Piston Rod Size Selection, page 27.

Rod End Connection	Mounting Style	Type of Mounting	Stroke Factor
Fixed and Rigidly Guided	TB, TD, JJ, C		0.5
Pivoted and Rigidly Guided	TB, TD, JJ, C		0.7
Fixed and Rigidly Guided	TC, HH		1.0
Pivoted and Rigidly Guided	D		1.0
Pivoted and Rigidly Guided	TC, HH, DD		1.5
Supported but not Rigidly Guided	TB, TD, JJ, C		2.0
Pivoted and Rigidly Guided	BB, DB, SBd		2.0
Supported but not Rigidly Guided	TC, HH		4.0
Supported but not Rigidly Guided	BB, DB, SBd		4.0

Long Stroke Cylinders

When considering the use of long stroke cylinders, the piston rod should be of sufficient diameter to provide the necessary column strength.

For tensile (pull) loads, the rod size is selected by specifying standard cylinders with standard rod diameters and using them at or below the rated pressure.

For long stroke cylinders under compressive loads, the use of stop tubes should be considered, to reduce bearing stress. The Piston Rod Selection Chart on page 27 provides guidance where unusually long strokes are required.

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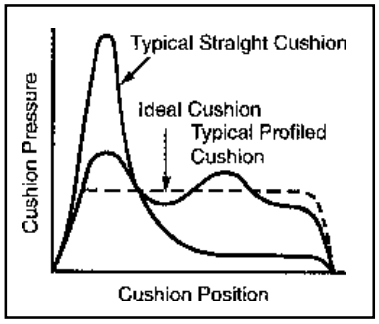
For more comprehensive information on the calculation of cylinder bore size required, please refer to the European cylinder inPHorm selection program 1260/1-Eur.

An Introduction to Cushioning

Cushioning is recommended as a means of controlling the deceleration of masses, or for applications where piston speeds are in excess of 0.1m/s and the piston will make a full stroke. Cushioning extends cylinder life and reduces undesirable noise and hydraulic shock. Deceleration devices or built-in 'cushions' are optional and can be supplied at the head and cap ends of the cylinder without affecting its envelope or mounting dimensions.

Standard Cushioning

Ideal cushion performance shows an almost uniform absorption of energy along the cushioning length, as shown. Many forms of cushioning exist, and each has its own specific merits and advantages. In order to cover the majority of applications, HMI and HMD cylinders are supplied with profiled cushioning as standard. Final speed may be adjusted using the cushion screws. The performance of profiled cushioning is indicated on the diagram, and cushion performance for each of the rod sizes available is illustrated graphically in the charts on page 30.



Note that cushion performance will be affected by the use of water or high water based fluids. Please consult the factory for details.

Alternative Forms of Cushioning

To complement the standard offering of profiled cushioning, special cushions can be designed to suit applications where the energy to be absorbed exceeds the standard cushion performance. Please consult the factory for further details.

Cushion Length

Where specified, HMI/HMD cylinders incorporate the longest cushion sleeve and spear that can be accommodated within the standard envelope without reducing the rod bearing and piston bearing lengths. See table of cushion lengths on page 31. Cushions are adjustable via recessed needle valves.

Cushion Calculations

The charts on page 30 show the energy absorption capacity for each bore/rod combination at the head (annulus) and the cap (full bore) ends of the cylinder. The charts are valid for piston velocities in the range 0.1 to 0.3m/s. For velocities between 0.3 and 0.5m/s, the energy values derived from the charts should be reduced by 25%. For velocities of less than 0.1m/s where large masses are involved, and for velocities of greater than 0.5m/s, a special cushion profile may be required. Please consult the factory for details.

The cushion capacity of the head end is less than that of the cap, and reduces to zero at high drive pressures owing to the pressure intensification effect across the piston. The energy absorption capacity of the cushion decreases with drive pressure, which in normal circuits is the relief valve pressure.

Formulae

Cushioning calculations are based on the formula $E = {}^1/_2mv^2$ for horizontal applications. For inclined or vertically downward or upward applications, this is modified to:

$E = {}^1/_2mv^2 + mgl \times 10^{-3} \times \sin\alpha$
(for inclined or vertically downward direction of mass)

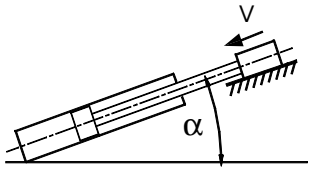
$E = {}^1/_2mv^2 - mgl \times 10^{-3} \times \sin\alpha$
(for inclined or vertically upward direction of mass)

Where:

E = energy absorbed in Joules
g = acceleration due to gravity = $9.81 m/s^2$
v = velocity in metres/second
l = length of cushion in millimetres (see page 31)
m = mass of load in kilogrammes (including piston, rod and rod end accessories, see pages 15, 22 and 31)
a = angle to the horizontal in degrees
p = pressure in bar

Example

The following example shows how to calculate the energy developed by masses moving in a straight line. For non-linear motion, other calculations are required; please consult the factory. The example assumes that the bore and rod diameters are already appropriate for the application. The effects of friction on the cylinder and load have been ignored.



Selected bore/rod 160/70mm (No.1 rod).
Cushioning at the cap end.

Pressure =	160 bar
Mass =	10000kg
Velocity =	0.4m/s
Cushion length =	41mm
α =	45°
$\sin\alpha$ =	0.70

$$E = {}^1/_2mv^2 + mgl \times 10^{-3} \times \sin a$$

$$E = \frac{10000 \times 0.4^2}{2} + 10000 \times 9.81 \times \frac{41}{10^3} \times 0.70$$

$$E = 800 + 2815 = 3615 \text{ Joules}$$

Note that, as velocity is greater than 0.3m/s, a de-rating factor of 0.75 must be applied before comparison with the curves on the cushioning charts. Applying this factor to the calculated energy figure of 3615 Joules gives a corrected energy figure of:

$$\frac{3615}{0.75} = 4820 \text{ Joules}$$

Comparison with the curve shows that the standard cushion can safely decelerate this load. If the calculated energy exceeds that indicated by the curve, select a larger bore cylinder and re-calculate.

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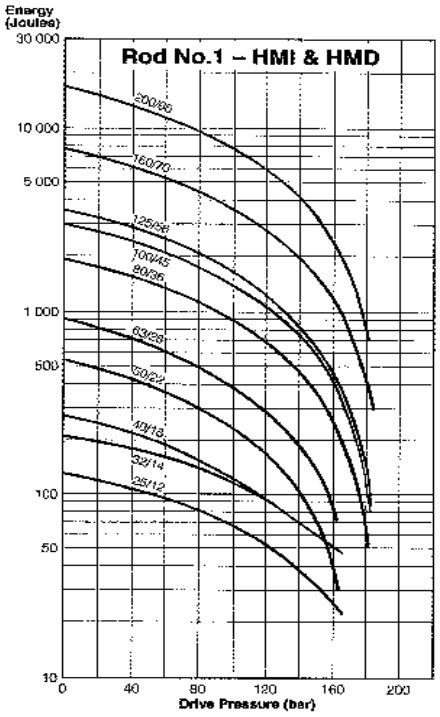
Cushioning requirements can be calculated automatically for individual cylinder/load combinations using the European cylinder inPHorm selection program 1260/1-Eur.

