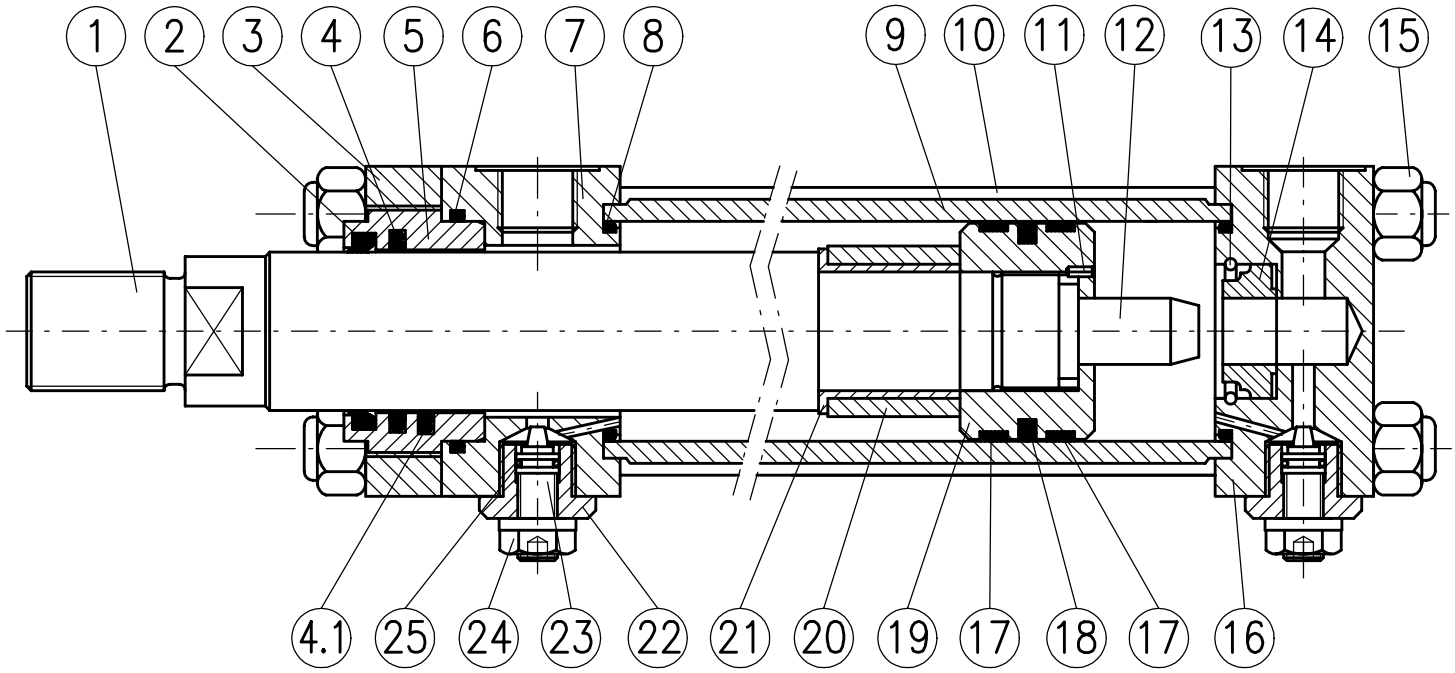
CYLINDERS SERIES CH

According to ISO 6020/2 – 1991 – DIN 24554, compact series 160 bar

Working pressure up to 21 Mpa
Maximum pressure 25 Mpa
Working temperature –20 to 80°C
Stroke tolerance 0 to 1.2mm for strokes up to 1000mm, 0 to 2.5mm for longer strokes
10 bores, 25 to 200mm
up to 3 rods per bore

ON DEMAND:
End of stroke braking, adjustable on both ends
Drainage on the rod
Double rod seals
Special seals fit for a wide range of fluids and temperatures
Inductive proximity sensors for end of stroke control
Air vents on both ends



POS	ITEM	MATERIAL	POS	ITEM	MATERIAL
1	Rod	Chromium-plated steel	13	Rear flashing ring	Steel
2	Dust scraper	Polyurethane	14	Rear brake bushing	Bronze
3	Flange	Steel	15	Self-braking nut	Steel
4	Rod seal	Polyurethane/PTFE	16	Rear head	Steel
4,1	2nd Rod seal (option L)	Nitrile rubber and PTFE	17	Anti-friction slide	PTFE
5	Guide bushing	Cast iron	18	Piston seal	Polyurethane/PTFE
6	O-Ring + PBK	Nitrile rub.+polyurethane	19	Piston	Steel
7	Head	Steel	20	Front brake bushing	Steel
8	O-Ring + PBK	Nitrile rub.+polyurethane	21	Spacer	Steel
9	Liner	Steel	22	Safety plug	Steel
10	Tie rod	Steel	23	Adjustment needle	Steel
11	Safety pin	Steel	24	Locknut	Steel
12	Brake spur	Steel	25	O-Ring	Nitrile rubber

