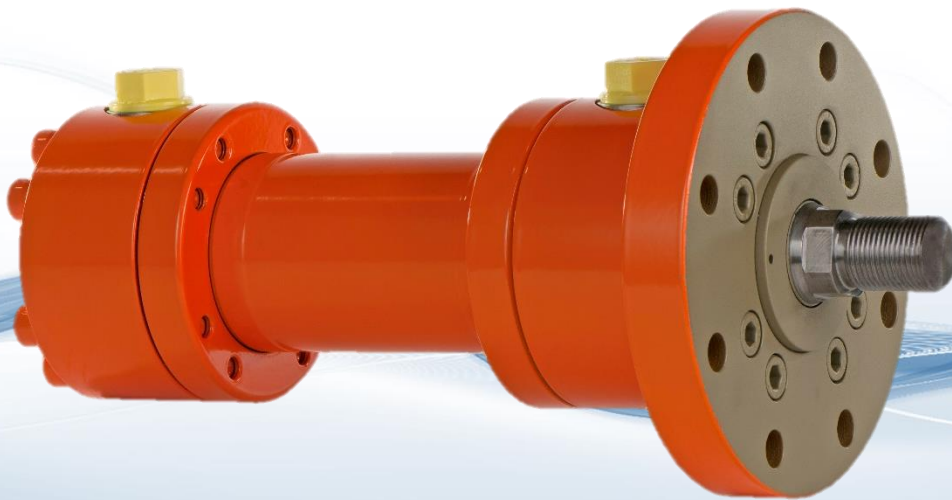


**HELPEBS
CONTROLS**

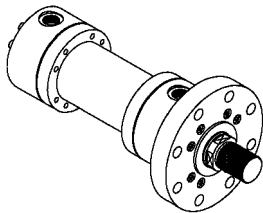
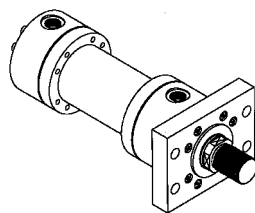
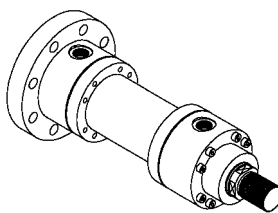
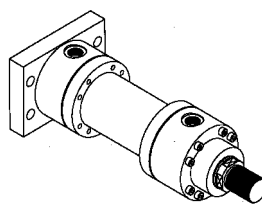
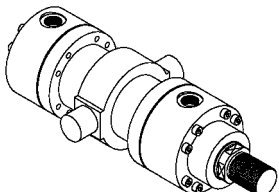
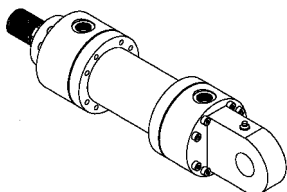
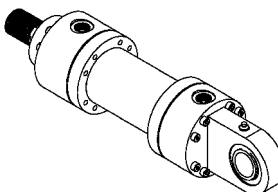
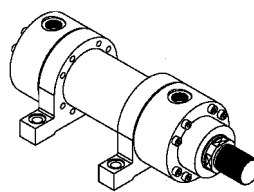
ROUNDLINE CYLINDERS ER RANGE

High quality range of ISO 6020/1 roundline cylinders from 40mm bore to 200mm bore

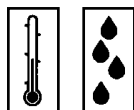


PERFORMANCE UNDER PRESSURE
AGAIN. AND AGAIN. AND AGAIN.

◆ MOUNTING STYLES

Available mountings and where to find them			
<p>Front Circular Flange Mount – Style FCF</p>  <p>(ISO style MF3) page 3</p>	<p>Front Rectangular Flange Mount – Style FRF</p>  <p>(ISO style MF1) page 3</p>	<p>Rear Circular Flange Mount – Style RCF</p>  <p>(ISO style MF4) page 3</p>	<p>Rear Rectangular Flange Mount – Style RRF</p>  <p>(ISO style MF2) page 3</p>
<p>Intermediate Fixed Trunnion Mount – Style T</p>  <p>(ISO style MT4) page 5</p>	<p>Rear Pivot Mount – Style P</p>  <p>(ISO style MP3) page 5</p>	<p>Rear Spherical Bearing Mount – Style SBp</p>  <p>(ISO style MP5) page 5</p>	<p>Side Lug Mount – Style SL</p>  <p>(style MS2) page 7</p>

◆ FLUIDS AND TEMPERATURES



Temperatures

Standard cylinders may be operated at temperatures of -45 to +90°C. For temperatures over 90°C consult the factory for specific recommendations giving operating temperature, source and characteristics of the heat, medium and cycle time. It should be noted that many seal compounds exhibit reduced life as the temperature nears their stated limit. In such applications, it is a good practice to specify high-temperature seals to assure long, satisfactory life.

Fluids

Seal materials employed in standard ER Series cylinders are Buna-N, Polyurethane and Teflon. As such, standard cylinders are particularly suited for use with any good grade petroleum base hydraulic oil. For normal temperature ranges, an oil having a viscosity range of 250-300 S.S.U. at 38°C is recommended. The oil should be maintained at SAE Level 3-4 cleanliness, normally accomplished with a 10 micron filtration system. Standard

seals are also compatible with most Water-Glycol and Water-Oil Emulsion fluids with temperatures limited to a maximum of 60°C. Whenever there is a question of compatibility, contact the factory or the fluid manufacturer. NEVER change system fluid or MIX fluids until a careful check as to compatibility has been made.

