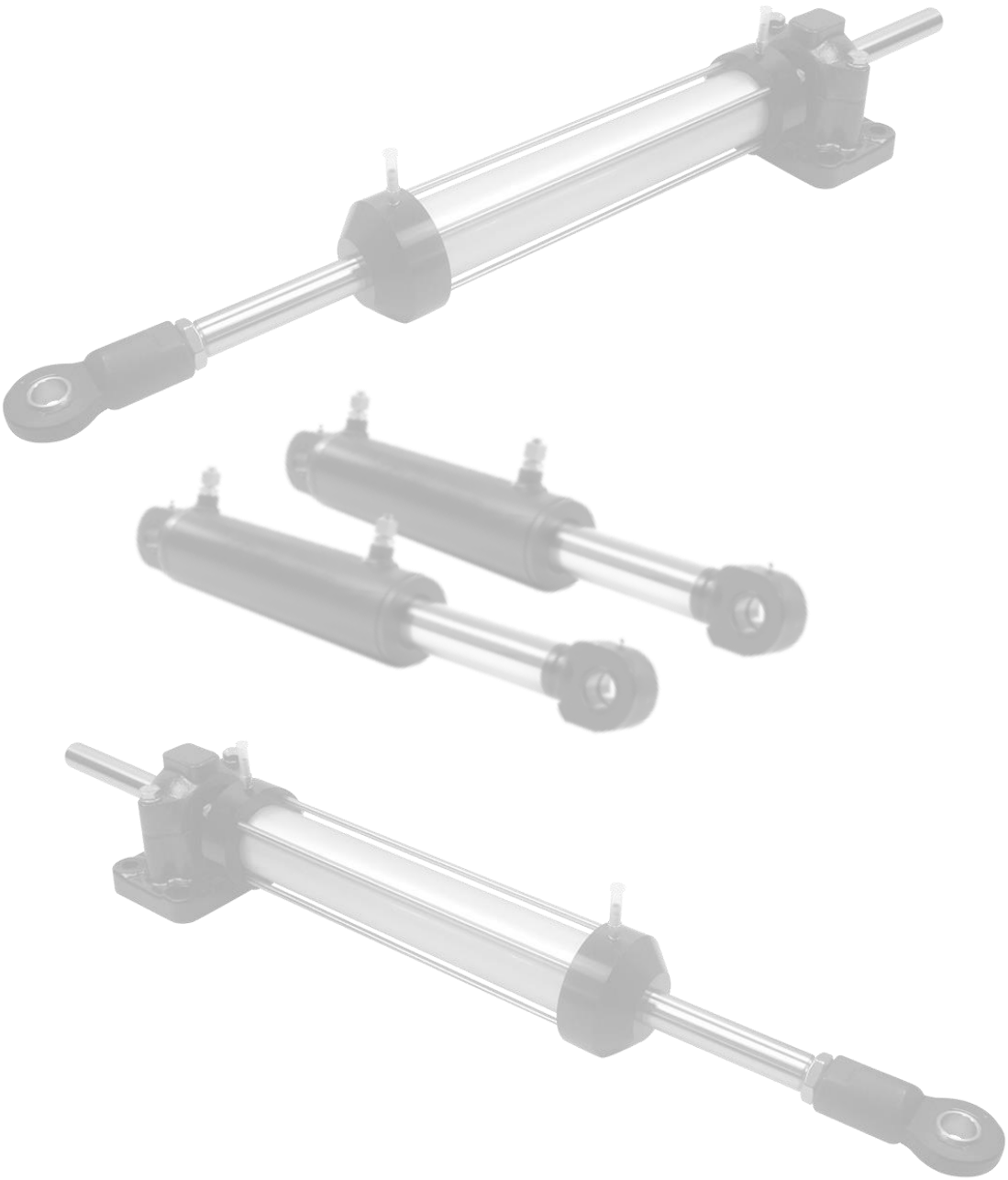
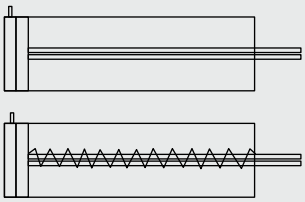
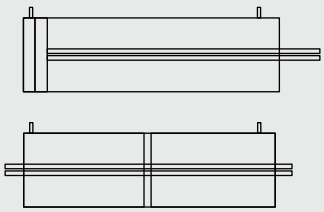
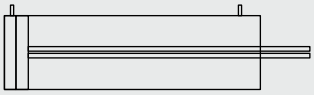
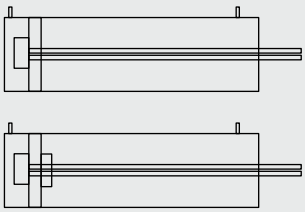
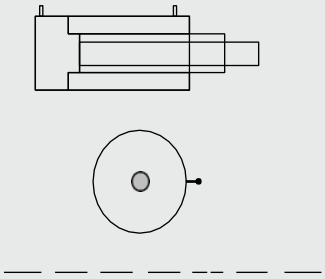
GLIDEMASTER HYDRAULICS

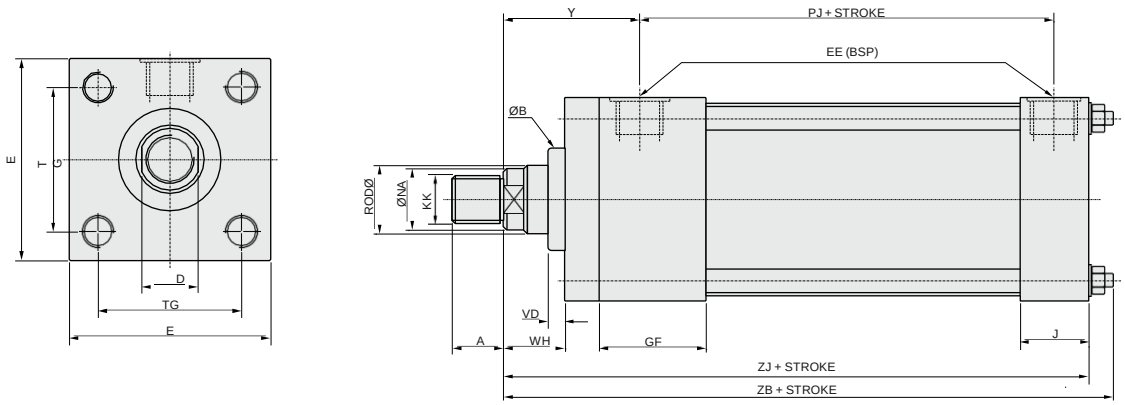


Symbols

Denomination	Applications	Symbol
Single acting cylinder	The fluid pressure is applied in one sense only (forward stroke) Back stroke: by undefined force By means of a spring	
Double acting cylinder	The fluid pressure is applied alternatively in two directions (forward and back stroke) Single rod Double rod	
Differential cylinder	The ratio between the cylinder section and the ring section of the piston near the rod is essential for the cylinder operation Double rod	
Cylinder with non-adjustable cushion	Acting from one side only Acting from both sides	
Double acting telescopic cylinder Hydraulic pressure source Pipes	Cylinder with several pistons which enter into each other with forward and backward movement Control pipe (straight line for simplified representations)	

Double Acting Hydraulic Cylinders

- Max. pressure : 160 bar
- Max. reciprocating speed : 12m/min
- Breakaway pressure : 3 to 5 bar
- Standard cushioning length : 20mm
- Single and Double rod design
- Temperature Range : 20^{0}C to 150^{0}C depending on seal type
- Seal types to suit a wide variety of operating environment
- Cushion available at either end



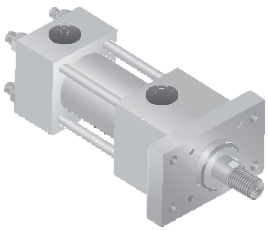
Dimensions

Bore	Rod Ø		A		B		D		E	EE	GF	J	KK		NA		PJ	TG	WH	Y	ZJ	VD	ZB
25	12		14		24		10		40	1/4"	35.0	22	M 10 x 1.25		11		56.0	30	15.0	48.0	115.0	5.0	121.0
32	18	20	16	20	28	32	14	17	50	1/4"	40.0	25	M12X1.25	M16X1.5P	17	19	69.0	36	25.0	63.0	145.0	6.0	170.0
40	18	25	18	28	30	40	15	21	63	1/4"	48.3	30	M14X1.5	M20X1.5P	17	24	88.0	44	23.6	67.9	171.9	9.6	185.9
50	22	25	22	28	34	40	18	21	75	3/8"	45.6	30	M16X1.5	M20X1.5P	21	24	96.0	54	23.6	66.2	176.2	9.6	193.6
63	28	35	28	36	42	55	22	30	90	3/8"	49.0	32	M20X1.5	M27X2P	26	33	97.4	64	21.6	66.4	179.6	9.6	199.6
80	36	45	36	45	50	60	30	39	115	1/2"	58.0	38	M27X2P	M39X2P	34	42	101.0	83	20.6	75.6	196.6	5.6	216.6
100	45	70	45	63	60	88	39	64	130	3/4"	77.0	50	M33X2P	M56X2P	43	67	115.0	97	32.2	104.2	244.2	3.2	269.2
125	56	90	56	85	72	108	46	84	165	3/4"	77.3	50	M42X2P	M76X2P	54	87	130.0	126	30.7	113.0	268.0	5.2	298.0
150	70	110	63	95	88	130	64	103	190	1"	80.5	51	M56X2P	M95X2P	68	107	131.0	146	25.0	109.5	266.5	5.2	296.5
200	90	130	85	112	108	155	84	123	245	1-1/4"	90.0	60	M64X3P	M120X2P	88	127	142.0	190	39.0	133.0	309.0	14.6	320.0

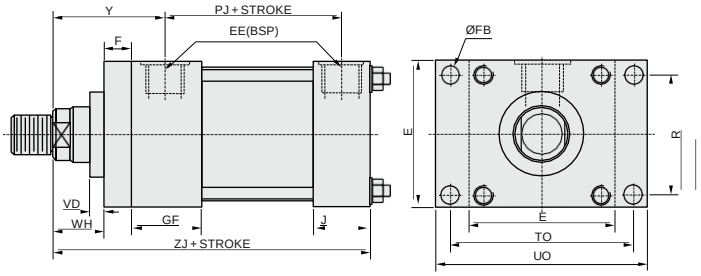
Note : Special orders as per customer specifications are also accepted.

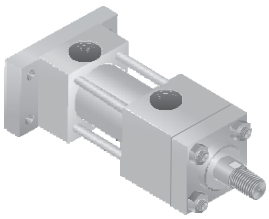
Tie Rod Type Cylinders

Flange and Side Lugs Mountings

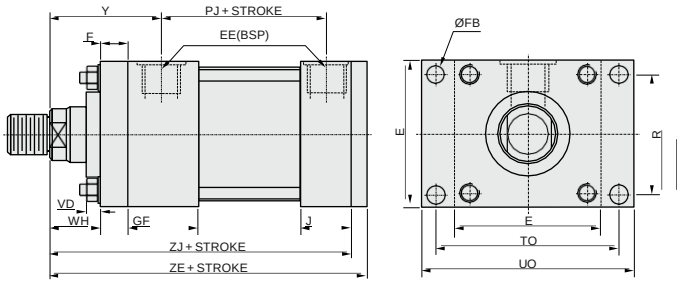


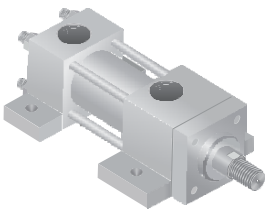
ME5-Head Rectangular Flange



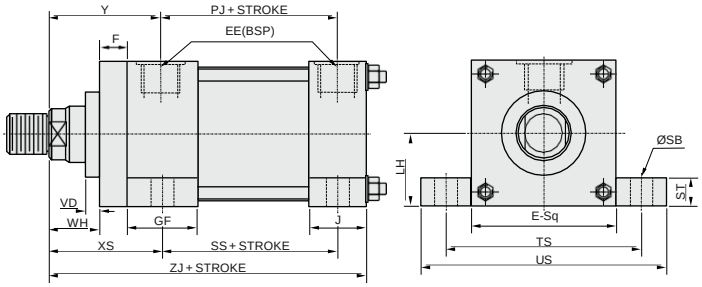


ME6-Cap Rectangular Flange





MS2-Side Lugs Mounting



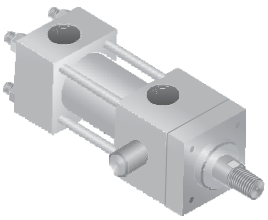
Dimensions

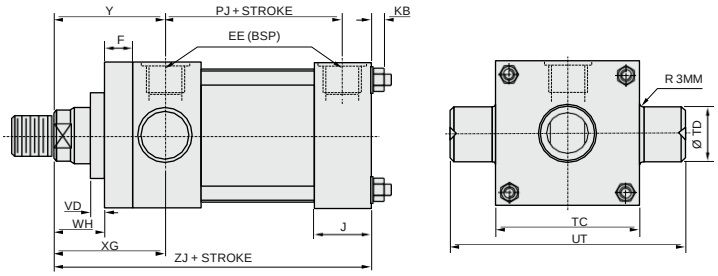
Bore	E	EE	F	FB	GF	J	LH	R	SB	ST	TO	TS	UO	US	XS	Y	+Stroke			
																	PJ	SS	ZJ	ZE
25	40	1/4"	8	5.5	35.0	22	20.0	27	6.6	8.5	51	54	65	72	33.0	48.0	56	73.0	115.0	123.0
32	50	1/4"	10	9.0	40.0	25	25.0	30	10	10	70	70	90	90	48.0	63.0	69	84.5	145.0	155.0
40	63	1/4"	10	11.0	48.5	30	31.5	41	11	13	87	85	115	105	56.0	67.9	88	98.0	171.9	181.9
50	75	3/8"	12	13.5	45.6	30	37.5	52	14	19	105	102	142	127	56.0	66.2	96	100.0	176.2	188.7
63	90	3/8"	12	13.5	49.0	35	45.0	65	18	26	117	124	160	161	58.0	66.4	97	104.5	179.6	191.6
80	115	1/2"	15	17.5	58.0	35	57.5	83	18	26	149	149	190	186	64.6	75.6	101	111.5	196.6	211.6
100	130	3/4"	20	17.5	77.0	50	65.0	97	21	32	162	172	220	216	91.0	104.2	115	128.5	244.2	264.2
125	165	3/4"	30	22.0	77.3	50	82.5	126	26	32	208	210	260	254	89.0	113.0	130	148.5	268.0	298.0
150	190	1"	30	26.0	80.5	51	102.5	155	33	38	253	260	320	318	96.0	109.5	131	147.5	266.5	296.5
200	245	1-1/4"	30	33.0	90.0	60	122.5	190	39	44	300	311	380	381	116.0	133.0	142	167.0	309.0	339.0

Note : Special orders as per customer specifications are also accepted.