TECHNICAL CHARACTERISTICS

CHOOSING THE PRODUCTION SERIES

In order to identify the production series, make sure that, while the plant is working, the operating pressures indicated for each series are not exceeded. The general dimensioning of the cylinder ensures wide safety margins. Do not exceed the maximum pressure value that corresponds to the test pressure, considering also any overpressure caused by throttle valves in the circuits and/or by vertical loads (with downward rods) and end of stroke braking (see paragraph 1.7). We recommend that you adopt strokes longer (by a few millimeters) than the working stroke, in order to prevent the use of the use of the cylinder's internal stops as a mechanical end of stroke. Also check that the expected working temperature and speed are consistent with the type of seals installed.

1.1 HYDRAULIC CYLINDERS – SERIES CH

The CH hydraulic cylinders, dimensioned according to standard ISO 6020/2 – DIN 24554, represent the future use of hydraulic actuators.

- manufactured according to CNC technology, with top-quality materials, they provide maximum reliability and duration
- the use of standard components during assembly facilitates the replacement of any worn components
- they can be equipped with progressive braking of rear and front end of stroke, consisting of self-centering spurs that can slow-down gradually the masses concerned, even of considerable size. Dynamic reliable standard seals are used, that are easy to find on the market and can be modified according to the requested application.

1.2 RANGE OF USE OF CH CYLINDERS

- maximum pressure 25 Mpa (250 bar)
- pressure up to 21 Mpa (210 bar)

1.3 CYLINDER LINER

The cylinder liner is made up of a top-quality thick steel pipe, either cold-drawn or hot-rolled, provided with internal micro-finish (roughness RA $\leq$ 0.4 micron, diameter tolerance H9).

1.4 ROD

Rods are made with top-quality steel, minimum yield point 700 N/mm^2, coated with hard chrome. This surface treatment ensures proper protection against any damage and long-life seals. The minimum surface finish is 0.2 micron. Rods with strong chrome filling, induction-hardened or made of special steel, can be manufactured on demand.

1.5 HEADS

Heads are made of steel and are manufactured in such a way that they can ensure perfect concentricity between the cylinder liner, the rod bushing and the rod. Wide inner passages are manufactured to minimize any load loss when the fluid is conveyed.

1.6 POSITION OF CONNECTIONS, AIR VENTS AND DAMPING REGULATION

In all models, apart from PI, connections are arranged on side 1, damping regulations on side 3 and air vents on side 2.
For PI execution, connections are positioned on side 1, the damping adjustment on side 4, the air vents on side 2.
For special positioning requirements, contact our Technical Department.

1.7 PISTON

The piston is made with a special material, specially processed to ensure a concentric guide between rod damping bushing, cylinder liner and head damping bushing.

Moreover, a large part of its radial surface touches the cylinder liner. This confers considerable stability, so that any rod bending, caused by external radial loads, is minimized.

1.8 END OF STROKE BRAKING

The end of stroke braking is usually adopted on all cylinders working at a speed > 0.1 m/sec., or when loads in vertical direction are activated.
This braking is also a safety device in case of failure of control equipment (such as servosystems).
The ratio below makes it possible to promptly calculate, based on the cylinder bore (braking section), the supply pressure, the braking length and the working speed, as well as the mass that can be damped by every single cylinder.
This reaction limits the overpressure value to 250 bar, protecting the cylinder's components that are under stress during braking.

$$M = \frac{(p_2 \cdot S - p_1 \cdot A) \cdot 2 \cdot L_f}{V_0^2} \cdot 10^{-2} \text{ [kg]}$$

p_1 = supply pressure (bar)
V_0 = working speed (m/sec.)
L_1 = Braking length L_{f1} or L_{f2} (mm)
p_2 = maximum pressure 250 bar
S = braking section S_1 or S_2 (cm^2)
A = piston area (cm^2)

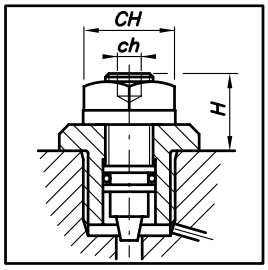
The damped mass values obtained from this ratio are simply theoretical, and Grices may not be held liable for the use of this ratio.
The data to be inserted in the ratio to calculate the mass that can be damped may be obtained from the following table

