



Hydraulic Cylinders Type R1 - Round heads with counter flanges

Conforms to ISO 6020-1: Nominal pressure of 160 bar and max 250 bar

Series R1 hydraulic cylinders are designed for heavy mill duty application and conforms to ISO 6020-1. It is completely interchangeable among manufacturers. It allows manufacturers of hydraulic equipments flexibility in the design of cylinders while it does not restrict technical development; however, it does provide basic guidelines.

Standard Specifications :

- Heavy duty construction
- Double Acting Design
- Bore Sizes: **40 mm to 200 mm**
- Rod Sizes: **22 mm to 140 mm**
- Strokes up to **5000 mm**
- **Two** rod diameters per bore
- **Two** seals options
- **Air Bleed** at both ends
- **Male & Female** rod end threads
- **Eight** standard mounting styles
- **Adjustable** or **Fixed** cushioning
- **Oversized & SAE Flange** oil port options

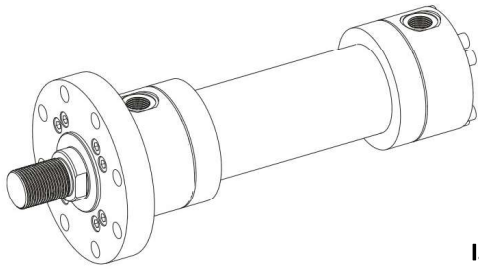
Ordering Instructions :

Cylinder Series: R1 [ISO 6020-1]		Mounting Style: see section 1 <table border="1"> <thead> <tr> <th></th> <th>REF. ISO</th> </tr> </thead> <tbody> <tr> <td>A - Front Round Flange</td> <td>MF3</td> </tr> <tr> <td>B - Rear Round Flange</td> <td>MF4</td> </tr> <tr> <td>D - Fixed Eye</td> <td>MP3</td> </tr> <tr> <td>E - Foot</td> <td>MS2</td> </tr> <tr> <td>L - Intermediate Trunnion</td> <td>MT4*</td> </tr> <tr> <td>N - Front Rectangular Flange</td> <td>MF1</td> </tr> <tr> <td>P - Rear Rectangular Flange</td> <td>MF2</td> </tr> <tr> <td>S - Fixed Eye with Spherical Bearing</td> <td>MP5</td> </tr> </tbody> </table>			REF. ISO	A - Front Round Flange	MF3	B - Rear Round Flange	MF4	D - Fixed Eye	MP3	E - Foot	MS2	L - Intermediate Trunnion	MT4*	N - Front Rectangular Flange	MF1	P - Rear Rectangular Flange	MF2	S - Fixed Eye with Spherical Bearing	MP5	Bore Size: From Ø40 - 200 mm, see section 13		Rod Size: From Ø22 - 140 mm, see section 13		Stroke: Up to 5000 mm, see section 6	
	REF. ISO																										
A - Front Round Flange	MF3																										
B - Rear Round Flange	MF4																										
D - Fixed Eye	MP3																										
E - Foot	MS2																										
L - Intermediate Trunnion	MT4*																										
N - Front Rectangular Flange	MF1																										
P - Rear Rectangular Flange	MF2																										
S - Fixed Eye with Spherical Bearing	MP5																										
Oil Port Positions: see section 4 B1;B2;B3 & B4 - Front Head Oil Port at Location 1;2;3 & 4 X1;X2;X3 & X4 - Rear Head Oil Port at Location 1;2;3 & 4		Oil Port options: see section 2 & 3 0 - Standard 1 - Front & Rear Oversized Oil Ports D - Front Oversized Oil Port Y - Rear Oversized Oil Port M - Front & Rear SAE Flange Oil Port		Sealing System: S - Standard [NBR + PTFE + PU] [-20°C to 85°C] V - Viton, For High Temp. [FKM + PTFE] [-20°C to 120°C]		Spacer: see section 7 0 - None; 2 - 50 mm; 4 - 100 mm; 6 - 150 mm; 8 - 200 mm																					
Rod End: see section 13 1 - Male Thread 2 - Female Thread		Rod Treatment: see section 8 K - Ground & hard chrome plated T - Induction hardened, Ground & hard chrome plated		Cushioning: see section 5 0 - None Slow Adjustable Slow Fixed 1 - Rear end 7 - Rear end 2 - Front end 8 - Front end 3 - Both ends 9 - Both ends																							

