RAX hYdraulics

Hydraulic Cylinders Type R5 - Round heads with counter flanges

Conforms to ISO 6022: Nominal pressure of 250 bar and max 320 bar

Series R5 hydraulic cylinders are designed for heavy mill duty application and conforms to ISO 6022. It is completely inter-changeable 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: **50** mm to **320** mm
- Rod Sizes: **36** mm to **220** mm
- Strokes up to **5000** mm
- **Two** seals options
- **Air Bleed** at both ends
- **Five** standard mounting styles
- **Adjustable** cushioning
- **Oversized** & **SAE Flange** oil port options

Ordering Instructions :

R5	A	-	050	/	036	/	0500	-	0	K	0	S	0	-	B1X1

Cylinder Series:
R5 [ISO 6022]

Mounting Style: see section 1

	REF. ISO
A - Front Round Flange	MF3
B - Rear Round Flange	MF4
L - Intermediate Trunnion	MT4*
S - Fixed Eye with Spherical Bearing	MP5
Z - Front Threaded Holes	Non-ISO

Bore Size: From Ø50 - 320 mm, see section 13

Rod Size: From Ø36 - 220 mm, see section 13

Stroke: Up to 5000 mm, see section 6

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 [BSPP]
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

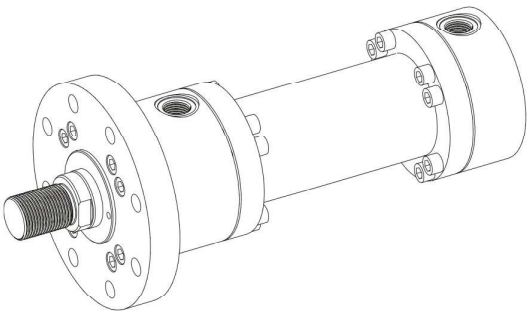
Rod Treatment: see section 8
K - Ground & hard chrome plated
T - Induction hardened, Ground & hard chrome plated

Cushioning: see section 5
0 - None
Slow Adjustable
1 - Rear end
2 - Front end
3 - Both ends

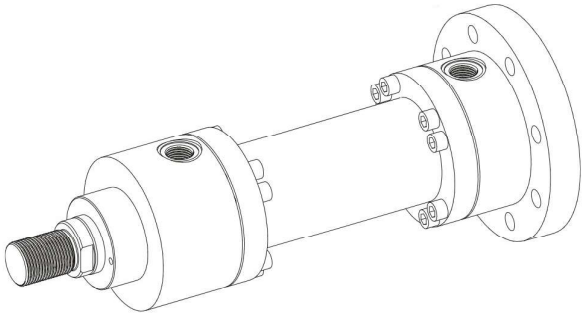
***NOTE:** For style L [MT4], **XV** Dimension must be indicated in the order code, see section 9

1 Mounting Style :

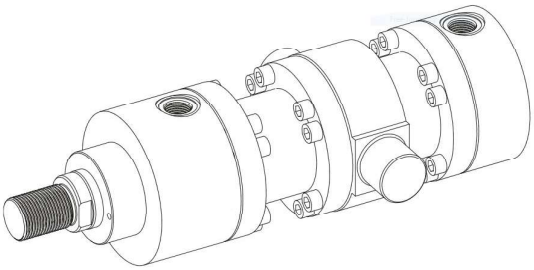
- 5 different standard styles of mounting as shown below
- Browse through subsequent pages for technical details and mounting dimensions
- Piston Rod End dimensions are given separately in section 13



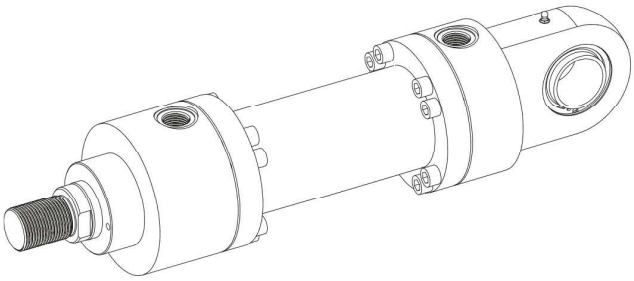
ISO MF3
Style A [Front Round Flange**]**