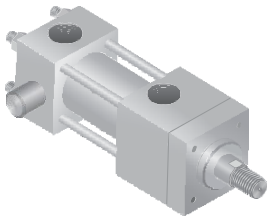
All dimensions in mm unless otherwise stated.

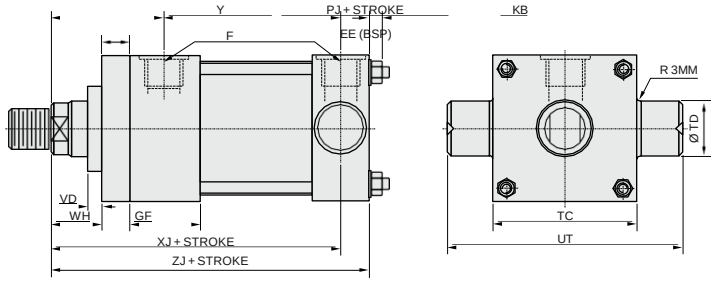
Standard Trunnion Mountings



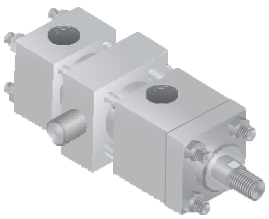


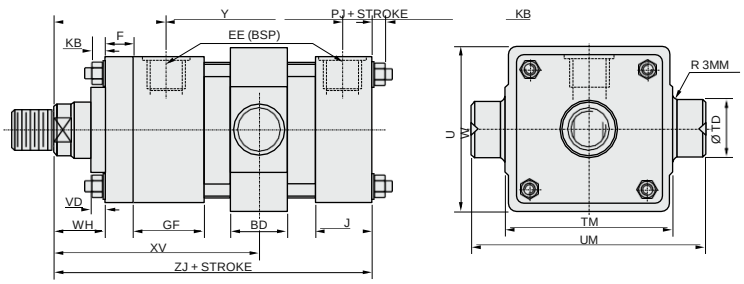
MT1-Head Trunnion Mounting





MT2-Cap Trunnion Mounting





MT4-Intermediate
Fixed Trunnion Mounting

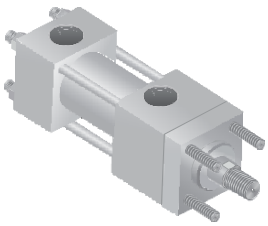
Dimensions

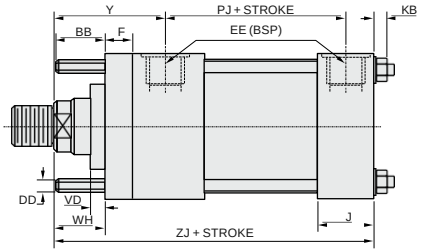
Bore	E	EE	F	TD	GF	J	XV	TM	UM	UW	WH	VD	XG	KB	BD	Y	TC	UT	+ Stroke		
																			PJ	XJ	ZJ
25	40	1/4"	08	12	35.0	22	To be specified	48	68	45	15.0	5.0	44.0	7	20	48.0	40	58	56.0	101.0	115.0
32	50	1/4"	10	16	40.0	25		55	79	54	25.0	6.0	54.0	8	25	63.0	44	68	69.0	133.0	145.0
40	63	1/4"	10	25	48.3	30		76	126	92	23.6	9.6	56.0	10	30	67.9	63	113	88.0	156.9	179.9
50	75	3/8"	12	25	45.6	30		89	139	112	23.6	9.6	56.0	15	30	66.2	75	125	96.0	161.2	176.2
63	90	3/8"	12	30	49.0	32		100	160	126	21.6	9.6	58.0	15	40	66.4	90	150	97.4	163.6	179.6
80	115	1/2"	15	35	58.0	38		127	197	260	20.6	5.6	64.6	18	45	75.6	115	185	101.0	177.6	196.6
100	130	3/4"	20	40	77.0	50		140	220	180	32.2	3.2	91.0	18	50	104.2	130	210	115.0	219.0	244.2
125	165	3/4"	30	42	77.3	50		178	262	215	30.7	5.2	91.0	22	52	113.0	165	249	130.0	243.0	268.0
150	190	1"	30	48	80.5	51		200	311	260	25.0	5.2	96.0	24	58	109.5	190	301	131.0	241.0	260.5
200	245	1-1/4"	30	54	90.0	60		279	387	355	39.0	14.6	116.0	28	64	133.0	245	353	142.0	279.0	309.0

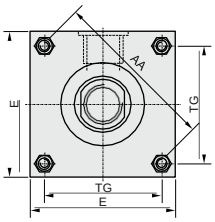
Note : Special orders as per customer specifications are also accepted.

Tie Rod Type Cylinders

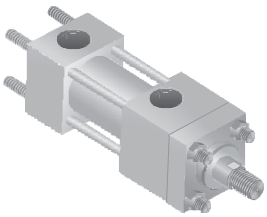
Extended Tie Rod Mountings

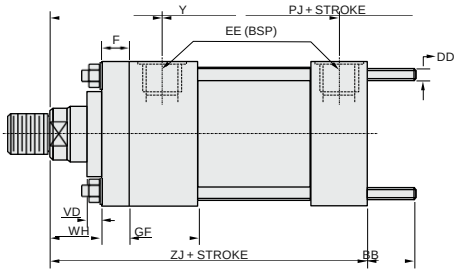


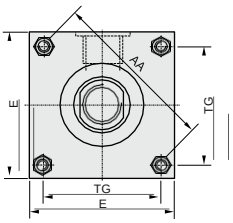




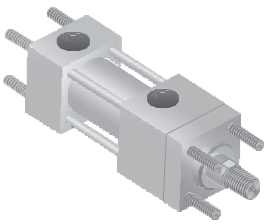
MX3-Tie Rod Extended Head End

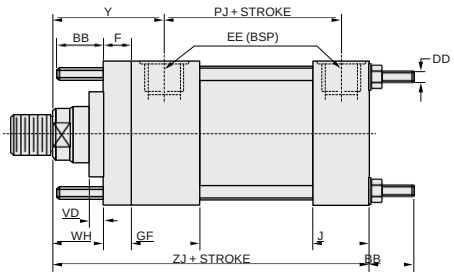


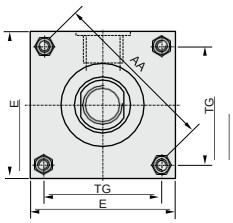




MX2-Tie Rod Extended Cap End







Tie Rod Extended Both Ends

Dimensions

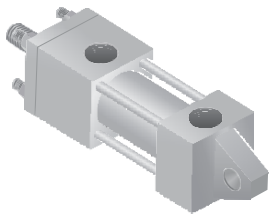
Bore	E	EE	F	BB	GF	J	TG	DD	AA	WH	VD	KB	Y	+Stroke	
														PJ	ZJ
25	40	1/4"	08	19	35.0	22	30	M6	40.0	15.0	5.0	7.0	48.0	56.0	115.0
32	50	1/4"	10	24	40.0	25	36	M6	47.0	25.0	6.0	8.0	63.0	69.0	145.0
40	63	1/4"	10	35	48.3	30	44	M10	59.3	23.6	9.6	12.0	67.9	88.0	171.9
50	75	3/8"	12	46	45.6	30	54	M12	73.5	23.6	9.6	15.0	66.2	96.0	176.2
63	90	3/8"	12	46	49.0	32	64	M12	90.5	21.6	9.6	15.0	66.4	97.4	179.6
80	115	1/2"	15	59	58.0	38	83	M16	117.3	20.6	5.6	18.0	75.6	101.0	196.6
100	130	3/4"	20	59	77.0	50	97	M16	137.1	32.2	3.2	18.0	104.2	115.0	244.2
125	165	3/4"	30	81	77.3	50	126	M20	178.1	30.7	5.2	20.0	113.0	130.0	268.0
150	190	1"	30	92	80.5	50	146	M24	219.2	25.0	5.2	24.0	109.5	131.0	266.5
200	245	1-1/4"	30	115	90.0	60	190	M30	268.7	39.0	14.6	28.0	133.0	142.0	309.0

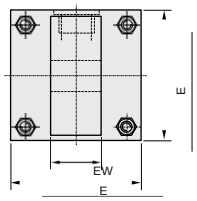
Note : Special orders as per customer specifications are also accepted.

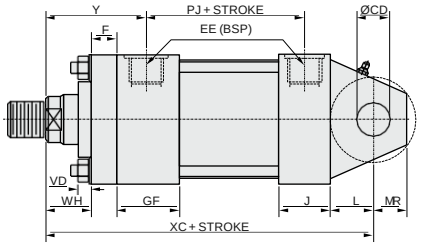
All dimensions in mm unless otherwise stated.

Pivot Mountings

1. Pivot pin not supplied

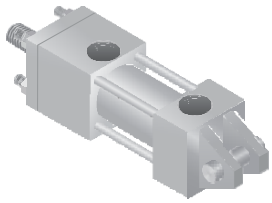


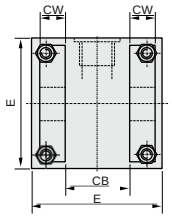


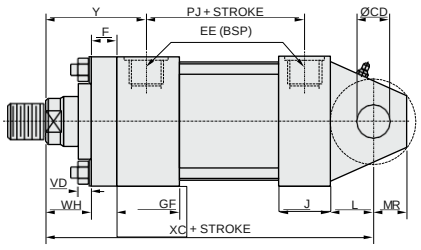


MP3-Cap Mounting Fixed Eye

2. Supplied complete with pivot pin

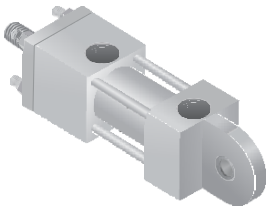


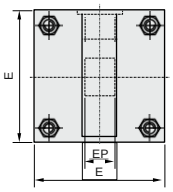


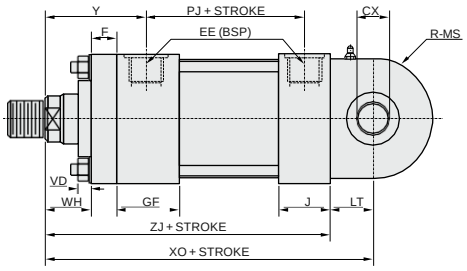


MP1-Cap Mounting Fixed Clevis

3. Pivot pin not supplied







Cap Mounting Fixed Eye

Dimensions

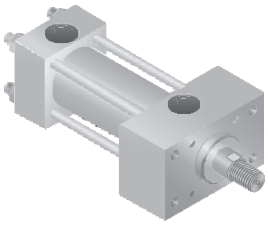
Bore	E	EE	F	CB	GF	J	CD	EP	CW	CX	EW	VD	L	MR	WH	Y	LT	MS	+Stroke		
																			PJ	XO	XC
25	40	1/4"	8	12	35.0	22	10	8	6.0	12	12	5.0	13	12	15.0	48.0	16	15	56.0	131.0	128.0
32	50	1/4"	10	16	40.0	25	12	11	8.0	16	16	6.0	19	15	25.0	63.0	20	20	69.0	165.0	164.0
40	63	1/4"	10	20	48.3	30	14	13	10	20	20	9.6	19	17	23.6	67.9	25	29	88.0	196.9	190.9
50	75	3/8"	10	30	45.6	30	20	17	15	25	30	9.6	32	29	23.6	66.2	31	30	96.0	207.2	208.2
63	90	3/8"	12	30	49.0	32	20	19	15	30	30	9.6	32	29	21.6	66.4	38	40	97.4	217.6	211.6
80	115	1/2"	15	40	58.0	38	28	23	20	40	40	5.6	39	34	20.6	75.6	48	50	101.0	244.6	235.6
100	130	3/4"	20	50	77.0	50	36	30	25	50	50	3.2	54	50	32.2	104.2	58	60	115.0	302.2	298.2
125	165	3/4"	30	60	77.3	50	45	38	30	60	60	5.2	57	53	30.7	113.0	72	70	130.0	340.0	325.0
150	190	1"	30	80	80.5	51	70	47	40	80	70	5.2	63	59	25.0	109.5	92	90	131.0	352.5	323.5
200	245	1-1/4"	30	80	90.0	60	70	57	40	100	80	14.6	82	78	39.0	133.0	116	110	142.0	425.0	391.0

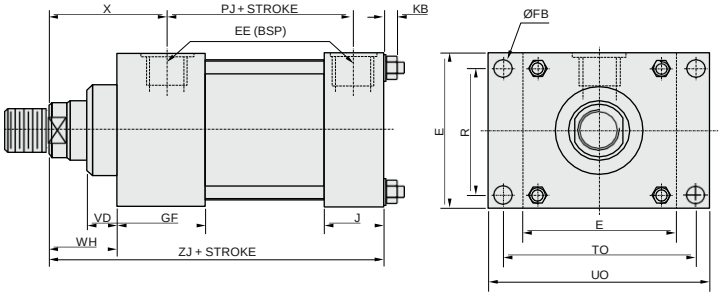
Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

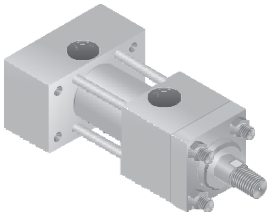
Tie Rod Type Cylinders

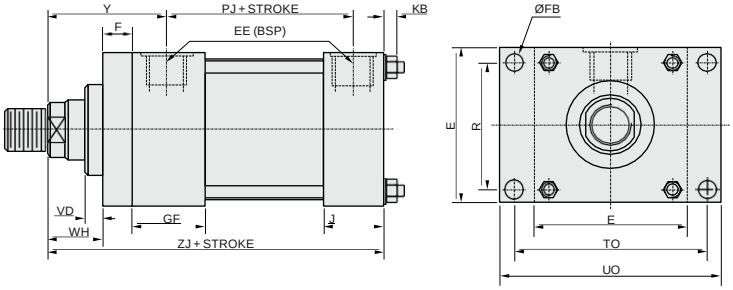
Head Rectangular & Cap Rectangular Flange Mountings





Style 1-Head Rectangular Flange Mounting





Style 2-Cap Rectangular Flange Mounting

Dimensions

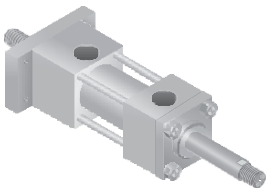
Bore	E	EE	F	ø FB	GF	J	R	TO	UO	X	Y	+Stroke		
												PJ	ZP	ZJ
25	40	1/4"	8	5.5	35.0	22	27	51	65	40.0	48.0	56.0	107.0	115.0
32	50	1/4"	10	9.0	40.0	25	30	70	90	53.0	63.0	69.0	135.0	145.0
40	63	1/4"	10	11.0	48.3	30	41	87	115	57.9	67.9	88.0	161.9	171.9
50	75	3/8"	12	13.5	45.6	30	52	105	142	54.2	66.2	95.0	164.2	176.2
63	90	3/8"	12	13.5	49.0	32	65	117	160	54.4	66.4	97.4	167.6	179.6
80	115	1/2"	15	17.5	58.0	38	83	149	190	60.6	75.6	101.0	181.6	196.6
100	130	3/4"	20	17.5	77.0	50	97	162	220	84.2	104.2	115.0	224.2	244.2
125	165	3/4"	30	22.0	77.3	50	126	208	260	83.0	113.0	130.0	238.0	268.0
150	190	1"	30	26.0	80.5	51	155	253	320	79.5	109.5	131.0	230.5	260.5
200	245	1-1/4"	30	33.0	90.0	60	190	300	380	103.0	133.0	165.0	182.0	328.0

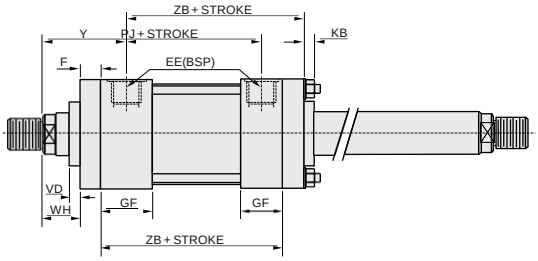
Note : Special orders as per customer specifications are also accepted.