Bore (mm)	**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**
S_1 (cm^2) rod forward	1,77	3,52	5,50	7,68	13,07	21,98	35,51	51,81	98,94	144,37
S_2 (cm^2) rod backward	4,52	6,91	11,43	18,5	29,39	46,45	74,70	118,86	190,79	303,83
L_{f1} (mm) rod forward	19	19	28	29	29	29	31	31	35	38
L_{f2} (mm) rod backward	19	19	28	29	29	29	29	29	40	40
A (cm^2)	4,9	8	12,6	19,6	31,2	50,3	78,5	122,7	201,1	314,2

1.9 DAMPING ADJUSTMENT

For a precise damping adjustment, both ends of the cylinder are equipped with needle valves, as indicated in the figures below. These devices are provided with a system that prevents their accidental removal. They are also equipped with a SEAL-LOCK locknut, that must be carefully tightened after adjustment, to ensure perfect sealing. The table below shows the dimensions and typology of such devices, based on the cylinder bore.

Bores	**H** (mm)	**CH** (mm)	**ch** (mm)
25-32	Fixed braking		
40 to 200	18	17	5



1.10 SPACERS

Cylinders with strokes > 1000mm should feature spacers of adequate design, so as increase the rod and piston guide, in order to reduce any overload phenomena, resulting in early wear.
The table on the right indicates the spacer length based on stroke; for the stroke values not included in the table, contact our technicians. As a general rule, spacers are not mounted on cylinders when strokes are < 1000mm and on cylinders subjected to only one pulling action.

STROKE (mm)	**1001 to 1500**	**1501 to 2000**	**2001 to 2500**	**2501 to 3000**
Spacer symbol	1	2	3	4
Length (mm)	50	100	150	200

1.11 SEALS

On the basis of particular working conditions of the cylinders, such as speed, fluid used and temperature, the relevant seal shall be chosen in conformity with the manufacturer's recommendations.
Our cylinders feature seals provided with seats conforming to the provisions of ISO 7425, that allow our cylinders to work under the heaviest conditions, such as very low or high speed, heavy working, mineral or synthetic fluids.
The type of seals to be used in the relevant working conditions are indicated below.

TYPE A (STANDARD), usually supplied in the absence of particular recommendations, considerable sealing at low pressure, to be used for speeds up to 0.5 m/sec., at temperatures ranging between –20 and +80°C, operation with mineral oil, air, nitrogen.

TYPE B (LOW FRICTION), anti-friction, not recommended when loads are to be held in position, and recommended at speeds up to 4 m/sec., at temperatures ranging between –20 and +80°C, operation with mineral oil, air, nitrogen.

TYPE C (LOW FRICTION, VITON), anti-friction, not recommended when loads are to be held in position, and recommended at speeds up to 4 m/sec., at temperatures ranging between –20 and +135°C, operation with phosphoric ester-based fire-retardant fluids.

TYPE E (CGR + PTFE), anti-friction, not recommended when loads are to be held in position, and recommended at speeds up to 4 m/sec., at temperatures ranging between –20 and +60°C, operation with water-glycol.

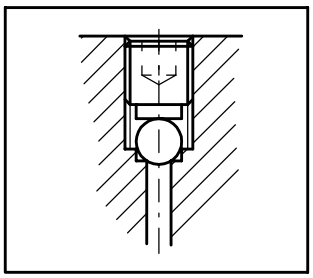
1.12 OIL PORTS

In order to reduce any turbulence and water hammer in the cylinder's connecting pipes as much as possible, we recommend that you ensure that the oil speed does not exceed 6 m/sec. The maximum flow rates that can be obtained with these criteria are shown in the table below.

OIL PORT ∅	1/4"	3/8"	1/2"	3/4"	1"	1 ¼"
MAX. FLOW RATE. (l/min)	14	28	48	63	102	162

1.13 AIR VENTS

Air vents are provided on demand on both ends of the cylinder. Vents are mounted inside the head and the bottom, so as to be protected from any accidental removal, as shown in the figure on the right.
To drain the system, unscrew the nut, discharge the air and close it again, carefully checking its sealing.