Fire Resistant Fluids such as Phosphate Esters and Chlorinated Hydrocarbons require special seal compounds. These can be supplied in lieu of the standard seals at a moderate extra charge. The specific fluid and/or seal compounds should always be given on your order.

Cylinders to be operated with raw water as the fluid medium require special plating and/or special materials. There are two general classifications of cylinders made for use with water: (1) Water-Fitted Cylinders and (2) Water-Hydraulic Cylinders. Consult factory for additional information.

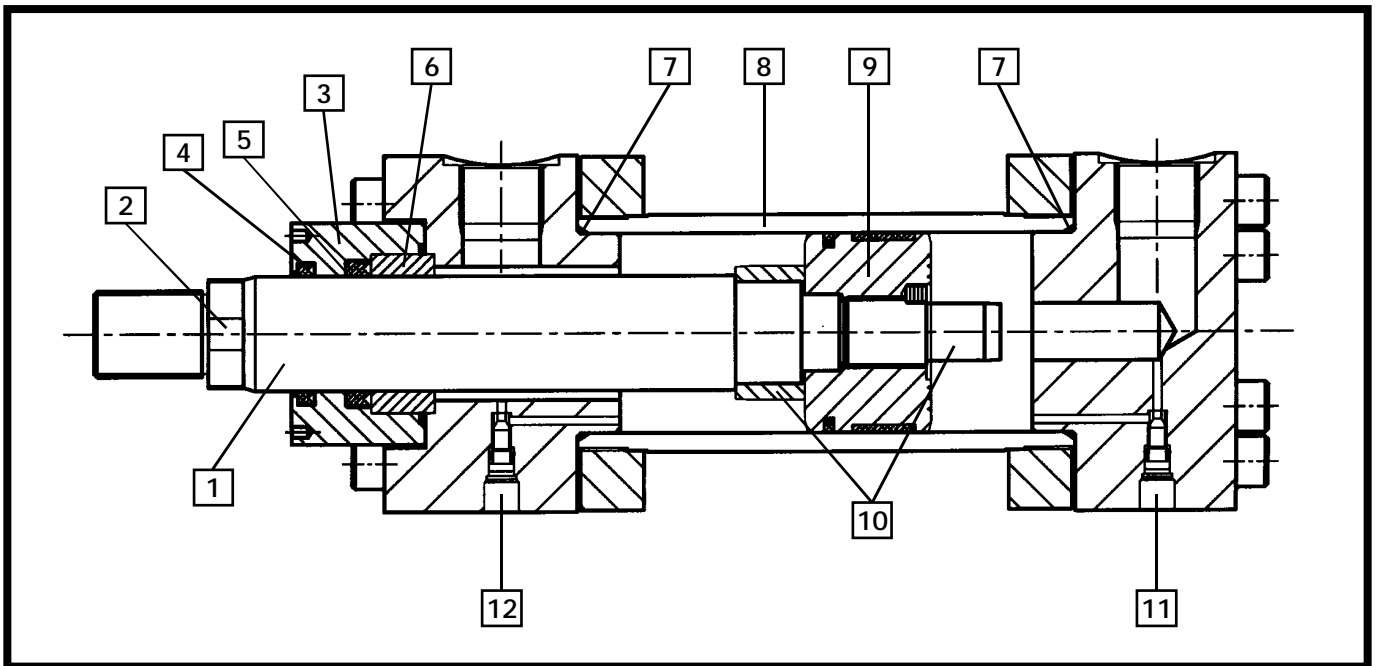
Standard Specifications

ISO 6020/1

- Construction: Heads bolted to flanges
- Working Pressures to 160 bar
- Bore sizes 40mm – 200mm
- Rod diameters 22mm – 140mm
- Standard fluid – Hydraulic Oil
- Strokes in any practical length
- Cushions optional at either or both ends
- Air bleeds optional at either or both ends
- Temperatures – 45°C to +90°C with standard seals
- Choice of 8 mounting styles
- Choice of 2 rod diameters per bore

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CONSTRUCTION



1 Piston Rod

Piston rods are manufactured from precision ground, high tensile steel and hard chrome plated. In addition, they are induction case hardened to give a dent resistant surface.

2 Wrench Flats

Four wrench flats are provided as standard for easy attachment on all rod diameters.

3 Rod Gland

Easily removable for replacement of rod packings and wiper. It is not necessary to disassemble the cylinder. Easier to service since, on removal of the ductile iron gland, the piston rod remains supported by the separate rod bearing.

4 Rod Wiper

Synthetic wiper is designed to wipe off abrasive dust and contaminants on the retract stroke to ensure long life for packings, rod bearing, and piston rod. Where the rod will be exposed to gummy materials such as "road tar", a metallic rod scraper is available.

5 Rod Seal

The polyurethane rod seal has a unique design which incorporates the optimum sealing properties of a "U" configuration with the elastomeric properties of a compression-type seal. The polyurethane material was selected for toughness, abrasion resistance, and the ability to resist extrusion under rough service conditions.

6 Rod Bearing

High load bearing bronze piloted into the head. Located inboard of the seals to ensure a well lubricated bearing for the fastest cycling applications. It need not be removed for rod seal replacement.

7 Static Seals

Pressure activated "O" ring seals are used at rod gland and tube ends. Located to eliminate extrusion and to provide positive leak tight seal.

8 Tube

The steel tube is honed to a 0.4 micro metres R_a max finish for low friction and long seal and piston bearing life. Tube ends are machined on the O.D. concentric with the I.D.