Cushion Energy Absorption Capacity Data

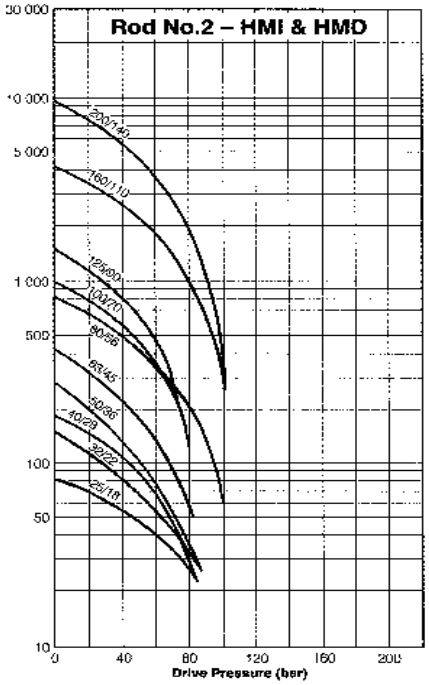
The cushion energy absorption capacity data shown below is based on the maximum fatigue-free pressure developed in the tube. If working life cycle applications of less than 10^6 cycles are envisaged, then greater energy absorption figures can be applied. Please consult the factory if further information is required.

Head End (Rod Outward)

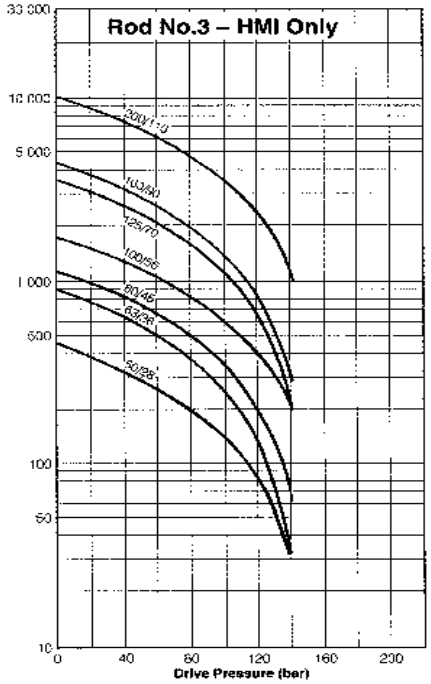
Rod No.1 – HMI & HMD



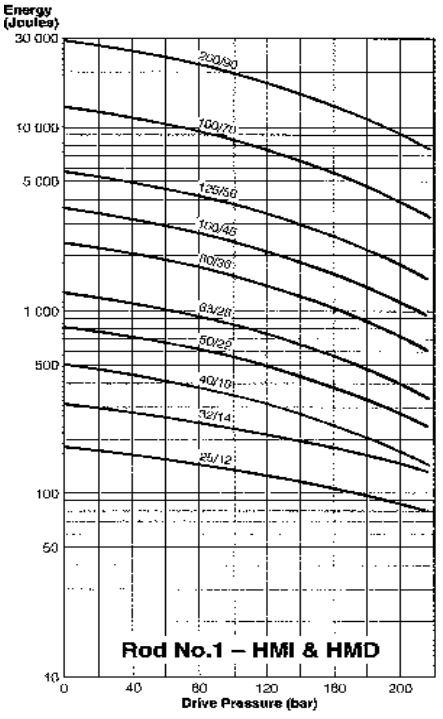
Rod No.2 – HMI & HMD

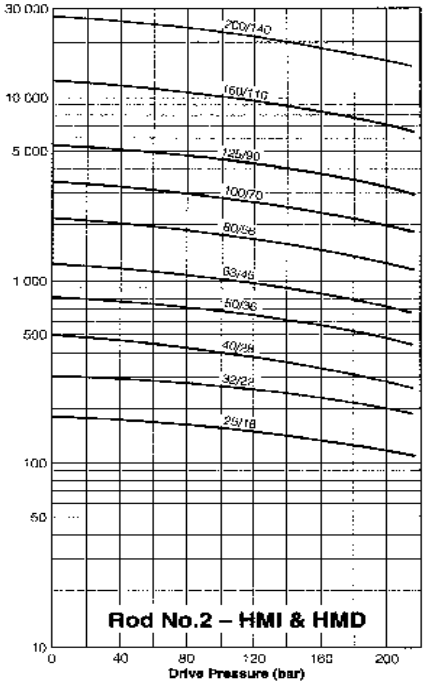


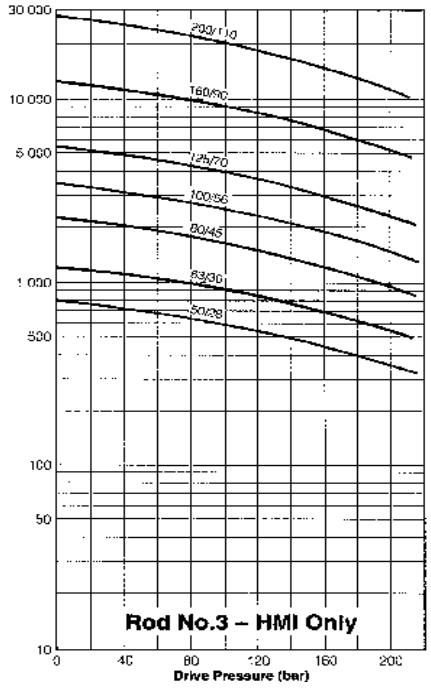
Rod No.3 – HMI Only



Cap End (Rod Inward)







Rod No.1 – HMI & HMD **Rod No.2 – HMI & HMD** **Rod No.3 – HMI Only**

Cushion Length, Piston and Rod Mass

Bore ϕ	Rod No.	Rod ϕ	Cushion Length – ISO & DIN				– ISO Only		Piston & Rod at Zero Stroke (kg)	Rod Only per 10mm Stroke (kg)
			Rod No.1		Rod No.2		Rod No.3			
			Head	Cap	Head	Cap	Head	Cap		
25	1	12	22	20	24	20	-	-	0.12	0.01
	2	18							0.16	0.02
32	1	14	24	20	24	20	-	-	0.23	0.01
	2	22							0.30	0.03
40	1	18	29	29	29	30	-	-	0.44	0.02
	2	28							0.60	0.05
50	1	22	29	29	29	29	29	29	0.70	0.03
	2	36							0.95	0.08
	3	28							0.80	0.05
63	1	28	29	29	29	29	29	29	1.20	0.05
	2	45							1.60	0.12
	3	36							1.35	0.08
80	1	36	35	32	27	32	35	32	2.30	0.08
	2	56							2.90	0.19
	3	45							2.50	0.12
100	1	45	35	32	26	32	29	32	4.00	0.12
	2	70							5.10	0.30
	3	56							4.40	0.19
125	1	56	28	32	27	32	27	32	7.10	0.19
	2	90							9.40	0.50
	3	70							8.00	0.30
160	1	70	34	41	34	41	34	41	13.70	0.30
	2	110							17.20	0.75
	3	90							15.30	0.50
200	1	90	46	56	49	56	50	56	27.00	0.50
	2	140							34.00	1.2
	3	110							30.00	0.75

Pressure Limitations – Introduction

The pressure limitations of a hydraulic cylinder must be reviewed when considering its application. To assist the designer in obtaining the optimum performance from a cylinder, the following guidelines are provided. If in doubt, please consult the factory.

