AHM Series

Metric Hydraulic Cylinders

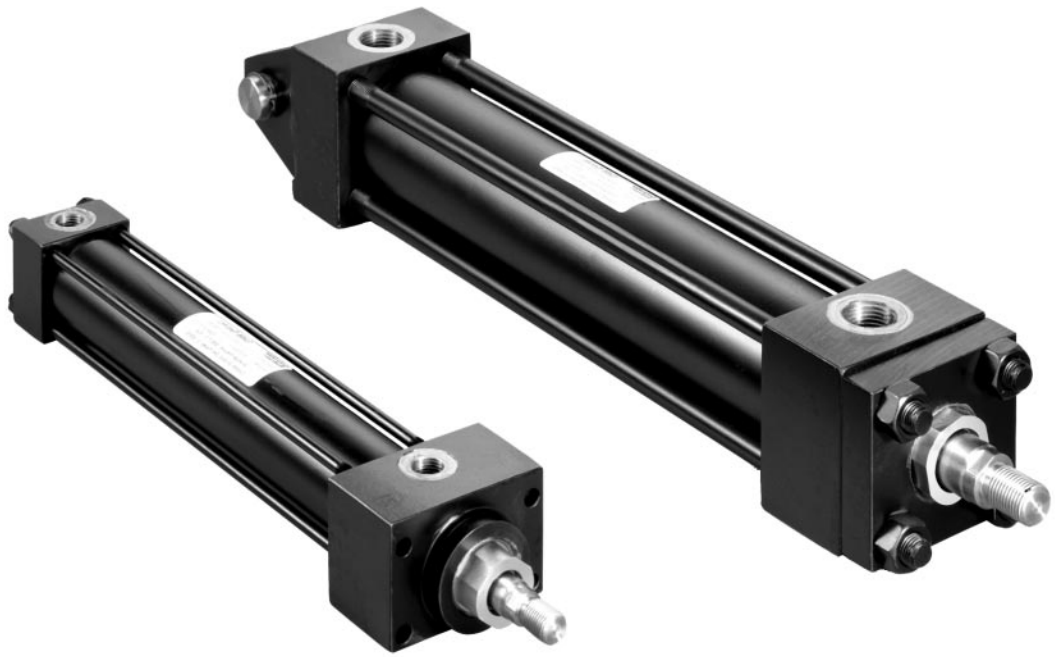
- Conforms to ISO 6020/2 (1991)
- Working pressures to 210 bar
- Bore Sizes 25mm to 200mm
- 12 standard mounting styles

ATLAS CYLINDERS

Catalog AHM 100

Series AHM
Metric Hydraulic Cylinder

As a major supplier of pneumatic and hydraulic cylinders, Atlas Cylinders introduces the Series AHM *metric* hydraulic cylinder. Atlas Series AHM cylinders are designed to meet the requirements of ISO 6020/2 (1991), 160 Bar Compact Series. Series AHM cylinders may be used for working pressures up to 210 Bar.



- **Conforms to ISO 6020/2 (1991)**
- **For working pressures up to 210 bar**

Series AHM Metric Hydraulic Cylinders

Introduction

Headquartered in Eugene, Oregon, Atlas Cylinders is one of the largest suppliers of high quality, dependable cylinders to industry. We have been for more than 40 years. Today, you'll find Atlas products at work in almost every industry including wood products, entertainment, aerospace, petroleum, and mobile, just to name a few.

Originally known as Sawyer Machine Works, Atlas was an all-purpose machine shop. The first cylinder line was developed in 1953 and was given the trade name Atlas. Since that time, many new product lines have been added, so that today, with its many different families of hydraulic and pneumatic cylinders, including custom cylinders, Atlas has one of the broadest product offerings of any cylinder manufacturer.

The Series AHM cylinders described in this catalog are 160 bar Compact Series cylinders to ISO 6020/2 rated for use at working pressures up to 210 bar. They have been designed to satisfy the requirements of a wide range of industries in which cylinders to ISO standards are specified.

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

Contents

Index

ISO Cylinder Mounting Styles and Where to Find Them

The standard range of Series AHM 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 following pages. Application-specific mounting information is shown in the mounting information section of this catalog.

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

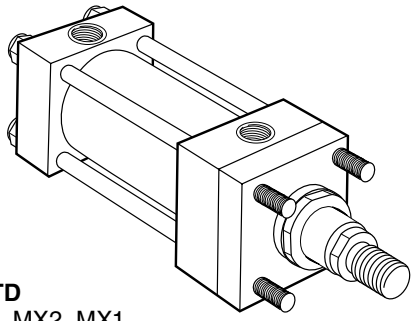
Style C, foot mounted cylinders do not absorb forces on their centerline. As a result, the application of force by the cylinder produces a moment which attempts to rotate the cylinder about its mounting bolts. It is important, therefore, that the cylinder should be firmly secured to the mounting surface 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.

Pivot Mountings

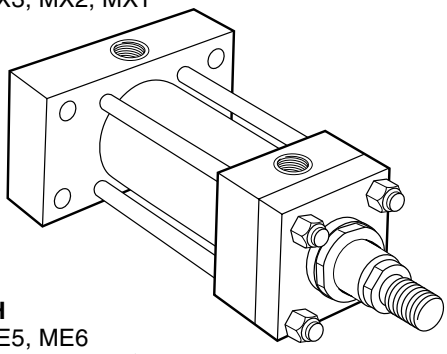
Cylinders with pivot mountings, which absorb forces on their centerlines, should be used where the machine member to be moved travels in a curved path. Pivot mountings may be used for tension (pull) or compression (push) applications. Cylinders using a fixed clevis, styles BB and B, may be used if the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

Trunnion Mounted Cylinders

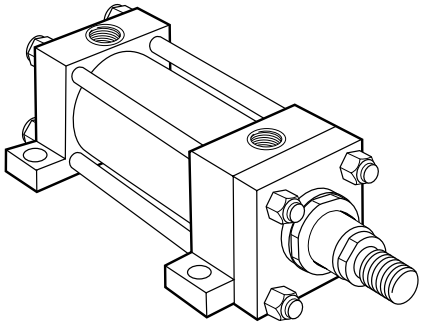
These cylinders, styles D, DB and DD, are designed to absorb force on their centerlines. They are suitable for tension (pull) or compression (push) applications, and may be used where the machine member to be moved travels in a curved path in a single plane. Trunnion pins are designed for shear loads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



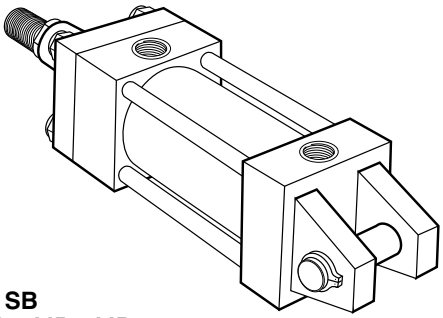
Styles TB, TC, TD
ISO Styles MX3, MX2, MX1 **TB**



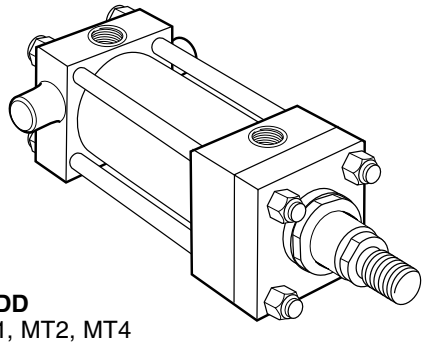
Styles JJ, HH
ISO Styles ME5, ME6 **HH**



Style C
ISO Style MS2 **C**



Styles B, BB, SB
ISO Styles MP3, MP1, MP5 **BB**



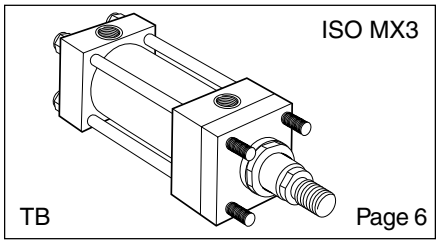
Styles D, DB, DD
ISO Styles MT1, MT2, MT4 **DB**

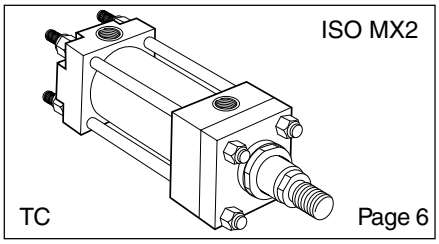
Series AHM Standard Features and Specifications

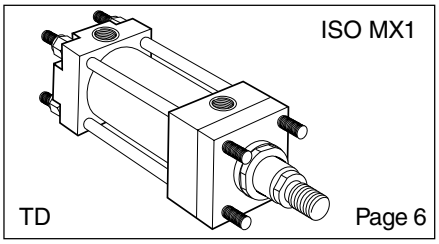
- ISO 6020/2 mounting interchangeable
- 12 standard mounting styles
- Up to 3 rod sizes per bore
- Wide range of mounting accessories
- Up to 3 male and 3 female rod end threads per bore
- Bore sizes – 25mm to 200mm
- Strokes – available in any practical stroke length
- Working pressure up to 210 bar
- Piston rods – 12mm to 140mm
- Single and Double rod designs
- Cushions available at either or both ends
- Temperature Range – -20°C to 150°C depending on seal type
- Seal types to suit a wide variety of operating environments

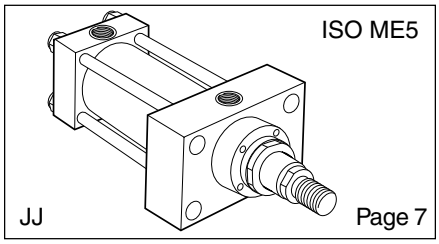
In line with our policy of continuing product improvement, specifications in this catalog are subject to change.

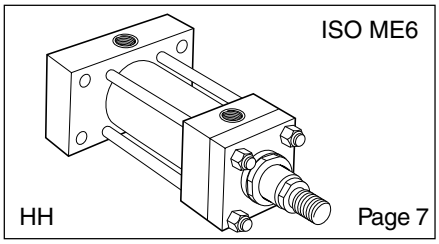
Available Mountings and Where To Find Them