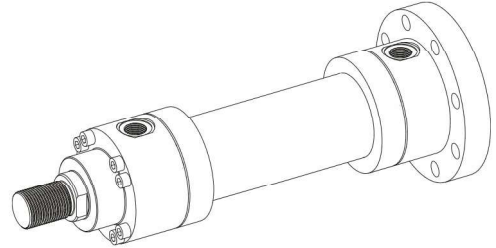
*NOTE: For style L [MT4], XV Dimension must be indicated in the order code, see section [9](#)

1 Mounting Style :

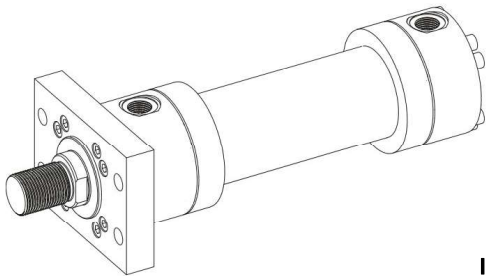
- 8 different standard styles of mounting as shown below
- Browse through subsequent pages for technical details and mounting dimensions
- Piston Rod End dimensions are given separately in section [13](#)



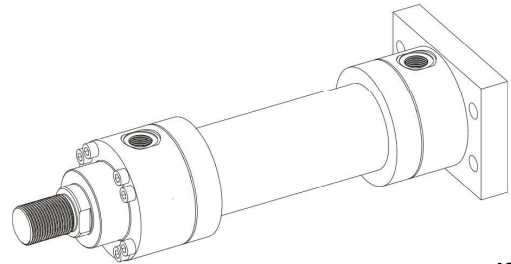
ISO MF3
Style A [Front Round Flange]



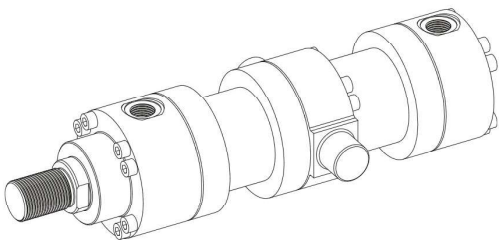
ISO MF4
Style B [Rear Round Flange]



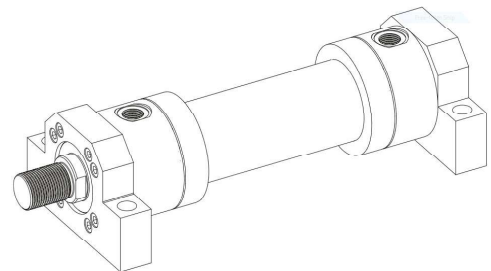
ISO MF1
Style N [Front Rectangular Flange]



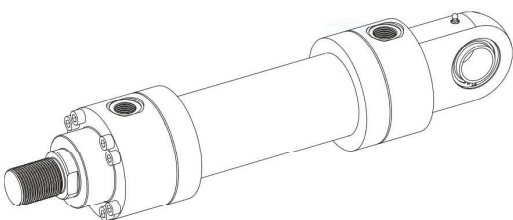
ISO MF2
Style P [Rear Rectangular Flange]



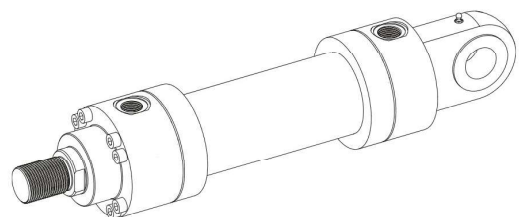
ISO MT4
Style L [Intermediate Trunnion]



ISO MS2
Style E [Foot Mounting]



ISO MP5
Style S [Rear Fixed Eye with Spherical Bearing]



ISO MP3
Style D [Rear Fixed Eye]

2 Size Of Oil Ports & Round Head Dimension [mm]:

Bore Ø		40	50	63	80	100	125	160	200
Standard Oil Ports	D _{min}	29	29	36	36	42	42	52	52
	EE (BSPP)	G ½	G ½	G ¾	G ¾	G 1	G 1	G 1 ¼	G 1 ¼
Oversized Oil Ports	D1 _{min}	36	36	42	42	52	52	58	58
	EE1 (BSPP)	G ¾	G ¾	G 1	G 1	G 1 ¼	G 1 ¼	G 1 ½	G 1 ½