Low Pressure Operation

At low operating pressures, a wide range of application factors begin to affect cylinder performance. As a result, consideration should be given to factors such as seal friction and mounting alignment when selecting a cylinder for low pressure use. Low Friction seals are available to optimise performance at low pressures – see pages 7 and 34. If in doubt, please consult the factory.

Maximum Pressure

HMI and HMD cylinders are designed to the mounting dimensions specified in ISO 6020/2 and DIN 24 554 for 160 bar cylinders but, due to the selection of materials, they can be used at higher pressures depending on the application and the choice of rod size and rod end style. As a result, the majority of these cylinders can be operated at 210 bar.

The designer must, however, take account of fatigue stress which may restrict the cylinder to a lower pressure.

Three main areas of cylinder design may be affected: the cylinder body (pressure envelope), the cylinder mountings, and the piston rod.

The maximum pressures illustrated in the tables on page 32 are based on pure tensile and compressive loadings, without the presence of any bending stresses. Where it is impractical to avoid side loadings, eg: by the use of pivot mountings, please consult the factory giving full details of the application.

Cylinder Body (Pressure Envelope)

In many applications, the pressure developed within a cylinder may be greater than the working pressure, due to pressure intensification across the piston and cushioning, eg: meter-out circuits. In most cases, this intensification does not affect the cylinder mountings or piston rod threads in the form of increased loading. This induced pressure should not exceed the 340 bar fatigue limit of the cylinder body. The cushion energy absorption data on page 30 is based on this maximum induced pressure. If in doubt, please consult the factory.

For more comprehensive information about pressure limitations for individual cylinders, please refer to the European cylinder inPHorm selection program 1260/1-Eur.

All dimensions are in millimetres unless otherwise stated.

Cylinder Mountings
Subject to restrictions imposed by the cylinder body and piston rod/piston rod end, all HMI and HMD cylinder mountings are within their fatigue limits when operated at 210 bar.

Piston Rods (Push Loads)
Fatigue stress only occurs under tensile load conditions. For push loads, therefore, where a piston rod is in compression and attachments are securely butted to the rod shoulder, fatigue is not an issue. All HMI and HMD cylinders may be used for push loads at 210 bar. However, piston rod buckling must be considered – see page 27.

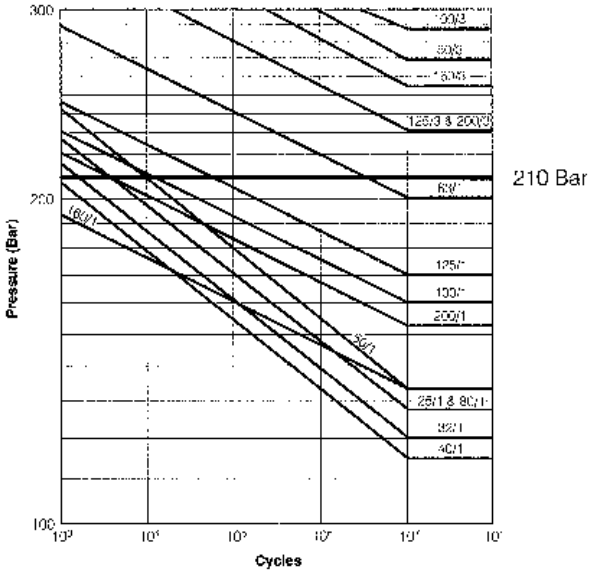
Piston Rods (Pull Loads)
Under pull load conditions, the threads between the piston and piston rod may be subjected to full load variations. It is under these conditions that fatigue failure must be considered. Most piston rod options are fatigue free at 210 bar. The charts below show the fatigue life profiles of only those piston rods which are affected by fatigue at or below the 210 bar nominal pressure. This allows the designer to de-rate the operating pressure in order to achieve a fatigue-free life for the piston rod, or to estimate the fatigue life of the rod in terms of cylinder cycles.

Double Rodded Cylinders
The method of attachment of the piston rods to the piston in double rodded cylinders results in one rod being stronger than the other – see pages 14 and 21. The stronger rod is identified by the letter 'K' stamped on its end, and its pressure limitations are identical to those shown on the charts for the equivalent single rod assembly. The chart for the Double Rod Cylinder Style 4, below, applies to the weaker rod only.

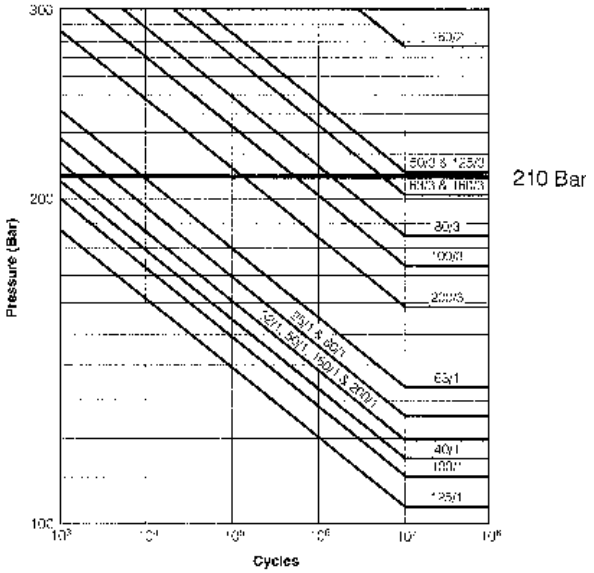
Fatigue Life of Piston Rods under Pull Load Conditions

Note: Curves are labelled according to bore size and rod number, eg: 100/3 is a cylinder with 100mm bore, fitted with a No.3 rod.