9 Pistons and Piston Seals

All pistons are machined from a fine grain alloy iron. They are threaded directly onto the piston rod, torqued and sealed. The piston seal is an endless glass filled Teflon material with an "O", ring expander. One or more (depending on bore size) bronze filled Teflon bearing strips are also employed on this type piston to eliminate metal-to-metal contact. This type of piston offers long life, low friction, near zero leakage, and great tolerance for side loading. It can be used successfully on virtually any application and is offered as standard at no extra cost.

10 11 12 Cushions

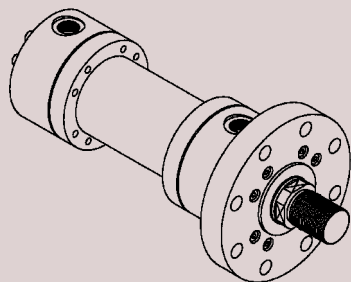
Cushion pistons (10) are tapered to provide gradual deceleration and eliminate shock upon entrance. The adjusting screw with fine threads (11) provides a wide range of adjustment. It is interchangeable with the ball check (12) permitting field changes of position. Neither the adjusting screw nor ball check plug project beyond the head or cap surface and are held captive by a retaining ring.

Air Bleeds (Optional)

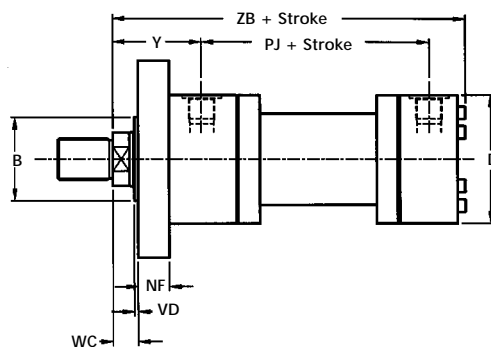
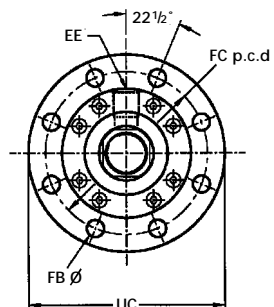
When required, air bleeds are located where they can be employed most successfully. The straight thread plugs are equipped with metallic "O" rings so they can be used repeatedly with a good seal every time. Consult factory for further details.

FLANGE MOUNTINGS

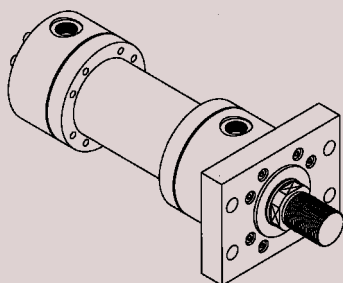
Front Circular Flange Mount – Style MF3



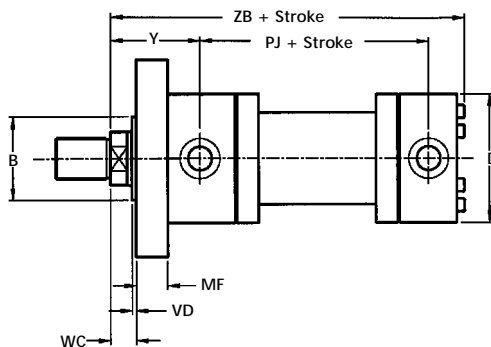
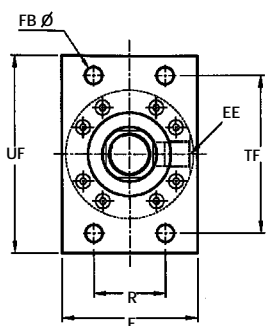
(ISO style MF3)



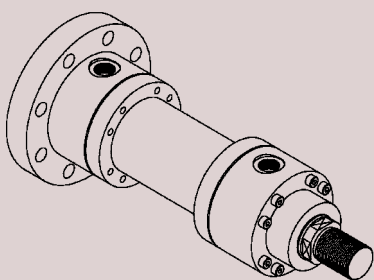
Front Rectangular Flange Mount – Style MF1



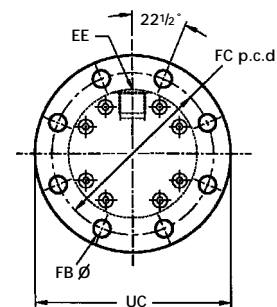
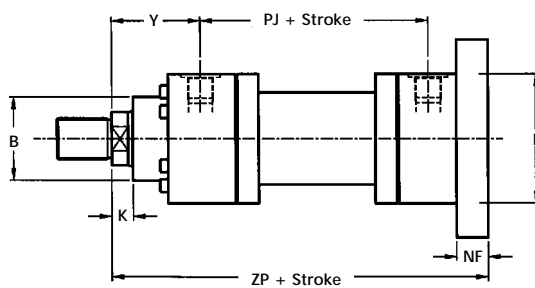
(ISO style MF1)



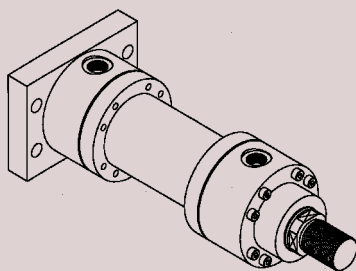
Rear Circular Flange Mount – Style MF4



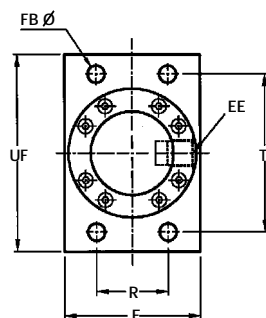
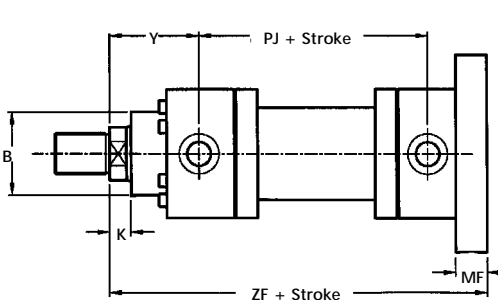
(ISO style MF4)