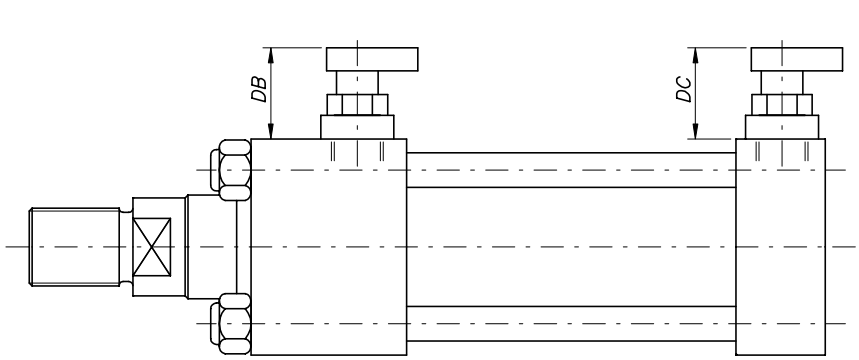
1.14 DRAINAGE

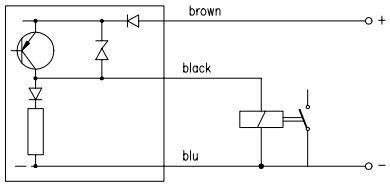
The drainage on the rod seal ensures better sealing at high speed, in particular in cylinders with strokes > 2000mm or in applications where the chamber, rod side, is constantly under pressure.
The drainage port (1/8") is usually positioned on the same axis of the supply port and must be directly connected to the tank. For any further explanations on this matter, please contact our Technical Department.

1.15 PROXIMITY SENSORS

When the piston position is to be detected in any hydraulic system, some proximity sensors can be directly mounted in the cylinder heads. The mounting temperature is –25 to +80°C. Permissible dynamic pressure 350 bar. The sensor is provided with a built-in amplifier, with direct supply (10 to 30Vdc), analog output PNP for 200mA max., supplied complete with connector with cable (4m long).
Sensors can be mounted on head and bottom, for bores up to 200mm, and are arranged on side 2 of the cylinder. They make it possible to obtain an electric signal near the end of stroke positioning of the piston.

Bore (mm)	DB_{max} (mm)	DC_{max} (mm)
40	77	67
50	75	71
63	72	65
80	74	71
100	73	65
125	71	51
160	71	34
200	67	20





Thechnical data of sensor:

Working temperature	−25 +80 °C
Supply voltage	10−30 V dc
Load	200 mA
Execution	PNP
Output type	NA

RESTRICTIONS

- in OA and FA execution, the sensor is mounted on the head on side 3, facing the supply, and does not allow the mounting of damping adjustment;
- in PI execution (bores 40 – 50 – 63), sensors are removed for fastening the feet's screws and then re-mounted, for all bores, in the presence of air vents they are arranged on the side of the damping adjustment;
- in Op and FP execution, the sensor is mounted on the bottom on side 3 facing the supply, and does not allow the mounting of damping adjustment;
- for 25 and 32mm bores, the proximity sensors are not provided.

2.1 PEAK LOAD

When the cylinder is working under compression, check the peak load. Table **1** shows the most common types of restriction. Each of them is associated to a coefficient **K**. The maximum stroke of cylinder L multiplied by coefficient **K** produces the L_v value (virtual length, L_v **= L*K**). Graph **2** indicates the rod's minimum diameter, based on load. The point of intersection between L_v in mm. and pushing force F in KN must be below the characteristic curve of the rod to be checked.
Example:
cylinder CD63/28/750/FA/00B (front flange), that exerts a 55 KN pressure. Table **1** shows coefficient **K**, determined by the type of restriction **K = 2**, the virtual length is L_v **= L*K** L_v **= 750*2 = 1500 mm**
In graph **2** you can check whether the point of intersection between L_v and **F** is below the curve of rod Ø 28. Since the stability condition has not been met, adopt the differential rod Ø 45. The cylinder CD63/45/750FA00B will be therefore selected, for which the stability condition has been met.