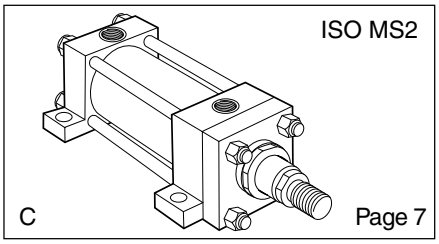

ISO MX3
TB Page 6

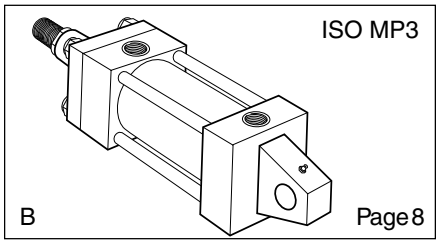

ISO MX2
TC Page 6

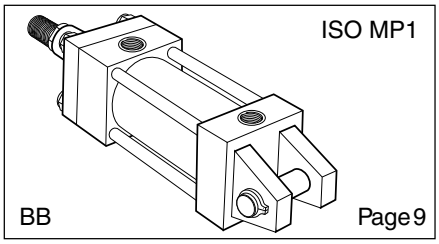

ISO MX1
TD Page 6

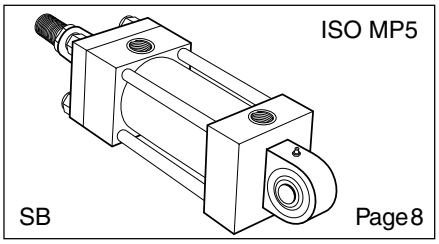

ISO ME5
JJ Page 7

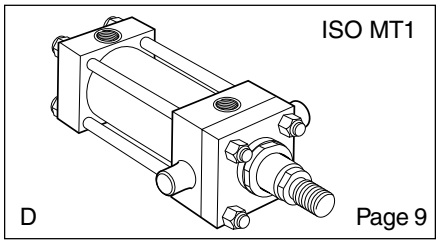

ISO ME6
HH Page 7

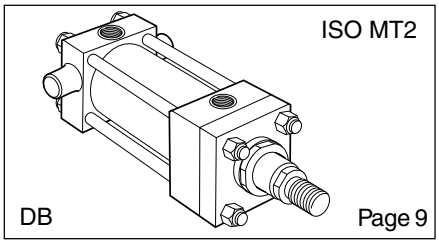

ISO MS2
C Page 7

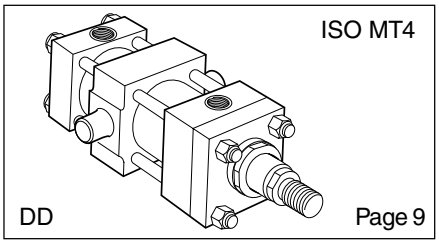

ISO MP3
B Page 8


ISO MP1
BB Page 9

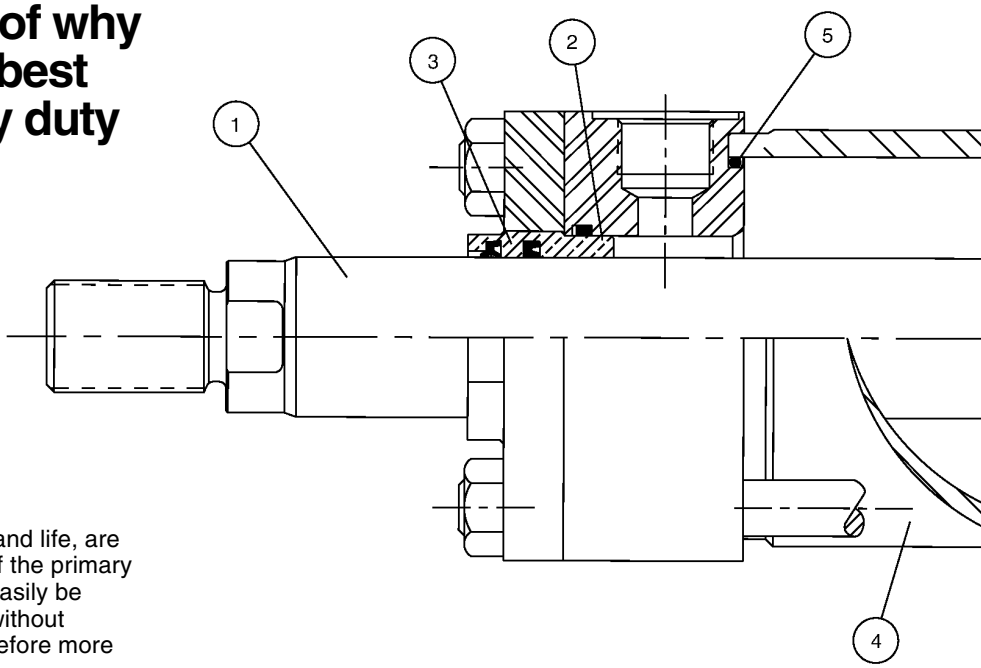

ISO MP5
SB Page 8


ISO MT1
D Page 9


ISO MT2
DB Page 9


ISO MT4
DD Page 9

Here is the inside story of why the Series AHM is your best choice in a metric heavy duty hydraulic cylinder…



1 Piston Rod

Gland seal life is maximized 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 'Quick' Gland

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

3 Rod Seals

The Tuff Seal primary seal 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, allow-ing 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.

The Tuff Seal is manufactured from an enhanced poly-urethane, giving efficient retention of pressurized fluid and long service life.

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 minimize internal friction and prolong seal life.

5 Cylinder Body Seals

To make sure that the cylinder body remains leaktight, even under pressure shock conditions, Atlas utilizes pressure-energized body seals.

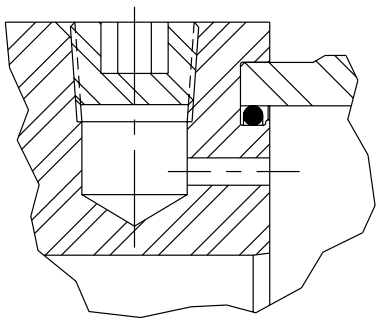
6 One-Piece Piston

Side loading is resisted by the wide bearing surfaces of the pistons. A long thread engagement secures the piston to the piston rod and, as an added safety feature, pistons are secured by an anaerobic adhesive.

Optional

Air Bleeds

Available as an option at both ends, the air bleeds are recessed into the head and cap.

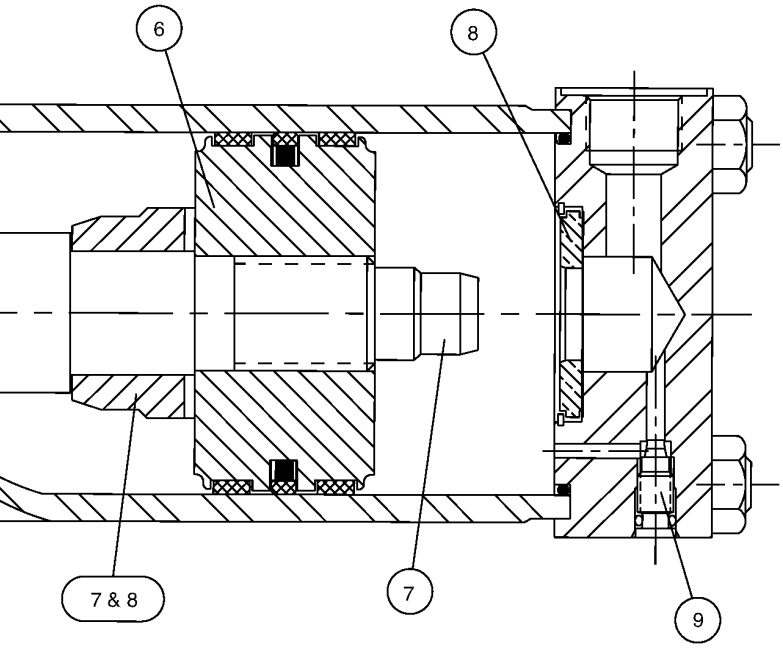


Servo Cylinders

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. For low-friction appli-cations – consult factory.

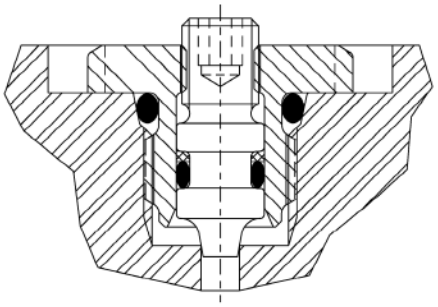
Seal Classes

To accommodate the many types of fluids and the varying temperature ranges used in industry, Atlas offers a range of rod gland, piston and body seals. These are described in detail on page 25.



9 Cushion Adjustment

Needle valves are provided at both ends of the cylinder for precise cushion adjustment. 63 mm bores and smaller contain cartridge cushion assembly shown below.



10 Piston Seals

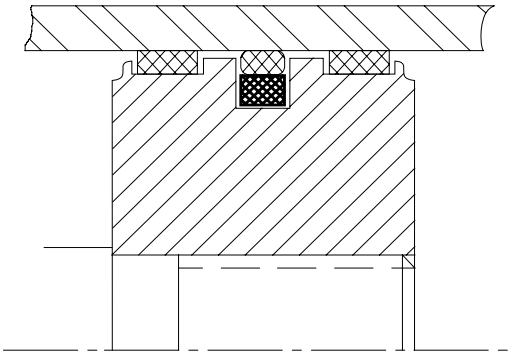
The B style piston is a single seal design which incorporates two wear strips. This design provides smooth operation, long bearing life, and high load carrying capacity.

7 Cushioning

Progressive deceleration is available by using profiled cushions at the head and cap – see page 20 for details. The head end cushion is self aligning, while the polished cap end spear is an integral part of the piston rod.

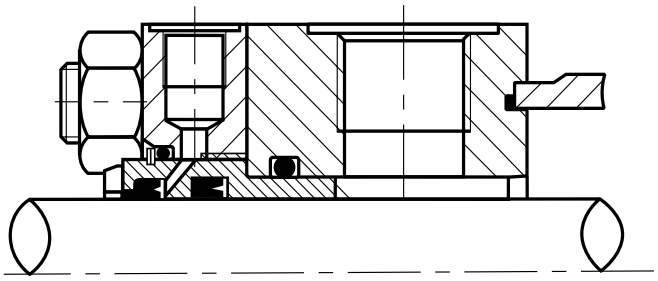
8 Floating Cushion Bushings and Sleeves

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 bushing at the cap end. A ball check valve in the head, and the floating bronze cushion bushing in the cap, provide minimum fluid restriction at the start of the return stroke. This allows full pressure to be applied over the entire area of the piston, providing full power and fast cycle times. In some cylinders, a slotted sleeve design is used in place of the check valve.

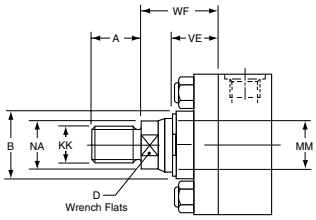


Gland Drains

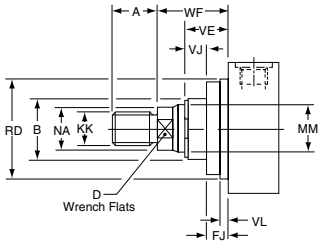
The accumulation of fluid behind the gland wiperseal of long stroke cylinders, or cylinders with constant back pressure, can be relieved by specifying the option of a gland drain. A port between the wiperseal and primary seal allows fluid to be piped back to a reservoir. By fitting a transparent tube 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 26.



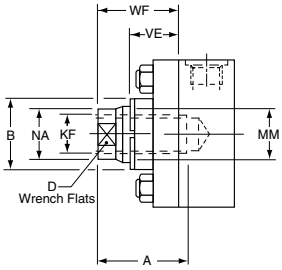
Thread Styles 4 & 7 – All Except JJ Mount



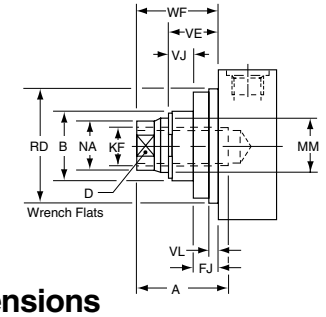
Thread Styles 4 & 7 – JJ Mount



Thread Style 9 – All Except JJ Mount



Thread Style 9 – JJ Mount

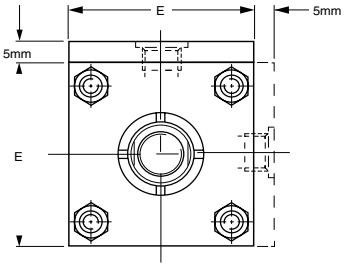


Thread Styles 4 & 7
The smallest diameter rod end thread for each bore size is designated Style 4 when supplied with a No.1 rod. When the same rod end thread is supplied with a No.2 or No.3 rod, it is designated Style 7.

Thread 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.

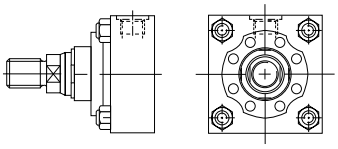
Thread Style 3
Non-standard piston rod ends are designated 'Style 3'. A dimensional sketch or description should accompany the order. Please specify dimensions KK or KF, A, rod stand out WF and thread type.

25 & 32mm Bore Cylinders



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

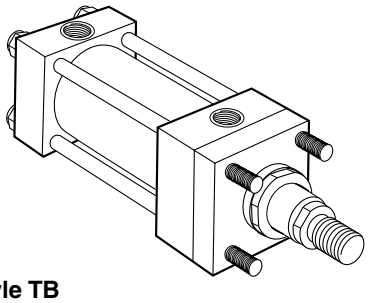
Gland Retainer – 160 and 200mm Bore
On all 160mm and 200mm bore ISO mounting styles except TB and TD, the gland retainer is separately bolted to the head, as shown.



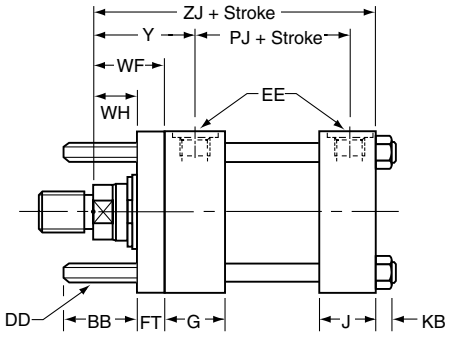
Piston Rod End Dimensions

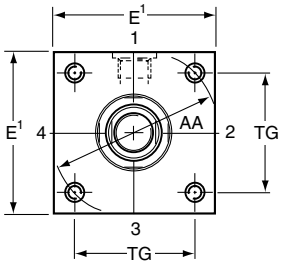
Bore ϕ	Rod No.	MM Rod ϕ	Style 4 KK	Style 4 A	Style 7 KK	Style 7 A	Style 9 KF	Style 9 A	B f9	D	NA	VE	WF	JJ Mount Only VL min	JJ Mount Only RD f8	JJ Mount Only VJ	JJ Mount Only FJ
25	1	12	M10x1.25	14	-	-	M8x1	14	24	10	11	16	25	3	38	6	10
	2	18	M14x1.5	18	M10x1.25	14	M12x1.25	18	30	15	17	16					
32	1	14	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					

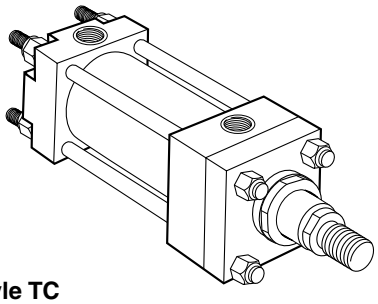
All dimensions are in millimeters unless otherwise stated.