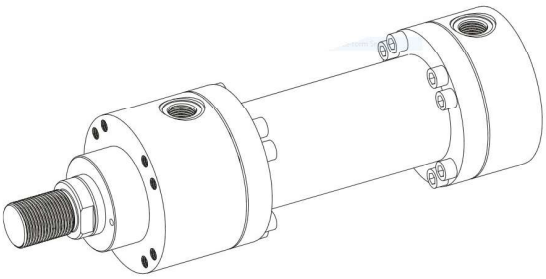
ISO MF4
Style B [Rear Round Flange**]**



ISO MT4
Style L [Intermediate Trunnion**]**



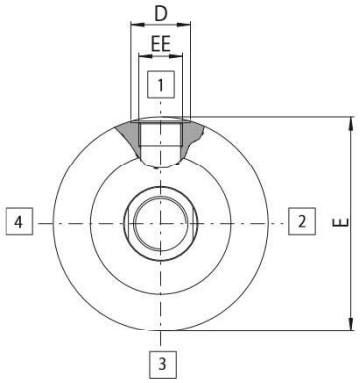
ISO MP5
Style S [Fixed Eye with Spherical Bearing**]**



Non - ISO
Style Z [Front Threaded Holes**]**

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

Bore Ø		50	63	80	100	125	140	160	180	200	250	320
Standard Oil Ports	D min	29	36	36	42	42	52	52	52	52	58	58
	EE (BSPP)	G ½	G ¾	G ¾	G 1	G 1	G 1 ¼	G 1 ¼	G 1 ¼	G 1 ¼	G 1 ½	G 1 ½
Oversized Oil Ports	D1 min	36	42	42	52	52	58	58	58	58	69	69
	EE1 (BSPP)	G ¾	G 1	G 1	G 1 ¼	G 1 ¼	G 1 ½	G 1 ½	G 1 ½	G 1 ½	G 2	G 2



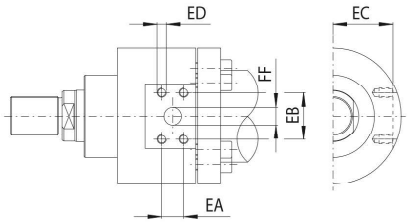
- Oil ports **EE** are threaded according to GAS standard with counter bore dimension **D.**
- When oversized oil ports are selected dimensions **D** and **EE** are respectively modified into **D1** and **EE1.**

Bore Ø		50	63	80	100	125	140	160	180	200	250	320
Front & Rear Head Ø	E max	108	124	148	175	214	255	270	315	330	412	510

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

3 SAE 6000 Flange Oil Port Dimensions (ISO 6162-2) [mm]:

Bore Ø	DN	EC	EA ±0.25	EB ±0.25	ED 6g	FF 0 / -1.5
50	13	46	18.2	40.5	M8 X 1.25	13
63	19	51	23.8	50.8	M10 X 1.5	19
80		65				
100	25	77	27.8	57.2	M12 X 1.75	25
125		99				
140	32	118	31.6	66.6	M14 X 2	32
160		126				
180		150				
200		158				
250	38	195	36.7	79.3	M16 X 2	38
320	51	245	44.5	96.8	M20 X 2 .5	51



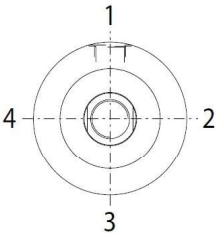
SAE 6000 flange not available for style B (ISO MF4) bores 50 and 63

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:

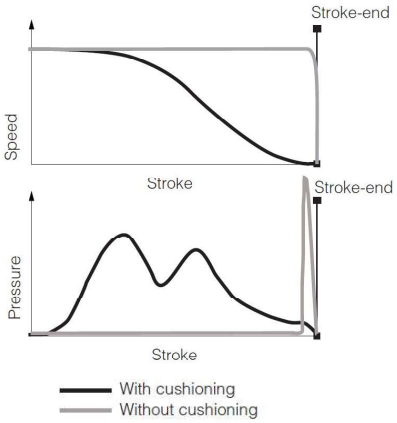
Cushioning is recommended for applications where:
- The piston makes a full stroke with speed over than 0.05 m/s;
- It is necessary to reduce undesirable noise and mechanical shocks;
- Vertical application with heavy loads.

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).

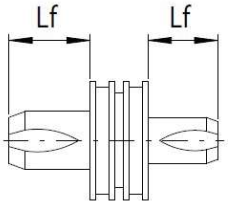
In case of high masses and/or very high operating speeds it is recommended to back them off to optimize the cushioning effect. The adjustment screw has a special design to prevent unlocking and expulsion. The cushioning effect is highly ensured even in case of variation of the fluid viscosity.

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		50	63	80	100	125	140	160	180	200	250	320
Rod Ø		36	45	56	70	90	90	110	110	140	180	220
Cushioning Length [mm]	Lf Front	29	40	45	50	60	60	64	64	64	80	100
	Lf Rear	35	38	45	50	60	60	64	64	64	64	64



6 Stroke Selection:

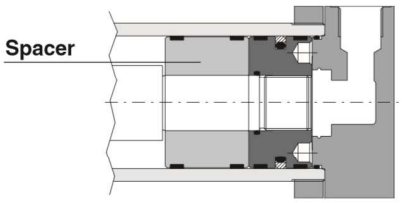
Stroke has to be selected a few mm longer than the working stroke, to prevent to use the cylinder heads as mechanical stroke-end.
Minimum stroke [mm]: see table at side
Maximum stroke: 5000 mm
Stroke tolerances:

- 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

Bore Ø	50	63	80	100	125	140
Minimum Stroke	70	70	20	25	50	50
Bore Ø	160	180	200	250	320	-
Minimum Stroke	50	70	70	80	120	-

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 options **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:
R5 L - 50 / 28 / 0500 - 0 K 0 S 0 - B1X1
XV = 200

10 Cylinder's Housing Features:

The cylinder's housings are made in different materials depending to the bore (see table at side); the internal surfaces are lapped: diameter tolerance H8, roughness Ra ≤ 0.25 µm.

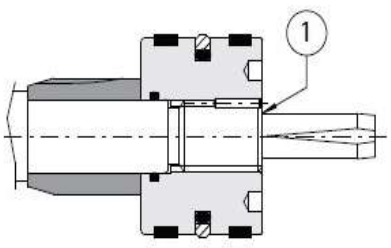
Bore Ø	Material
50 - 200	cold drawn and stressed steel
250 - 320	Hot rolled steel

11 Fluid Requirements:

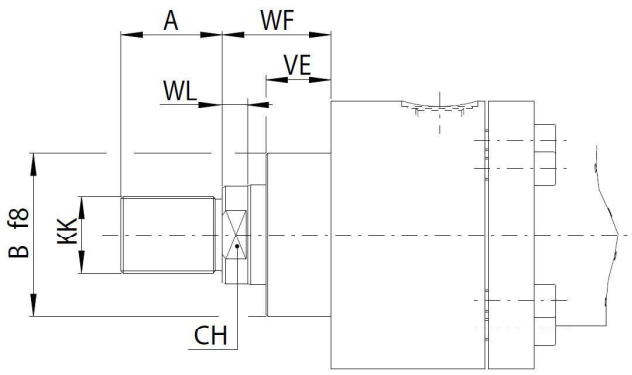
Cylinders and servo cylinders are suitable for operation with mineral oils with or without additives (**HH, HL, HLP, HLP-D, HM, HV**), fire resistant fluids (**HFA** oil in water emulsion, 90-95% water and 5-10% oil; **HFB** water in oil emulsion, 40% water; **HFC** water glycol, max 45% water) and synthetic 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 :