Graph 2

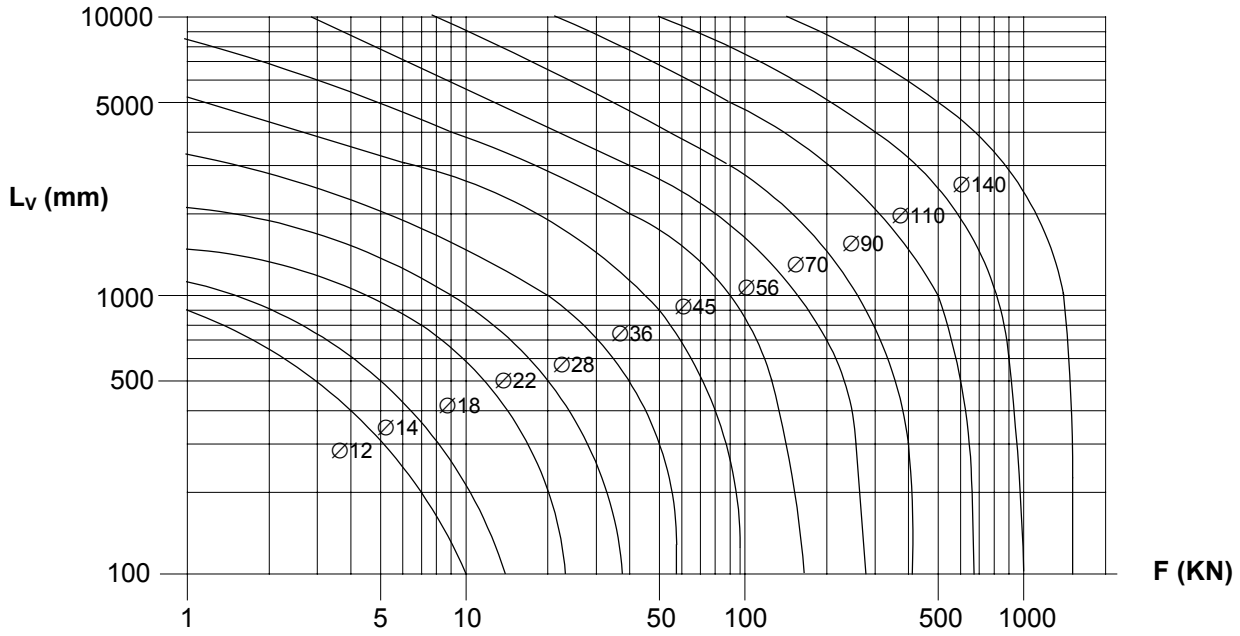
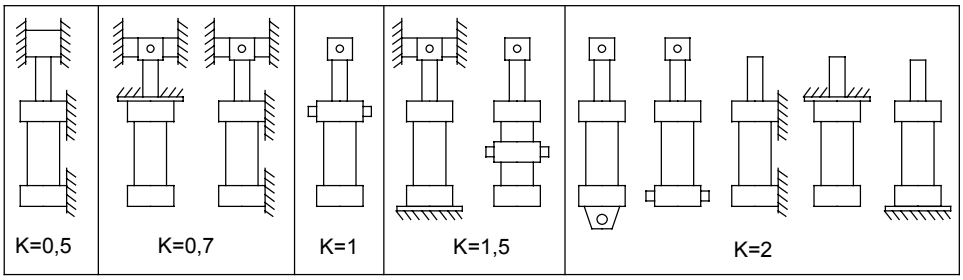
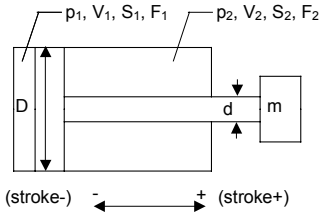


Table 1





2.2 PRACTICAL UNIT OF MEASUREMENT FOR FORCE AND SPEED CALCULATION

DESCRIPTION	SYMBOL	UNIT OF MEASURE
Section	S	cm^2
Pressure	p	bar
∅ piston	D	mm
∅ rod	d	mm
Speed	V	m/s
Capacity	Q	l/min
Load	m	kg

PUSHING FORCE (**STROKE +**)

$F_1=(p_1 \bullet S_1)$ (Kg)

PULLING FORCE (**STROKE -**)

$F_2=(p_2 \bullet S_2)$ (Kg)

PUSHING SPEED (**STROKE +**)

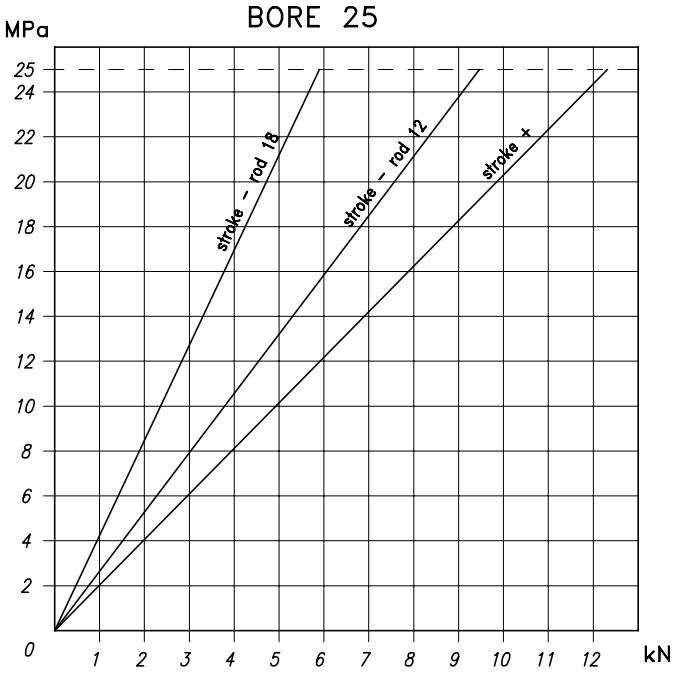
$V_1=Q/(6 \bullet S_1)$ (m/s)