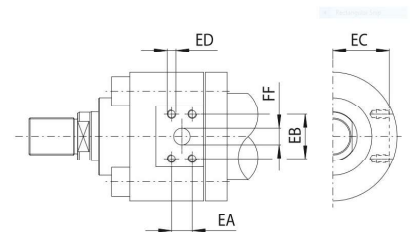
- Oil ports EE are threaded according to GAS standard with counter bore dimension D.
- When oversized oil ports are selected dimensions D and EE are respectively modified into D1 and EE1.

Bore Ø		40	50	63	80	100	125	160	200
Front & Rear Head Ø	E _{max}	78	95	116	130	158	192	238	285

- If not otherwise specified, E is the value of the front and rear round heads dimension for all the mounting styles.

3 SAE 3000 Flange Oil Port Dimensions (ISO 6162-1) [mm]:

Bore Ø	DN	EC	EA ±0.25	EB ±0.25	ED 6g	FF 0/-1.5
63	13	50	17.5	38.1	M8 X 1.25	13
80		58				
100	19	71	22.3	47.6	M10 X 1.5	19
125		89				
160	25	113	26.2	52.4	M10 X 1.5	25
200		137				



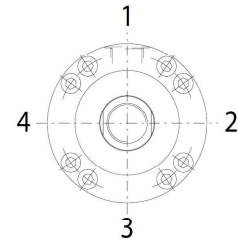
SAE 3000 flange not available for bores 40 and 50

4 Position of Oil Ports:

- FRONT HEAD: B* = oil port position;
- REAR HEAD: X* = oil port position;
- *Selected position (1, 2, 3 or 4)

The oil ports and cushioning adjustments positions are available, respectively on sides 1 and 3 for all styles except E (see the figure at side): the style E has the cushioning adjustments on side 2.

Unless otherwise specified by customer, the standard oil port position remains as shown in figure at side, i.e. B1 & X1.



5 Cushioning:

Cushioning is recommended for applications where:

- The piston makes a full stroke with speed over than 0.05 m/s;
- It is necessary to reduce undesirable noise and mechanical shocks;
- Vertical application with heavy loads.

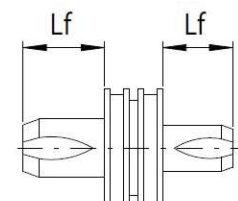
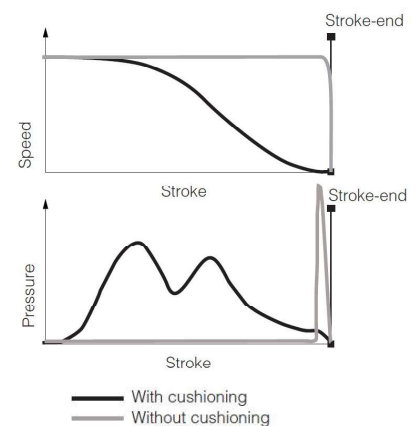
The stroke-end cushioning are hydraulic dampers specifically designed to dissipate the energy of the mass connected to the cylinder rod, by progressively increasing the pressure in the cushioning chamber and thus reducing the rod speed before the cylinder's mechanical stroke-end (see the graphics at side). The regulating screws are supplied fully screwed in (max cushioning effect).

In case of high masses and/or very high operating speeds it is recommended to back them off to optimize the cushioning effect. The adjustment screw has a special design to prevent unlocking and expulsion. The cushioning effect is highly ensured even in case of variation of the fluid viscosity.

Cushioning Length:

Lf is the total cushioning length. When the stroke-end cushioning are used as safety devices, to mechanically preserve the cylinder and the system, it is advisable to select the cylinder's stroke longer than the operating one by an amount equal to the cushioning length Lf; in this way the cushioning effect does not influence the movement during the operating stroke.

Bore Ø		40		50		63		80		100		125		160		200
Rod Ø		22	28	28	36	36	45	45	56	56	70	70	90	90	110	140
Cushioning Length [mm]	Lf Front	25	25	29	29	29	29	27	27	26	26	27	27	34	34	49
	Lf Rear	30	30	30	32	32	32	32	32	32	32	41	41	56	56	56



6 Stroke Selection:

Stroke has to be selected a few mm longer than the working stroke, to prevent to use the cylinder heads as mechanical stroke-end.