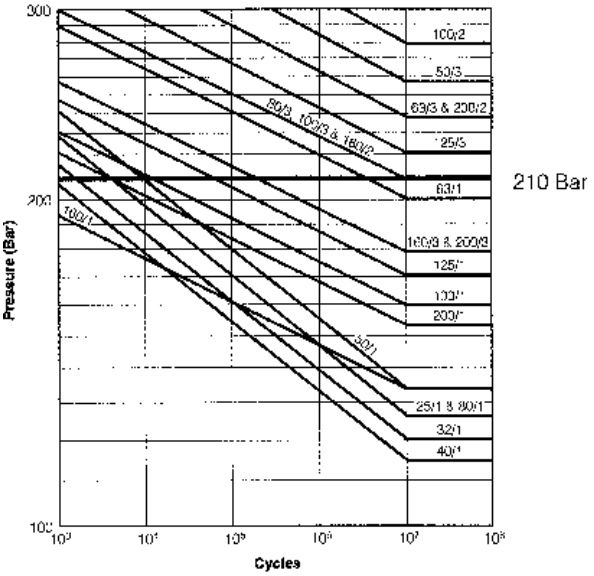
Style 4



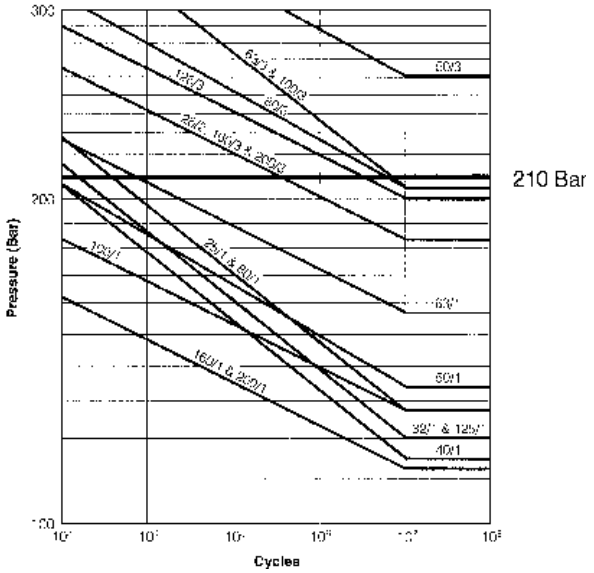
Style 9



Style 7



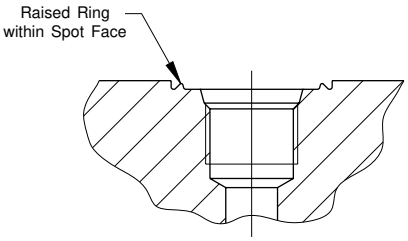
Double Rod Style 4



Standard Ports

Series HMI and HMD cylinders are supplied with BSP parallel threaded ports, of a size suitable for normal speed applications – see table opposite. HMI cylinders are also available with metric ports to DIN 3852 Part 1 and ISO 6149. Threaded ports are spotfaced for sealing washers. The ISO 6149 port incorporates a raised ring in the spot face for identification.

ISO 6149 Port Identification



Oversize and Additional Ports

For higher speed applications, Series HMI and non-standard HMD cylinders are available with oversize BSP or metric ports to the sizes shown in the table opposite, or with extra ports in head or cap faces that are not used for mountings or cushion screws. On 25mm and 32mm bore cylinders, 20mm high port bosses are necessary to provide the full thread length at the cap end – see pages 3 and 38 for increased height at the head end. Note that Y and PJ dimensions may vary slightly to accommodate oversize ports – please contact the factory where these dimensions are critical.

Port Size and Piston Speed

One of the factors which influences the speed of a hydraulic cylinder is fluid flow in the connecting lines, introduced to or expelled from the cap end port. Due to piston rod displacement, the flow at the cap end port will be greater than that at the head end, at the same piston speed. Fluid velocity in connecting lines should be limited to 5m/s to minimize fluid turbulence, pressure loss and hydraulic shock. The tables opposite are a guide for use when determining whether cylinder ports are adequate for the application. Data shown gives piston speeds for standard and oversize ports and connecting lines where the velocity of the fluid is 5m/s. If the desired piston speed results in a fluid flow in excess of 5m/s in connecting lines, larger lines with two ports per cap should be considered. Parker recommends that a flow rate of 12m/s in connecting lines should not be exceeded.

Speed Limitations

Where large masses are involved, or piston speeds exceed 0.1m/s and the piston will make a full stroke, cushions are recommended – see page 29. For cylinders with oversize ports and with a fluid velocity exceeding 8m/s into the cap end, please contact the factory with details of the application.

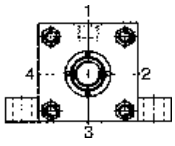
Bore ϕ	Standard Cylinder Ports				
	Port size BSP/G inches	Port Size Metric [1]	Bore of Connecting Lines	Cap End flow in l/min @ 5 m/s	Piston Speed m/s
25	1/4	M14x1.5	7	11.5	0.39
32	1/4	M14x1.5	7	11.5	0.24
40	3/8	M18x1.5	10	23.5	0.31
50	1/2	M22x1.5	13	40	0.34
63	1/2	M22x1.5	13	40	0.21
80	3/4	M27x2	15	53	0.18
100	3/4	M27x2	15	53	0.11
125	1	M33x2	19	85	0.12
160	1	M33x2	19	85	0.07
200	1.1/4	M42x2	24	136	0.07

Bore ϕ	Oversize Cylinder Ports (Not to DIN 24 554)				
	Port size BSP/G inches	Port Size Metric [1]	Bore of Connecting Lines	Cap End Flow in l/min @ 5 m/s	Piston Speed m/s
25	3/8 [2]	M18x1.5 [2, 3]	10	23.5	0.80
32	3/8 [2]	M18x1.5 [2, 3]	10	23.5	0.48
40	1/2	M22x1.5 [3]	13	40	0.53
50	3/4	M27x2 [3]	15	53	0.45
63	3/4	M27x2 [3]	15	53	0.28
80 [4]	1	M33x2	19	85	0.28
100 [4]	1	M33x2	19	85	0.18
125 [4]	1.1/4	M42x2	24	136	0.18
160 [4]	1.1/4	M42x2	24	136	0.11
200 [4]	1.1/2	M48x2	30	212	0.11

[1] Not to DIN 24 554
[2] 20mm high port bosses fitted at cap end
[3] ISO 6149 ports are not available on some bore/rod combinations
[4] Consult factory – available on certain bore sizes only
Not recommended for JJ mountings at pressures above 100 bar

Ports, Air Bleeds and Cushion Adjustment Location

The table below shows standard positions for ports, and cushion adjusting screws where fitted. For cylinders up to 63mm bore, a cartridge type adjuster is fitted which may protrude by up to 3mm on 25mm and 32mm bore cylinders. Above 63mm bore, a flush fitting socket-headed adjuster is used; these may also be fitted to smaller cylinders if mounting space is critical. Air bleeds, see page 35, may be fitted in unoccupied faces of the head or cap, depending on mounting.



Positions of Ports and Cushion Screws in Head and Cap		Mounting Styles - ISO and DIN																													
		TB, TC and TD				JJ [5]				HH				C [6]	B and BB				SBd				D			DB				DD			
Head	Port	1	2	3	4	1	2	3	4	1	2	3	4	1	1	2	3	4	1	2	3	4	1	3		1	2	3	4	1	2	3	4
	Cushion	2	3	4	1	3	3	1	1	3	4	1	2	2	2	3	4	1	2	3	4	1	3	1		3	4	1	2	3	4	1	2
Cap	Port	1	2	3	4	1	2	3	4	1	2	3	4	1	1	2	3	4	1	2	3	4	1	2	3	4	1		3	1	2	3	4
	Cushion	2	3	4	1	3	4	1	2	3	3	1	1	2	2	3	4	1	2	3	4	1	3	4	1	2	3		1	3	4	1	2

[5] JJ port positions shown apply to all HMI cylinders, and to 125-200mm bore HMD. For HMD cylinders up to 100mm bore, ports can only be fitted in positions 1 and 3, with cushion screws in the opposite face.

[6] Ports in positions 2 and 4 on 25mm and 32mm bore cylinders are only available with a No.1 rod.

All dimensions are in millimetres unless otherwise stated.