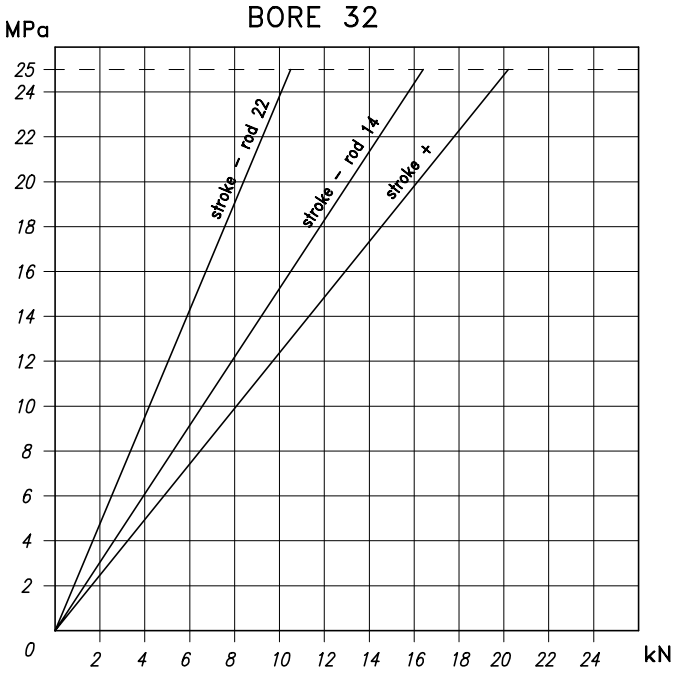
PULLING SPEED (**STROKE -**)

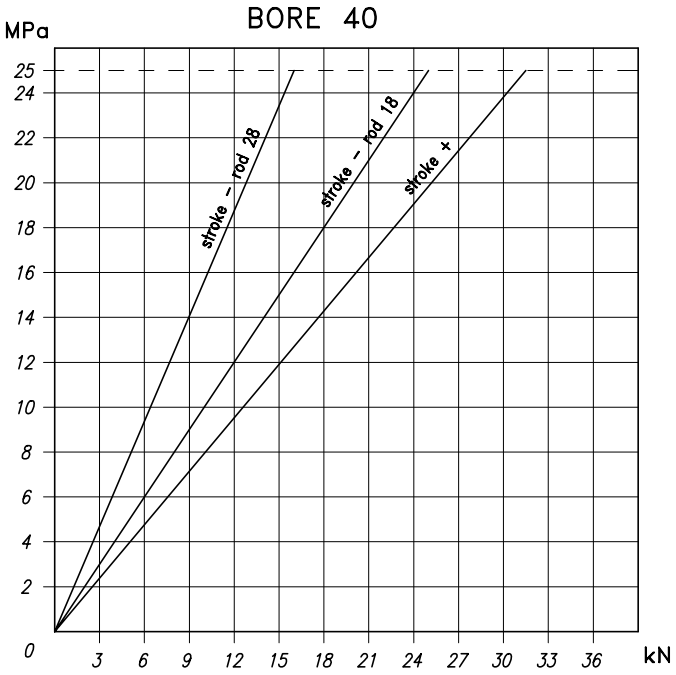
$V_2=Q/(6 \bullet S_2)$ (m/s)

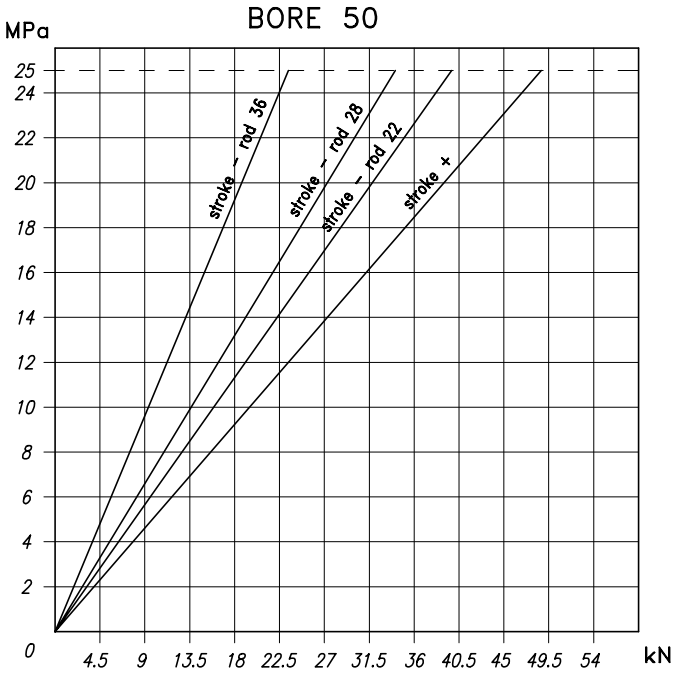
$$S_1 = \frac{\pi \bullet D^2}{4 \bullet 100} \ (cm^2) \qquad S_2 = \frac{\pi \bullet (D^2 - d^2)}{4 \bullet 100} \ (cm^2)$$