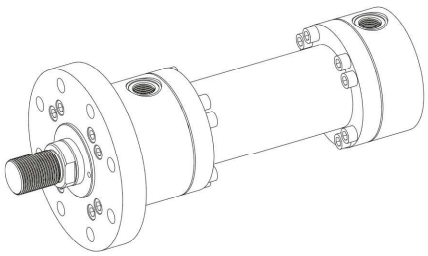


Rod End Dimensions :

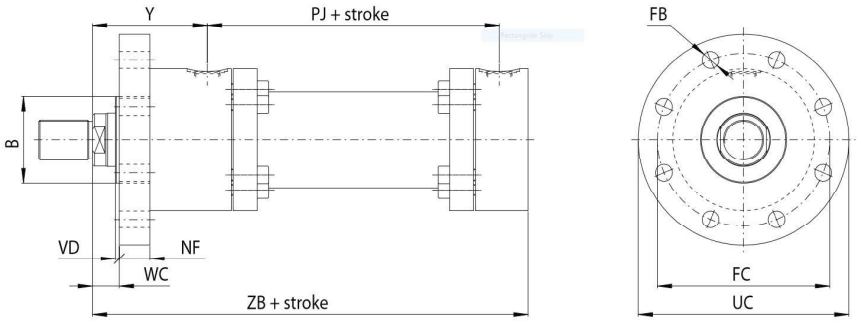
Bore Ø	Rod Ø	A Max	B f8	CH Flat/Hole	KK 6g	VE max	WF	WL min
50	36	36	63	30	M27 X 2	29	47	8
63	45	45	75	39	M33 X 2	32	53	10
80	56	56	90	48	M42 X 2	36	60	10
100	70	63	110	62	M48 X 2	41	68	10
125	90	85	132	80	M64 X 3	45	76	15
140	90	90	145	Ø10 X 4	M72 X 3	45	76	15
160	110	95	160	Ø10 X 4	M80 X 3	50	85	15
180	110	105	185	Ø10 X 4	M90 X 3	55	95	15
200	140	112	200	Ø12 X 4	M100 X 3	61	101	15
250	180	125	250	Ø15 X 4	M125 X 4	71	113	-
320	220	160	320	Ø15 X 4	M160 X 4	88	136	-

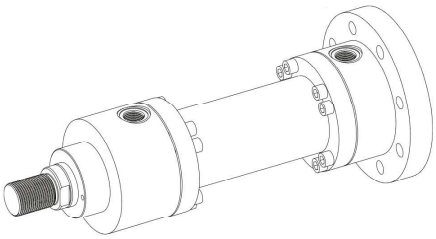
All dimensions are in mm .