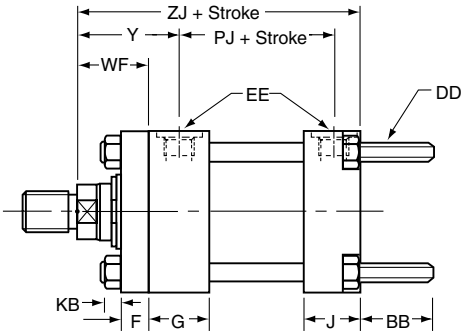
Style TB
Tie Rods Extended Head End
(ISO Style MX3)

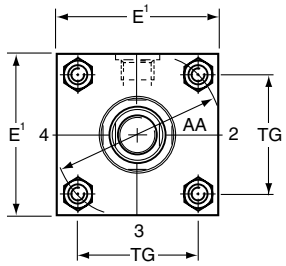


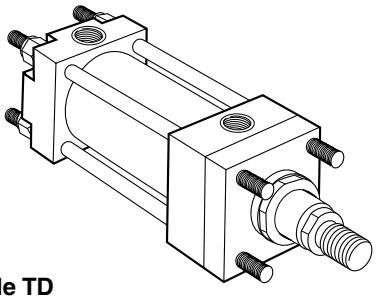




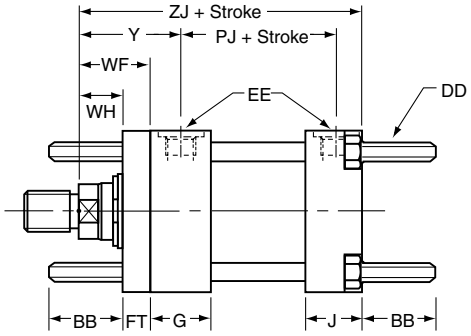
Style TC
Tie Rods Extended Cap End
(ISO Style MX2)

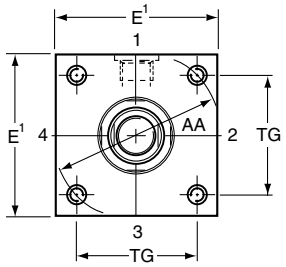






Style TD
Tie Rods Extended Both Ends
(ISO Style MX1)





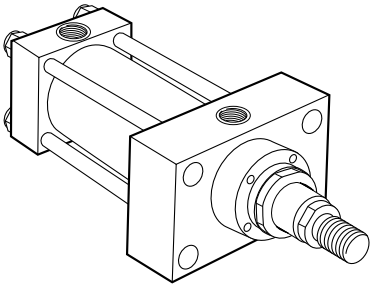
[1]Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders – see page 6

Dimensions – TB, TC & TD

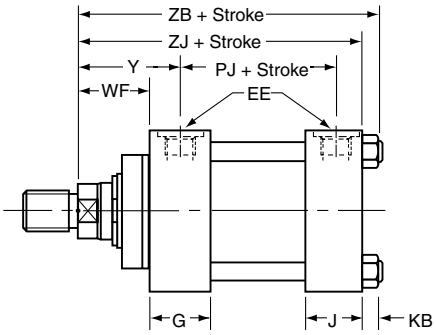
See also Rod End Dimensions, page 6, and Mounting Information, page 15

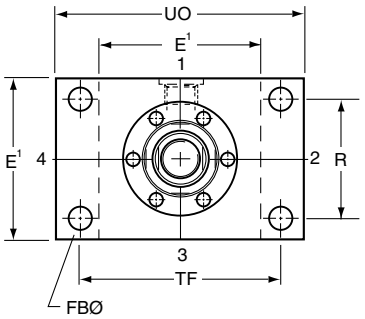
Bore ϕ	AA	BB	DD	E	EE BSP/G inches	F	FT	G	J	KB	TG	WF	WH	Y	+ Stroke PJ	+ Stroke ZJ
25	40	19	M5x0.8	40[1]	1/4	10	10	40	25	4	28.3	25	15	50	53	114
32	47	24	M6x1	45[1]	1/4	10	10	40	25	5	33.2	35	25	60	56	128
40	59	35	M8x1	63	3/8	10	10	45	38	6.5	41.7	35	25	62	73	153
50	74	46	M12x1.25	75	1/2	16	16	45	38	10	52.3	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

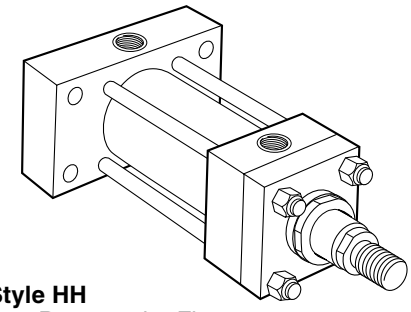
All dimensions are in millimeters unless otherwise stated.



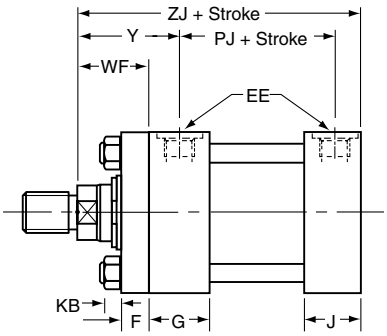
Style JJ
Head Rectangular Flange
(ISO Style ME5)

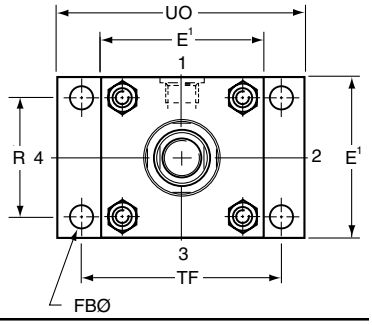


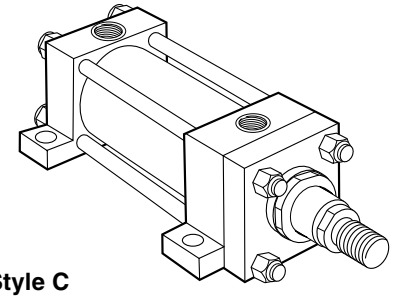




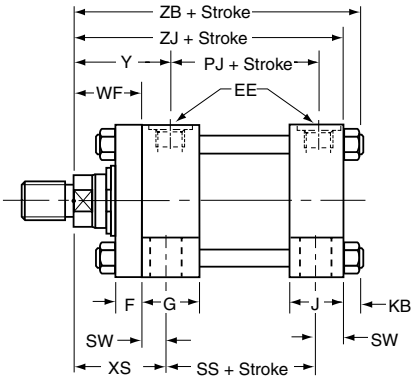
Style HH
Cap Rectangular Flange
(ISO Style ME6)



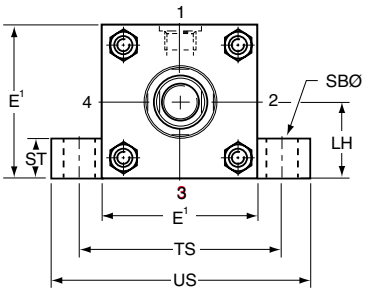




Style C
Side Lugs
(ISO Style MS2)



A thrust key may be used with this mounting style.

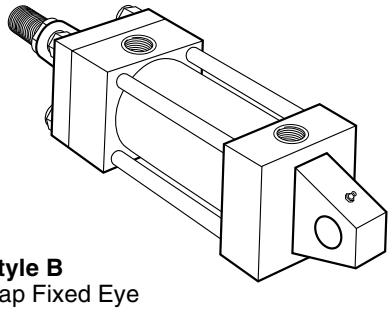


[1]Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders, except Style JJ in port positons 2 and 4 – see pages 6 and 23

Dimensions – JJ, HH & C See also Rod End Dimensions, page 6, and Mounting Information, page 15

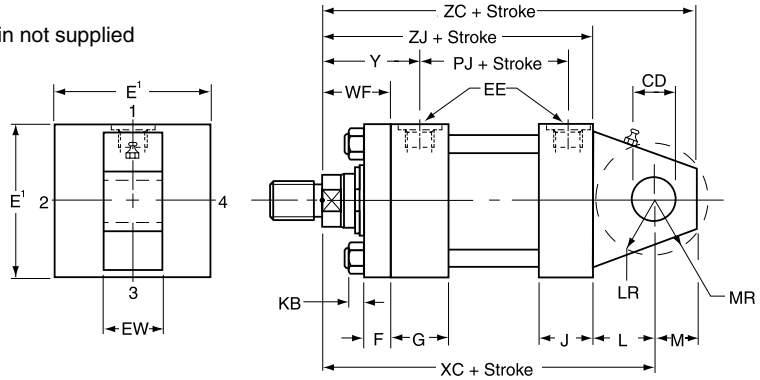
Bore ϕ	E	EE BSP/G inches	F	FB	G	J	KB	LH h10	R	SB	ST	SW	TF	TS	UO	US	WF	XS	Y	+ Stroke PJ	+ Stroke SS	+ Stroke ZB	+ Stroke ZJ
25	40[1]	1/4	10	5.5	40	25	4	19	27	6.6	8.5	8	51	54	65	72	25	33	50	53	73	121	114
32	45[1]	1/4	10	6.6	40	25	5	22	33	9	12.5	10	58	63	70	84	35	45	60	56	73	137	128
40	63	3/8	10	11	45	38	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

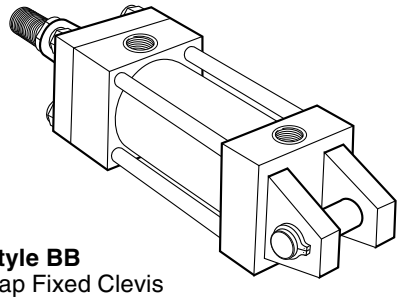
All dimensions are in millimeters unless otherwise stated.



Style B
Cap Fixed Eye
(ISO Style MP3)

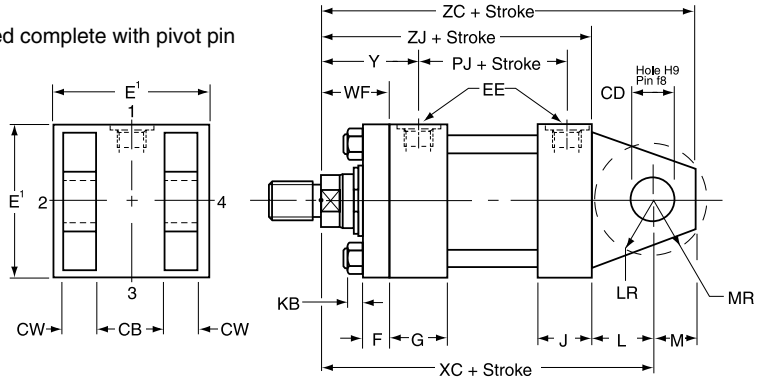
Pivot pin not supplied

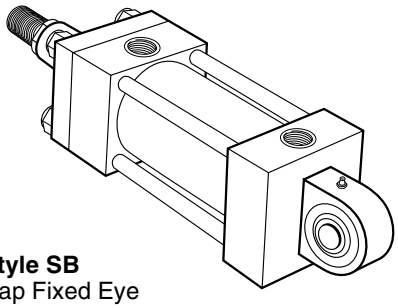




Style BB
Cap Fixed Clevis
(ISO Style MP1)

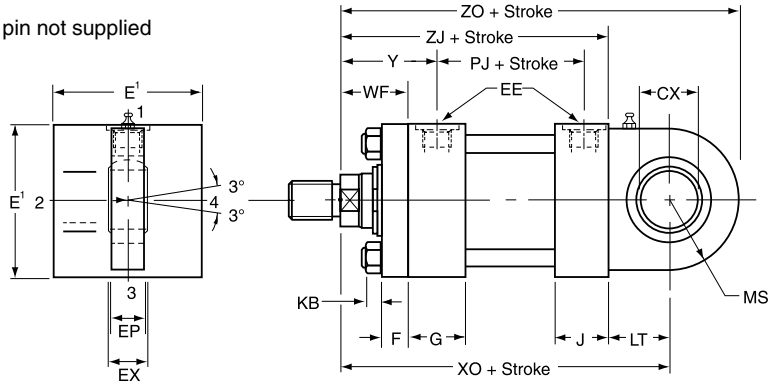
Supplied complete with pivot pin





Style SB
Cap Fixed Eye
(ISO Style MP5)

Pivot pin not supplied



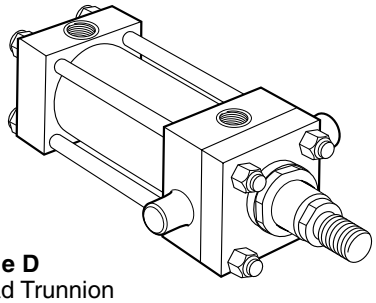
[1]Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders – see page 6

Dimensions – B, BB & SB

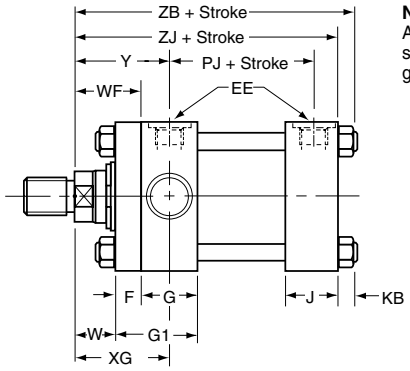
See also Rod End Dimensions, page 6, and Mounting Information, page 15

Bore	CB	CD	CW	CX	E	EE	EP	EW	EX	F	G	J	KB	L	LR	LT	M	MR	MS	WF	Y	+ Stroke					
						BSP/G																PJ	XC	XO	ZC	ZJ	ZO
ϕ	A16	H9				inches		h14											max								
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

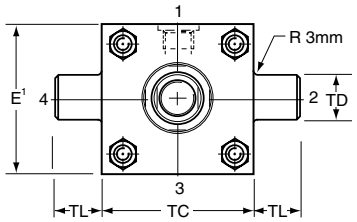
All dimensions are in millimeters unless otherwise stated.