Rear Rectangular Flange Mount – Style MF2



(ISO style MF2)



FLANGE MOUNTINGS DIMENSIONS

Bore	MM Rod Dia.	B f8	D Max	E	EE BSP	FB h13	FC	K	MF
40	22	50	78	80	1/2	9	106	13	16
	28								
50	28	60	94	100	1/2	11	126	14	20
	36								
63	36	70	113	120	3/4	13.5	145	16	25
	45								
80	45	85	130	135	3/4	17.5	165	18	32
	56								
100	56	106	158	160	1	22	200	20	32
	70								
125	70	132	192	195	1	22	235	23	32
	90								
160	90	160	238	-	1 1/4	22	280	25	-
	110								
200	110	200	285	-	1 1/4	26	340	30	-
	140								

Important Notice
For optional ports see page 8

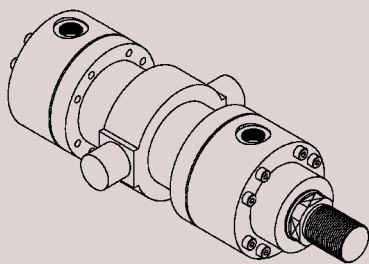
Be sure to add Stroke to these Dimensions

Bore	MM Rod Dia.	NF	PJ	R	TF	UC Max	UF	VD Min	WC	Y	ZB Max	ZF	ZP
40	22	16	97	40.6	98	125	115	3	16	71	196	206	206
	28												
50	28	20	111	48.2	116.4	148	140	4	18	72	213	225	225
	36												
63	36	25	117	55.5	134	170	160	4	20	82	234	249	249
	45												
80	45	32	134	63.1	152.5	195	185	4	22	91	260	282	282
	56												
100	56	32	162	76.5	184.8	238	225	5	25	108	312*	332	332
	70												
125	70	32	174	90.2	217.1	272	255	5	28	121	337*	357	357
	90												
160	90	36	191	-	-	316	-	5	30	143	386*	-	406
	110												
200	110	40	224	-	-	385	-	5	35	190	466	-	490
	140												

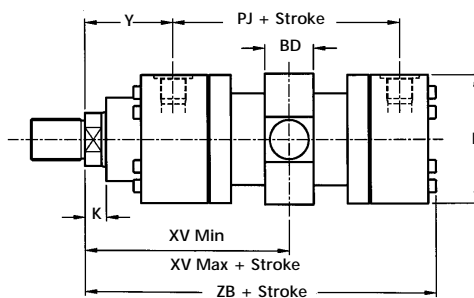
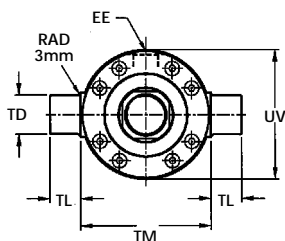
*Not in accordance with Standard.

TRUNNION & PIVOT MOUNTINGS

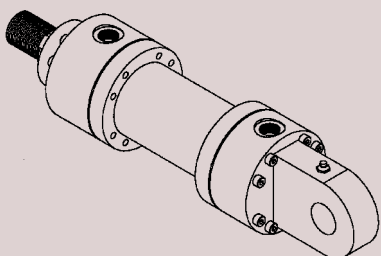
Intermediate Fixed Trunnion Mount – Style MT4



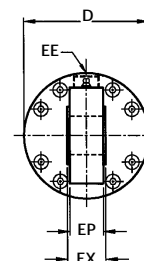
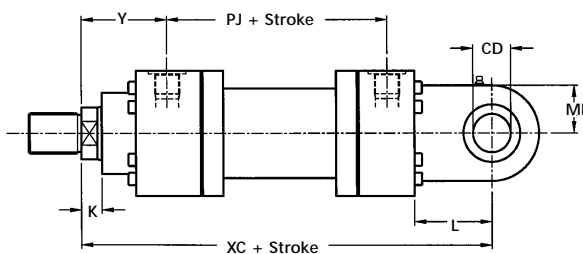
(ISO style MT4)



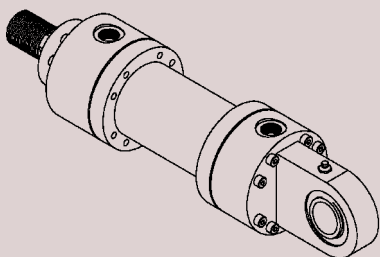
Rear Pivot Mount – Style MP3



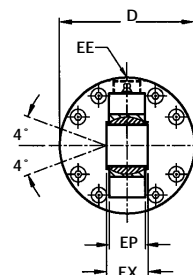
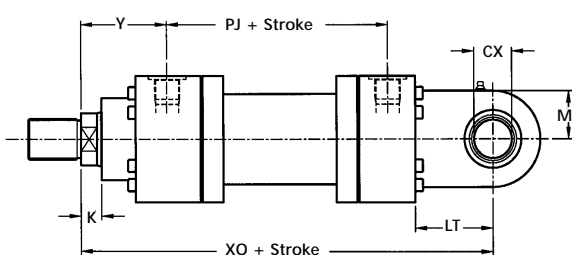
(ISO style MP3)