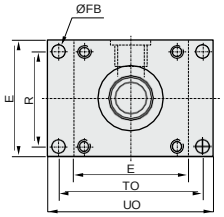
All dimensions in mm unless otherwise stated.

Double-Ended Hydraulic Cylinders-003

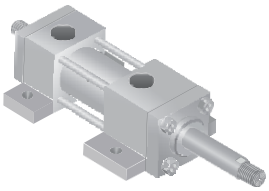
Double-Ended Hydraulic Cylinders-003

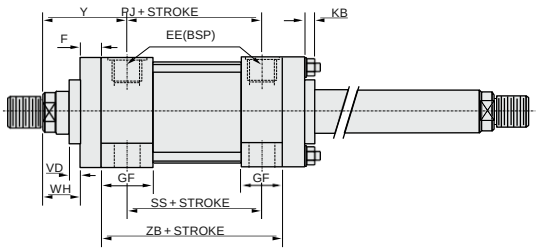


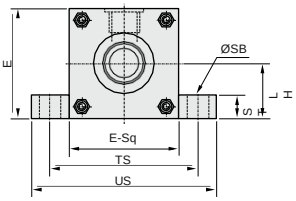




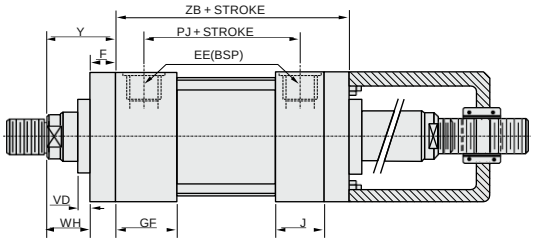
Head Rectangular Flange

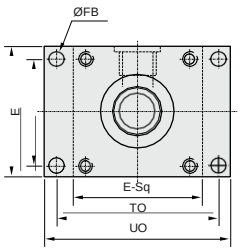






Side Lugs Mounting





Adjustable Cylinder with Flange Mountings

Various types of mountings

- Flange Mountings
- Foot Mountings
- Trunnion Mountings
- Tie Rod Extended Mountings

- Also available in adjustable stroke with cushioning
- Double-ended cylinder with female threading at both ends of rods
- Double-ended cylinder with
- hollow piston rod
- Tandem type double-ended cylinder also available as per requirement

Dimensions

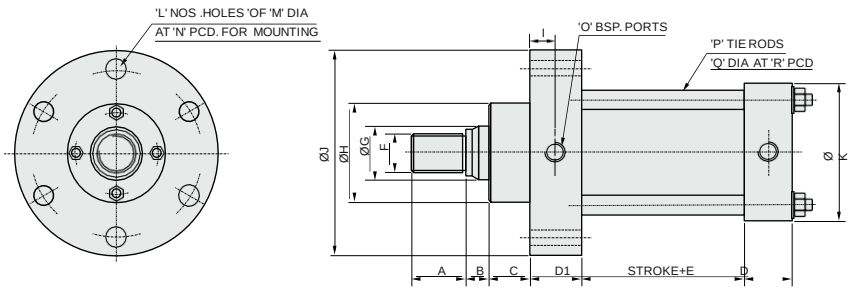
Bore	Rod		Add Stroke			Add 2 X Stroke	Bore	Rod		44Add Stroke			Add 2 X Stroke
Ø	No.	mm Ø	ZB	PJ	SS	ZJ	Ø	No.	mm Ø	ZB	PJ	SS	ZJ
25	1	12	104	53	88	154	100	1	45	151	101	107	265
	2	18						2	56				
32	1	16	108	56	88	178		3	70				
	2	22											
40	1	20	125	73	105	195	125	1	56	175	117	131	289
	2	25						2	70				
50	1	25	125	74	99	207		3	90				
	2	28					158	1	70	188	130	130	302
	3	35						2	90				
63	1	28	127	80	93	223		3	110				
	2	35					200	1	110	242	160	172	356
	3	45						2	130				
80	1	35	144	93	110	246		3	140				
	2	45											
	3	56											

All dimensions in mm unless otherwise stated.

Heavy Duty Cylinders-004

Round End Cylinder

Bore: Ø40 to 400mm
Stroke length: Up to 2400mm
Pressure: Up to 250kg/cm²



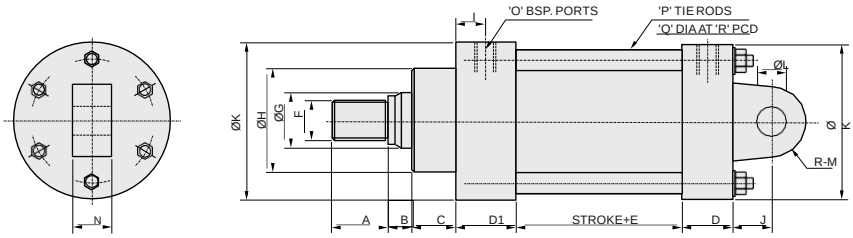
Dimensions

Pressure Rating : 200 kg/cm²																			Tonnage at 135 kg/cm²
Bore	A	B	C	D	D1	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
40	26	16	47	24	32	65	M20x1.5P	25	68	17.0	115	77	6	9	96	1/4"	6	8	60.0	1.5
50	26	16	47	26	34	65	M20x1.5P	25	68	19.0	145	98	6	11	122	3/8"	6	10	77.0	2.8
63	32	19	47	32	41	77	M27x2P	35	77	22.0	157	110	6	11	135	1/2"	6	10	88.0	4.4
80	50	26	61	32	42	85	M39x2P	45	100	23.0	185	130	6	13	160	1/2"	6	12	105.0	6.4
100	50	26	60	45	56	92	M56x2P	70	115	27.5	265	180	6	22	225	3/4"	6	20	141.5	11.6
125	50	26	60	45	56	102	M76x2P	90	115	27.5	295	210	6	22	255	3/4"	6	20	172.5	17.6
150	64	30	60	45	58	107	M95x2P	110	146	29.5	350	251	6	26	305	3/4"	6	24	204.0	25.5
200	76	30	59	48	59	119	M120x2P	130	167	30.5	415	315	8	26	370	3/4"	8	24	267.0	45.2
250	80	30	59	48	59	129	M140x2.5P	150	195	30.5	480	380	10	26	435	3/4"	10	24	332.0	70.0
300	120	35	70	62	62	139	M150x3P	180	261	31.0	550	450	16	26	505	3/4"	16	24	403.0	100.2

- Piston and piston rod are supported with replaceable self-lubricating bronze filled PTFE bearings which provide accurate and smooth frictionless movement.
- End covers are all fabricated and are of robust design to withstand heavy forces. Cold phosphatizing is done for rust prevention prior to painting.
- Wide varietites of mounting styles are available.
- Tie rod design makes the cylinder rugged and maintenance easier.
- Inspection : Hydrostatic pressure testing of all hydraulic cylinders at maximum working pressure for leakages and guaranteed performance.
- Optional piston rod and threads may be offered on request.
- For special cylinders like double-ended cylinders, stroke adjustment cylinders and cylinders for mobile application, please contact our Sales Department.

Clevis End Cylinder

Bore: Ø40 to 400mm
Stroke length: Up to 2400mm
Pressure: Up to 250kg/cm²



Dimensions

Pressure Rating : 200 kg/cm²																			Tonnage at 135 kg/cm²
Bore	A	B	C	D	D1	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
40	50	16	47	24	32	65	M20x1.5P	25	68	17.0	30	77	15	18	20	1/4"	6	8	60.0	1.5
50	32	16	47	26	35	65	M20x1.5P	25	68	19.0	36	98	20	22	30	3/8"	6	10	77.0	2.8
63	26	19	47	32	41	77	M27x2P	35	77	22.0	36	110	20	22	30	1/2"	6	10	88.0	4.4
80	26	26	61	32	42	85	M39x2P	45	100	23.0	43	130	25	28	40	1/2"	6	12	105.0	6.4
100	50	26	60	45	50	92	M56x2P	70	115	27.5	62	180	35	40	50	3/4"	6	20	141.5	11.6
125	50	26	60	45	50	102	M76x2P	90	115	27.5	72	210	45	50	60	3/4"	6	20	172.5	17.6
150	64	30	60	45	52	107	M95x2P	110	146	29.5	85	251	50	55	65	3/4"	6	24	204.0	25.5
200	76	30	59	48	55	119	M120x2P	130	167	30.5	120	315	75	90	75	3/4"	8	24	267.0	45.2
250	80	30	59	48	55	129	M140x2.5P	150	195	30.5	150	380	100	120	100	3/4"	10	24	332.0	70.0
300	120	35	70	62	62	139	M150x3P	180	261	31.0	170	450	120	140	120	3/4"	16	24	403.0	100.2

Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

Mill Duty Type Cylinders-004

Cylinders designed for extreme conditions

Mill type cylinders are designed for applications even under extreme conditions.

- Service-friendly modular system
- Various types of mounting
- Interchangeability, thanks to standardization
- Industry-specific and project-related cylinders on enquiry

Heavy Duty Mill Type Cylinder
Series 1X/2X

Features

- Nominal pressure : 250 bar
- Piston Ø : 40 to 320mm
- Piston rod Ø : 22 to 220mm
- Mounting types : 6
- Max. stroke length : 6000mm
- Max. stroke speed : 0.5m/s

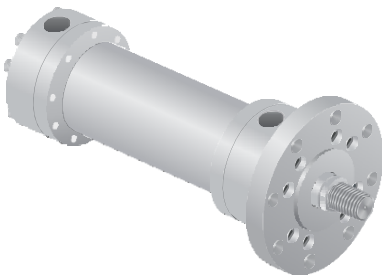
ISO 6022 Mill Type Cylinder Series 1X

Features

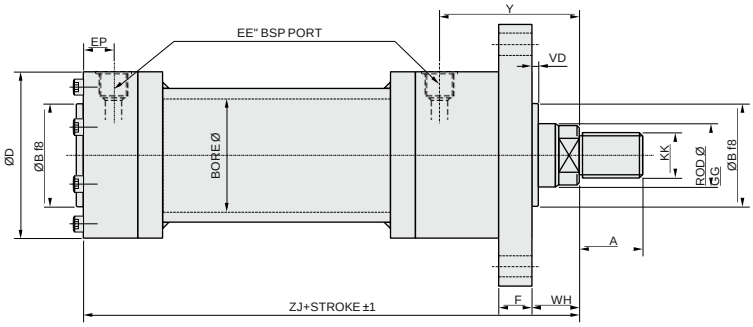
- Nominal pressure : 250 to 350 bar
- Piston Ø : 40 to 320mm
- Piston rod Ø : 25 to 220mm
- Mounting types : 6
- Max. stroke length : 6000mm
- Max. stroke speed : 0.5m/s

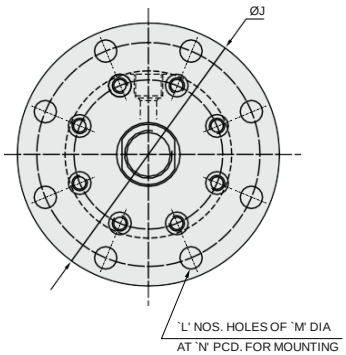
Note : Special orders as per customer specifications are also accepted.
For detailed information of cylinder or to order, contact our Sales Department.

Front Circular Flange Mounting



Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ømm Hardchrome Plated 25µ thk
Mounting	Front Circular Flange MF3 Mounting
Working pressure	160 bar
Design	Mill Duty Double Acting
Max. speed	0.5m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil





Dimensions

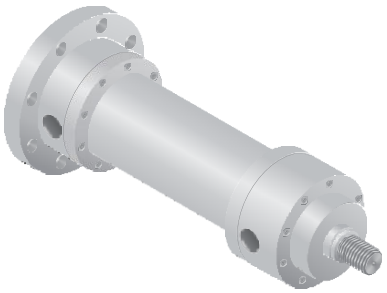
Bore dia	Rod dia	Rod thd	Thd lg	Port	Spigot OD	Dist	Spigot	Mfg hole Pcd	Mfg hole	Flange		End port	Gland port	Cyl OD	Hole nos.	Total lg
H8	GG f8	KK	A	EE"BSP	B f8	WH	Width VD	Ø N ±0.2	M	J	F	EP	Y	ØD	L	ZJ
32	18	M14x1.5	18	3/8"	40	16	3	92	9.0	110	16	17	64	67	6	170
32	22	M16x1.5	22	3/8"	40	16	3	92	9.0	110	16	17	64	67	6	170
40	22	M16x1.5	22	1/2"	50	16	3	106	9.0	125	16	22	71	78	6	190
40	28	M20x1.5	28	1/2"	50	16	3	106	9.0	125	16	22	71	78	6	190
50	28	M20x1.5	28	1/2"	60	18	4	126	11.0	150	20	22	72	95	6	205
50	36	M27x2	36	1/2"	60	18	4	126	11.0	150	20	22	72	95	6	205
63	36	M27x2	36	3/4"	70	20	4	145	13.5	170	25	25	82	116	8	224
63	45	M33x2	45	3/4"	70	20	4	145	13.5	170	25	25	82	116	8	224
80	45	M33x2	45	3/4"	85	22	4	165	17.5	195	32	25	91	130	8	250
80	56	M42x2	56	3/4"	85	22	4	165	17.5	195	32	25	91	130	8	250
100	56	M42x2	56	1"	106	25	5	200	22.0	240	32	30	108	158	8	300
100	70	M48x2	63	1"	106	25	5	200	22.0	240	32	30	108	158	8	300
125	70	M48x2	63	1"	132	28	5	235	22.0	275	32	30	121	192	8	325
125	90	M64x3	85	1"	132	28	5	235	22.0	275	32	30	121	192	8	325
160	90	M64x3	85	1-1/4"	160	30	5	280	22.0	320	36	36	143	238	8	370
160	110	M80x3	95	1-1/4"	160	30	5	280	22.0	320	36	36	143	238	8	370
200	110	M80x3	95	1-1/4"	200	35	5	340	26.0	385	40	36	190	285	10	450
200	140	M100x3	112	1-1/4"	200	35	5	340	26.0	385	40	36	190	285	10	450
250	140	M100x3	112	1-1/2"	250	40	8	420	33.0	490	56	40	210	365	12	550
250	180	M125x4	125	1-1/2"	250	40	8	420	33.0	490	56	40	210	365	12	550

Note : Special orders as per customer specifications are also accepted.