14 Round Flange Mountings :

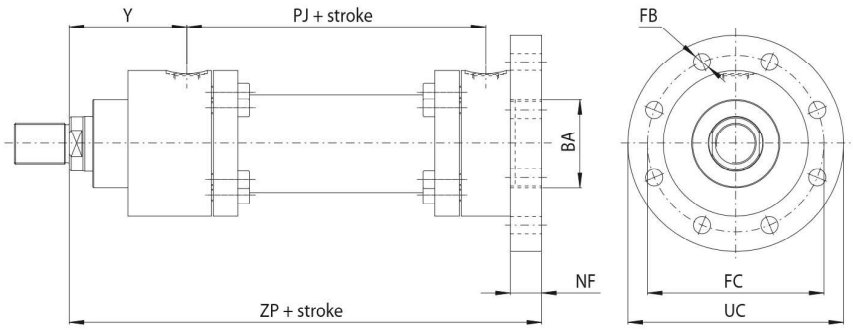


Style A
ISO MF3
Front Round Flange





Style B
ISO MF4
Rear Round Flange



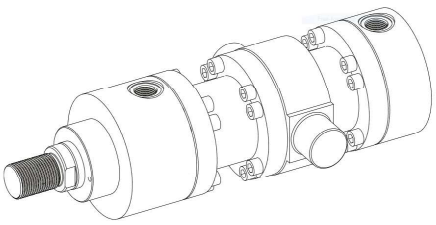
Installation Dimensions - MF3 & MF4

Bore Ø	Rod Ø	B/BA f8/H8	FC js13	FB H13	NF js13	UC max	VD min	WC	Y ±2	+ Stroke		
										PJ	ZB max	ZP
50	36	63	132	13.5	25	160	4	22	98	120	244	265
63	45	75	150	13.5	28	180	4	25	112	133	274	298
80	56	90	180	17.5	32	215	4	28	120	155	305	332
100	70	110	212	22	36	260	5	32	134	171	340	371
125	90	132	250	22	40	300	5	36	153	205	396	430
140	90	145	300	26	40	340	5	36	181	208	430	465
160	110	160	315	26	45	370	5	40	185	235	467	505
180	110	185	365	33	50	425	5	45	205	250	505	550
200	140	200	385	33	56	455	5	45	220	278	550	596
250	180	250	475	39	63	545	8	50	260	325	652	703
320	220	320	600	45	80	680	8	56	310	350	764	830

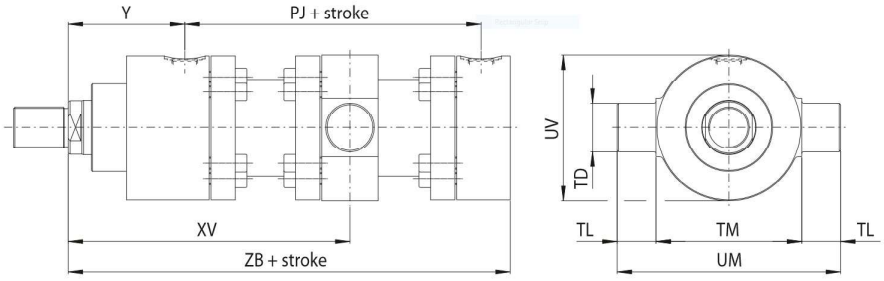
All dimensions are in mm .

NOTE: For Rod End Dimensions refer to the section 13

15 Trunnion Mounting :



Style L
ISO MT4
Intermediate Trunnion



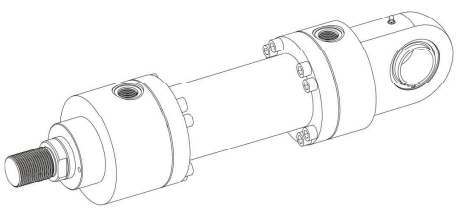
Installation Dimensions - MT4

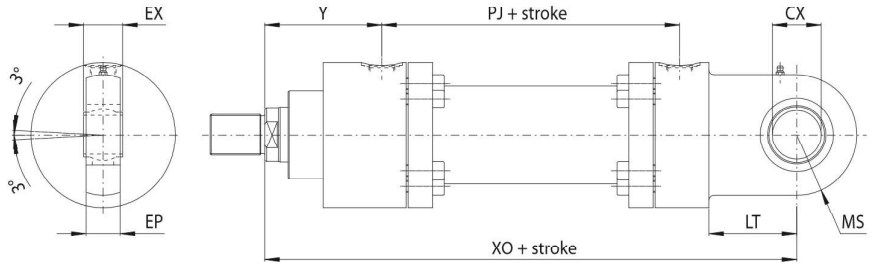
Bore Ø	Rod Ø	TD f8	TL js13	TM h12	UM	UV	Y ±2	Min. Stroke	XV min	+ Stroke XV max	+ Stroke PJ	+ Stroke ZB
50	36	32	25	112	162	108	98	175	260	85	120	244
63	45	40	32	125	189	124	112	185	285	100	133	274
80	56	50	40	150	230	150	120	150	290	140	155	305
100	70	63	50	180	280	180	134	160	320	160	171	340
125	90	80	63	224	350	219	153	245	410	165	205	396
140	90	90	70	265	405	260	181	250	440	190	208	430
160	110	100	80	280	440	280	185	260	465	205	235	467
180	110	110	90	320	500	315	205	350	540	190	250	505
200	140	125	100	335	535	333	220	390	590	200	278	550
250	180	160	125	425	675	412	260	460	690	230	325	652
320	220	200	160	530	850	510	310	560	820	260	350	764