Maximum stroke: 5000 mm

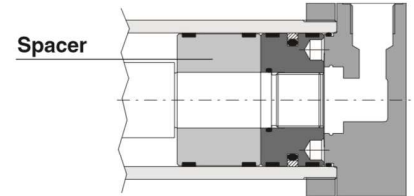
Stroke tolerances:

- 0 +2 mm for strokes up to 1250 mm
- 0 +5 mm for strokes from 1250 to 3150 mm
- 0 +8 mm for strokes over 3150 mm

7 Spacer:

For strokes longer than 1000 mm, proper spacers have to be introduced in the cylinder's construction to increase the rod and piston guide and to protect them from overloads and premature wear. Spacers can be omitted for cylinders working in traction mode. The introduction of spacers increases the overall cylinder's dimensions: spacers' length has to be added to all stroke dependent dimensions.

Stroke [mm]	1001 to 1500	1501 to 2000	2001 to 2500	2501 to 5000
Spacer Code	2	4	6	8
Length [mm]	50	100	150	200



8 Rod Features & options:

The rods materials have high strength - EN8D / C45 & the rod surface is chrome plated: diameter tolerances f7, roughness Ra ≤ 0.25 µm.

Rod hardness can be improved selecting the option **T** :

K = Ground and hard chrome plated (for rods from 22 to 110mm)

T = Induction surface hardening, ground & hard chrome plated

- 56-60 HRC (613-697 HV) hardness

9 Note [Trunnion Mounting]:

XV - For cylinders with mounting style **L** the stroke must always exceed the minimum values reported in the table. The requested XV value must be included between **XV min** and **XV max** and it must be always indicated, with dimension in millimetres, together with the cylinder code. See the following example:

R1 L - 50 / 28 / 0500 - 0 K 0 S 0 - B1X1 - 1

XV = 200

10 Cylinder's Housing Features:

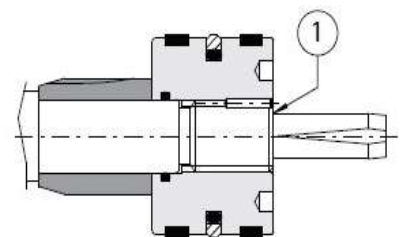
The cylinder's housings are made in "cold drawn and stressed steel"; the internal surfaces are lapped: diameter tolerance H8, roughness Ra ≤ 0.25 µm.

11 Fluid Requirements:

Cylinders and servo cylinders are suitable for operation with mineral oils with or without additives (**HH**, **HL**, **HLP**, **HLP-D**, **HM**, **HV**), fire resistant fluids (**HFA** oil in water emulsion, 90-95% water and 5-10% oil; **HFB** water in oil emulsion, 40% water; **HFC** water glycol, max 45% water) and synthetic fluids (**HFD-U** organic esters, **HFD-R** phosphate esters). The fluid must have a viscosity within 15 and 100 mm²/s, a temperature within 0 and 70°C and fluid contamination class ISO 20/18/15 according to ISO 4406 NAS1638 class 9.

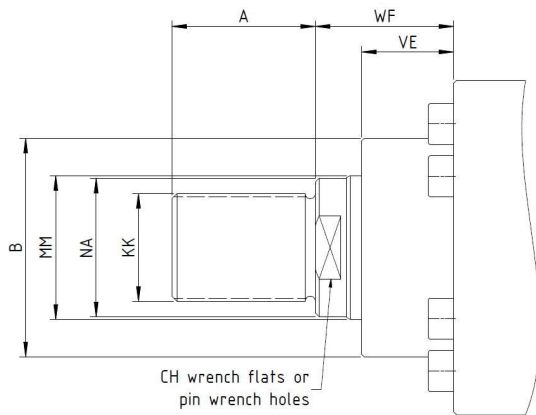
12 Rod - Piston Coupling:

The rod and piston are mechanically coupled by a threaded connection in which the thread on the rod is at least equal to the external thread KK. The piston is screwed to the rod by a pre-fixed tightening torque in order to improve the fatigue resistance. The Grub screw **1** avoids the piston unscrewing.