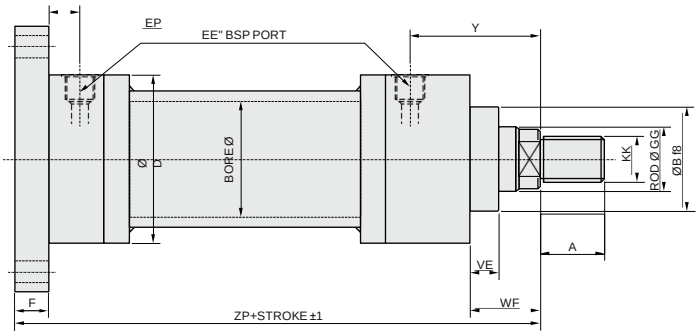
All dimensions in mm unless otherwise stated.

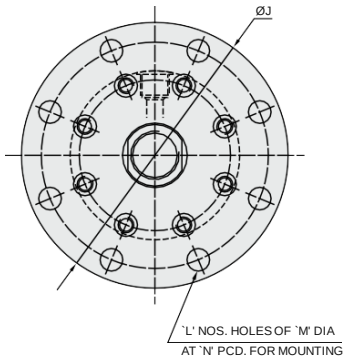
Mill Duty Type Cylinders-004

Rear Circular Flange Mounting - Style MF4



Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ømm Hardchrome Plated 25µ thk
Mounting	Rear Circular Flange MF4 Mounting
Working pressure	160 bar
Design	Mill Duty Double Acting
Max. speed	0.5m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil





Dimensions

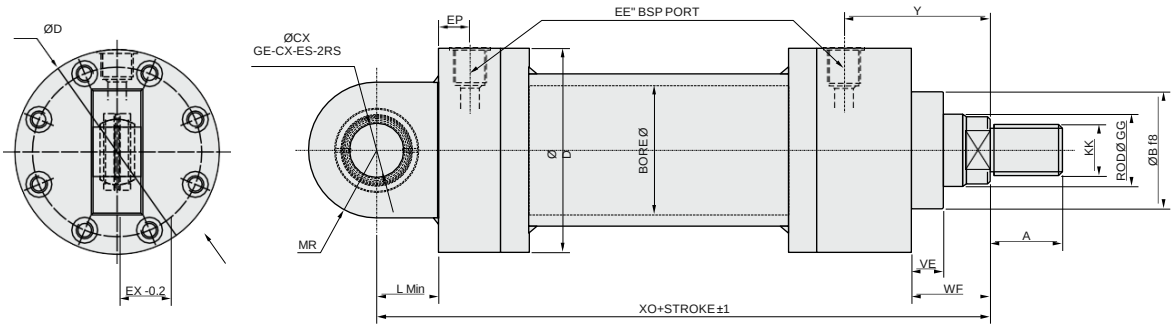
Bore dia	Rod dia	Rod thd	Thd lg	Port	Spigot OD	Dist	Spigot	Mtg hole Pcd	Mtg hole	Flange		End port	Gland port	Cyl OD	Hole nos.	Total lg
H8	GG f8	KK	A	EE"BSP	B f8	WF	VE	Ø N ±0.2	M	J	F	EP	Y	ØD	L	ZP
32	18	M14x1.5	18	3/8"	40	32	19	92	9.0	110	16	17	64	67	6	170
32	22	M16x1.5	22	3/8"	40	32	19	92	9.0	110	16	17	64	67	6	170
40	22	M16x1.5	22	1/2"	50	32	19	106	9.0	125	16	22	71	78	6	190
40	28	M20x1.5	28	1/2"	50	32	19	106	9.0	125	16	22	71	78	6	190
50	28	M20x1.5	28	1/2"	60	38	24	126	11.0	150	20	22	72	95	6	205
50	36	M27x2	36	1/2"	60	38	24	126	11.0	150	20	22	72	95	6	205
63	36	M27x2	36	3/4"	70	45	29	145	13.5	170	25	25	82	116	8	224
63	45	M33x2	45	3/4"	70	45	29	145	13.5	170	25	25	82	116	8	224
80	45	M33x2	45	3/4"	85	54	36	165	17.5	195	32	25	91	130	8	250
80	56	M42x2	56	3/4"	85	54	36	165	17.5	195	32	25	91	130	8	250
100	56	M42x2	56	1"	106	57	37	200	22.0	240	32	30	108	158	8	300
100	70	M48x2	63	1"	106	57	37	200	22.0	240	32	30	108	158	8	300
125	70	M48x2	63	1"	132	60	37	235	22.0	275	32	30	121	192	8	325
125	90	M64x3	85	1"	132	60	37	235	22.0	275	32	30	121	192	8	325
160	90	M64x3	85	1-1/4"	160	66	41	280	22.0	320	36	36	143	238	8	370
160	110	M80x3	95	1-1/4"	160	66	41	280	22.0	320	36	36	143	238	8	370
200	110	M80x3	95	1-1/4"	200	75	45	340	26.0	385	40	36	190	285	10	450
200	140	M100x3	112	1-1/4"	200	75	45	340	26.0	385	40	36	190	285	10	450
250	140	M100x3	112	1-1/2"	250	96	64	420	33.0	490	56	40	210	365	12	550
250	180	M125x4	125	1-1/2"	250	96	64	420	33.0	490	56	40	210	365	12	550

Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

ISO 6022 - Rear Pivot Mounted Hydraulic Cylinders with Spherical Bearing - Style MP6

Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ømm Hardchrome Plated 25µ thk
Mounting	Rear Pivot Mounting MF6
Working pressure	160 bar
Design	Mill Duty Double Acting
Max. speed	0.5m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil



Dimensions

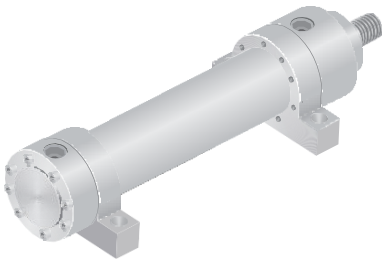
Bore dia H8	Rod dia GG f8	Rod thd KK	Thd lg A	Port EE"BSP	Spigot OD B f8	Dist WF	Spigot VE	Clevis dist L min	Bearing dia CX	Clevis radius MR	End port EP	Gland port Y	Cyl OD ØD	Clevis thk EX -0.2	Total lg XO
32	18	M14x1.5	18	3/8"	40	32	19	20	16	20	17	64	67	16	170
32	22	M16x1.5	22	3/8"	40	32	19	20	16	20	17	64	67	16	170
40	22	M16x1.5	22	1/2"	50	32	19	25	20	25	22	71	78	20	190
40	28	M20x1.5	28	1/2"	50	32	19	25	20	25	22	71	78	20	190
50	28	M20x1.5	28	1/2"	60	38	24	32	25	32	22	72	95	25	205
50	36	M27x2	36	1/2"	60	38	24	32	25	32	22	72	95	25	205
63	36	M27x2	36	3/4"	70	45	29	40	32	40	25	82	116	32	224
63	45	M33x2	45	3/4"	70	45	29	40	32	40	25	82	116	32	224
80	45	M33x2	45	3/4"	85	54	36	50	40	50	25	91	130	40	250
80	56	M42x2	56	3/4"	85	54	36	50	40	50	25	91	130	40	250
100	56	M42x2	56	1"	106	57	37	63	50	63	30	108	158	50	300
100	70	M48x2	63	1"	106	57	37	63	50	63	30	108	158	50	300
125	70	M48x2	63	1"	132	60	37	71	63	71	30	121	192	63	325
125	90	M64x3	85	1"	132	60	37	71	63	71	30	121	192	63	325
160	90	M64x3	85	1-1/4"	160	66	41	90	80	90	36	143	238	80	370
160	110	M80x3	95	1-1/4"	160	66	41	90	80	90	36	143	238	80	370
200	110	M80x3	95	1-1/4"	200	75	45	112	100	112	36	190	285	100	450
200	140	M100x3	112	1-1/4"	200	75	45	112	100	112	36	190	285	100	450
250	140	M100x3	112	1-1/2"	250	96	64	160	125	160	40	210	365	125	550
250	180	M125x4	125	1-1/2"	250	96	64	160	125	160	40	210	365	125	550

Note : Special orders as per customer specifications are also accepted.

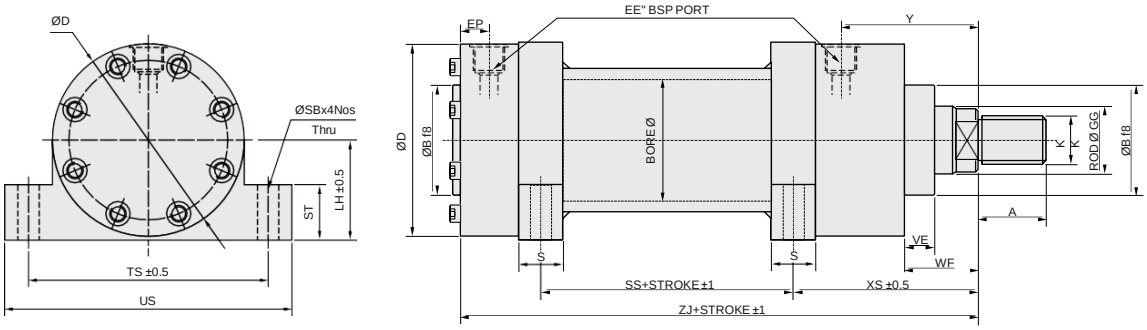
All dimensions in mm unless otherwise stated.

Mill Duty Type Cylinders-004

ISO 6022 - Side Lugs Mounting - Style MS2



Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ømm Hardchrome Plated 25µ thk
Mounting	Side Lugs Mounting MS2
Working pressure	160 bar
Design	Mill Duty Double Acting
Max. speed	0.5m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil



Dimensions

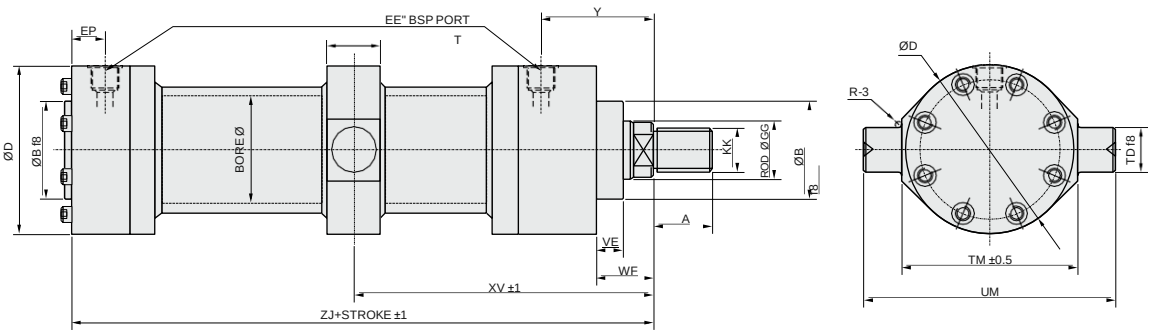
Bore dia	Rod dia	Rod thd	Thd lg	Port	Spigot OD	Dist	Spigot	Side lugs Mtg. details								End port	Gland port	Cyl OD	Total lg
H8	GG f8	KK	A	EE"BSP	B f8	WF	VE	TS ±0.5	US	LH ±0.5	ST	ØSB	SS ±1	XS ±0.5	S	EP	Y	ØD	ZJ
32	18	M14x1.5	18	3/8"	40	32	19	90	110	38	25	11	40	88.5	25	17	64	67	170
32	22	M16x1.5	22	3/8"	40	32	19	90	110	38	25	11	40	88.5	25	17	64	67	170
40	22	M16x1.5	22	1/2"	50	32	19	100	120	43	30	11	44	97.5	25	22	71	78	190
40	28	M20x1.5	28	1/2"	50	32	19	100	120	43	30	11	44	97.5	25	22	71	78	190
50	28	M20x1.5	28	1/2"	60	38	24	120	145	52	40	14	51	102.0	32	22	72	95	205
50	36	M27x1.5	36	1/2"	60	38	24	120	145	52	40	14	51	102.0	32	22	72	95	205
63	36	M27x1.5	36	3/4"	70	45	29	150	180	62	45	18	51	115.0	32	25	82	116	224
63	45	M33x1.5	45	3/4"	70	45	29	150	180	62	45	18	51	115.0	32	25	82	116	224
80	45	M33x1.5	45	3/4"	85	54	36	170	210	70	50	22	60	128.0	40	25	91	130	250
80	56	M42x1.5	56	3/4"	85	54	36	170	210	70	50	22	60	128.0	40	25	91	130	250
100	56	M42x1.5	56	1"	106	57	37	205	250	82	60	26	70	154.0	50	30	108	158	300
100	70	M48x1.5	63	1"	106	57	37	205	250	82	60	26	70	154.0	50	30	108	158	300
125	70	M48x1.5	63	1"	132	60	37	245	300	100	70	33	76	170.0	56	30	121	192	325
125	90	M64x1.5	85	1"	132	60	37	245	300	100	70	33	76	170.0	56	30	121	192	325
160	90	M64x1.5	85	1-1/4"	160	66	41	295	350	119	80	33	79	199.0	60	36	143	238	370
160	110	M80x1.5	95	1-1/4"	160	66	41	295	350	119	80	33	79	199.0	60	36	143	238	370
200	110	M80x1.5	95	1-1/4"	200	75	45	350	415	145	100	39	100	252.0	72	36	190	285	450
200	140	M100x15	112	1-1/4"	200	75	45	350	415	145	100	39	100	252.0	72	36	190	285	450
250	140	M100x1.5	112	1-1/2"	250	96	64	450	525	190	140	45	154	288.0	80	40	210	365	550
250	180	M125x1.5	125	1-1/2"	250	96	64	450	525	190	140	45	154	288.0	80	40	210	365	550

Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

ISO 6022 - Intermediate Trunnion Mounting - Style MT4

Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ø mm Hardchrome Plated 25µ thk
Mounting	Intermediate Trunnion Mounting MT4
Working pressure	160 bar
Design	Mill Duty Double Acting
Max. speed	0.5m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil



Dimensions

Bore dia	Rod dia	Rod thd	Thd lg	Port	Spigot OD	Dist	Spigot	Trunnion Mtg. details				Trunnion dist.	End port	Gland port	Cyl OD	Total lg
H8	GG f8	KK	A	EE"BSP	B f8	WF	VE	TM ±0.5	UM	ØTD f8	T	XV ±0.5	EP	Y	ØD	ZJ
32	18	M14x1.5	18	3/8"	40	32	19	75	99	16	26	155	17	64	67	170
32	22	M16x1.5	22	3/8"	40	32	19	75	99	16	26	155	17	64	67	170
40	22	M16x1.5	22	1/2"	50	32	19	90	122	20	30	170	22	71	78	190
40	28	M20x1.5	28	1/2"	50	32	19	90	122	20	30	170	22	71	78	190
50	28	M20x1.5	28	1/2"	60	38	24	105	145	25	35	175	22	72	95	205
50	36	M27x2	36	1/2"	60	38	24	105	145	25	35	175	22	72	95	205
63	36	M27x2	36	3/4"	70	45	29	120	170	32	42	195	25	82	116	224
63	45	M33x2	45	3/4"	70	45	29	120	170	32	42	195	25	82	116	224
80	45	M33x2	45	3/4"	85	54	36	135	199	40	50	210	25	91	130	250
80	56	M42x2	56	3/4"	85	54	36	135	199	40	50	210	25	91	130	250
100	56	M42x2	56	1"	106	57	37	160	240	50	60	240	30	108	158	300
100	70	M48x2	63	1"	106	57	37	160	240	50	60	240	30	108	158	300
125	70	M48x2	63	1"	132	60	37	195	295	63	73	260	30	121	192	325
125	90	M64x3	85	1"	132	60	37	195	295	63	73	260	30	121	192	325
160	90	M64x3	85	1-1/4"	160	66	41	240	366	80	90	305	36	143	238	370
160	110	M80x3	95	1-1/4"	160	66	41	240	366	80	90	305	36	143	238	370
200	110	M80x3	95	1-1/4"	200	75	45	295	455	100	110	365	36	190	285	450
200	140	M100x3	112	1-1/4"	200	75	45	295	455	100	110	365	36	190	285	450
250	140	M100x3	112	1-1/2"	250	96	64	370	570	125	135	410	40	210	365	550
250	180	M125x4	125	1-1/2"	250	96	64	370	570	125	135	410	40	210	365	550

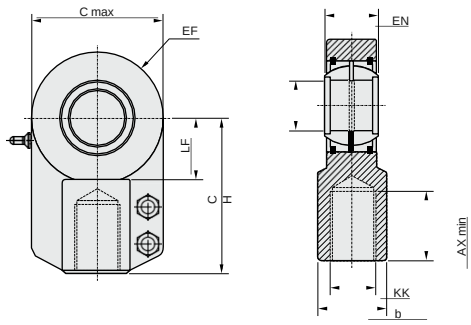
Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

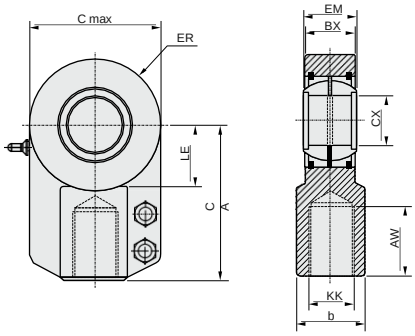
Mill Duty Type Cylinders-004

Rear Pivot Mounted Hydraulic Cylinders with Spherical Bearing

Rod eye with spherical bearing
ISO 6982



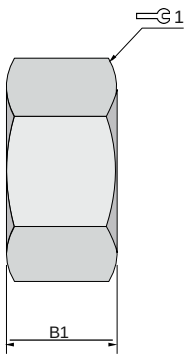
Rod eye with plain bearing
ISO 6981



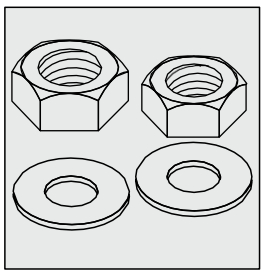
Dimensions

Bore Ø	KK	Spherical bearing part no.	Plain bearing part No.	AX and AW min	b	BX	C Max	CA & CH	CK H9 & CN H7	EF & ER	EM h12 & EN h12	LE & LF	Nominal force kn	Mass kg
40	M16x1.5P	145239	148729	23	25	17	47	52	20	25	20	22	20	0.4
50	M20x1.5P	145240	148730	29	30	21	58	65	25	32	25	27	32	0.7
63	M27x2P	145241	145231	37	38	27	70	80	32	40	32	32	50	1.2
80	M33x2P	145242	145232	46	47	32	89	97	40	50	40	40	80	2.1
100	M42x2P	145243	145233	57	58	40	108	120	50	63	50	50	125	4.4
125	M48x2P	145244	145234	64	70	52	132	140	63	71	63	62	200	7.6
160	M63x2P	145245	145235	86	90	66	168	180	80	90	80	78	320	14.5
200	M80x3P	148724	148737	96	110	84	210	210	100	112	100	98	500	28.0
250	M100x3P	148726	148739	113	135	102	260	260	125	160	125	120	800	43.0
320	M125x4P	148727	148740	126	165	130	360	310	160	250	160	150	1250	80.0

KK	B-1	1	KK	B-1	1
M4	3.2	7	M16x1.5	8.0	24
M5	3.2	8	M18	9.0	28
M6	3.2	10	M20x1.5P	10.0	30
M8	4.0	13	M20x2.5P	12.0	34
M10	5.0	16	M22	12.0	35
M10x1.25P	5.0	17	M24x2P	13.5	38
M12	6.0	18	M27x2P	13.5	41
M12x1.25P	6.0	19	M30x2P	16.0	50
M14	7.0	21	M36x2P	18.0	55
M14x1.5P	8.0	21	M42x2P	21.0	65
M14x1.25P	7.0	22	M46x2P	24.0	70
M16	8.0	24	M48x2P	24.0	75



Nuts for Rod Clevis and Rod end attachments

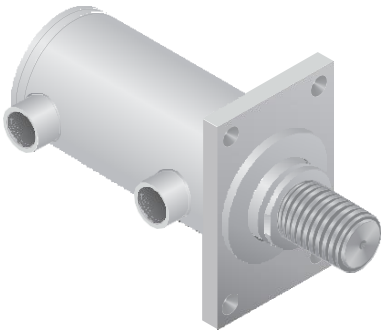


Note : Special orders as per customer specifications are also accepted.

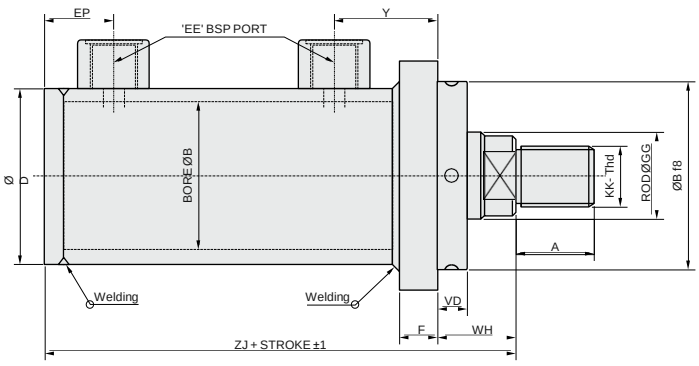
All dimensions in mm unless otherwise stated.

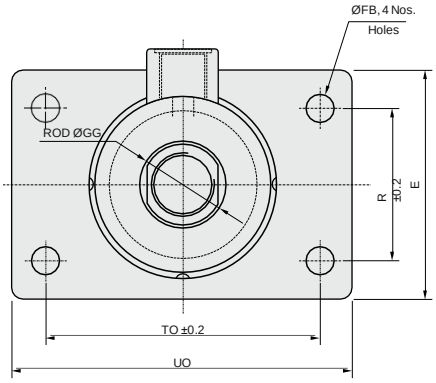
Welded Type Cylinders-004

Front Rectangular Flange Mounting - Style ME5



Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ømm Hardchrome Plated 25µ thk
Mounting	Front Rectangular Flange ISO ME5 Mounting
Working pressure	160 bar
Design	Welded/Double Acting
Max. speed	0.1m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil





Dimensions

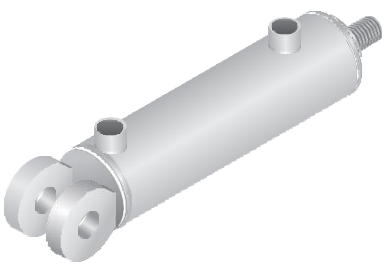
Bore dia	Rod dia	Rod thd	Thd lg	Port	Spigot OD	Dist	Spigot	Mfg hole center		Mfg hole	Flange			Tube OD	Gland port	End port	Total lg
H8	GG f8	KK	A	EE"BSP	B f8	WH	width VD	R ±0.2	TO ±0.2	FB H13	E	UO	F	D	Y	EP	ZJ
40	18	M14x1.5	18	3/8"	54	25	12	41	87	11	63	110	10	50	40	29	135
40	28	M20x1.5	28	3/8"	54	25	12	41	87	11	63	110	10	50	40	29	135
50	22	M16x1.5	22	1/2"	64	25	12	52	105	14	75	130	16	60	43	29	141
50	36	M27x2	36	1/2"	64	25	12	52	105	14	75	130	16	60	43	29	141
63	28	M20x1.5	28	1/2"	80	32	13	65	117	14	90	145	16	75	44	29	149
63	45	M33x2	45	1/2"	80	32	13	65	117	14	90	145	16	75	44	29	149
80	36	M27x2	36	3/4"	100	31	13	83	149	18	115	180	20	95	59	35	182
80	56	M42x2	56	3/4"	100	31	13	83	149	18	115	180	20	95	59	35	182
100	45	M33x2	45	3/4"	120	35	14	97	162	18	130	200	22	115	73	35	200
100	56	M48x2	63	3/4"	120	35	14	97	162	18	130	200	22	115	73	35	200
125	70	M42x2	56	1"	145	35	14	126	208	22	165	250	22	145	75	44	218
125	56	M64x3	85	1"	145	35	14	126	208	22	165	250	22	145	75	44	218
160	90	M48x2	63	1"	185	32	12	155	253	26	205	300	25	190	95	63	280
160	110	M80x3	95	1"	185	32	12	155	253	26	205	300	25	190	95	63	280

Note : Special orders as per customer specifications are also accepted.

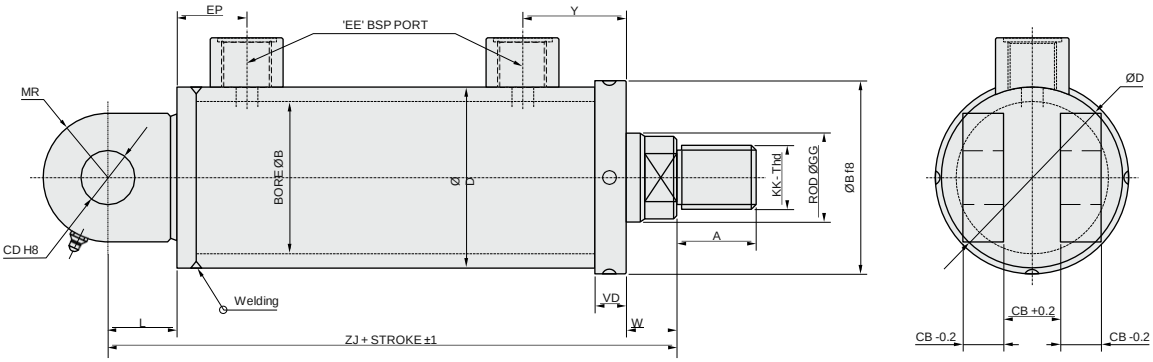
All dimensions in mm unless otherwise stated.