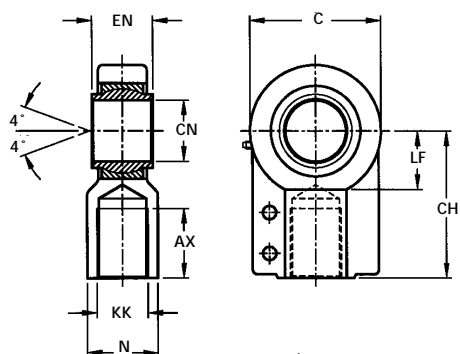
Rear Spherical Bearing – Style MP5



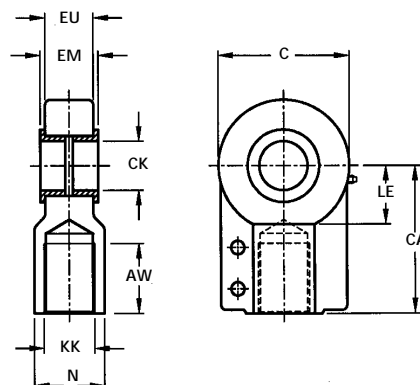
(ISO style MP5)



Spherical Bearing Rod Eye



Plain Bearing Rod Eye



DIMENSIONS

Bore	MM Rod Dia.	BD Max	CD H9	CX H7	D Max	EE BSP	EP	EX h12	K	L
40	22	30	20	20	78	1/2	18	20	13	41
	28									
50	28	35	25	25	94	1/2	22	25	14	52
	36									
63	36	45	32	32	113	3/4	27	32	16	65
	45									
80	45	50	40	40	130	3/4	35	40	18	82
	56									
100	56	60	50	50	158	1	40	50	20	95
	70									
125	70	75	63	63	192	1	52	63	23	103
	90									
160	90	90	80	80	238	1 1/4	66	80	25	135
	110									
200	110	110	100	100	285	1 1/4	84	100	30	165
	140									

Important Notice
For optional ports see page 8

Be sure to add Stroke to these Dimensions

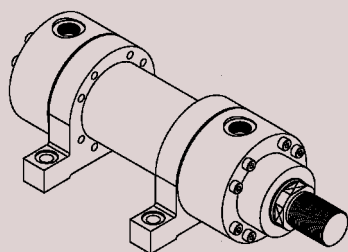
Bore	MM Rod Dia.	LT	MR	MS	PJ	TD f8	TL	TM h12	UV Max	XC	XO	XV Min	XV Max	Y	ZB	Min Stroke MT4
40	22	41	25	25	97	20	16	90	78	231	231	123	98	71	196	25
	28															
50	28	52	32	32	111	25	20	105	95	257	257	140	105	72	213	35
	36															
63	36	65	40	40	117	32	25	120	116	289	289	158	108	82	234	50
	45															
80	45	82	50	50	134	40	32	135	130	332	332	175	125	91	260	50
	56															
100	56	95	63	63	162	50	40	160	158	395	395	204	149	108	312*	55
	70															
125	70	103	71	71	174	63	50	195	195	428	428	231	161	121	337*	70
	90															
160	90	135	90	90	191	80	63	240	240	505	505	272	182	143	386*	90
	110															
200	110	165	112	112	224	100	80	295	300	615	615	335	245	190	466	90
	140															

*Not in accordance with Standard.

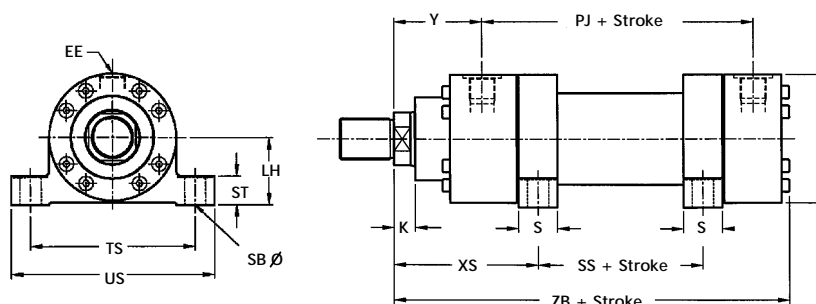
Spherical & Plain Bearing Rod Eyes																	
Bore	MM Rod Dia.	Spherical Bearing Rod Eye	Plain Bearing Rod Eye	AW & AX	C	CA & CH	CK & CN	EM & EN	EU	KK	LE & LF	N	SCREW	Tightening Torque MA Nm	Nom. Cyl. Force KN	STATIC LOAD KN	DYNAMIC LOAD KN
40	22	REB-20LO	REF-20PO	23	47	52	20	20	17	M16x1.5	22	25	M8	32	20	48	30
	28	REB-25LO	REF-25PO	29	58	65	25	25	21	M20x1.5	27	30	M8	32	32	78	48
50	28	REB-32LO	REF-32PO	37	70	80	32	32	27	M27x2	32	38	M10	64	50	114	67
	36																
63	36	REB-40LO	REF-40PO	46	89	97	40	40	32	M33x2	41	47	M10	64	80	204	100
	45																
80	45	REB-50LO	REF-50PO	57	108	120	50	50	40	M42x2	50	58	M12	110	125	310	156
	56																
100	56	REB-63LO	REF-63PO	64	132	140	63	63	52	M48x2	62	70	M12	110	200	430	255
	70																
125	70	REB-80LO	REF-80PO	86	168	180	80	80	66	M64x3	78	90	M16	195	320	695	400
	90																
160	90	REB-100LO	REF-100PO	96	210	210	100	100	84	M80x3	98	110	M20	385	500	1060	610
	110																
200	110	REB-125LO	REF-125PO	113	262	260	125	125	102	M100x3	120	135	M20	385	800	1430	950
	140																