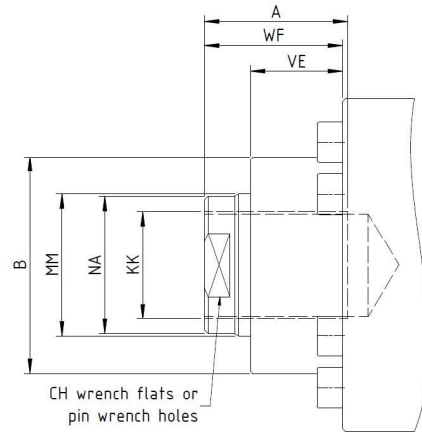


13 Piston Rod End Data :

Rod End [Male] Code 1



Rod End [Female] Code 2



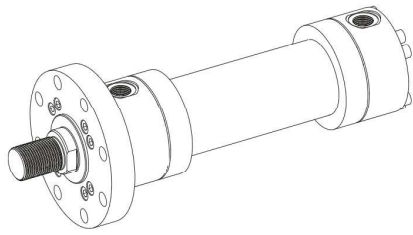
Rod End Dimensions :

Bore Ø	Rod/MM Ø	A	B f8	KK 6g Code 1	KF 6H Code 2	CH	NA	VE max	WF
40	22 28	22 28	60	M16 X 1.5 M20 X 1.5	M16 X 1.5 M20 X 1.5	18 22	21 26	19	32
50	28 36	28 36	70	M20 X 1.5 M27 X 2	M20 X 1.5 M27 X 2	22 30	26 34	24	38
63	36 45	36 45	85	M27 X 2 M33 X 2	M27 X 2 M33 X 2	30 39	34 43	29	45
80	45 56	45 56	106	M33 X 2 M42 X 2	M33 X 2 M42 X 2	39 48	43 54	36	54
100	56 70	56 63	132	M42 X 2 M48 X 2	M42 X 2 M48 X 2	48 62	54 68	37	57
125	70 90	63 85	160	M48 X 2 M64 X 3	M48 X 2 M64 X 3	62 80	68 88	37	60
160	90 110	85 95	200	M64 X 3 M80 X 3	M64 X 3 M80 X 3	80 100	88 108	41	66
200	110 140	95 112	250	M80 X 3 M100 X 3	M80 X 3 M100 X 3	100 128	108 138	45	75

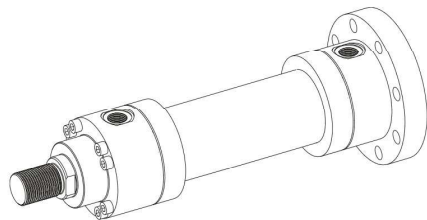
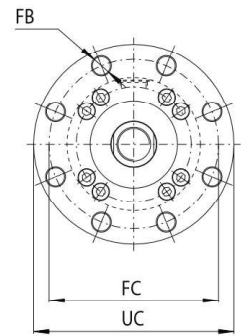
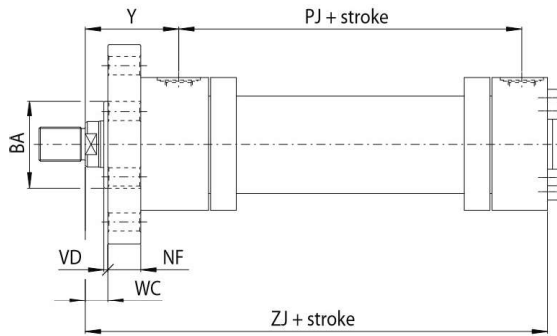
All dimensions are in mm .

NOTE: Tolerances: max for male thread; min for female thread.