Rear Female Clevis Mounting - Style MP1

Ordering code
AHP - WC - MP1 - Bore x Rod x Stroke



Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ømm Hardchrome Plated 25µ thk
Mounting	Rear Female Clevis ISO MP1 Mounting
Working pressure	160 bar
Design	Welded/Double Acting
Max. speed	0.2m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil



Dimensions

Bore dia	Rod dia	Rod thd	Thd lg	Port	Spigot OD B	Spigot	Dist	Hole	Radius	MP1	MP1	Rod extn	Tube OD	Gland port Y	End port	Total lg
B H8	GG f8	KK	A	EE"BPS	f8	width VD	L	CD-H8	MR	CB-02	CW-02	W	D		EP	ZJ
40	18	M14x1.5	18	3/8"	54	12	19	14	16	20	10	33	50	50	29	172
40	28	M20x1.5	28	3/8"	54	12	19	14	16	20	10	33	50	50	29	172
50	22	M16x1.5	22	1/2"	64	12	32	20	20	30	15	29	60	57	29	191
50	36	M27x 2	36	1/2"	64	12	32	20	20	30	15	29	60	57	29	191
63	28	M20x1.5	28	1/2"	80	13	32	25	25	30	15	35	75	60	29	200
63	45	M33x2	45	1/2"	80	13	32	25	25	30	15	35	75	60	29	200
80	36	M27x2	36	3/4"	100	13	39	30	35	40	20	20	95	78	35	229
80	56	M42x2	56	3/4"	100	13	39	30	35	40	20	20	95	78	35	229
100	45	M33x2	45	3/4"	120	14	54	35	40	50	25	20	115	91	35	257
100	70	M48x2	63	3/4"	120	14	54	35	40	50	25	20	115	91	35	257
125	56	M42x2	56	1"	145	14	57	45	45	60	30	29	140	95	44	289
125	90	M64x3	85	1"	145	14	57	45	45	60	30	29	140	95	44	289
160	70	M48x2	63	1"	185	12	63	60	60	70	35	20	180	105	63	308
160	110	M80x3	95	1"	185	12	63	60	60	70	35	20	180	105	63	308

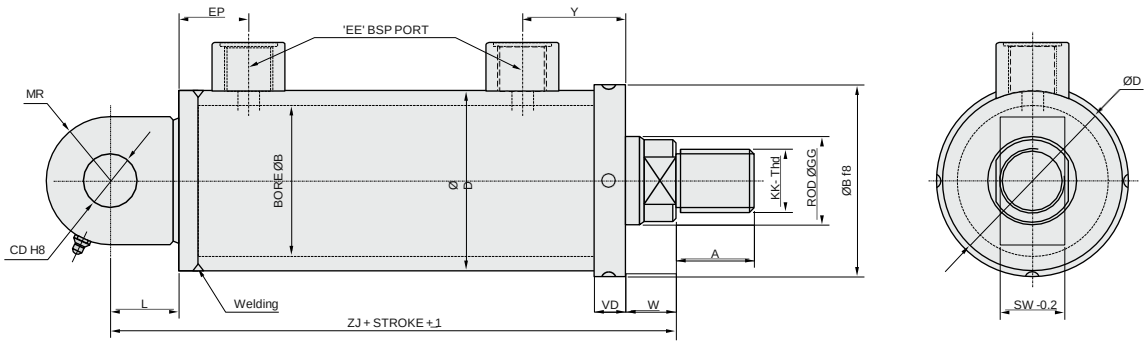
Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

Welded Type Cylinders-004

Rear Male Clevis Mounting - Style MP3

Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ø mm Hardchrome Plated 25µ thk
Mounting	Side Lugs Mounting MS2
Working pressure	160 bar
Design	Mill Duty Double Acting
Max. speed	0.5m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil



Dimensions

Bore dia	Rod dia	Rod thd	Thd lg	Port	Spigot OD	Spigot	Dist	Hole r	Radius	MP3	Rod extn	Tube OD	Gland port	End port	Total lg
H8	GG f8	KK	A	EE"BSP	B f8	width VD	L	CD-H8	MR	SW-02	W	D	Y	EP	ZJ
40	18	M14x1.5	18	3/8"	54	12	19	14	16	20	33	50	50	29	172
40	28	M20x1.5	22	3/8"	54	12	19	14	16	20	33	50	50	29	172
50	22	M16x1.5	22	1/2"	64	12	32	20	20	30	29	60	57	29	191
50	36	M27x2	36	1/2"	64	12	32	20	20	30	29	60	57	29	191
63	28	M20x1.5	28	1/2"	80	13	32	25	25	30	35	75	60	29	200
63	45	M33x2	45	1/2"	80	13	32	25	25	30	35	75	60	29	200
80	36	M27x2	36	3/4"	100	13	39	30	35	40	20	95	78	35	229
80	56	M42x2	56	3/4"	100	13	39	30	35	40	20	95	78	35	229
100	45	M33x2	45	3/4"	120	14	54	35	40	50	20	115	91	35	257
100	70	M48x2	63	3/4"	120	14	54	35	40	50	20	115	91	35	257
125	56	M42x2	56	1"	145	14	57	45	45	60	29	140	95	44	289
125	90	M64x3	85	1"	145	14	57	45	45	60	29	140	95	44	289
160	70	M48x2	63	1"	185	12	63	60	60	70	20	180	105	63	308
160	110	M80x3	95	1"	185	12	63	60	60	70	20	180	105	63	308

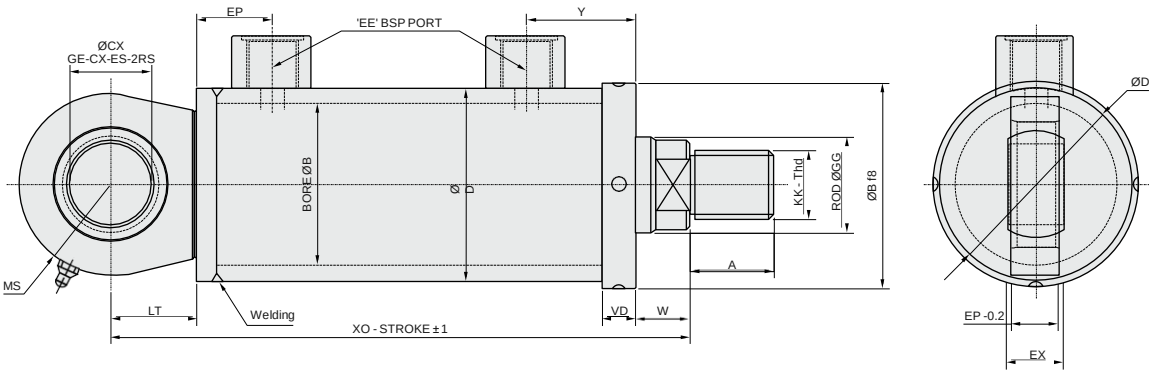
Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

Rear Clevis with Spherical Bearing Mounting - Style MP5

Ordering code
AHP - WC - MP5 - Bore x Rod x Stroke

Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ø mm Hardchrome Plated 25µ thk.
Mounting	Rear Clevis with Spherical Bearing Mounting
Working pressure	160 bar
Design	Welded/Double Acting
Max. speed	0.2m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil



Dimensions

Bore dia B H8	Rod dia GG f8	Rod thd KK	Thd lg A	Port EE"BPS	Spigot OD B f8	Spigot width VD	Dist LT	Clevis thk EP - 0 2	Bearing thk EX	Bearing dia CX - H7	Radius MS	Rod extn W	Tube OD D	Gland port Y	End port EP	Total lg XO
40	18	M14x1.5	18	3/8"	54	12	25	13	16	20	29	33	50	50	29	178
40	28	M20x1.5	28	3/8"	54	12	25	13	16	20	29	33	50	50	29	178
50	22	M16x1.5	22	1/2"	64	12	31	17	20	25	33	29	60	57	29	191
50	36	M27x2	36	1/2"	64	12	31	17	20	25	33	29	60	57	29	191
63	28	M20x1.5	28	1/2"	80	13	38	19	22	30	40	35	75	60	29	206
63	45	M33x2	45	1/2"	80	13	38	19	22	30	40	35	75	60	29	206
80	36	M27x2	36	3/4"	100	13	48	23	28	40	50	20	95	78	35	238
80	56	M42x2	56	3/4"	100	13	48	23	28	40	50	20	95	78	35	238
100	45	M33x2	45	3/4"	120	14	58	30	35	50	62	20	115	91	35	261
100	70	M48x2	63	3/4"	120	14	58	30	35	50	62	20	115	91	35	261
125	56	M42x2	56	1"	145	14	72	38	44	60	80	29	140	95	44	304
125	90	M64x3	85	1"	145	14	72	38	44	60	80	29	140	95	44	304
160	70	M48x2	63	1"	185	12	92	47	55	80	92	20	180	105	63	337
160	110	M80x3	95	1"	185	12	92	47	55	80	92	20	180	105	63	337

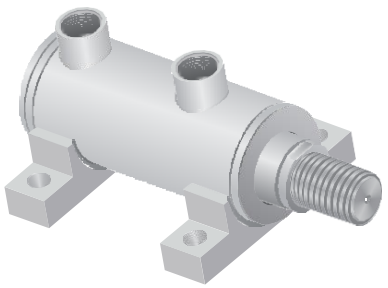
Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

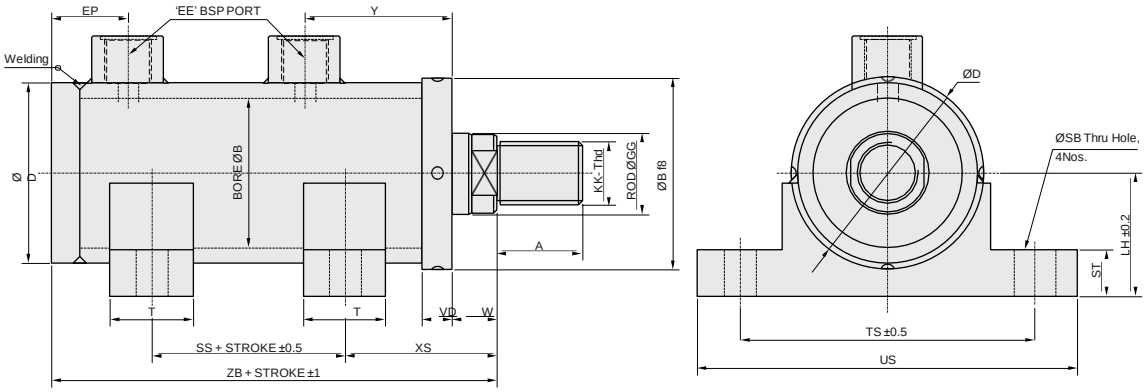
Welded Type Cylinders-004

Side Lugs Mounting - Style MS2

Ordering code
AHP - WC - MS2 -Bore x Rod x Stroke



Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ømm Hardchrome Plated 25µ thk
Mounting	Side Lugs Mounting as per ISO MS2
Working pressure	160 bar
Design	Welded/Double Acting
Max. speed	0.2m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil



Dimensions

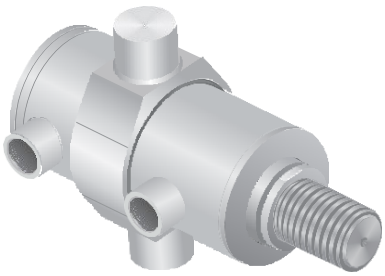
Bore B H8	Rod GG f8	Rod thd KK	Thd lg A	Port EE"BPS	Spigot OD B f8	Width VD	Dist XS	CCD SS	CCD TS	Dist US	Centre dist LH	Leg thk ST	Hole dia SB	Leg width T	Rod extn W	Tube OD D	Gd port Y	End port EP	Total lg ZB
40	18	M14x1.5	18	3/8"	54	12	45	98	83	103	31	12.5	11	24	23	50	50	29	167
40	28	M20x1.5	28	3/8"	54	12	45	98	83	103	31	12.5	11	24	23	50	50	29	167
50	22	M16x1.5	22	1/2"	64	12	54	92	102	127	37	19	14	30	25	60	57	29	173
50	36	M27x2	36	1/2"	64	12	54	92	102	127	37	19	14	30	25	60	57	29	173
63	28	M20x1.5	28	1/2"	80	13	65	86	124	161	44	26	18	36	31	75	60	29	181
63	45	M33x2	45	1/2"	80	13	65	86	124	161	44	26	18	36	31	75	60	29	181
80	36	M27x2	36	3/4"	100	13	68	105	149	186	57	26	18	40	29	95	78	35	208
80	56	M42x2	56	3/4"	100	13	68	105	149	186	57	26	18	40	29	95	78	35	208
100	45	M33x2	45	3/4"	120	14	79	102	172	216	63	32	26	48	37	115	91	35	220
100	70	M48x2	63	3/4"	120	14	79	102	172	216	63	32	26	48	37	115	91	35	220
125	56	M42x2	56	1"	145	14	79	131	210	254	82	32	26	50	34	140	95	44	253
125	90	M64x3	85	1"	145	14	79	131	210	254	82	32	26	50	34	140	95	44	253
160	70	M48x2	63	1"	185	12	86	130	260	318	101	38	33	60	34	180	105	63	289
160	110	M80x3	95	1"	185	12	86	130	260	318	101	38	33	60	34	180	105	63	289

Note : Special orders as per customer specifications are also accepted.

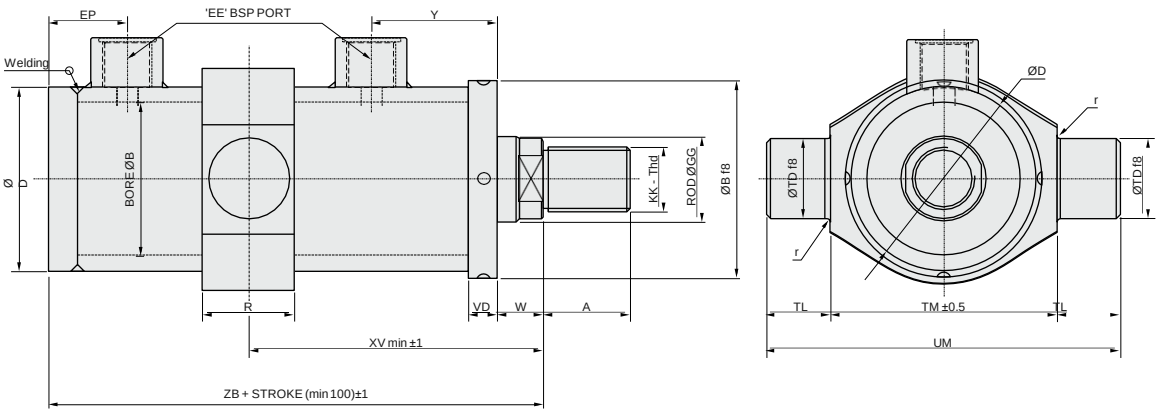
All dimensions in mm unless otherwise stated.