SIDE LUG MOUNT & DIMENSIONS

Side Lug Mount – Style MS2

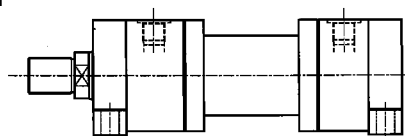
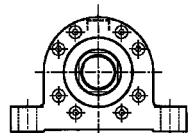


(Style MS2)



Important Notice

For optional ports see page 8
The MS2 mounting shown above does not conform to ISO6020/1 standards. Should the ISO6020/1 MS2 mounting be specified (see drawing below) then please consult factory for details.



(ISO Style MS2)

Be Sure To Add Stroke To This Dimension

Bore	MM Rod Dia.	D Max	EE BSP	K	LH h10	PJ	S	SB	SS	ST	TS	US	XS	Y	ZB Max	Min Stroke MS2
40	22	78	1/2	13	48	97	25	11	24	20	110	130	106	71	196	30
	28															
50	28	94	1/2	14	52	111	32	14	26	25	120	145	116	72	213	40
	36															
63	36	113	3/4	16	62	117	32	18	33	25	145	180	123	82	234	50
	45															
80	45	130	3/4	18	70	134	40	22	42	30	170	210	136	91	260	60
	56															
100	56	158	1	20	82	162	50	26	49	35	200	245	164	108	312	80
	70															
125	70	192	1	23	100	174	56	33	55	35	245	300	180	121	337	120
	90															
160	90	238	1 1/4	25	142	191	56	33	66	45	320	400	206	143	386	250
	110															
200	110	285	1 1/4	30	170	224	60	36	90	50	400	500	257	190	466	300
	140															

MS2 mounting dimensions in above table not in accordance with standard.

CUSHIONS

Cushions

Tapered cushions, designed to provide gradual deceleration and eliminate shock upon entrance of the cushion pistons, have now been considerably improved. The tapered cushion has been married with a fine thread, wide range, adjusting screw. This new combination offers a positive, low shock deceleration and a

method to adjust the cushioning effect for speeds and loads.

The adjusting screw is identified by a cross-slot in the head of the screw. It does not project beyond the surface of the head (or cap) through its full range of adjustment so no clearance need be considered on close fit installations. The adjusting screw and the cushion check can be interchanged in the same cylinder end. This flexibility can be important if, after installation, it is discovered that the adjusting screw is inaccessible.

The cushion check, which does not require adjustment, has a single slot in its head. It does not project beyond the surface of the head (or cap). The cushion check plus the tapered cushion piston provides rapid acceleration out of cushioning. There is no spring in the cushion check to fatigue, hence, no worry of mechanical failure.

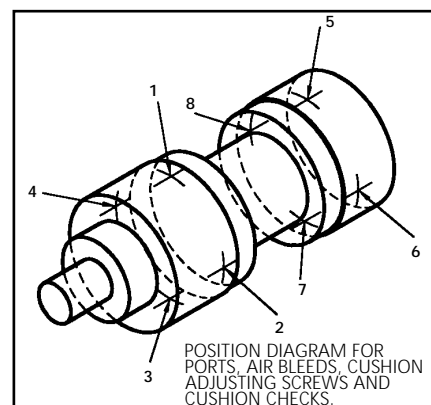
All cushion screws are held captive by a spring-loaded retaining ring. This ring is removable for maintenance or changeover purposes.

Cushioning is designed to properly cushion the cylinder and is not intended to cushion large inertia loads. Cushions do not substitute for speed controls or deceleration valves on most installations.

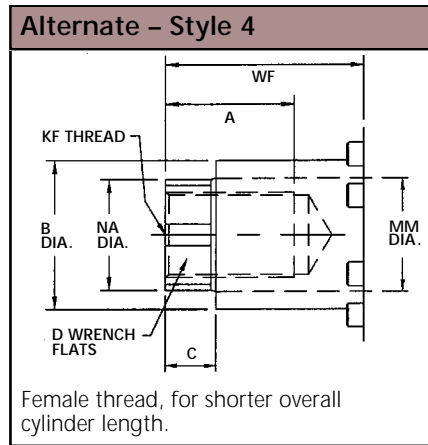
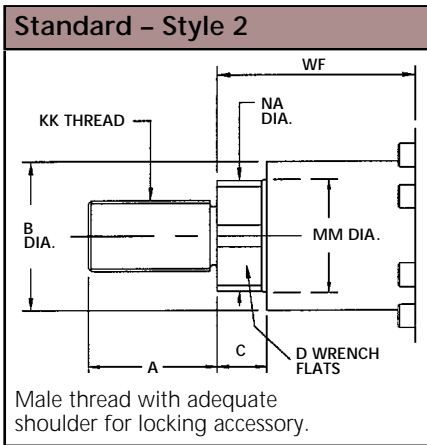
The standard positions for ports are 1 and 5 (see diagram below). Where possible, the standard for cushion adjusting screws will be 2 and 6 and the standard positions for cushion checks will be 4 and 8.