Seals and Fluid Data

Group	Seal Materials – a combination of:	Fluid Medium to ISO 6743/4-1982	Temperature Range
1	Nitrile (NBR), PTFE, Polyamide, enhanced polyurethane (AU)	Mineral oil HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606 oil, air, nitrogen	–20°C to +80°C
2	Nitrile (NBR), PTFE, Polyamide	Water glycol (HFC)	–20°C to +60°C
5	Fluorocarbon elastomer (FPM), PTFE, Polyamide	Fire resistant fluids based on phosphate esters (HFD-R) Also suitable for hydraulic oil at high temperatures/ environments. **Not suitable for use with Skydrol** See fluid manufacturer's recommendations.	–20°C to +150°C
6	Various compounds including nitrile, polyamide, enhanced polyurethane fluorocarbon elastomers and PTFE	Water Oil in water emulsion 95/5 (HFA)	+5°C to +55°C
7		Water in oil emulsion 60/40 (HFB)	+5°C to +60°C

Operating Medium
Sealing materials used in the standard cylinder are suitable for use with most petroleum-based hydraulic fluids.

Special seals are available for use with water-glycol or water-in-oil emulsions, and with fluids such as fire-resistant synthetic phosphate ester and phosphate ester-based fluids.

If there is any doubt regarding seal compatibility with the operating medium, please consult the factory.

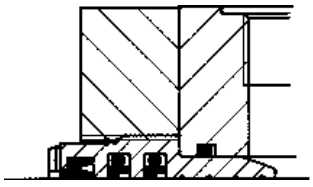
The table above is a guide to the sealing compounds and operating parameters of the materials used for standard and optional rod gland, piston and body seals.

Green Fluids
Special seals for use with 'green fluids' are available to special order. Please consult the factory for details.

Temperature
Standard seals can be operated at temperatures between -20°C and +80°C. Where operating conditions result in temperatures which exceed these limits, special seal compounds may be required to ensure satisfactory service life – please consult the factory.

Special Seals
Group 1 seals are fitted as standard to HMI and HMD cylinders. For other duties, the optional seal groups 2, 5, 6 and 7 are available – please quote in the cylinder order code, shown on page 4 for HMI (ISO) cylinders and page 39 for HMD (DIN) cylinders. Special seals, in addition to those shown in the table below, can also be supplied. Please insert an S (Special) in the order code and specify fluid medium when ordering.

Low Friction Seals
For applications where very low friction and an absence of stick-slip are important, the option of low friction seals is available. In low pressure applications, their use should also be considered. If in doubt, please consult the factory. The gland seals comprise two low friction PTFE stepped seals and a conventional double lip wiper. The piston which is supplied for low friction applications is illustrated on page 7.



Water Service
Special cylinders are available for use with water as the fluid medium. Modifications include a stainless steel piston rod with lipseal piston, and plating of internal surfaces. When ordering, please specify the maximum operating pressure or load/speed conditions, as the stainless steel rod is of lower tensile strength than the standard material.

Warranty Parker Hannifin warrants cylinders modified for use with water or water base fluids to be free of defects in materials and workmanship, but cannot accept responsibility for premature failure caused by corrosion, electrolysis or mineral deposits in the cylinder.

Weights – Series HMI and HMD Cylinders

Bore ϕ	Rod ϕ	Mounting Styles - Weight at Zero Stroke						Weight per 10mm Stroke
		TB, TC, TD	C	JJ, HH	B, BB, SBd	D, DB	DD	
		kg	kg	kg	kg	kg	kg	kg
25	12	1.2	1.4	1.5	1.4	1.3	1.5	0.05
	18						1.6	0.06
32	14	1.6	1.9	2.0	1.9	1.7	2.0	0.06
	22	1.7						0.08
40	18	3.7	4.0	4.7	4.2	3.9	4.6	0.09
	28	3.8	4.1	4.8	4.3	4.0	4.7	0.12
50	22	5.9	6.5	7.2	7.0	6.3	7.9	0.14
	28	6.0	6.6	7.3	7.1		8.0	0.16
	36				7.2	6.4		0.18
63	28	8.5	9.7	10.1	10.1	8.9	10.6	0.19
	36	8.6	9.8	10.2	10.2	9.0	10.7	0.22
	45	8.7	9.9	10.3	10.4	9.1	10.9	0.27
80	36	16.0	17.3	18.9	19.5	16.5	20.5	0.27
	45	16.1	17.4	19.0	19.6	16.6		0.32
	56	16.3	17.7	19.2	19.8	16.8	20.7	0.39
100	45	22.0	24.0	25.0	28.0	22.7	26.0	0.40
	56			26.0			27.0	0.47
	70	23.0	25.0		29.0	23.2		0.58
125	56	42.0	44.0	48.0	53.0	43.0	48.0	0.65
	70		45.0		54.0		49.0	0.76
	90	43.0		49.0		44.0	50.0	0.95
160	70	69.0	73.0	78.0	90.0	71.0	84.0	1.00
	90				91.0	72.0	85.0	1.20
	110	70.0	74.0	79.0	92.0			1.40
200	90	122.0	129.0	138.0	157.0	127.0	153.0	1.50
	110	123.0	130.0		158.0	128.0		1.80
	140	124.0	131.0	140.0	160.0	129.0	155.0	2.30

Weights for accessories begin on page 15 for HMI cylinders and page 22 for HMD cylinders.

All dimensions are in millimetres unless otherwise stated.

Air Bleeds

The option of bleed screws is available at either or both ends of the cylinder, at any position except in the port face. The selected positions should be shown in the order code – see page 4 for HMI cylinders and page 39 for HMD. Cylinders with bore sizes up to 40mm are fitted with M5 bleed screws; for bore sizes of 50mm and above, M8 bleed screws are fitted. Note that, for cylinders of 50mm bore and above, where it is essential to have the air bleed in the port face, bosses can be welded to the cylinder tube. Please contact the factory for details.

Gland Drains

The tendency of hydraulic fluid to adhere to the piston rod can result in an accumulation of fluid in the cavity behind the gland wiperseal under certain operating conditions. This may occur with long stroke cylinders; where there is a constant back pressure as in differential circuitry, or where the ratio of the extend speed to the retract speed is greater than 2 to 1.

A gland drain port can be provided in the retainer on all mounting styles except JJ – 25, 32 and 40mm bores with no.1 rod, and style D – 100 to 200mm bores, where it is mounted in the head. Where the gland is provided in the retainer, the thickness of the retainer is increased by 6mm on 32 and 40mm bore cylinders with no.2 rod, and by 4mm on 63mm bore cylinders with no.2 rod. Note that, on style JJ cylinders, drain ports cannot normally be positioned in the same face as ports or cushion valves – please consult the factory.

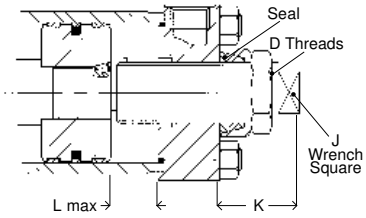
Gland drains should be piped back to the fluid reservoir, which should be located below the level of the cylinder.

Bore ϕ	Port Thread	
	Style JJ	All Others
25-50	1/8 BSPP	1/8 NPTF
63-200	1/8 BSPP	1/8 BSPP

Stroke Adjusters

Where absolute precision in stroke length is required, a screwed adjustable stop can be supplied. Several types are available – the illustration shows a design suitable for infrequent adjustment at the uncushioned cap end of a cylinder. Please contact the factory, specifying details of the application and the adjustment required.