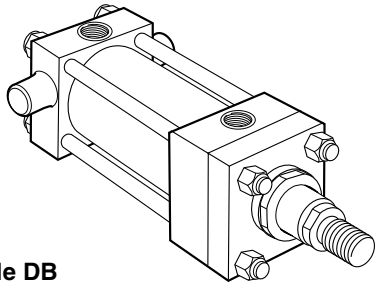


Style D
Head Trunnion
(ISO Style MT1)

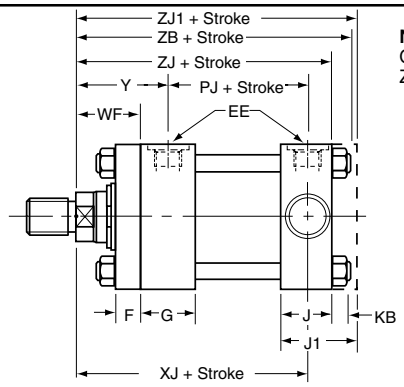


Notes:
A one-piece head and retainer is used on 100mm-200mm bore sizes – G1 dimension. On 160 and 200mm bores, the bolted gland is recessed, with tie rods screwed into the head.

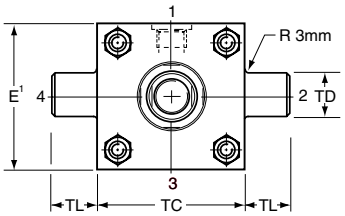


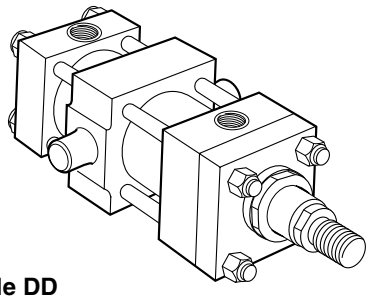


Style DB
Cap Trunnion
(ISO Style MT2)

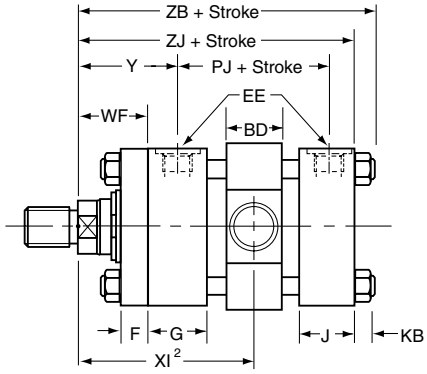


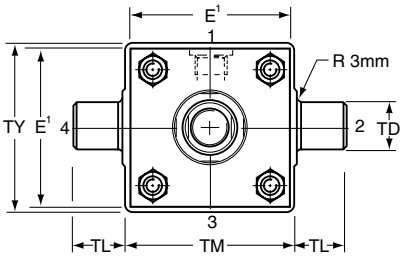
Note:
On 100-200mm bore cylinders, dimension J becomes J1. ZJ1 replaces ZB, and tie rods are screwed directly into the cap.





Style DD
Intermediate Fixed Trunnion
(ISO Style MT4)



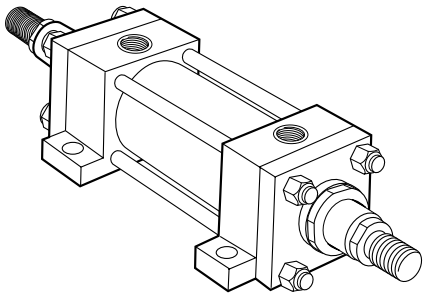


[1]Head depth increased by 5mm to accommodate port on 25mm and 32mm bore cylinders – see page 6
[2]Dimensions to be specified by customer

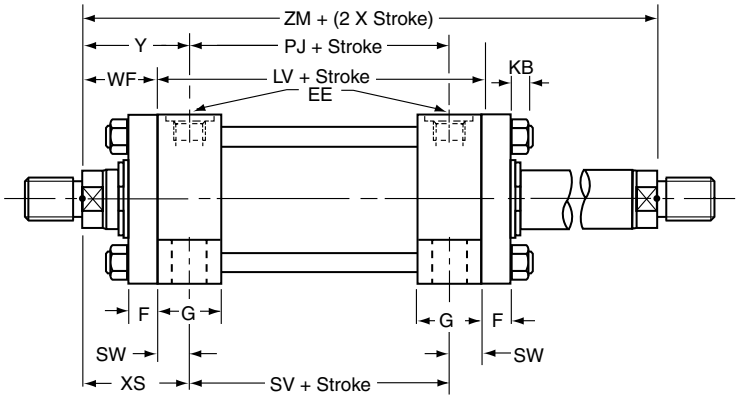
Dimensions – D, DB & DD See also Rod End Dimensions, page 6, and Mounting Information, page 15

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	Style DD min stroke	Min XI dim'n
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 millimeters 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.

Dimensions

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

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 cushioning section of this catalog.

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	AHM	R	E	1	4	M	1	4	M	125	M	11	44

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 millimeters unless otherwise stated.

Accessory Selection

Accessories for the rod end of a cylinder are selected by reference to the rod end thread, 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 SB – when fitted with the No. 1 rod, or the No. 2 or No. 3 rods with Style 7 rod end.

Rod and Cap End Accessories

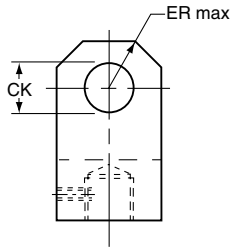
Accessories for the AHM ISO cylinder include:

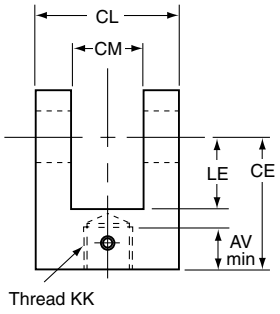
Rod End – rod clevis, eye bracket and pivot pin
– plain rod eye, clevis bracket and pivot pin
– rod eye with spherical bearing

Cap End – eye bracket for style BB mounting
– clevis bracket for style B mounting
– pivot pin for eye bracket and clevis bracket

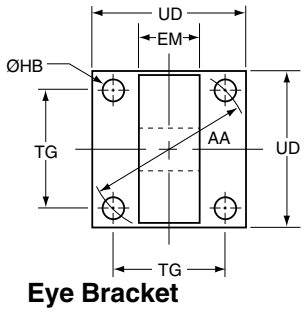
Rod Clevis, Eye Bracket and Pivot Pin

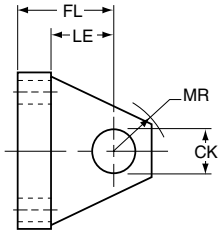
Thread KK	Rod Clevis	Eye Bracket	Pivot Pin	Nominal Force kN	Weight kg
M10x1.25	143447	144808	143477	8	0.3
M12x1.25	143448	144809	143478	12.5	0.6
M14x1.5	143449	144810	143479	20	0.8
M16x1.5	143450	144811	143480	32	2.2
M20x1.5	143451	144812	143480	50	2.7
M27x2	143452	144813	143481	80	5.9
M33x2	143453	144814	143482	125	9.4
M42x2	143454	144815	143483	200	17.8
M48x2	143455	144816	143484	320	26.8
M64x3	143456	144817	143485	500	39.0





Rod Clevis





Eye Bracket

All dimensions are in millimeters unless otherwise stated.

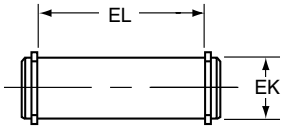
Rod Clevis Dimensions

Part No.	AV	CE	CK H9	CL	CM A16	ER	KK	LE	Weight kg
143447	14	32	10	26	12	12	M10x1.25	14	0.08
143448	16	36	12	34	16	17	M12x1.25	19	0.25
143449	18	38	14	42	20	17	M14x1.5	19	0.32
143450	22	54	20	62	30	29	M16x1.5	32	1.0
143451	28	60	20	62	30	29	M20x1.5	32	1.1
143452	36	75	28	83	40	34	M27x2	39	2.3
143453	45	99	36	103	50	50	M33x2	54	2.6
143454	56	113	45	123	60	53	M42x2	57	5.5
143455	63	126	56	143	70	59	M48x2	63	7.6
143456	85	168	70	163	80	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

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

Eye Bracket – Cap End Mounting for Style BB

Bore ϕ	Eye Bracket	Nominal Force kN	Weight kg
25	144808	8	0.2
32	144809	12.5	0.3
40	144810	20	0.4
50	144811	32	1.0
63	144812	50	1.4
80	144813	80	3.2
100	144814	125	5.6
125	144815	200	10.5
160	144816	320	15.0
200	144817	500	20.0

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	8	0.5
M12x1.25	143458	143647	143478	12.5	1.0
M14x1.5	143459	143648	143479	20	1.3
M16x1.5	143460	143649	143480	32	3.2
M20x1.5	143461	143649	143480	50	3.8
M27x2	143462	143650	143481	80	6.9
M33x2	143463	143651	143482	125	12.5
M42x2	143464	143652	143483	200	26.0
M48x2	143465	143653	143484	320	47.0
M64x3	143466	143654	143485	500	64.0

Plain Rod Eye/Knuckle 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

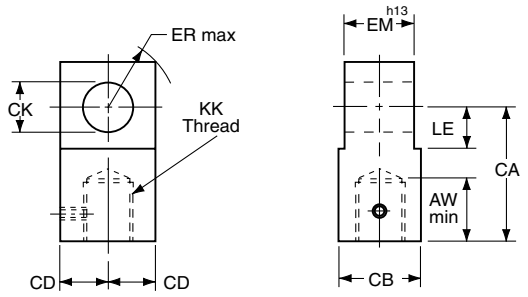
Clevis Bracket Dimensions

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

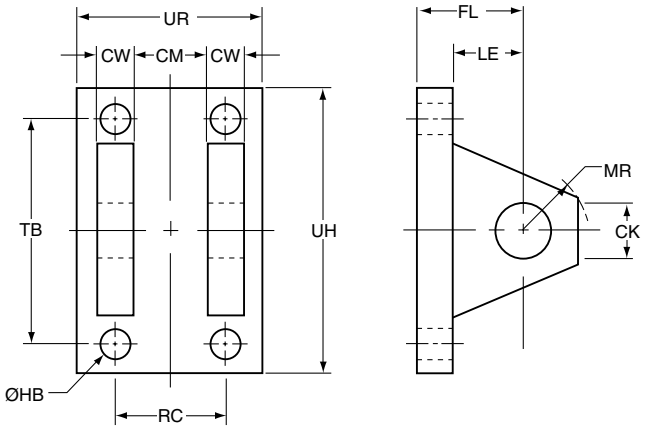
Clevis Bracket – For Style B

Bore ϕ	Clevis Bracket	Nominal Force kN	Weight kg
25	143646	8	0.4
32	143647	12.5	0.8
40	143648	20	1.0
50	143649	32	2.5
63	143649	50	2.5
80	143650	80	5.0
100	143651	125	9.0
125	143652	200	20.0
160	143653	320	31.0
200	143654	500	41.0

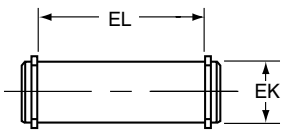
Plain Rod Eye/Knuckle



Clevis Bracket



Pivot Pin for Clevis Bracket and Plain Rod Eye – Dimensions

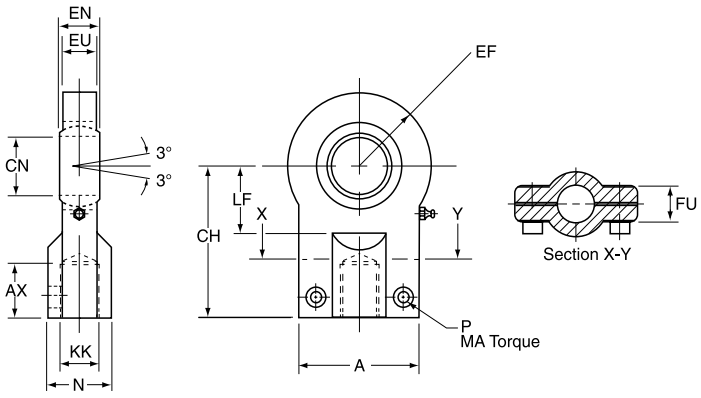


Part No.	EK f8	EL	Weight kg
143477	10	29	0.02
143478	12	37	0.05
143479	14	45	0.08
143480	20	66	0.2
143481	28	87	0.4
143482	36	107	1.0
143483	45	129	1.8
143484	56	149	4.2
143485	70	169	6.0

All dimensions are in millimeters unless otherwise stated.