Cushion Lengths

Bore	Rod	Cushion Length Head	Cushion Length Cap
40	All	22	22
50	All	22	22
63	All	22	22
80	All	22	25
100	All	22	25
125	All	25	25
160	All	25	28
200	All	25	38



ROD END INFORMATION



Important

Specify on order

1. Type of thread
2. Length of thread
3. Rod extension if non-standard
4. Any non standard thread please supply full details

ISO 6020/1									
Bore	MM Rod Dia.	A	B Dia. (f8)	C	D	KK	NA	KF	WF
40	22	22	50	13	18	M16 x 1.5	21	M16 x 1.5	32
	28	28			22	M20 x 1.5	27	M20 x 1.5	
50	28	28	60	14	22	M20 x 1.5	27	M20 x 1.5	38
	36	36			30	M27 x 2	34	M27 x 2	
63	36	36	70	16	30	M27 x 2	34	M27 x 2	45
	45	45			39	M33 x 2	43	M33 x 2	
80	45	45	85	18	39	M33 x 2	43	M33 x 2	54
	56	56			48	M42 x 2	54	M42 x 2	
100	56	56	106	20	48	M42 x 2	54	M42 x 2	57
	70	63			62	M48 x 2	68	M48 x 2	
125	70	63	132	23	62	M48 x 2	68	M48 x 2	60
	90	85			80	M64 x 3	88	M64 x 3	
160	90	85	160	25	80	M64 x 3	88	M64 x 3	66
	110	95			100	M80 x 3	108	M80 x 3	
200	110	95	200	30	100	M80 x 3	108	M80 x 3	75
	140	112			128	M100 x 3	138	M100 x 3	

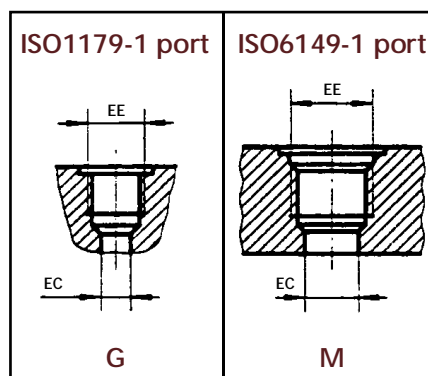
PORTING AND AIR BLEEDS

Porting

BSP Ports will be supplied with spotface for sealing washers as standard unless otherwise specified. Alternative ports, as listed opposite, may be specified. In addition, we can also offer square and rectangular flange ports to ISO6164 and ISO6162-1 – consult factory.

Air Bleeds

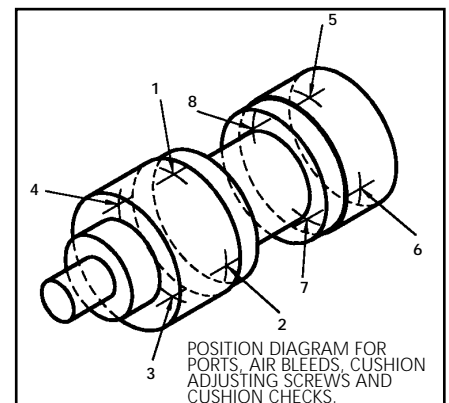
An air bleed may be ordered at either or both ends of the cylinder as an option. The air is bled from the cylinder by backing out the bleed plug to allow air to pass by the threads. When air bubbles stop and oil starts to flow, re-tighten plug. It is recommended that bleeding be done with pressure on the opposite end of the cylinder so that the bleed plug is not subjected to pump pressure when being backed out. Air bleeds should always be positioned at the highest point of the cylinder. Please specify positions of air bleeds by position number from the chart.



Bore	G		M	
	EE	EC	EE	EC
40	G 1/2	14	M22 x 1,5	14
50				
63	G 3/4	18	M27 x 2	18
80				
100	G 1	23	M33 x 2	23
125				
160	G 1 1/4	30	M42 x 2	30
200				

Port Positions

All ports are supplied in positions 1 and 5 as standard. Please specify optional positions as required.

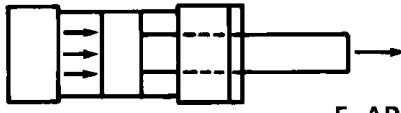


THEORETICAL FORCES DEVELOPED BY CYLINDERS

Bore	Rod	Effective Area Push sq.mm	Effective Area Pull sq.mm	Theoretical Force in Newtons at Various Pressures (in bars)											
				35 bar		50 bar		70 bar		100 bar		125 bar		160 bar	
				Push	Pull	Push	Pull	Push	Pull	Push	Pull	Push	Pull	Push	Pull
40	22	1257	877	4400	3070	6285	4385	8799	6139	12570	8770	15713	10963	20112	14032
	28	1257	641	4400	2244	6285	3205	8799	4487	12570	6410	15713	8013	20112	10256
50	28	1964	1348	6874	4718	9820	6740	13748	9436	19640	13480	24550	16850	31424	21568
	36	1964	946	6874	3311	9820	4730	13748	6622	19640	9460	24550	11825	31424	15136
63	36	3117	2100	10910	7350	15585	10500	21819	14700	31170	21000	38963	26250	49872	33600
	45	3117	1526	10910	5341	15585	7630	21819	10682	31170	15260	38963	19075	49872	24416
80	45	5027	3436	17595	12026	25135	17180	35189	24052	50270	34360	62838	42950	80432	54976
	56	5027	2564	17595	8974	25135	12820	35189	17948	50270	25640	62838	32050	80432	41024
100	56	7854	5391	27489	18869	39270	26955	54978	37737	78540	53910	98175	67388	125664	86256
	70	7854	4005	27489	14018	39270	20025	54978	28035	78540	40050	98175	50063	125664	64080
125	70	12272	8423	42952	29481	61360	42115	85904	58961	122720	84230	153400	105288	196352	134768
	90	12272	5910	42952	20685	61360	29550	85904	41370	122720	59100	153400	73875	196352	94560
160	90	20106	13743	70371	48101	100530	68715	140742	96201	201060	137430	251325	171788	321696	219888
	110	20106	10603	70371	37111	100530	53015	140742	74221	201060	106030	251325	132538	321696	169648
200	110	31416	21911	109956	76689	157080	109555	219912	153377	314160	219110	392700	273888	502656	350576
	140	31416	16022	109956	56077	157080	80110	219912	112154	314160	160220	392700	200275	502656	256352

Please note that these are theoretical forces only and consideration must be given to pressure drops in the system and pipe runs.