Bore ϕ	D	J	K min	L max
40	M12x1.25	7	75	130
50	M20x1.5	12	75	200
63	M27x2	16	75	230
80	M33x2	20	85	230
100	M42x2	26	70	450
125	M48x2	30	70	500
160	M64x3	40	75	500
200	M80x3	50	80	500



Rod Locking Devices

These units provide positive locking of the piston rod. They require hydraulic pressure to release and loss of pressure causes the clamp to operate, allowing them to be used as a fail-safe device. Please contact the factory for further information.

Single-Acting Cylinders

Standard HMI and HMD series cylinders are of the double-acting type. They are suitable for use as single-acting cylinders, where the load or other external force is used to return the piston after the pressure stroke.

Spring-Returned, Single-Acting Cylinders

Series HMI and HMD single-acting cylinders can also be supplied with an internal spring to return the piston after the pressure stroke. Please supply details of load conditions and friction factors, and advise whether the spring is required to advance or return the piston rod.

On spring-returned cylinders, it is recommended that tie rod extensions be specified to allow the spring to be 'backed off' until compression is relieved. Tie rod nuts should be welded to the tie rods at the opposite end of the cylinder, to further assure safe disassembly. Please contact the factory when ordering spring-returned cylinders.

Multiple Stroke Positioning

To obtain linear force in one plane with controlled stopping at intermediate points, several designs are available. For three stopped positions, it is common practice to mount two standard single rod Style HH cylinders back-to-back, or to use through-tie rods. By extending or retracting the stroke of each cylinder independently, it is possible to achieve three positions at the piston ends. An alternative technique is to use a tandem cylinder with an independent piston rod in the cap section. Please consult the factory for further details.

Rod End Bellows

Unprotected piston rod surfaces which are exposed to contaminants with air hardening properties should be protected by rod end bellows. Longer rod extensions are required to accommodate the collapsed length of the bellows. Please consult the factory for further information.

Metallic Rod Wipers

Metallic rod wipers replace the standard wiper seal, and are recommended where dust or splashings might damage the wiper seal material. Metallic rod wipers do not affect cylinder dimensions.

DC Proximity Sensors

These can be fitted to give reliable end of stroke signals. See catalogue 0810 for details.

Position Feedback

Linear position transducers of various types are available for HMI and HMD series cylinders. Please contact the factory for further details.

All dimensions are in millimetres unless otherwise stated.

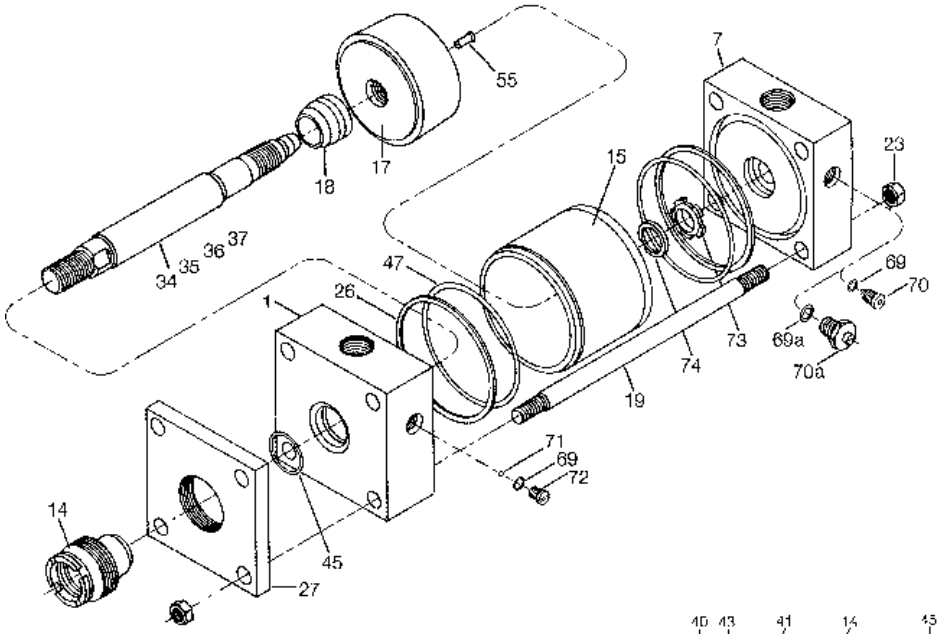
Service Assemblies and Seal Kits

Service Assembly Kits and Seal Kits for HMI and HMD cylinders simplify the ordering and maintenance processes. They contain sub-assemblies which are ready for installation, and are supplied with full instructions. When ordering Service Assemblies and Seal Kits, please refer to the identification plate on the cylinder body, and supply the following information:

Serial Number - Bore - Stroke - Model Number - Fluid Type

Key to Part Numbers

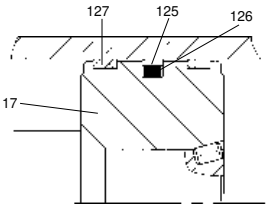
1 Head
7 Cap
14 Gland/bearing cartridge
15 Cylinder body
17 Piston
18 Cushion sleeve
19 Tie rod
23 Tie rod nut
26 Back-up washer (not 25–50mm bore cylinders)
27 Retainer
34 Piston rod – single rod, no cushion



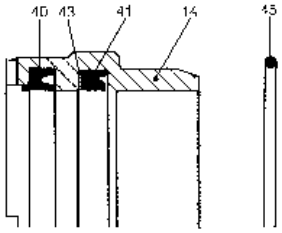
35 Piston rod – single rod, cushion at head end
36 Piston rod – single rod, cushion at cap end
37 Piston rod – single rod, cushion at both ends
40 Wiperseal – for 14 and 122
41 Lipseal – for 14
43 Back-up washer, gland lipseal 41 (Group 5 seals)
45 O-ring – gland/head
47 O-ring – cylinder body
55 Locking pin – piston/rod
57[1] Piston rod – double (stronger[2]) rod, no cushion
58[1] Piston rod – double (stronger[2]) rod, cushion one end
60[1] Piston rod – double (weaker[2]) rod, no cushion
61[1] Piston rod – double (weaker[2]) rod, cushion one end
69 O-ring – needle valve and check valve screws
69a O-ring – cartridge-type needle valve
70 Needle valve, cushion adjustment
70a Needle valve assembly, cartridge type
71 Ball – cushion check valve (bore sizes above 100mm)
72 Cushion check valve screw (bore sizes above 100mm)
73 Floating cushion bush
74 Retaining ring for cushion bush
122 Low Friction Gland Cartridge
123 Stepseal for 122
124 Pre-load ring for stepseal 123
125 Standard piston seal
126 Energising ring for standard seal 125
127 Wear ring for standard piston
128 LoadMaster piston seal
129 Energising ring for LoadMaster seal 128
130 Wear ring for LoadMaster piston
131 Low friction piston seal
132 Energising ring for low friction seal 131
133 Wear ring for low friction piston

[1] Not illustrated
[2] See pages 14 and 21 – double rod strength

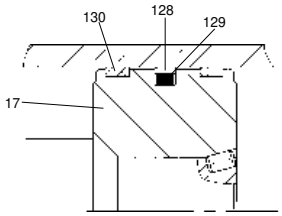
Rod ϕ	Gland Cartridge Wrench	Spanner Wrench
12	69590	11676
14	69590	11676
18	84765	11676
22	69591	11676
28	84766	11703
36	69592	11703
45	69593	11677
56	69595	11677
70	69596	11677
90	84768	11677
110	-	-
140	-	-



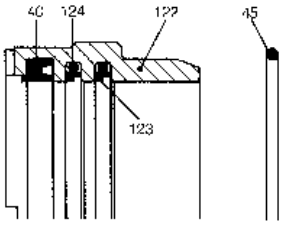
Standard Piston



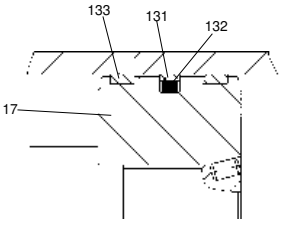
Gland Cartridge and Seals



LoadMaster Piston



Low Friction Gland and Seals



Low Friction Piston

Contents and Part Numbers of Seal Kits for Pistons and Glands

(see key to part numbers opposite)

RG Kit – Gland Cartridge and Seals* Contain items 14, 40, 41, 43, 45. Where the original gland incorporates a gland drain, please consult the factory.