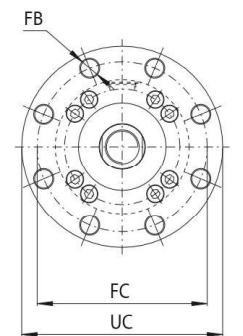
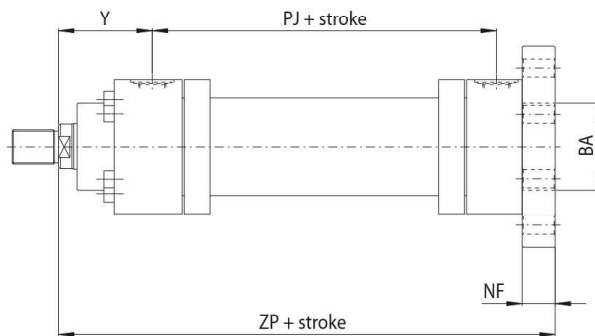
14 Round Flange Mountings :



Style A
ISO MF3
Front Round Flange



Style B
ISO MF4
Rear Round Flange



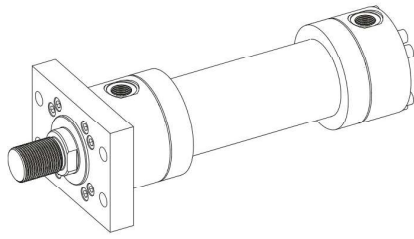
Installation Dimensions - MF3 & MF4

Bore Ø	Rod Ø	BA H8	FC js13	FB H13	NF js13	UC max	VD min	WC	Y	+ Stroke		
										PJ	ZJ	ZP
40	22 28	50	106	9	16	125	3	16	71	97	190	206
50	28 36	60	126	11	20	148	4	18	72	111	205	225
63	36 45	70	145	13.5	25	170	4	20	82	117	224	249
80	45 56	85	165	17.5	32	195	4	22	91	134	250	282
100	56 70	106	200	22	32	238	5	25	108	162	300	332
125	70 90	132	235	22	32	272	5	28	121	174	325	357
160	90 110	160	280	22	36	316	5	30	143	191	370	406
200	110 140	200	340	26	40	385	5	35	190	224	450	490

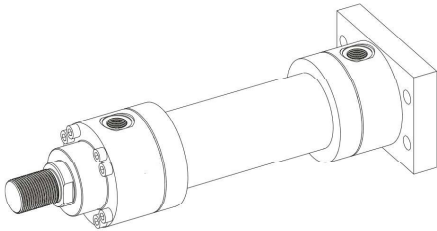
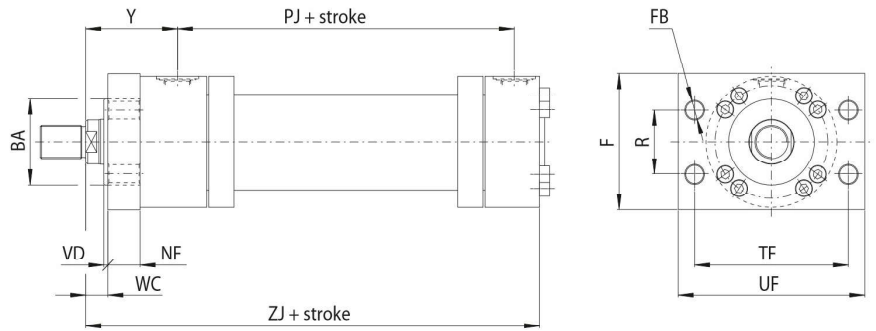
All dimensions are in mm .

NOTE: For Rod End Dimensions refer to the section [13](#)

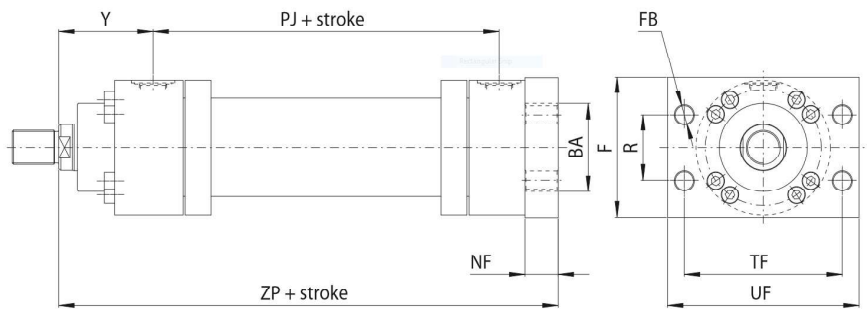
15 Rectangular Flange Mountings :