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	8	0.2
M12x1.25	145255	145531	12.5	0.3
M14x1.5	145256	145532	20	0.4
M16x1.5	145257	145533	32	0.7
M20x1.5	145258	145534	50	1.3
M27x2	145259	145535	80	2.3
M33x2	145260	145536	125	4.4
M42x2	145261	145537	200	8.4
M48x2	145262	145538	320	15.6
M64x3	145263	145539	500	28.0



Rod Eye with Spherical Bearing

All spherical bearings should be re-packed with grease when servicing. In unusual or severe working conditions, consult the factory regarding the suitability of the bearing chosen.

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 -.012	8	13	M10x1.25	16	17	10	M6
145255	45	17	22.5	48	16 -0.008	14 -.012	11	13	M12x1.25	20	21	10	M6
145256	55	19	27.5	58	20 -0.012	16 -.012	13	17	M14x1.5	25	25	25	M8
145257	62	23	32.5	68	25 -0.012	20 -.012	17	17	M16x1.5	30	30	25	M8
145258	80	29	40	85	30 -0.012	22 -.012	19	19	M20x1.5	35	36	45	M10
145259	90	37	50	105	40 -0.012	28 -.012	23	23	M27x2	45	45	45	M10
145260	105	46	62.5	130	50 -0.012	35 -.012	30	30	M33x2	58	55	80	M12
145261	134	57	80	150	60 -0.015	44 -.015	38	38	M42x2	68	68	160	M16
145262	156	64	102.5	185	80 -0.015	55 -.015	47	47	M48x2	92	90	310	M20
145263	190	86	120	240	100 -0.020	70 -.020	57	57	M64x3	116	110	530	M24

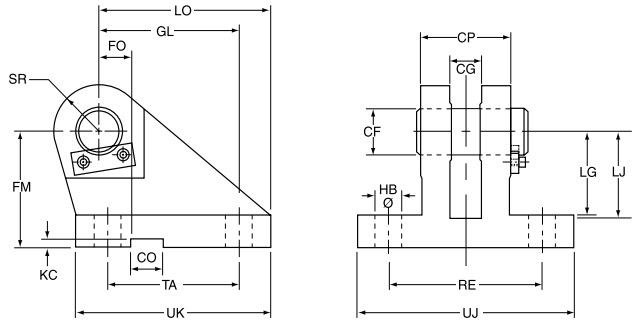
Mounting Bracket and Pivot Pin Dimensions - For Style SB

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 Mounting Bracket and Pivot Pin

Bore ϕ	Mounting Bracket and Pivot Pin	Nominal Force kN	Weight kg
25	145530	8	0.6
32	145531	12.5	1.3
40	145532	20	2.1
50	145533	32	3.2
63	145534	50	6.5
80	145535	80	12.0
100	145536	125	23.0
125	145537	200	37.0
160	145538	320	79.0
200	145539	500	140.0

Mounting Bracket and Pivot Pin



All dimensions are in millimeters unless otherwise stated.

Mounting Styles

General guidance for the selection of ISO and DIN mounting styles is given on page 4. The notes which follow provide information for use in specific applications and should be read in conjunction with the information on page 2.

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 develop.

Intermediate trunnions may be positioned at any point on the cylinder body. This position, dimension XI, should be specified at the time of order. Trunnions are not field adjustable.

Flange Mountings

Front flange-mounted (style JJ) cylinders incorporate a pilot diameter for accurate alignment on the mounting surface – see rod end dimensions for AHM 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 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 SB, where pin length will be determined by the customer's equipment.

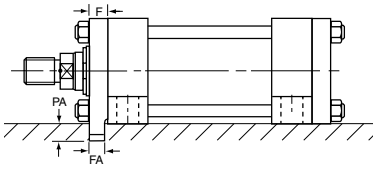
Spherical Bearings

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 bending 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 AHM order code.



Bore ϕ	F Nominal	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 and Nuts

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

Bore ϕ	Tie Rod 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

WARNING ⚠

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

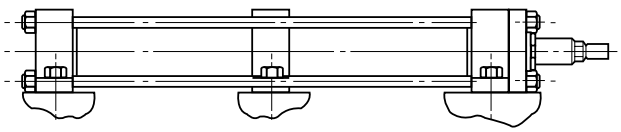
The cylinder user should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double piston rods. In some cases a stop is threaded onto one of the piston rods and used as an external stroke adjuster. The external stop will create a pinch point and the user should consider appropriate use of guards. If the external stop is not perpendicular to the contact surface it will place a bending moment on the piston rod which can led to piston rod failure. An external stop will also negate the effect of a cushion and will subject the piston rod to impact loading. These two (2) conditions can cause piston rod failure. The use of an external stroke adjuster should be reviewed with our engineering department.

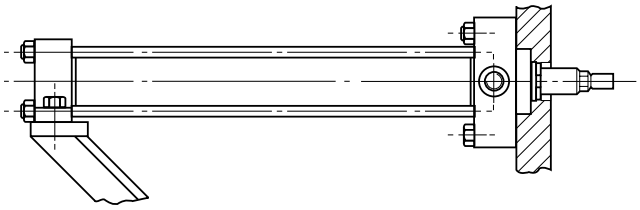
All dimensions are in millimeters unless otherwise stated.

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 Atlas recommends for each bore size are shown in the table below.



Intermediate Foot Mounting



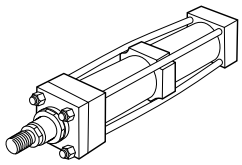
End Support Mounting

Maximum Stroke Lengths of Unsupported Cylinders (in mm)

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 (meters)												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										
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	

Consult Factory

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. In these cases, the use of a stroke adjuster should be considered. 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
SB (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)	XV 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 millimeters unless otherwise stated.

Calculation of Cylinder Diameter

General Formula

The cylinder output forces are derived from the formula:

$$F = \frac{P \times A}{10000}$$

Where F = Force in kN.

P = Pressure at the cylinder in bar.

A = Effective area of cylinder piston in square mm.

Prior to selecting the cylinder bore size, properly size the piston rod for tension (pull) or compression (push) loading (see the Piston Rod Selection Chart).

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, repeat the process and increase the system operating pressure or cylinder diameter if possible. For assistance, contact your local authorized distributor.

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

Piston Rod Size Selection

To select a piston rod for thrust (push) applications, follow these steps:

1. Determine the type of cylinder mounting style and rod end connection to be used. Consult the Stroke Factor table on page 18 and determine which factor corresponds to the application.
2. Using the appropriate stroke factor from page 18, 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 16.
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.

Stop Tubes

The required length of stop tube, where necessary, is read from the vertical columns on the right of the graph below by following the horizontal band within which the point of intersection, determined in steps 2 and 3 opposite, 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:

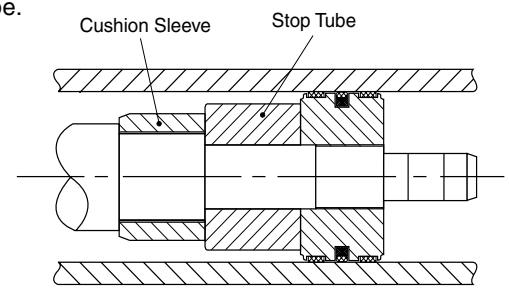
1. Cylinder mounting style.
2. Rod end connection and method of guiding load.
3. Bore required, stroke, length of rod extension (dimensions WF) if greater than standard.
4. Mounting position of cylinder. (Note: if at an angle or vertical, specify the direction of the piston rod.)
5. Operating pressure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

When specifying a cylinder with a stop tube, state the **gross** stroke of the cylinder and the length of the stop tube. The gross stroke is equal to the net (working) stroke of the cylinder plus the stop tube length. See the example below:

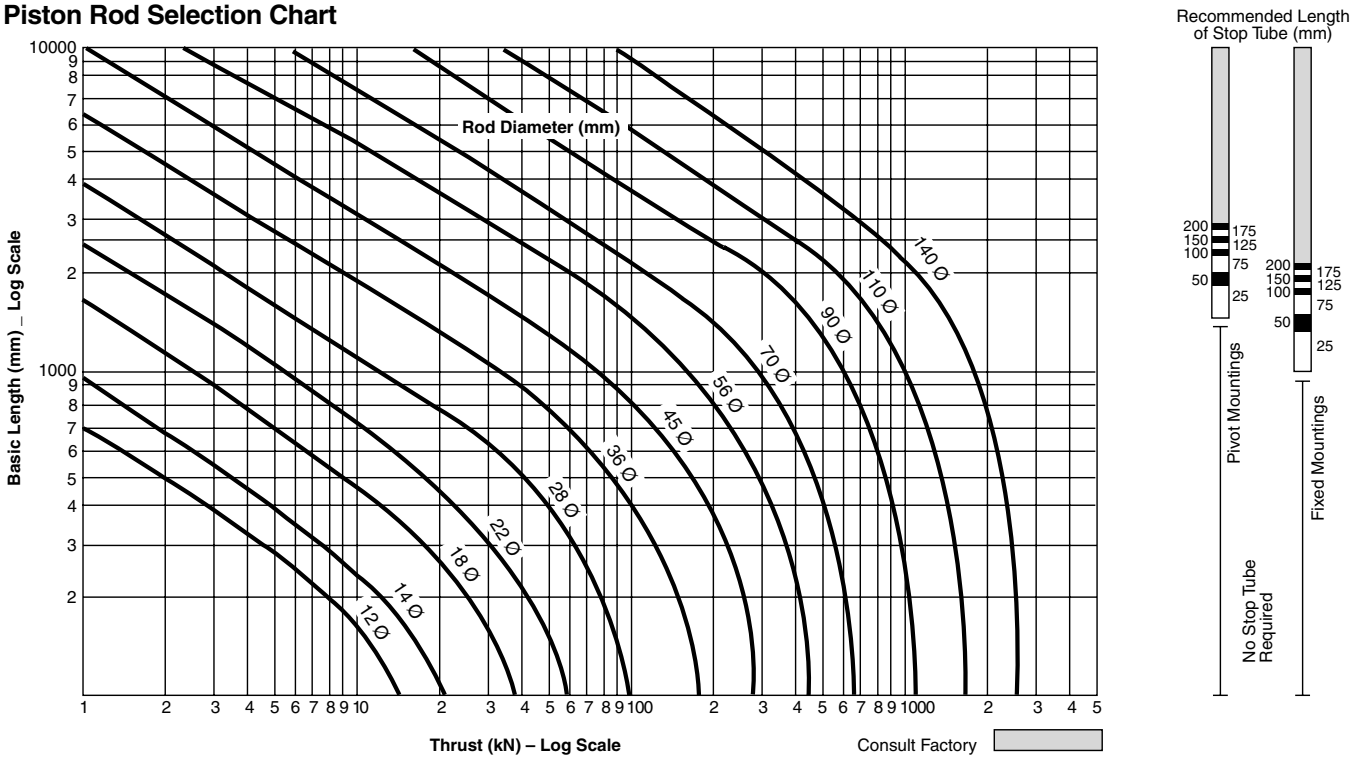
Ex. 80-JJ-AHM-R-E-S-14-M1375M1100

1) Stop tube = 175
2) Net stroke = 1200

– the cylinder net stroke will be 1200mm with 175mm of stop tube.

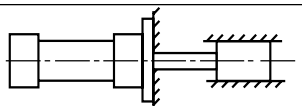
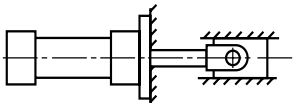
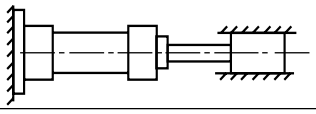
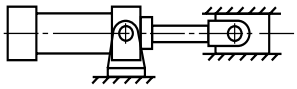
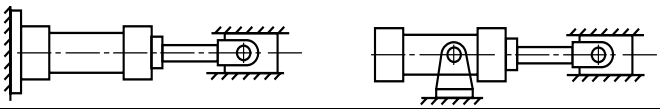
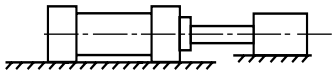
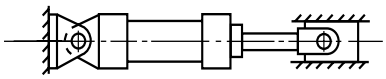
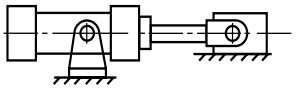


Piston Rod Selection Chart



Stroke Factors

The stroke factors below are used in the calculation of cylinder 'basic length' – see Piston Rod Size Selection.

Rod End Connection	Mounting Style	Type of Mounting	Stroke Factor
Fixed and Rigidly Guided	TB, TD, C, JJ		0.5
Pivoted and Rigidly Guided	TB, TD, C, JJ		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, C JJ		2.0
Pivoted and Rigidly Guided	B, BB, DB, SB		2.0
Pivoted and Supported but not Rigidly Guided	DD		3.0

Long Strokes 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 in this catalog provides guidance where unusually long strokes are required.

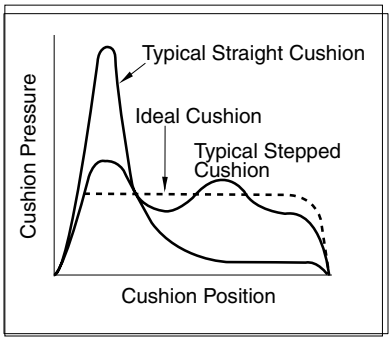
An Introduction to Cushioning

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.