RK Kit – Gland Cartridge Seals* Contain items 40, 41, 43, 45.

RGF Kit – Low Friction Gland Cartridge and Seals* Contains items 122, 40, 45, plus two each of 123 and 124.

RKF Kit – Seals for Low Friction Gland Cartridge* Contains items 40 and 45, plus two each of 123 and 124.

Rod ϕ	RG Kit*	RK Kit*	RGF Kit*	RKF Kit*
12	RG2HM0121	RK2HM0121	RG2HMF0121	RK2HMF0121
14	RG2HM0141	RK2HM0141	RG2HMF0141	RK2HMF0141
18	RG2HM0181	RK2HM0181	RG2HMF0181	RK2HMF0181
22	RG2HM0221	RK2HM0221	RG2HMF0221	RK2HMF0221
28	RG2HM0281	RK2HM0281	RG2HMF0281	RK2HMF0281
36	RG2HM0361	RK2HM0361	RG2HMF0361	RK2HMF0361
45	RG2HM0451	RK2HM0451	RG2HMF0451	RK2HMF0451
56	RG2HM0561	RK2HM0561	RG2HMF0561	RK2HMF0561
70	RG2HM0701	RK2HM0701	RG2HMF0701	RK2HMF0701
90	RG2HM0901	RK2HM0901	RG2HMF0901	RK2HMF0901
110	RG2HM1101	RK2HM1101	RG2HMF1101	RK2HMF1101
140	RG2HM1401	RK2HM1401	RG2HMF1401	RK2HMF1401

CB Kit – Cylinder Body End Seals* Contains two each of items 47, 26 (not 25–50mm bore).

PN Kit – Standard Piston Seals* Contains CB Kit, plus two of item 127 and one each of items 125 and 126.

PZ Kit – LoadMaster Piston Seals* Contains CB Kit, plus two of item 130 and one each of items 128 and 129.

PF Kit – Low Friction Piston Seals* Contains CB Kit, plus two of item 133 and one each of items 131 and 132.

Bore ϕ	CB Body Seal Kit*	PN Piston Seal Kit*	PZ Piston Seal Kit*	PF Piston Seal Kit*
25	CB025HM001	PN025HM001	PZ025HM001	PF025HM001
32	CB032HM001	PN032HM001	PZ032HM001	PF032HM001
40	CB040HM001	PN040HM001	PZ040HM001	PF040HM001
50	CB050HM001	PN050HM001	PZ050HM001	PF050HM001
63	CB063HM001	PN063HM001	PZ063HM001	PF063HM001
80	CB080HM001	PN080HM001	PZ080HM001	PF080HM001
100	CB100HM001	PN100HM001	PZ100HM001	PF100HM001
125	CB125HM001	PN125HM001	PZ125HM001	PF125HM001
160	CB160HM001	PN160HM001	PZ160HM001	PF160HM001
200	CB200HM001	PN200HM001	PZ200HM001	PF200HM001

* Seal Groups – Ordering

The part numbers shown in the tables above are for Group 1 seals, denoted by the last character of each part number. For Group 2, 5, 6 or 7 seals, substitute a '2', '5', '6' or '7' for the '1' at the end of the number sequence.

Contents and Part Numbers of Service Assembly Kits

(see key to part numbers opposite)

Head Assembly

Non-cushioned: 1, 26, 47
Cushioned: 1, 26, 47, 69, (69a), 70, (70a), 71, 72

Cap Assembly

Non-cushioned: 7, 26, 47
Cushioned: 7, 26, 47, 69, (69a), 70, (70a), 73, 74

Cylinder Body

All types: 15

Cushion Screw/Cartridge Assembly

Screw type: 69, 70
Cartridge type: 69a, 70a

Check Valve Screw Assembly

Screw type: 69, 71, 72 (bore sizes above 100mm)

Piston Rod Assemblies

These kits contain a fully assembled piston and rod assembly which is ready to install. They comprise a piston assembly of the appropriate type – Standard, LoadMaster or Low Friction, see parts list below, plus a rod assembly from the types listed below.

Piston Assemblies

Standard: 17, 125, 126, 127 x 2
LoadMaster: 17, 128, 129, 130 x 2
Low Friction: 17, 131, 132, 133 x 2

Rod Assemblies

Single rod, non-cushioned: 34
Single rod, cushioned head: 35, 18
Single rod, cushioned cap: 36
Single rod, cushioned both ends: 37, 18

Double rod, non-cushioned: 57, 60,
Double rod, cushioned stronger end: 58, 60, 18
Double rod, cushioned weaker end: 58, 61, 18
Double rod, cushioned both ends: 58, 61, 18 x 2

Tie Rod Torques

Please refer to the table on page 24.

Repairs

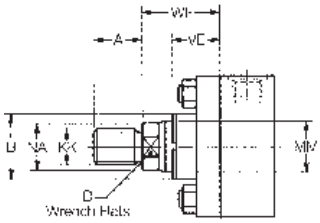
Although HMI and HMD cylinders are designed to make on-site maintenance or repairs as easy as possible, some operations can only be carried out in our factory. It is standard policy to fit a cylinder returned to the factory for repair with those replacement parts which are necessary to return it to 'as good as new' condition. Should the condition of the returned cylinder be such that repair would be uneconomical, you will be notified.

All dimensions are in millimetres unless otherwise stated.

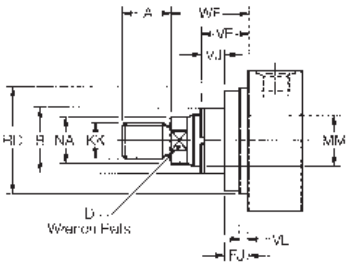
Rod End Styles 4 and 7

The HMD cylinder to DIN 24 554 is available with two sizes of rod for each bore size. The smaller diameter rod is designated No.1 and the larger No.2. Both rods share the same size of male rod end for each bore size, designated Style 4 for the No.1 rod and Style 7 for the No.2. For each bore size, the thread form and length of thread are identical – see tables below. Note that a wider range of rod end styles is available in the ISO section of this catalogue – see page 3.