Style N
ISO MF1
Front Rectangular Flange



Style P
ISO MF2
Rear Rectangular Flange



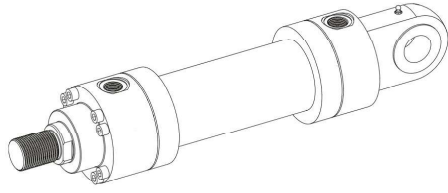
Installation Dimensions - MF1 & MF2

Bore Ø	Rod Ø	BA H8	F max	FB H13	NF js13	R js13	TF js13	UF max	VD	WC	Y	+Stroke		
												PJ	ZJ	ZP
40	22 28	50	80	9	16	40.6	98	115	3	16	71	97	190	206
50	28 36	60	100	11	20	48.2	116.4	140	4	18	72	111	205	225
63	36 45	70	120	13.5	25	55.5	134	160	4	20	82	117	224	249
80	45 56	85	135	17.5	32	63.1	152.5	185	4	22	91	134	250	282
100	56 70	106	160	22	32	76.5	184.8	225	5	25	108	162	300	332
125	70 90	132	195	22	32	90.2	217.1	255	5	28	121	174	325	357

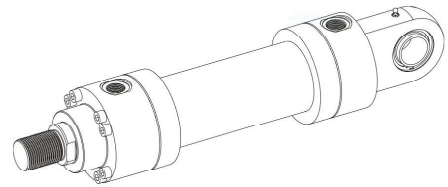
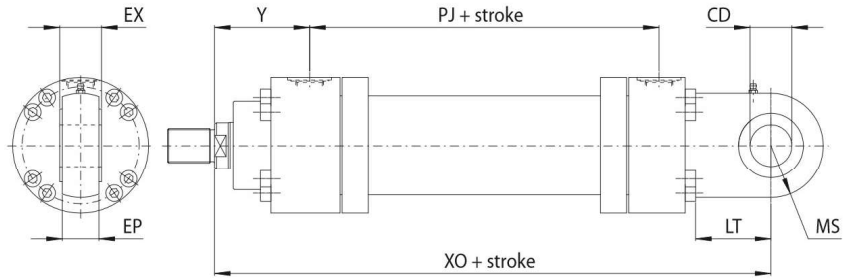
All dimensions are in mm .

NOTE: For Rod End Dimensions refer to the section [13](#)

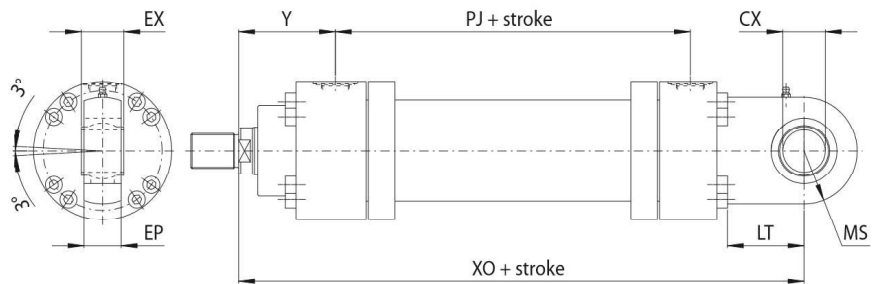
16 Pivot Mountings :



Style D
ISO MP3
Rear Fixed Eye



Style S
ISO MP5
Rear Fixed Eye with Spherical Bearing



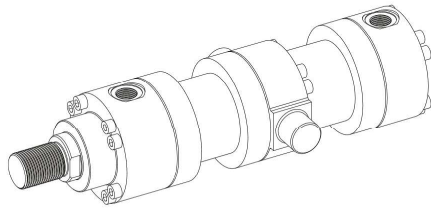
Installation Dimensions - MP3 & MP5

Bore Ø	Rod Ø	CX H7	CD H9	EX h12	EP	LT min	MS max	Y	+Stroke	
									PJ	XO
40	22 28	20	20	20	18	25	25	71	97	231
50	28 36	25	25	25	22	32	32	72	111	257
63	36 45	32	32	32	27	40	40	82	117	289
80	45 56	40	40	40	35	50	50	91	134	332
100	56 70	50	50	50	40	63	63	108	162	395
125	70 90	63	63	63	52	71	71	121	174	428
160	90 110	80	80	80	66	90	90	143	191	505
200	110 140	100	100	100	84	112	112	190	224	615