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, AHM 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 the next page.



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

Cushion Length

Where specified, AHM 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 21. Cushions are adjustable via recessed needle valves.

Cushion Calculations

The charts on the next page 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 due to the pressure intensification effect across the piston.

The energy absorption capacity of the cushion decreases with drive pressure.

Formula

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

$E = \frac{1}{2}mv^2 + mgl \times 10^{-3} \times \sin\alpha$

(for inclined or vertically downward direction of mass)

$E = \frac{1}{2}mv^2 - mgl \times 10^{-3} \times \sin\alpha$

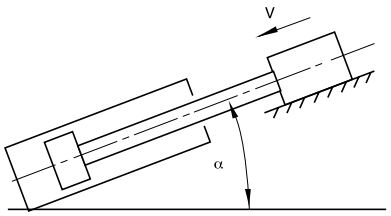
(for inclined or vertically upward direction of mass)

Where:

E = energy absorbed in Joules
g = acceleration due to gravity = 9.81m/s^2
v = velocity in meters/second
l = length of cushion in millimeters
m = mass of load in kilograms (including piston, rod and rod end accessories)
α = 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°
Sinα =	0.70

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

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

$= 800 + 2815 = 3615$ Joules

Note that velocity is greater than 0.3m/s; therefore, 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:

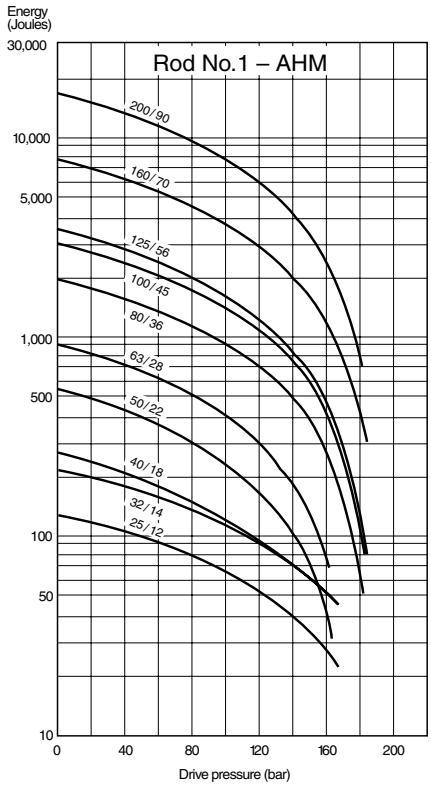
$\frac{3615}{0.75} = 4820$ Joules

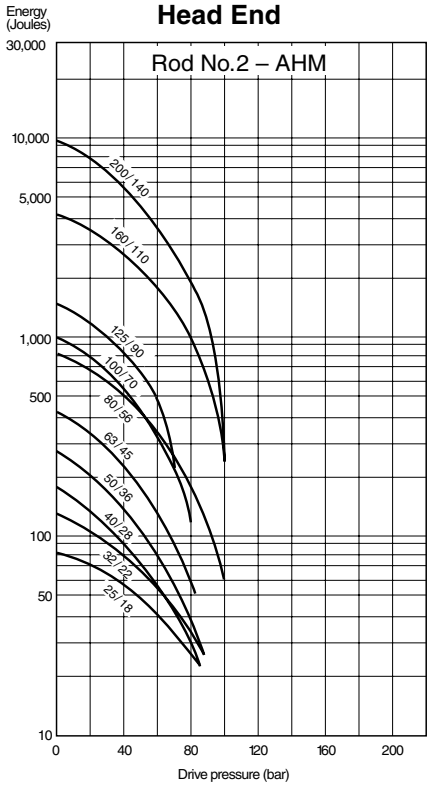
Comparison with the curve shows that the standard cushion can safely decelerate this load. If the calculated energy exceeds that indicated by the curve, select a larger bore cylinder and re-calculate.

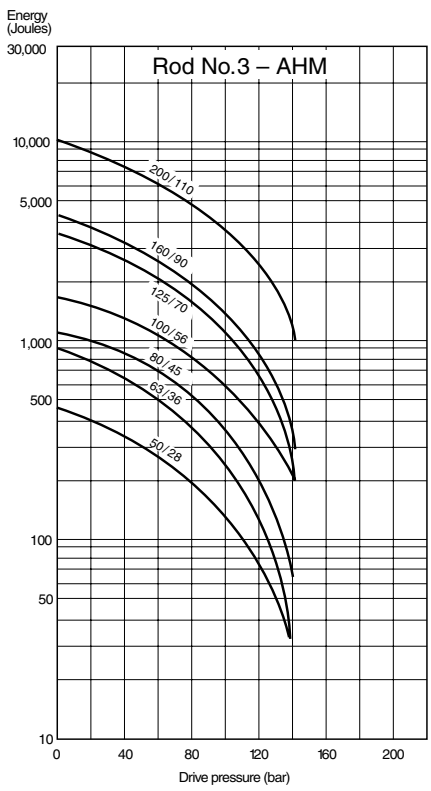
Cushion Energy Absorption Capacity Data

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

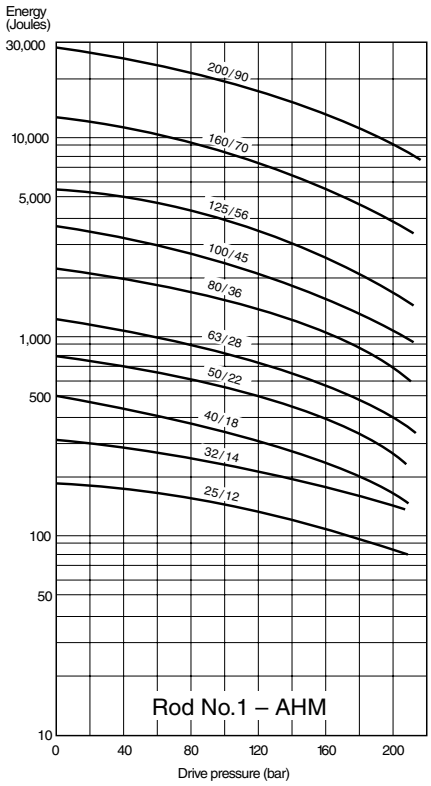
Head End

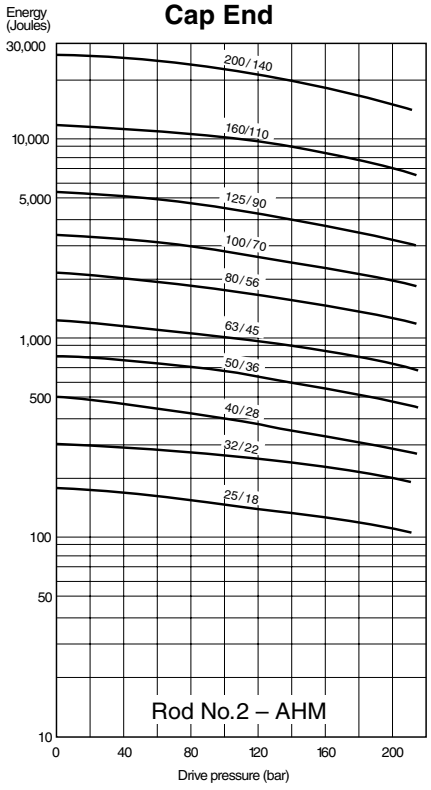


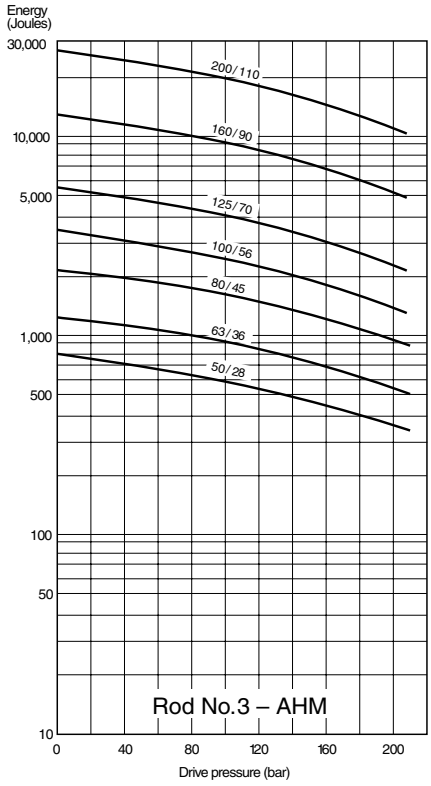




Cap End







Cushion Length, Piston and Rod Mass

Bore ϕ	Rod No.	Rod ϕ	Cushion Length - ISO				ISO		Piston & Rod 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							0.80	0.05
	3	28							0.95	0.08
63	1	28	29	29	29	29	29	29	1.20	0.05
	2	45							1.35	0.08
	3	36							1.60	0.12
80	1	36	35	32	27	32	35	32	2.30	0.08
	2	56							2.50	0.12
	3	45							2.90	0.19
100	1	45	35	32	26	32	29	32	4.00	0.12
	2	70							4.40	0.19
	3	56							5.10	0.30
125	1	56	28	32	27	32	27	32	7.10	0.19
	2	90							8.00	0.30
	3	70							9.40	0.50
160	1	70	34	41	34	41	34	41	13.70	0.30
	2	110							15.30	0.50
	3	90							17.20	0.75
200	1	90	46	56	49	56	50	56	27.00	0.50
	2	140							30.00	0.75
	3	110							34.00	1.23

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 information which follows highlights the recommended minimum and maximum pressures according to application. If in doubt, please consult the factory.

Minimum Pressure

Due to factors such as seal friction, the minimum operating pressure for AHM cylinders is 5 bar. Below this pressure, low friction seals should be specified. If in doubt, please consult the factory.

Maximum Pressure

AHM cylinders are designed to the mounting dimensions specified in ISO 6020/2 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.

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. In most cases, this intensification does not affect the cylinder mountings or piston rod threads in the form of increased loading. It may, however, affect the cylinder body and induce fatigue failure or cause premature seal wear. It is important, therefore, that the pressure due to cushioning or intensification does not exceed the 340 bar fatigue limit of the cylinder body. The cushion energy absorption data on the previous page is based on this maximum induced pressure. If in doubt, please consult the factory.

All dimensions are in millimeters unless otherwise stated.

Standard Ports

AHM Series cylinders are supplied with BSP parallel threaded ports, of a size suitable for normal speed applications – see table opposite. AHM cylinders are also available with a variety of optional ports.

Oversize Ports

For higher speed applications, AHM Series 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 rod end dimensions 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. 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 deter-mining whether cylinder ports are adequate for the applica-tion. 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. Atlas 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 cushion information. For cylinders with oversize ports and with a flow exceeding 8m/s into the cap end, a 'non-floating cushion' should be specified. Please consult the factory.

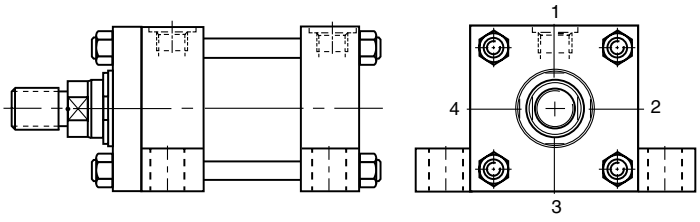
Ports, Air Bleeds and Cushion Adjustment Location

The table below shows standard positions for ports, and cushion adjusting screws where fitted. Air bleeds (see optional features) may be fitted in unoccupied faces of the head or cap, depending on mounting.

Bore ϕ	Standard Cylinder Ports				
	Port Size BSP/G inches	Port Size Metric[1]	Bore of Connecting Lines	Cap End Flow in l/min @ 5m/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)				
	Port Size BSP/G inches	Port Size Metric[1]	Bore of Connecting Lines	Cap End Flow in l/min @ 5m/s	Piston Speed m/s
25	3/8[2]	M18x1.5[2]	10	23.5	0.80
32	3/8[2]	M18x1.5[2]	10	23.5	0.48
40	1/2	M22x1.5	13	40	0.53
50	3/4	M27x2	15	53	0.45
63	3/4	M27x2	15	53	0.28
80[3]	1	M33x2	19	85	0.28
100[3]	1	M33x2	19	85	0.18
125[3]	1-1/4	M42x2	24	136	0.18
160[3]	1-1/4	M42x2	24	136	0.11
200[3]	1-1/2	M48x2	30	212	0.11

[1]Not to DIN 24 554
[2]20mm high port bosses fitted at cap end
[3]Consult factory – available on certain bore sizes only
Not recommended for JJ mountings at pressures above 100 bar



Positions of Ports and Cushion Screws in Head and Cap		Mounting Styles - ISO																													
		TB, TC and TD				JJ				HH				C	B and BB				SB				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

All dimensions are in millimeters unless otherwise stated.

Cylinder Port Options

Option "T" SAE Straight Thread O-Ring Port. Recommended for most hydraulic applications.

Option "U" Conventional NPTF Ports (Dry-Seal Pipe Threads). Recommended for pneumatic applications only.