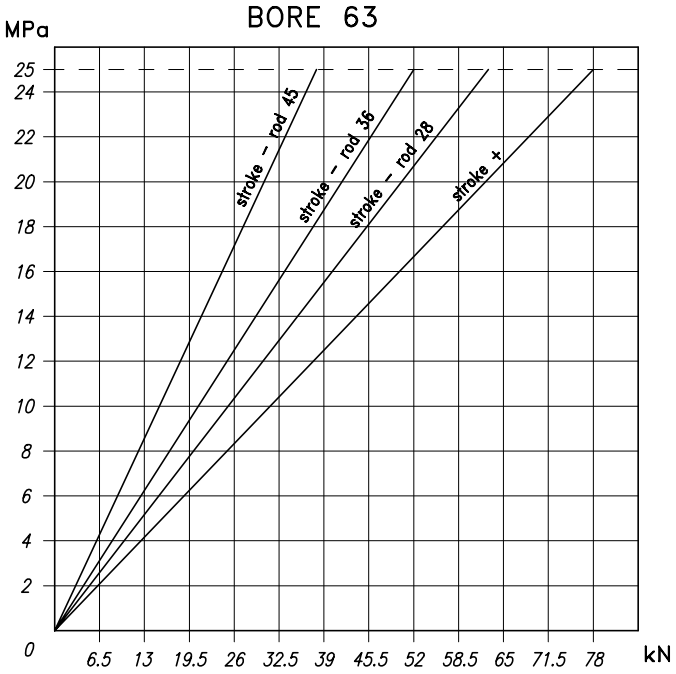
2.3 FORCE/PRESSURE DIAGRAMS

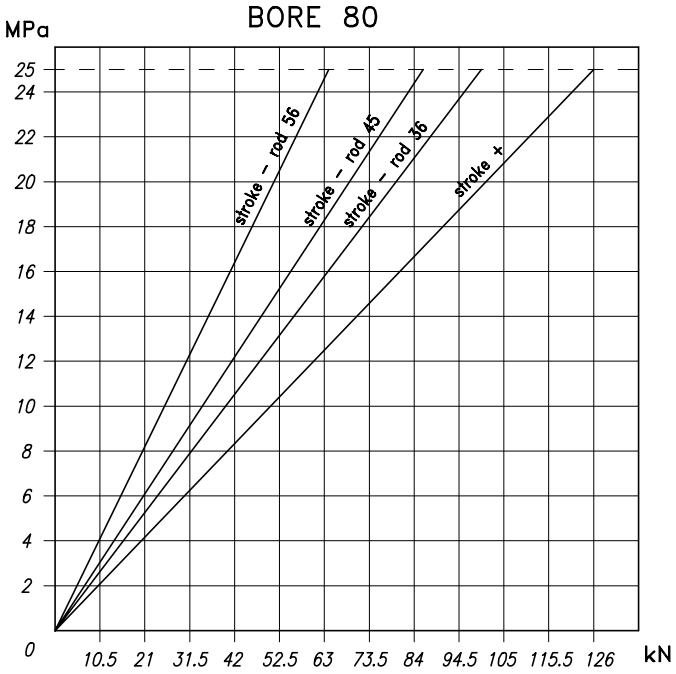


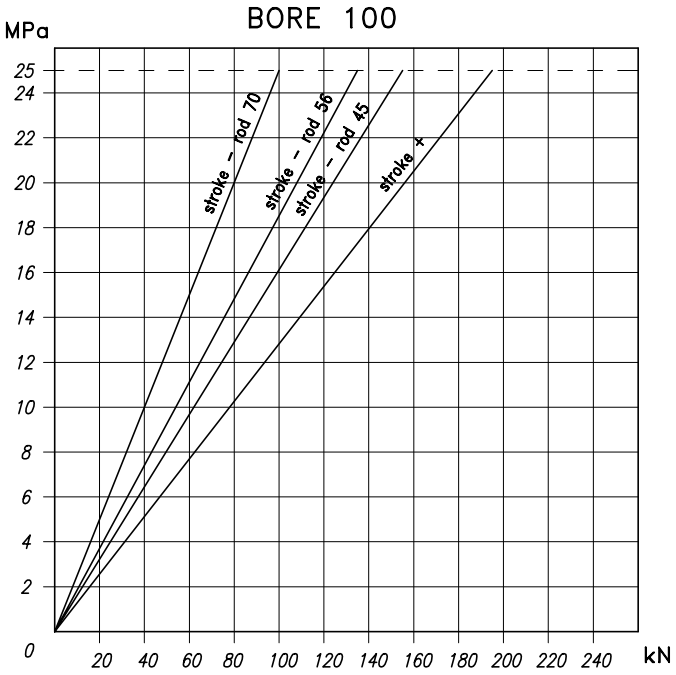


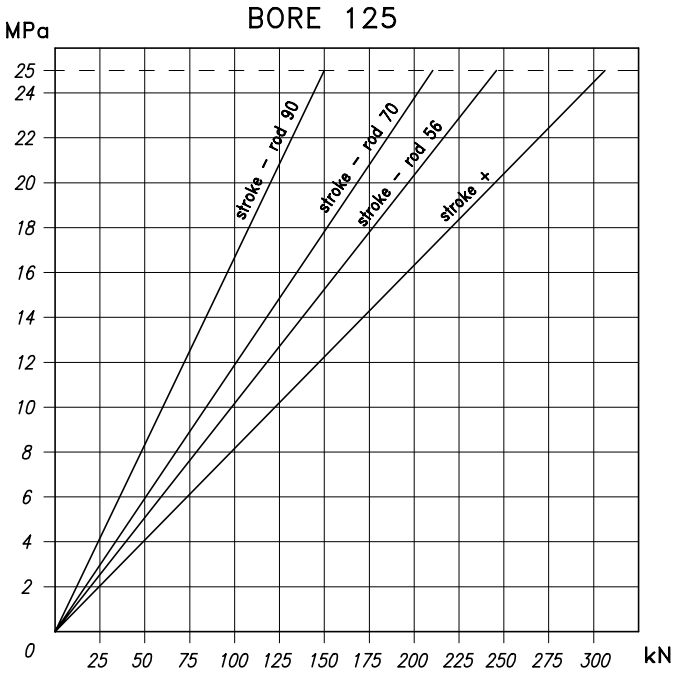

BORE 40
MPa
25
24
22
20
18
16
14