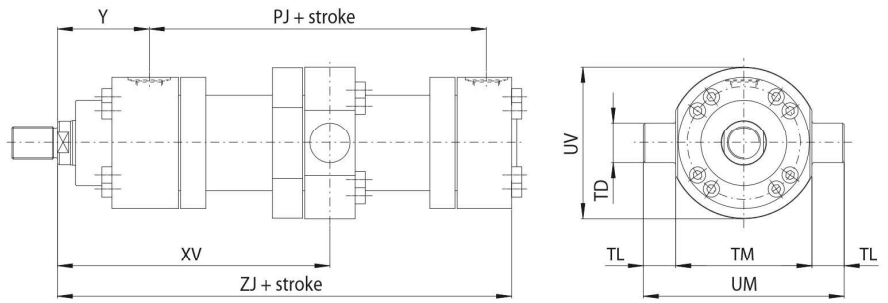
All dimensions are in mm .

NOTE: For Rod End Dimensions refer to the section [13](#)

17 Trunnion Mounting :



Style L
ISO MT4
Intermediate Trunnion



Installation Dimensions - MT4

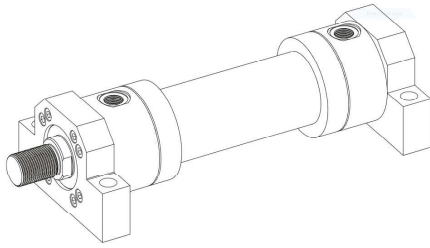
Bore Ø	Rod Ø	TD f8	TL js13	TM h12	UM	UV	Y	Min. Stroke	XV min	+ Stroke		
										XV max	PJ	ZJ
40	22 28	20	16	90	122	90	71	55	155	100	97	190
50	28 36	25	20	105	145	108	72	55	160	105	111	205
63	36 45	32	25	120	170	124	82	85	190	105	117	224
80	45 56	40	32	135	199	150	91	90	215	125	134	250
100	56 70	50	40	160	240	180	108	110	255	145	162	300
125	70 90	63	50	195	295	219	121	135	290	155	174	325
160	90 110	80	63	240	366	280	143	170	340	170	191	370
200	110 140	100	80	295	455	333	190	190	420	230	224	450

All dimensions are in mm .

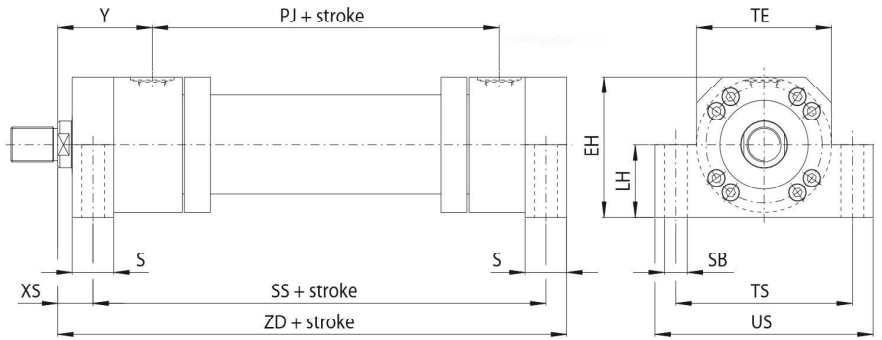
NOTE:

- XV dimension must be indicated in the order code, see section [9](#)
- For Rod End Dimensions refer to the section [13](#)

18 Foot Mounting :



Style E
ISO MS2
Foot Mounting



Installation Dimensions - MS2

Bore Ø	Rod Ø	EH max	LH h10	S js13	SB H13	TE js13	TS js13	US max	XS	Y	+Stroke		
											PJ	SS	ZD
40	22 28	82	43	25	11	78	100	120	19.5	71	97	183	190
50	28 36	100	52	32	14	95	120	145	22	72	111	199	205
63	36 45	120	62	32	18	116	150	180	29	82	117	211	224
80	45 56	135	70	40	22	130	170	210	34	91	134	236	250
100	56 70	161	82	50	26	158	205	250	32	108	162	293	300
125	70 90	196	100	56	33	192	245	300	32	121	174	321	325
160	90 110	238	119	60	33	238	295	350	36	143	191	364	370
200	110 140	288	145	72	39	285	350	415	39	190	224	447	450

All dimensions are in mm .

NOTE: For Rod End Dimensions refer to the section [13](#)