Option "R" BSPP Port (British Parallel Thread). ISO 228 port commonly used in Europe. See Figure R-G below.

Option "P" SAE Flange Ports Code 61 (3000 psi). Recommended for hydraulic applications requiring larger port sizes.

Option "B" BSPT (British Tapered Thread).

Option "M" Metric Straight Thread Port similar to Option "R" with metric thread. Popular in some European applications. See Figure R-G below.

Option "Y" ISO-6149-1 Metric Straight Thread Port. Recommended for all hydraulic applications designed per ISO standards. See Figure Y below.

Bore	"T" SAE	"U" NPTF Pipe Thread	"R" BSPP Parallel Thread (Standard)	"P" SAE 4-Bolt Flange Nom. Size	"B" BSPT Taper Thread	"M" Metric Straight Thread	"Y" ISO-6149-1 Metric Straight Thread
25	#6	1/4	1/4	N/A	1/4	M14 x 1.5	M14 x 1.5
32	#6	1/4	1/4	N/A	1/4	M14 x 1.5	M14 x 1.5
40	#6	3/8	3/8	N/A	3/8	M18 x 1.5	M18 x 1.5
50	#10	1/2	1/2	N/A	1/2	M22 x 1.5	M22 x 1.5
63	#10	1/2	1/2	1/2	1/2	M22 x 1.5	M22 x 1.5
80	#12	3/4	3/4	3/4	3/4	M27 x 2	M27 x 2
100	#12	3/4	3/4	3/4	3/4	M27 x 2	M27 x 2
125	#16	1	1	1	1	M33 x 2	M33 x 2
160	#16	1	1	1	1	M33 x 2	M33 x 2
200	#20	1-1/4	1-1/4	1-1/4	1-1/4	M42 x 2	M42 x 2

BSPP Port for AHM Series

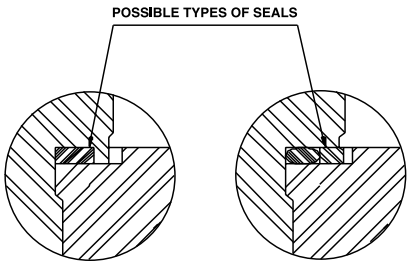
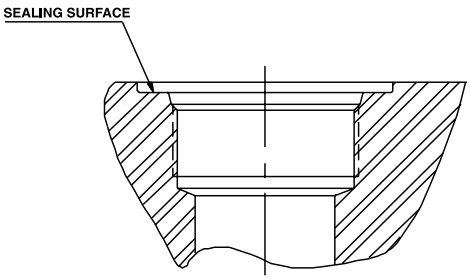


Figure R-G



ISO 6149-1 Port for AHM Series

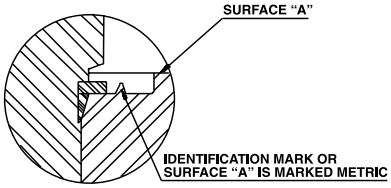
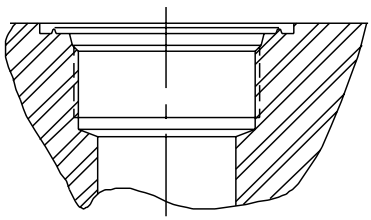


Figure Y



Seals and Fluid Data

Group	Seal Materials – a combination of:	Fluid Medium to ISO 6743/4-1982	Temperature Range
1	Nitrile (NBR), PTFE, enhanced polyurethane (AU)	Mineral oil HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606 oil, air, nitrogen	-20°C to +80°C
5	Fluorocarbon elastomer (FPM) PTFE	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

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.

Temperature

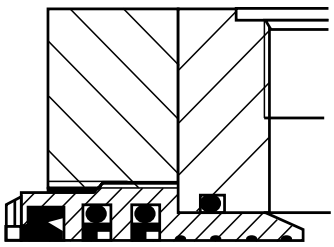
Standard seals can be operated at temperatures between -20°C and +80°C. Where operating conditions result in temperatures which exceed these limits, special seal compounds may be required to ensure satisfactory service life – please consult the factory.

Special Seals

Group 1 seals are fitted as standard to AHM cylinders. For other duties, the optional seal group 5 is available – please see the cylinder order code for AHM (ISO) cylinders. Special seals, in addition to those shown in the table above, 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. Please consult the factory.



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.

Warranty

Atlas 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 – AHM Series Cylinders

Bore ϕ	Rod ϕ	Mounting Styles - Weight at Zero Stroke						Weight per 10mm Stroke kg
		TB, TC TD kg	C kg	JJ, HH kg	B, BB, SB kg	D, DB kg	DD 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

All dimensions are in millimeters 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. 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 drain ports will be the same type as the ports specified on the cylinder assembly except for non "JJ" mounts on bore sizes 25, 32, 40 and 50 mm. In these cases they will be 1/8 NPTF.

The size of the gland drain ports are as shown on the adjacent table.

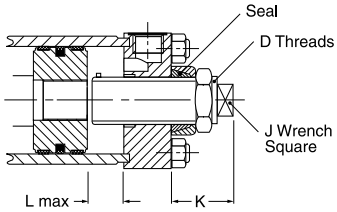
Gland drains should be piped back to the fluid reservoir, which should be located below the level of the cylinder.

Port Type	Port Size
R (BSPP)	1/8 BSPP
T (SAE)	#4 (SAE)
U (Pipe Thread)	1/8 NPTF
M (Metric Straight)	M10 x 1
Y (ISO 6149-1)	M10 x 1
B (BSPT)	1/8 BSPT
P (SAE 4 Bolt Flange)	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



Spring-Returned, Single-Acting Cylinders

AHM Series single-acting cylinders can 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, tie rod extensions will be supplied to allow the spring to be 'backed off' until compression is relieved. Tie rod nuts will 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.

Duplex and Tandem Cylinders

A tandem cylinder is made up of two cylinders mounted in line with pistons connected by a common piston rod and rod seals installed between the cylinders to permit double acting operation of each. Tandem cylinders allow increased output force when mounting width or height are restricted.

A duplex cylinder is made up of two cylinders mounted in line with pistons not connected with rod seals installed between the cylinders to permit double acting operation of each. Cylinders may be mounted with piston rod to piston or back to back and are generally used to provide three position operation.

Rod End Bellows

Unprotected piston rod surfaces which are exposed to contaminants with air hardening properties can 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.

Proximity Sensors

EPS proximity switches can be fitted to give reliable end of stroke signals.

Position Feedback

Linear position transducers of various types are available for AHM Series cylinders. Please contact the factory for further details.

All dimensions are in millimeters unless otherwise stated.

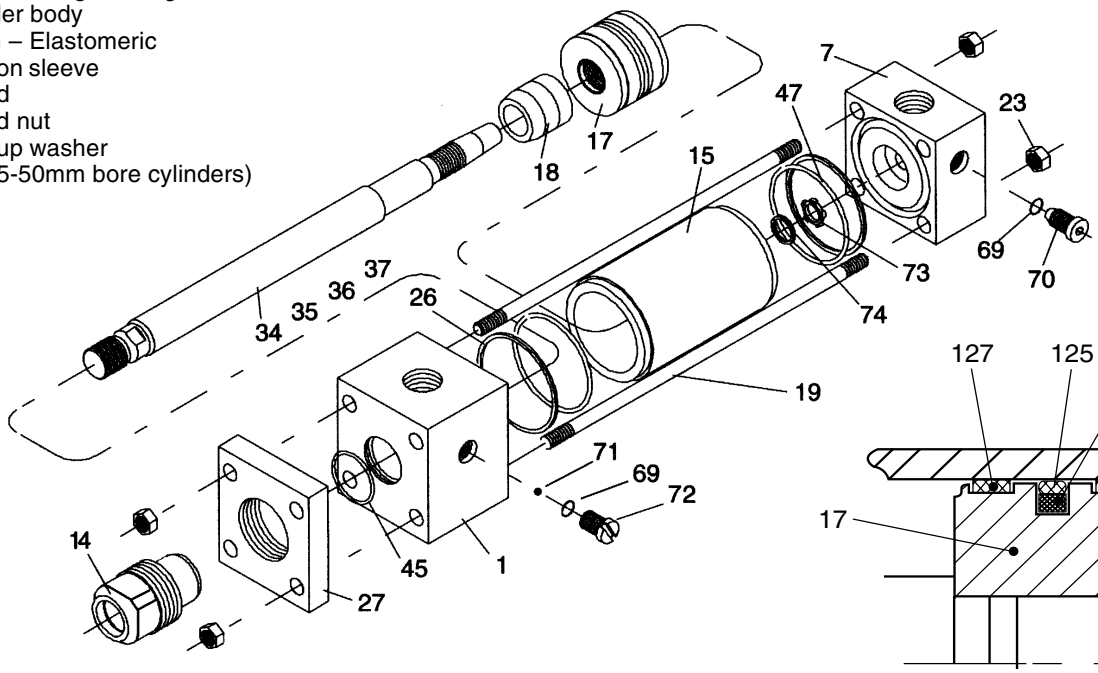
Service Assemblies and Seal Kits

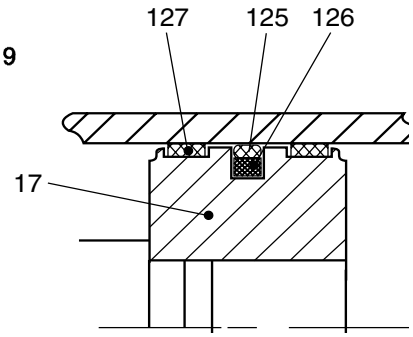
Service Assembly Kits and Seal Kits for AHM cylinders simplify the ordering and maintenance processes. They contain sub-assemblies which are ready for installation, and are supplied with full instructions. When ordering Service Assemblies and Seal Kits, please refer to the identification plate on the 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 – Elastomeric
18 Cushion sleeve
19 Tie rod
23 Tie rod nut
26 Back-up washer
(not 25-50mm bore cylinders)

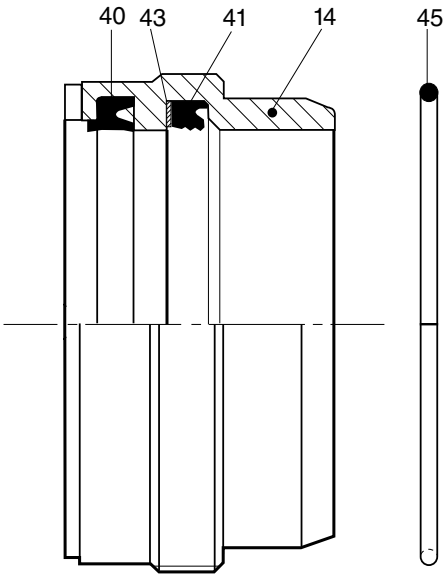




Elastomeric Piston

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 (not Group 1 seals)
45 O-ring – gland/head
47 O-ring – cylinder body
57[1] Piston rod – double rod, no cushion
58[1] Piston rod – double rod, cushion one end
60[1] Piston rod – double rod, no cushion
61[1] Piston rod – double rod, cushion one end
69 O-ring – needle valve and check valve screws
70 Needle valve, cushion adjustment
71 Ball – cushion check valve
72 Cushion check valve screw
72a Cushion check valve, cartridge type
73 Floating cushion bush
74 Retaining ring for cushion bush
125 Standard piston seal
126 Energising ring for standard seal 125
127 Wear ring for standard piston

[1]Not illustrated



Gland Cartridge and Seals

Contents and Part Numbers of Seal Kits for Pistons and Glands

(see key to part numbers opposite)

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

Rod Seal Kit – Gland Cartridge Seals* Contain items 40, 41, 43, 45

Rod ø	Gland Cartridge Assembly*		Rod Seal Kit*	
	Standard	Fluorocarbon	Standard	Fluorocarbon
12	B732-944	B732-1100	B732-966	B732-1112
14	B732-945	B732-1101	B732-967	B732-1113
18	B732-946	B732-1102	B732-968	B732-1114
22	B732-947	B732-1103	B732-969	B732-1115
28	B732-948	B732-1104	B732-970	B732-1116
36	B732-949	B732-1105	B732-971	B732-1117
45	B732-950	B732-1106	B732-972	B732-1118
56	B732-951	B732-1107	B732-973	B732-1119
70	B732-952	B732-1108	B732-974	B732-1120
90	B732-953	B732-1109	B732-975	B732-1121
110	B732-954	B732-1110	B732-976	B732-1122
140	B732-955	B732-1111	B732-977	B732-1123

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

Piston Kit – Standard Piston Seals* (includes Cylinder Body End Seals) Contains two each of items 47, 26 (not 25-50mm bore), two of item 127, and one each of items 125, 126.