Intermediate Trunnion Mounting - Style MT4

Ordering code
AHP - WC - MT4 - Bore x Rod x Stroke (min 100mm)



Hydraulic Cylinder Specifications	
Bore	ØBmm
Stroke	< 1000 ±1mm
Rod	Rod Ømm Hardchrome Plated 25µ thk
Mounting	Intermediate Trunnion Mounting
Working pressure	160 bar
Design	Welded/Double Acting
Max. speed	0.2m/sec.
Test pressure	210 bar
Medium	Hydraulic Mineral Oil



Dimensions

Bore	Rod	Rod thd	Thd lg	Port	Spigot OD	Width	Trunnion						Trun dist	Rod extn	Tube OD	GD port	End port	Total lg
B H8	GG f8	KK	A	EE" BSP	B f8	VD	TM ±0.5	UM	TL	TD f8	R	r	XV min	W	D	Y	EP	ZB
40	18	M14x1.5	18	3/8"	54	12	76	108	16	20	32	1.5	117	13	50	50	29	233
40	28	M20x1.5	28	3/8"	54	12	76	108	16	20	32	1.5	117	13	50	50	29	233
50	22	M16x1.5	22	1/2"	64	12	89	129	20	25	38	1.5	127	16	60	57	29	246
50	36	M27x2	36	1/2"	64	12	89	129	20	25	38	1.5	127	16	60	57	29	246
63	28	M20x1.5	28	1/2"	80	13	100	150	25	32	45	2.0	146	19	75	60	29	252
63	45	M33x2	45	1/2"	80	13	100	150	25	32	45	2.0	146	19	75	60	29	252
80	36	M27x2	36	3/4"	100	13	127	191	32	40	57	2.5	163	22	95	78	35	292
80	56	M42x2	56	3/4"	100	13	127	191	32	40	57	2.5	163	22	95	78	35	292
100	45	M33x2	45	3/4"	120	14	140	220	40	50	64	2.5	186	25	115	91	35	308
100	70	M48x2	63	3/4"	120	14	140	220	40	50	64	2.5	186	25	115	91	35	308
125	56	M42x2	56	1"	145	14	178	278	50	63	83	3.0	202	25	140	95	44	328
125	90	M64x3	85	1"	145	14	178	278	50	63	83	3.0	202	25	140	95	44	328
160	70	M48x3	63	1"	185	12	215	341	63	80	102	3.0	224	25	180	105	63	380
160	110	M80x3	95	1"	185	12	215	341	63	80	102	3.0	224	25	180	105	63	380

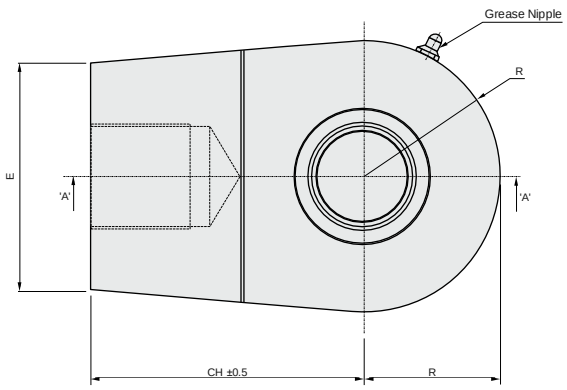
Note : Special orders as per customer specifications are also accepted.

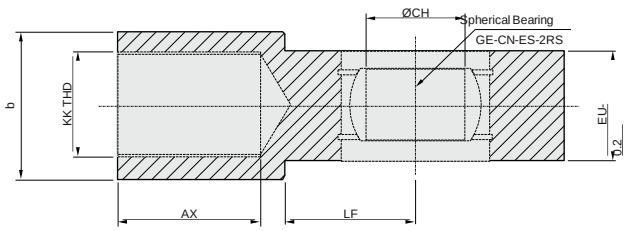
All dimensions in mm unless otherwise stated.

Welded Type Cylinders-004

Rod End Eye

Ordering code
AHP - WC - Rod Eye -Bore x Rod x Stroke





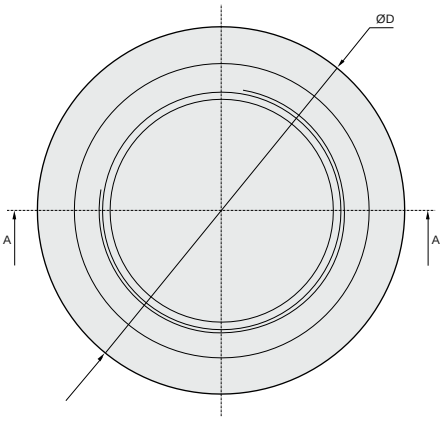
SECTION - 'A-A'

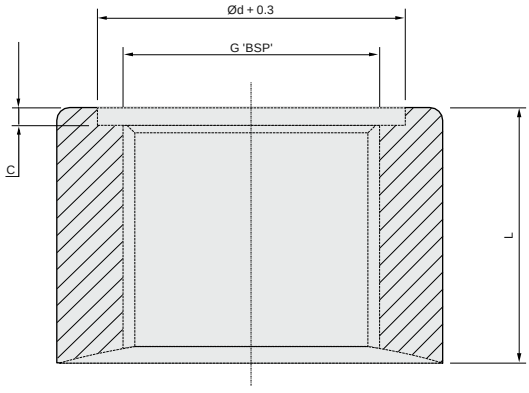
Bore dia B H8	Rod dia GG f8	Rod thd KK	Thd lg AX	Thick b	Radius R	Dist CH±0.5	Bearing ID CN	Eye thick EU-0.2	Dist LF	Width E
40	18	M14x1.5	19	30	31	65	20	21	27	22
40	28	M20x1.5	29	30	31	65	20	21	27	22
50	22	M16x1.5	23	38	38	80	25	27	32	28
50	36	M27x2	37	38	38	80	25	27	32	28
63	28	M20x1.5	29	47	48	97	30	32	41	38
63	45	M33x2	46	47	48	97	30	32	41	38
80	36	M27x2	37	58	59	120	40	40	50	49
80	36	M42x2	57	58	59	120	40	40	50	49
100	45	M33x2	46	70	71	140	50	52	62	61
100	70	M48x2	64	70	71	140	50	52	62	61
125	56	M42x2	57	90	90	180	60	66	78	80
125	90	M64x3	86	90	90	180	60	66	78	80
160	70	M48x2	64	110	112	210	80	84	98	100
160	110	M80X3	96	110	112	210	80	84	98	100
200	90	M64X3	86	135	145	260	100	102	120	125
200	140	M100X3	113	135	145	260	100	102	120	125

Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

AHP STD Adaptor
As per ISO Standards





SECTION - 'A-A'

Dimensions

Port size G" BSP	Stud OD D	Stud length L	Spotface dia d+0.3	Spotface deep C
1/8"	25	15	18	2.0
1/4"	30	20	23	2.0
3/8"	30	20	26	2.5
1/2"	35	20	31	2.5
3/4"	40	25	37	2.5
1"	50	30	45	3.0
1-1/4"	65	35	55	3.0
1-1/2"	65	35	61	3.0
2"	85	45	75	3.0

Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

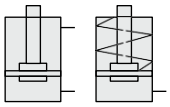
Thrust Chart

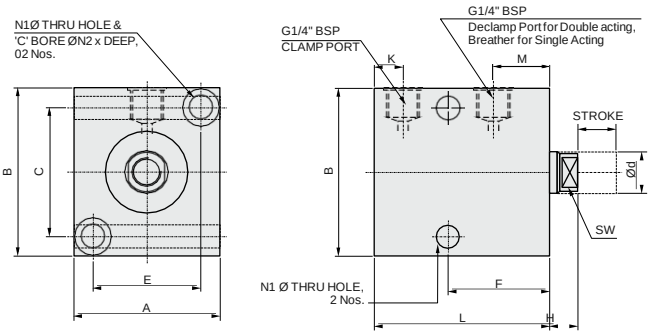
Theoretical Push & Pull Force Chart

Operating pressure at kg/sq. cm				Theoretical force (at Mechanical efficiency = 100%)							
				50		80		100		160	
Piston dia mm	Rod dia mm	Piston area sq. cm	Rod area sq. cm	Push kgf	Pull kgf	Push kgf	Pull kgf	Push kgf	Pull kgf	Push kgf	Pull kgf
25	12	4.91	1.13	245.47	188.91	392.75	302.26	490.94	377.83	785.50	604.52
	16		2.55		118.22		189.15		236.44		378.30
32	18	8.04	1.54	402.18	325.20	643.48	520.32	804.35	650.39	1286.96	1040.63
	20		3.80		212.09		339.34		424.17		678.67
40	18	12.57	2.55	628.40	501.15	1005.44	801.842	1256.80	1002.30	2010.88	1603.68
	25		6.16		320.48		512.77		640.97		1025.55
50	22	19.64	3.80	981.88	791.78	1571.00	1266.85	1963.75	1583.57	3142.00	2533.71
	25		10.18		472.87		756.59		945.74		1513.19
63	28	31.18	6.16	1558.82	1250.91	2494.12	2001.45	3117.65	2501.82	4988.24	4002.91
	35		15.91		763.51		1221.61		1527.01		2443.22
80	36	50.27	10.18	2513.60	2004.60	4021.76	3207.35	5027.20	4009.19	8043.52	6414.71
	45		24.63		1281.94		2051.10		2563.87		4102.20
100	45	78.55	15.91	3927.50	3132.18	6284.00	5011.49	7855.00	6264.36	12568.00	10022.98
	70		38.49		2003.03		3204.84		4006.05		6409.68
125	56	122.73	24.63	6136.72	490.51	9818.75	7848.09	12273.44	9810.11	19637.50	15696.18
	90		63.63		2955.44		4728.71		5910.89		9457.42
160	70	201.09	38.49	10054.40	8129.93	16087.04	13007.88	20108.80	16259.85	32174.08	26015.76
	110		95.05		5302.13		8483.40		10604.25		16966.80
200	90	314.20	63.63	15710.00	12528.73	25136.00	20045.96	31420.00	25057.45	50272.00	40091.92
	130		153.96		8012.10		12819.36		16024.20		25638.72

Note : Special orders as per customer specifications are also accepted.

Block Cylinder
Double Acting / Single Acting (Spring Return), Push Type





All dimensions in mm.

Overall dimension tolerance ±0.5 mm

Description

Block cylinders are widely used in work holding fixtures and other short stroke applications.

Advantages

As compared to the tie rod construction cylinders, these cylinders are very compact, due to the internal construction. These cylinders are versatile, i.e. they can be mounted in many different ways.

Versions

Two versions are available in all models.

- Double-acting
- Single-acting push type with spring return

Installation

The cylinder can be mounted on the front side (rod side), rear side and side faces, as shown in figures.

Specifications

Maximum operating pressure - 200 bar

Note

- For side mounting, positive stopper should be provided to reduce the load on the clamping bolts (fig.3).
- For the single-acting, spring return cylinder a breather is provided. It should be protected from cutting liquids and coolants.
- For ordering the seal kit, add the prefix 's' to the part number.

Force Push	7.5kn	19kn	46.5kn
Force Full	4.5kn	11.5kn	28kn
A	45	62	95
B	65	85	120
C	50	63	90
D	16	25	40
E	30	40	65
F	39.5	48.5	65.5
H	12	15	20
J	M10 x 15 Deep	M16 x 30 Deep	M24 x 30 Deep
K	11	11.5	15
M	22	27	39.5
N1	9	11	17
N2	14	17.5	25
P	9	11	17
SW	13	20	32

Double-acting cylinder						
Part No.	2110100	2110200	2120100	2120200	2130100	2130200
Stroke ±1	20	50	20	50	20	50
L	68	98	81	111	105	135
Oil Vol. Push	10 cc	25 cc	25 cc	63 cc	63 cc	156 cc
Oil Vol. Pull	6 cc	15 cc	15 cc	38 cc	37 cc	93 cc
Weight	1.5kg	2.3kg	2.5kg	3.5kg	9.6kg	12.3kg

Single-acting push type spring return cylinder						
Part No.	2310100	2310200	2320100	2320200	2330100	2330200
Stroke ±1	15	30	15	30	15	30
L	68	98	81	111	105	135
Oil Vol. Push	8 cc	15 cc	19 cc	38 cc	48 cc	95 cc
Spring Force	110 N	100 N	300 N	280 N	425N	400 N
Weight	1.5kg	2.3kg	2.5kg	3.5kg	9.6kg	12.3kg

Figure 01

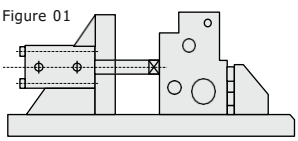


Figure 02

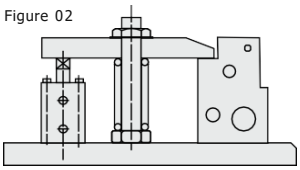
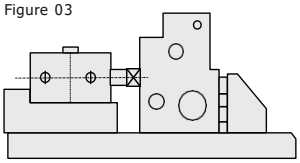


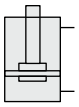
Figure 03

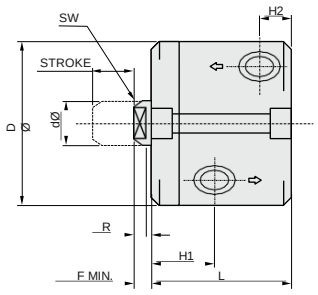


Note : Special orders as per customer specifications are also accepted.

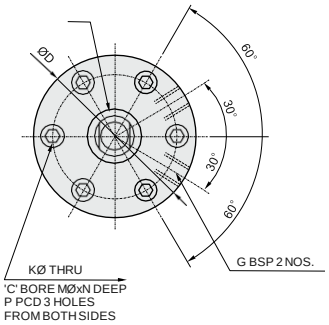
All dimensions in mm unless otherwise stated.

Compact Cylinder
Double Acting / Single Acting Rod End





All dimensions in mm



Overall dimension tolerance ±0.5 mm

Description

Compact cylinders are solid piston, double acting cylinders and are very compact in the axial direction.

Advantages

- These cylinders are used where height is a constraint.
- Mounting of the cylinder is very easy.

Specifications

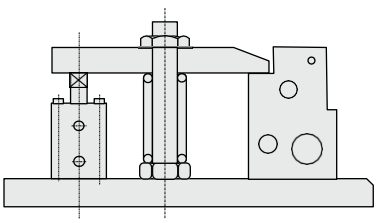
- Maximum operating pressure - 150 bar
- Double rod end cylinders can be available on request.

Note

- Due to compact design, port thread depth is short. Reduce the standard connector thread length to suit the port depth.
- For ordering the seal kit, add the prefix 's' to the part number.

Force Push	4.7kn	12kn	19kn	29kn
Force Pull	3kn	9kn	14kn	22kn
Bore Ø	20	32	40	50
E	M6 x 10 deep	M10 x 18 deep	M12 x 20 deep	M16 x 25 deep
F	5	5	6	6
d	12	16	20	25
D	45	65	76	95
G	1/8"	1/8"	1/4"	1/4"
SW	10	14	17	22
H1	15	17	22	26
H2	9	9	12	12
R	3.5	3.5	4	4
K	4.5	6.6	9	11
M	8	11	14	17.5
N	4.4	6.5	8.6	10.8
P	35	50	60	75

Application example



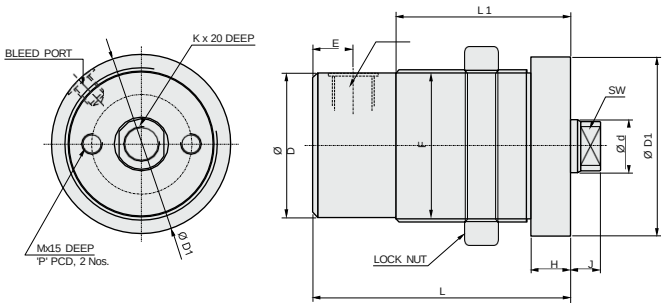
Part No.	2710100	2720100	2730100	2740100
Stroke ±1	10	10	10	10
L	36	42	50	56
Oil Vol. Push	3 cc	8 cc	13 cc	20 cc
Oil Vol. Pull	2 cc	15 cc	10 cc	15 cc
Weight	0.5kg	1kg	1.5kg	2kg

Part No.	2710200	2720200	2730200	2740200
Stroke ±1	25	25	25	25
L	51	57	65	71
Oil Vol. Push	8 cc	206 cc	31 cc	49 cc
Oil Vol. Pull	5 cc	15 cc	24 cc	37 cc
Weight	0.6kg	1.5kg	2kg	3.5kg

Note : Special orders as per customer specifications are also accepted.