Rod End Styles 4 & 7 – All Except JJ Mount

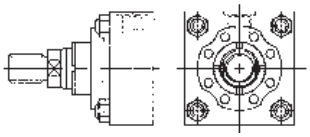


Rod End Styles 4 & 7 – JJ Mount

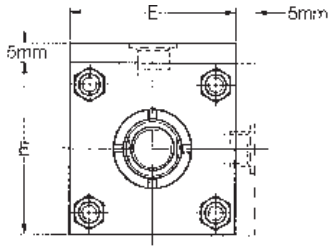


Gland Retainer – 160 and 200mm Bore

On all 160mm and 200mm bore DIN mounting styles except JJ, the gland retainer is separately bolted to the head, as shown.



25 & 32mm Bore Cylinders



5mm extra height applies to port face at head end only.

Piston Rod End Dimensions – Check pressure limitations of piston rods on page 31

Bore ϕ	Rod No.	MM Rod ϕ
25	1	12
	2	18
32	1	14
	2	22
40	1	18
	2	28
50	1	22
	2	36
63	1	28
	2	45
80	1	36
	2	56
100	1	45
	2	70
125	1	56
	2	90
160	1	70
	2	110
200	1	90
	2	140

Styles 4 & 7		B	D	NA	VE	WF
KK	A	f9				
M10x1.25	14	24	10	11	16	25
		30	15	17	16	
M12x1.25	16	26	12	13	22	35
		34	18	21	22	
M14x1.5	18	30	15	17	16	35
		42	22	26	22	
M16x1.5	22	34	18	21	22	41
		50	30	34	25	
M20x1.5	28	42	22	26	22	48
		60	39	43	29	
M27x2	36	50	30	34	25	51
		72	48	54	29	
M33x2	45	60	39	43	29	57
		88	62	68	32	
M42x2	56	72	48	54	29	57
		108	80	88	32	
M48x2	63	88	62	68	32	57
		133	100	108	32	
M64x3	85	108	80	88	32	57
		163	128	138	32	

JJ Mount Only			
VL min	RD f8	VJ	FJ
3	38	6	10
3	42	12	10
3	62	6	10
		12	
4	74	6	16
		9	
4	75	6	16
	88	13	
4	82	5	20
	105	9	
5	92	7	22
	125	10	
5	105	9	20
	150	10	22
5	125	10	22
	170	7	25
5	150	10	22
	210	7	25

All dimensions are in millimetres unless otherwise stated.

Model Numbers

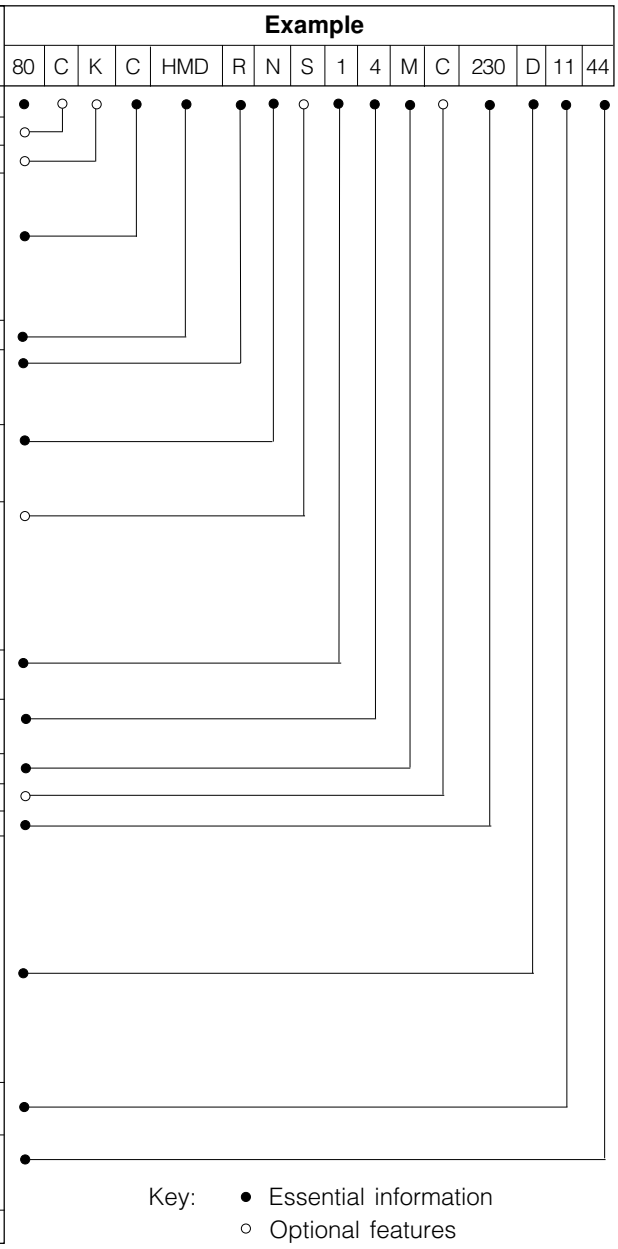
Each Parker series HMD cylinder is assigned a model number consisting of a set of characters. To develop a model number, select those characters which represent the cylinder features that you require, and put them down in the sequence indicated by the example below.

Double Rod Cylinders

For double rod cylinders, specify rod number and rod end symbols for both piston rods. A typical model number for a double rod cylinder would be:

100	K	JJ	HMD	R	N	1	4	M	1	4	M	125	A1	11	44

Feature	Description	Page	Symbol
Bore	Millimetres	–	–
Cushion – Head	If required	29	C
Double Rod [1]	If required	21	K
Mounting Style	Head Rectangular Flange Cap Rectangular Flange Side Lugs Cap Fixed Eye with Spherical Bearing Intermediate Fixed Trunnion	19 19 19 20 20	JJ HH C SBd DD
Series	Series name	-	HMD
Ports	BSP (ISO 228) – standard Metric to DIN 3852 Pt. 1 – optional Metric to ISO 6149	33 33 33	R M Y
Piston	Standard piston option LoadMaster – optional Low Friction (includes gland) – optional	7 7 7	N Z PF
Special Features [1]	One or more of the following: Oversize Ports Stop Tube Stroke Adjuster Or to detailed descriptions or drawings supplied by customer	 33 27 35	S
Piston Rod Number	Rod No.1 Rod No.2	19-21 19-21	1 2
Piston Rod End	Style 4 (with No.1 rod) Style 7 (with No.2 rod)	38 38	4 7
Rod Thread	Metric (standard)	38	M
Cushion – Cap	If required	29	C
Net Stroke	Millimetres	-	-
Fluid Medium – to ISO 6743/4 (1982)	Mineral Oil HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606 Oil, Air, Nitrogen – Group 1 Water Glycol HFC – Group 2 Fire-resistant fluids based on phosphate esters HFD-R – Group 5 Water, Oil in Water emulsion 95/5 HFA – Group 6 Water in Oil emulsion 60/40 HFB – Group 7	34 34 34 34 34	M C D A1 B
Port Position	Head position 1-4 Cap position 1-4	33 33	1 1
Air Bleeds	Head position 1-4 Cap position 1-4 No Air Bleed	33 33 33	4 4 00
Accessories [2]	When required include in order	22, 35	–



[1] Not to DIN 24 554

[2] Please state on order whether accessories are to be assembled to cylinder or supplied separately.

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