All dimensions are in mm .

NOTE: For Rod End Dimensions refer to the section 13

16 Pivot Mounting :





Style S
ISO MP5
Rear Fixed Eye with Spherical Bearing

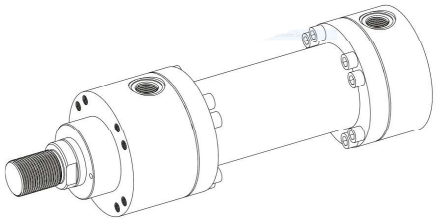
Installation Dimensions - MP5

Bore Ø	Rod Ø	CX H7	EX h12	EP	LT min	MS max	Y ±2	+Stroke	
								PJ	XO
50	36	32	32	27	40	40	98	120	305
63	45	40	40	35	50	50	112	133	348
80	56	50	50	40	63	63	120	155	395
100	70	63	63	52	71	71	134	171	442
125	90	80	80	66	90	90	153	205	520
140	90	90	90	65	113	113	181	208	580
160	110	100	100	84	112	112	185	235	617
180	110	110	110	88	135	118	205	250	690
200	140	125	125	102	160	160	220	278	756
250	180	160	160	130	200	200	260	325	903
320	220	200	200	162	250	250	310	350	1080

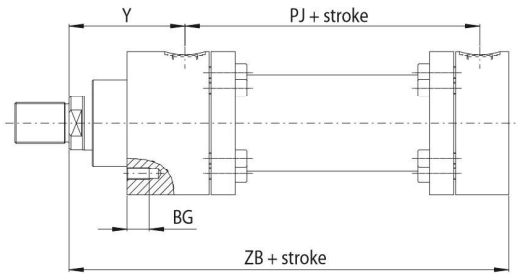
All dimensions are in mm .

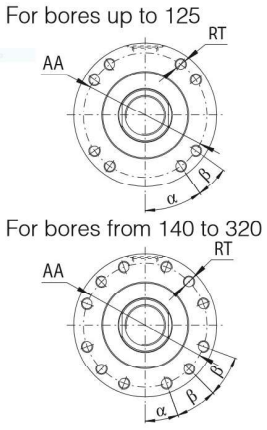
NOTE: For Rod End Dimensions refer to the section 13

17 Threaded holes Mounting :



Style Z
Non - ISO
Front Threaded Holes





Installation Dimensions -

Bore Ø	Rod Ø	AA	BG min	Y ±2	RT		α	β	+Stroke	
					Qty	Size			PJ	ZB max
50	36	90	20	98	8	M8	32.5°	25°	120	244
63	45	105	23	112	8	M10	32°	26°	133	274
80	56	128	23	120	8	M12	35°	20°	155	305
100	70	152	30	134	8	M14	35°	20°	171	340
125	90	188	33	153	8	M16	35°	20°	205	396
140	90	215	33	181	12	M16	27.5°	17.5°	208	430
160	110	241	43	185	12	M18	25°	20°	235	467
180	110	275	40	205	12	M20	25°	20°	250	505
200	140	295	40	220	12	M22	25°	20°	278	550
250	180	365	58	260	12	M27	27°	18°	325	652
320	220	458	70	310	12	M33	25°	20°	350	764

All dimensions are in mm .

NOTE: For Rod End Dimensions refer to the section 13