All dimensions in mm unless otherwise stated.

Threaded Body Cylinder
Single Acting (Spring Return), Push Type



All dimensions in mm

Overall dimension tolerance ±0.5 mm

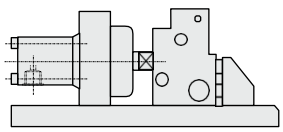
Description
Solid piston threaded body cylinder is single acting, spring return cylinder, suitable to use with hydro-pneumatic intensifier.

Advantages
- The cylinder is most simple in construction and very easy for maintenance.
- The piston force can be directly used for clamping (fig.1) The piston force can be increased by using a clamping strap leverage (fig.2)

Installation
The cylinder can be mounted in two ways

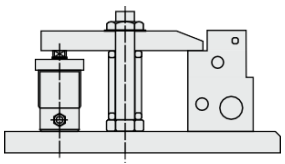
1. Against front collar with thread lock nut - Front mounting

Figure 01



2. With back mounting holes - Rear mounting

Figure 02



Specifications
- Maximum oil pressure 200 bar
- Return spring back pressure @ 1 bar

Note
- As the cylinder is single acting spring return, a breather is provided. It should be protected from cutting fluid and coolant.
- Heavy extensions to piston rod can influence return stroke of the cylinder.
- Lock nut has to be ordered separately.
- For ordering the seal kit, add the prefix 's' to the part number.

Note : Special orders as per customer specifications are also accepted.

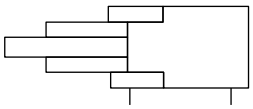
Force	3kn	5kn	10kn	18kn	30kn	30kn	50kn
Ø Bore	16	20	30	40	50	50	65
D	21.8	27.5	43.5	54.5	67.5	67.5	83
d	9.52	11.09	15.87	20.6	25.4	25.4	34.9
D1	30	36	56	65	78	78	96
E	9	10	12	12	14	14	14
F	M24x2P	M30x2P	M46x2P	M57x2P	M70x2P	M70x2P	M86x2P
G	1/8"	1/8"	1/4"	1/4"	3/8"	3/8"	3/8"
H	12	12	12	12	12	12	15
J	7	8	9	13	15	15	20
K	M6	M6	M10	M12	M16	M16	M16
M	—	M6	M6	M8	M10	M10	M12
P	—	20	30	36	48	48	56
SW	8	10	13	18	21	21	30

Part No.	1710100	1720100	1730100	1740100	1750100	1750100	1760100
Stroke ±1	15	10	10	10	10	50	25
L	78	70	72	77	81	160	110
L1	58	49	47	52	54	90	83
Min. Spring Force	79.8N	131N	197N	265N	461N	321.8N	516.3N
Oil Vol. Pull	3 cc	3 cc	7 cc	13 cc	20 cc	100 cc	84 cc
Weight	0.25kg	0.5kg	1kg	1.5kg	2kg	3.5kg	4.8kg

Part No.	—	1720200	1730200	1740200	1750200	1750200	1760200
Stroke ±1	—	25	25	25	25	100	50
L	—	98	102	105	110	260	160
L1	—	65	77	80	83	140	90
Min. Spring Force	—	110.38N	179.0N	245.5N	404N	269N	529.7N
Oil Vol. Pull	—	8 cc	18 cc	31 cc	50 cc	200 cc	166 cc
Weight	—	0.7kg	1.25kg	2kg	3kg	5.2kg	6.5kg

Hydraulic Telescopic Cylinders

Hydraulic Telescopic Cylinders
Single Acting/Double Acting 2, 3, 4 Stages



Introduction

Telescopic cylinders are specially designed hydraulic cylinders that provide an exceptionally long output travel from a very compact retracted length. Typically, the collapsed length of a telescopic cylinder is 20% to 40% of the fully extended length depending on the number of stages.

- This feature is very special for machine design engineers when a conventional single-stage rod-style actuator does not fit in an application to produce the required output stroke.

- Telescopic cylinders are usually powered by hydraulics, but some special light duty designs are powered by compressed air.

- Telescopic cylinders are referred to as single-stage telescopic cylinders and multi-stage telescopic cylinders. A common application for telescopic cylinders on a construction site is that of the dumping on a dump truck. In order to empty the load of gravel completely, the dump body must be raised to an angle of about 60º. To accomplish this long travel with a conventional hydraulic cylinder is very difficult considering that the collapsed length of a single-stage rod cylinder is approximately 110% of its output stroke.

- It would be very challenging for the design engineer to fit the single-stage cylinder into the chassis of the dump truck with the dump body in the horizontal rest position. This task is easily accomplished, however, using a telescopic style multi-stage cylinder.

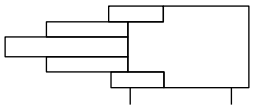
Design and Technical Terminology

Showing the telescopic principle, an object collapsed (top) and extended (bottom), providing more reach. Telescopic cylinders are designed with a series of steel tubes of progressively smaller diameters nested within each other. The largest diameter sleeve is called the main or barrel. The smaller inner sleeves are called the stages. The smallest stage is often called the plunger. The cylinders are usually mounted in machinery by pivot mounts welded to the end or outer body of the barrel as well as on the end of the plunger.

Telescopic cylinders can be built with as many as 6 stages. Six stages seem to be a practical design limit as stability problems become more difficult with larger numbers of stages. Telescopic cylinders require a careful design as they are subjected to large side forces especially at full extension. The weight of the steel bodies and the hydraulic oil contained within the actuator create moment loads on the bearing surfaces between stages. These forces, combined with the load being pushed, threaten to bind or even buckle the telescopic assembly. Sufficient bearing surfaces must only be used in machinery as a device for providing force and travel. Side forces and moment loads must be minimized. Telescopic cylinders should not be used to stabilize a structural component.

Telescopic cylinders are often limited to a maximum hydraulic pressure of 2000-3000 psi. This is because the outward forces produced by internal hydraulic pressure tend to expand the steel sleeve sections. Too much pressure will cause the nested sleeves to balloon outward, bind the mechanism and stop moving. The danger exists that a permanent deformation of the outer diameter of a sleeve could occur, thus ruining a telescopic actuator. For this reason, care must be taken to avoid shock pressures in a hydraulic system using telescopic cylinders. Often such hydraulic systems are equipped with shock suppressing components such as hydraulic accumulators to absorb pressure spikes.

Hydraulic Telescopic Cylinders
Single Acting/Double Acting 2, 3, 4 Stages



Basic Design - Types of Telescopic Cylinders

Telescopic cylinders can usually be classified into two basic designs: Single acting and double acting. A number of other special designs also exist including a hybrid single / double acting design and a constant speed, constant thrust design.

• Single Acting

Single acting telescopic cylinders are the simplest and most common design. As with a single acting rod style cylinder the single acting telescopic cylinder is extended using hydraulic pressure, but retracts using external forces when the hydraulic pressure is removed and relieved to the reservoir. This external retraction force is usually gravity acting on the weight of the load. This external weight must obviously be sufficient to overcome the friction and mechanical losses within the machine design even after the work portion of the machine cycle has been accomplished. In the example above of the dump truck, the weight of the dump body now raised at an angle of 60º, but empty of the load, must be enough to force the un-pressurized hydraulic fluid out of the cylinder and cause it to retract to the fully collapsed position.

• Double Acting

A double acting cylinder is extended and retracted using hydraulic pressure in both directions. Double acting telescopic cylinders are thus much more complex in design than the single acting type. This additional complexity is due to the requirement of adding retracting piston faces to all of the cylinder stages and the difficulty in supplying pressurized fluid to the retraction pistons of the intermediate stages.

To accomplish the double acting feature, additional hydraulic seals are added to internally seal off the individual stages. In addition, internal oil passageways are machined, so that as each stage completes retracting, an oil passage is opened to supply the next stage with pressurized fluid to retract. Thus, a double acting telescopic actuator usually retracts starting from the smallest diameter stage to finish with the largest stage retracting lastly. Because the seals used to accomplish this must pass over these internally machined fluid transfer holes, the seals are usually made from hard materials to resist wear and abrasion. They are often iron rings or glass reinforced nylon seals.

The extension and retraction fluid supply ports on double acting telescopic cylinders are usually located at the opposite ends of the cylinder's assembly. The extension port is mounted at the base of the outer barrel and the retraction port is mounted in the end of the plunger section. This can, in some applications, prove to be very difficult to connect with hydraulic hoses due to the distance between these ports at full extension. In such a circumstance, both ports can be located in the barrel. An internal passageway must be fitted however, so that the retracting fluid is supplied to the plunger section at full extension. This special passageway is in itself a telescopic assembly that extends with the cylinder and is outfitted with seals on the various stages.

This additional complexity makes double acting telescopic cylinders very expensive. They are usually custom-designed for each application. Typical applications of double acting telescopic cylinders include the packer-ejector cylinders in garbage trucks and transfer trailers, horizontal compactors, telescopic excavator shovels and roll-on/roll-off trucks. In all of these applications, the cylinder operates near horizontally and thus is usually not available to retract the actuator. A double acting design is, therefore, required to both push and pull the telescoping mechanism.

Care must be taken when controlling most double acting telescopic cylinders. The effective retraction area is often much less than the extension area. Thus, if the hydraulic fluid return line is blocked during extension, a pressure-intensifying effect can occur, causing seal failure or even causing the metal sleeve to balloon outward. The cylinder could thus be rendered unable to retract because of failed seals or jam in position due to binding.

Another problem can occur if a double acting telescopic cylinder encounters a load that pulls on the actuator during extension such as when a tilting load goes over center and opens the cylinder beyond the internal volume of the hydraulic oil. When the piston face catches up again and strikes the oil column a pressure spike occurs which can damage the actuator.

Single/Double Acting Combination

In some unique applications, a single acting telescopic cylinder is adequate to accomplish the work except for one stage that is required to be double acting.

An example of this is erecting the most of a large mobile drilling rig. The mast is erected to the vertical position using a telescopic cylinder. However, to lower the mast gravity is not available for the initial tilt back from the vertical position. Thus, the plunger stage only of the telescopic actuator is equipped as a double acting cylinder to provide the initial force to pull the mast back from vertical. Once the tilt back has been initiated, then gravity takes over and supplies the force to complete the full cylinder retraction. The remaining stages, therefore, are single acting. This special combination is much less complex and much less costly than using an entirely double acting design.

Constant Thrust Constant Speed

In some applications, a telescopic cylinder is required to extend with a constant force or constant speed. To accomplish this, the cylinder is designed so that all the stages extend at the same time. This can also be accomplished in a double acting design by matching the extension and retraction areas of the pistons on all the stages.

Piston Rod Sizes & Stop Tube

Piston Rod Sizes and Stop Tube

Piston Rod Size Selection

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

- Determine the type of cylinder mounting style and rod end connection to be used. Consult the Stroke Factor table and determine which factor corresponds to the application.
- Using the appropriate stroke factor, determine the 'basic length' from the equation : Basic Length = Net 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'.)
- 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
- 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.

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

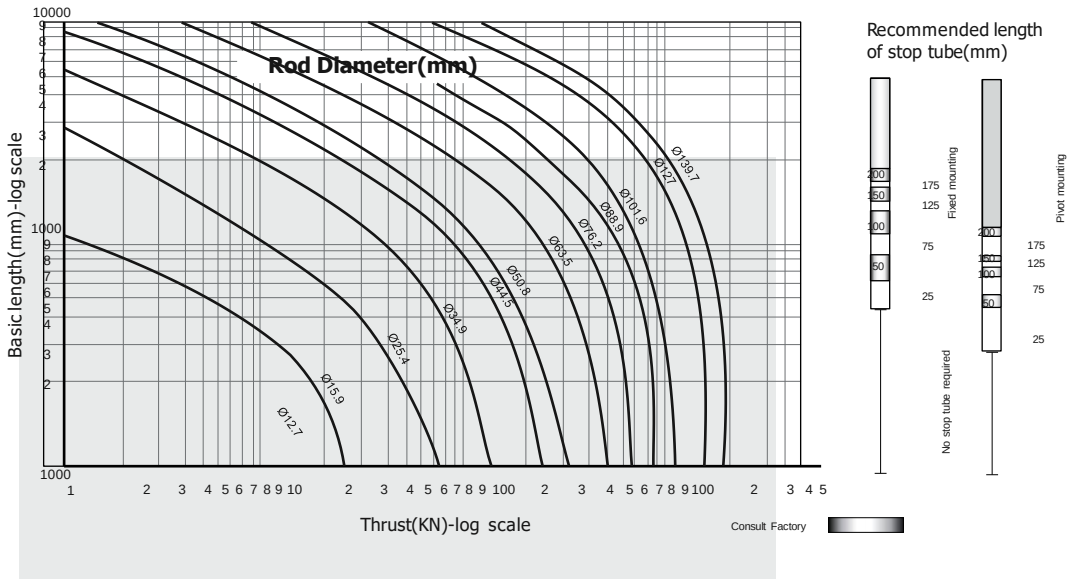
Stop Tube

Stop tubes prevent the cylinder from completing its full stroke, to provide a spread between the piston and the rod bearing at full extension. Note that stop tube requirements differ for fixed and pivot mounting cylinders. The required length of stop tube, where necessary, is read from the vertical columns on the right of the graph by following the horizontal band within which the point of intersection lies. If the required length of stop tube is in the region labeled 'consult factory', please supply the following:

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

The correct piston rod size is read from the diagonally curved lines labeled Rod Diameter above the point of intersection.

Pistion rod selection chart



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11. **Improper use and Indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.
12. **Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.
13. **Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.
14. **Force Majeure.** Seller does not assume the risk 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, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.
15. **Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provi- sions of this agreement will remain in full force and effect.
16. **Termination.** Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appointments a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) dissolves or liquidates all or a majority of its assets.
17. **Governing Law.** This agreement and the sale and delivery of all Products here- under shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the Government of India, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Satara, Maharashtra with respect to any dispute, controversy or claim arising out of or relating to this agreement.
18. **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 Section. Seller will defend and indemnify Buyer against allegations of infringement of patents, trademarks, copyrights, trade dress and trade secrets ("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 a Product sold pursuant to this Agreement 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 negotia- tions for settlement or compromise. If a Product 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 the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the fore- going, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products 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 Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.
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