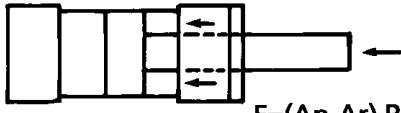
Force Developed on Push Stroke



$$F = \frac{AP}{10}$$

Force (Newtons) = Area of Piston (in sq. mm) times Pressure (in bar) divided by 10

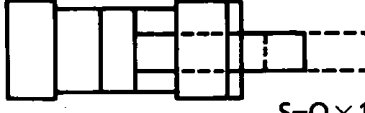
Force Developed on Pull Stroke



$$F = \frac{(A_p - A_r) P}{10}$$

Force (Newtons) = Area of Piston (in sq. mm) less Area of Rod (in sq. mm) times Pressure (in bar) divided by 10

Speed of Cylinder Travel



$$S = \frac{Q \times 10^3}{A}$$

S = Speed in metres per minute
 Q = Pump delivery in litres per minute
 A = Area of Piston in square mm - Rod Extend
 or
 A = Area of Piston minus Area of Rod - Rod Retract

Rod Column Strength

When considering a long stroke cylinder, it is necessary to select a piston rod size of sufficient diameter to provide the required column strength. If the cylinder is performing work on the pull stroke only (rod in tension), then the standard rod will be suitable providing the rated pressure of 160 bar is not exceeded. However should the cylinder be operating in the push stroke (rod in compression) then careful consideration need to be given to column strength. Factors which must be taken into consideration are the stroke length, rod extension length, mounting style, mounting altitude, force potential and rod end connections. If in doubt please consult factory.

Long Stroke Cylinders

Consideration must be given when selecting a cylinder with a long stroke with regards to mounting style, mounting altitude, column strength of the piston rod. If in doubt please consult factory.

MODEL NUMBER

Composition

63	ER	FCF	25	CC	W
Bore	Cylinder Series	Mounting	Stroke	Cushion	Modification
As Required	ER – ISO6020/1 "Roundline"	Listed Below	As Required Shown as Gross Stroke including Dual Piston or Stop Tube Length	CF – Cushion Front CR – Cushion Rear CC – Cushion both ends	A – Variation in Ports D – Double Rod Extension K – Any variation in Rod from Standard. Any variation from Standard Style 2 Rod End. M – Variation in Mounting W – Water Fitted Y – Variation in Construction

Mounting Styles

FCF – Front Circular Flange
 FRF – Front Rectangular Flange
 P – Pivot
 RCF – Rear Circular Flange
 RRF – Rear Rectangular Flange
 T – Trunnion
 SBp – Spherical Bearing
 SL – Side Lug

Order Information

To insure prompt delivery, please **BE SURE IN INCLUDE THIS INFORMATION WHEN ORDERING:**

- Quantity
- Series
- Bore
- Stroke – Gross Stroke always show in Model Number
- Dual Piston Or Stop Tube
- Mounting Style
- Cushion (front, rear, both or none)
- Rod End Style (if other than Style 2 standard)
- Rod Size (standard or oversize)
- Extra Rod Extension (where required)
- Port Size (if other than standard)
- Port Positions other than standard positions 1 and 5
- Cushion check, adjusting screw, and bleed positions (when required) if other than standard positions
- Medium (specify type of fluid)
- Operating Pressure and Maximum Shock Pressure
- Temperature
- Double rod extension (when required)
- XI dimension on all Intermediate Trunnion cylinders
- Delivery required, or scheduling

Complete and correct ordering information will eliminate untimely delays. When in doubt always contact our factory.

Policy and Warranty

POLICY The policy is one of continual improvement in design and manufacture to assure still finer products, hence, specifications are subject to change without notice.

WARRANTIES AND LIABILITIES Goods alleged by the Buyer to be defective or not to conform to the Contract and accepted by the Company as such during the period of 12 months after delivery will be replaced by the Company or if the Company shall so decide the total price in respect of the Goods shall be refunded to the Buyer. The total liability of the Company for any loss or damages or expenses of any description direct or indirect suffered by the Buyer and attributable to the Goods shall not exceed in total One million pounds Sterling. No claim in respect of allegedly defective Goods shall be valid unless the claim is made in writing immediately after the Buyer shall become aware of the alleged defect. Nor will such claim entitle the Buyer to cancel any outstanding part of the Order.

- For a full listing of the various types of hydraulic and pneumatic cylinders in the range please consult factory.
- Cylinders of all sizes, for all applications, pressures and fluid mediums... in almost every price range.
- Easily installed and serviced.
- Compact, rugged and reliable.
- Wide range of matched mounting accessories.
- Custom built variations of all standard cylinders at nominal cost.
- Cylinders to 750 mm bore in a variety of mountings and pressure ranges.