Rod ø	Body Seal Kit*		Piston Seal Kit*	
	Standard	Fluorocarbon	Standard	Fluorocarbon
25	B732-956	B732-1124	B732-978	B732-1134
32	B732-957	B732-1125	B732-979	B732-1135
40	B732-958	B732-1126	B732-980	B732-1136
50	B732-959	B732-1127	B732-981	B732-1137
63	B732-960	B732-1128	B732-982	B732-1138
80	B732-961	B732-1129	B732-983	B732-1139
100	B732-962	B732-1130	B732-984	B732-1140
125	B732-963	B732-1131	B732-985	B732-1141
160	B732-964	B732-1132	B732-986	B732-1142
200	B732-965	B732-1133	B732-987	B732-1143

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, 70, 71, 72, (72a)

Cap Assembly

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

Cylinder Body

All types: 15

Cushion Screw Assembly

Screw type: 69, 70

Check Valve Screw Assembly

Screw type: 69, 71, 72

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, see parts list below, plus a rod assembly from the types listed below.

Piston Assemblies

Standard: 17, 125, 126, 127x2

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 in the mounting information section.

Repairs

Although AHM 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 millimeters unless otherwise stated.

How to Order ISO Cylinders

Data Required On All Cylinder Orders

When ordering AHM Series cylinders, be sure to specify each of the following requirements:

(**NOTE:** – Duplicate cylinders can be ordered by giving the SERIAL NUMBER from the nameplate of the original cylinder. Factory records supply a quick, positive identification.)

a) Bore Size

b) Mounting Style
Specify your choice of mounting style – as shown and dimensioned in this catalog. If double rod is required, specify "with double rod."

c) Series Designation ("AHM")

d) Length of Stroke

e) Piston Rod Diameter
Call out rod diameter or rod code number. In AHM Series cylinders, standard rod diameters (Code No. 1) will be furnished if not otherwise specified, unless length of stroke makes the application questionable.

f) Piston Rod End Thread Style
Call out thread style number or specify dimensions. Thread style number 4 will be furnished if not otherwise specified.

g) Cushions (if required)
Specify "Cushion-head end," "Cushion-cap end" or "Cushion-both ends" as required. If cylinder is to have a double rod and only one cushion is required, be sure to specify clearly which end of the cylinder is to be cushioned.

h) Piston
Filled polyamide seals and wear ring are standard. Fluorocarbon also available.

i) Ports
BSP (ISO 228) are standard.

j) Fluid Medium
AHM Series hydraulic cylinders are equipped with seals for use with hydraulic oil. If other than hydraulic oil will be used, consult factory.

ADDITIONAL DATA is required on orders for cylinders with special modifications.
For further information, consult factory.

Service Policy

On cylinders returned to the factory for repairs, it is standard policy for the Atlas Cylinders to make such part replacements as will put the cylinder in as good as new condition. Should the condition of the returned cylinder be such that expenses for repair would exceed the costs of a new one, you will be notified.

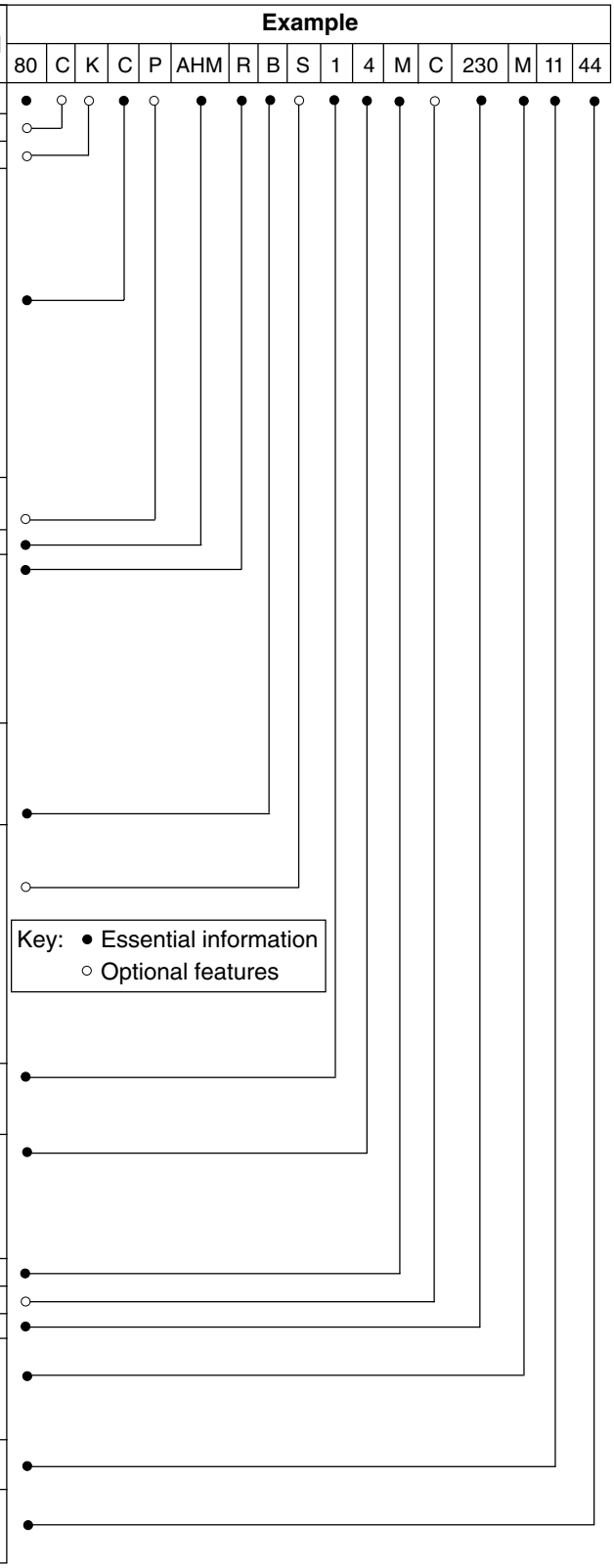
Certified Dimensions

Atlas Cylinders guarantees that all cylinders ordered from this catalog will be built to dimensions shown. All dimensions are certified to be correct, and thus it is not necessary to request certified drawings.

Series AHM Model Numbers – How to Develop and "Decode" Them

Atlas Series AHM cylinders can be completely and accurately described by a model number consisting of coded symbols. For single rod cylinders a maximum of 17 places for digits and letters are used in a prescribed sequence to produce a model number. Only twelve places are needed to completely describe a standard noncushioned AHM Series cylinder. To develop a model number, select only those symbols that represent the cylinder required, and place them in the sequence indicated below.

Feature	Description	Page	Symbol
Bore	Millimeters		–
Cushion – Head	If required	22	C
Double Rod	If required	7	K
Mounting Style	Head Tie Rods Extended	4	TB
	Cap Tie Rods Extended	4	TC
	Both Ends Tie Rods Extended	4	TD
	Head Rectangular Flange	5	JJ
	Cap Rectangular Flange	5	HH
	Side Lugs	5	C
	Cap Fixed Eye	2	B
	Cap Fixed Clevis	2	BB
	Cap Fixed Eye with Spherical Bearing	2	SB
	Head Trunnion	6	D
	Cap Trunnion	6	DB
	Intermediate Fixed Trunnion	6	DD
Mounting Modifications	Thrust Key for Style C mounting only	11	P
Series	Series name		AHM
Ports	BSP (ISO 228) – standard	24	R
	BSPT (Taper Thread)	24	B
	Metric Thread	24	M
	Metric Thread per ISO 6149	24	Y
	SAE – Straight Thread O-ring Port	24	T
	NPTF (Dry Seal Pipe Thread)	24	U
	SAE – Flange Ports (3000 psi)	24	P
Piston	B - Style Low Friction filled PTFE seals (standard)	5	B
	N - Style Split ring heavy duty seals (optional)		N
Special Features	One or more of the following:		S
	Gland Drain Port	26	
	Oversize Ports	23	
	Rod End Bellows	26	
	Stop Tube	18	
	Stroke Adjuster	26	
	Tie Rod Supports	16	
	Water Service Modifications	25	
	Or to detailed descriptions or drawings supplied by customer		
Piston Rod Number	Rod No.1	6	1
	Rod No.2	6	2
	Rod No.3	6	3
Piston Rod End	Style 4	6	4
	Style 7	6	7
	Style 9	6	9
	Style 3 (Special) Please supply description or drawing	6	3
Rod Thread	Metric (standard)	6	M
Cushion – Cap	If required	22	C
Gross Stroke	Millimeters		-
Fluid Medium ISO 6743/4 (1982)	Mineral Oil HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606 Oil, Air, Nitrogen – Group 1	25	M
	Fluorocarbon – Group 5	25	D
Port Positions	Head position 1-4	23	1
	Cap position 1-4	23	1
Air Bleeds	Head position 1-4	23	4
	Cap position 1-4	23	4
	No Air Bleed	23	00



Offer of Sale

The items described in this document are hereby offered for sale at prices to be established by Atlas Cylinder Division, and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Atlas Cylinder Division, or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F. O. B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment to Buyer. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.**

NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

5. Limitation of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

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

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

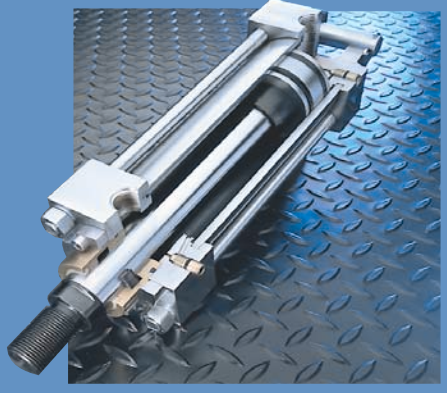
10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement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

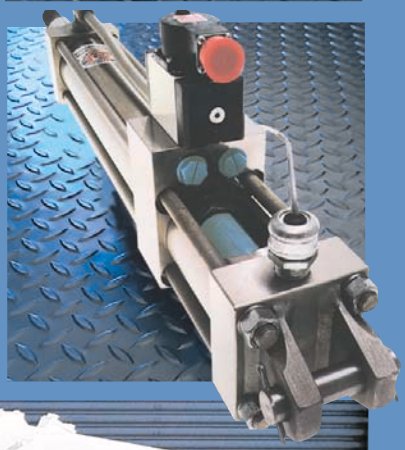
If claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

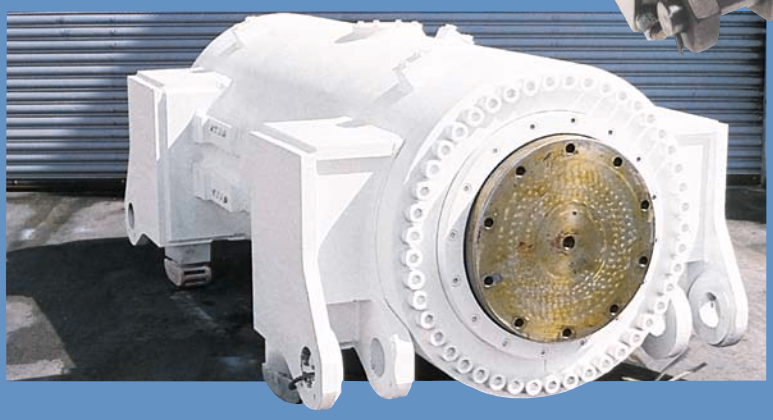
11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation,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

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of the action accrues.

A Diverse Range of Products







Whatever the industry or application, the Atlas Advantage works for you. Atlas' diverse line of both pneumatic and hydraulic cylinders is supported with a worldwide sales and service network.

No other manufacturer offers as diverse a product line base as Atlas. From JIC tie-rod, to welded cylinders, to custom requirements, Atlas Cylinders will meet your demands with quality and precision.

Light Duty Hydraulic Cylinders (Tie-Rod)
Series "L" 1,000 PSI hydraulic service. JIC/NFPA interchangeable.

Heavy Duty Hydraulic Cylinders (Tie-Rod)
Series "H" 3,000 PSI hydraulic service. JIC/NFPA interchangeable.

Feedback Cylinders
Series "ESP" Electronic stroke position, heavy duty hydraulic cylinder. 3,000 PSI hydraulic service.
Series "HE" Interchangeable with NFPA tie-rod hydraulic cylinders. Remote electronics available. 3,000 PSI.

Heavy Duty Air Cylinders
Series "A" 250 PSI air service. JIC/NFPA interchangeable.
Series "MM" Mill and mine style construction. 250 PSI air service.

Light Duty Air Cylinders
Series "2LA" Aluminum construction. 150 PSI air service. NFPA interchangeable.
Series "SS" and "SSM" Small bore, stainless steel round cylinders. 250 PSI air service.
Series "CD" Compact design.
Series "VA" Valve actuator construction. 150 PSI air service.

Metric Cylinders
Series "AHM" and "APM" Hard metric hydraulic and pneumatic cylinders designed to meet the requirements of ISO 6020/2 and ISO 6431 respectively.

Accumulators
Piston and bladder-type accumulators. Up to 5,000 PSI hydraulic service.

Custom Cylinders
Up to 48" bore and 40' stroke. Pressures to 10,000 PSI. Designs can include special materials, special construction, and cylinders built to various agency approvals (ABS, DNV, Coast Guard, etc.)

ATLAS CYLINDERS

29289 Airport Road
Eugene, OR 97402
(541) 689-9111
Fax (541) 688-6771

1021 Brooks Street, SE
Decatur, AL 35602
(256) 355-1812
Fax (256) 355-9296

www.atlascylinders.com