12
10
8
6
4
2
0
stroke - rod 28
stroke - rod 18
stroke +
3 6 9 12 15 18 21 24 27 30 33 36
kN

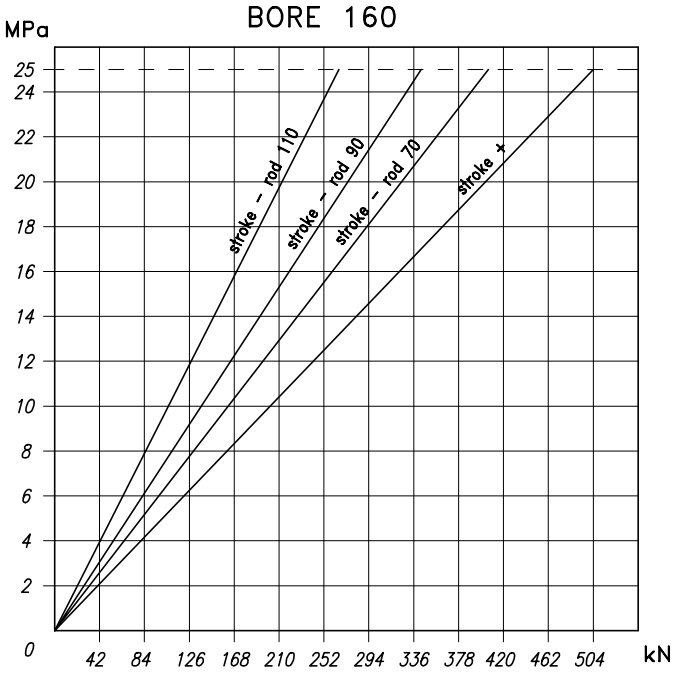

BORE 50
MPa
25
24
22
20
18
16
14
12
10
8
6
4
2
0
stroke - rod 36
stroke - rod 28
stroke - rod 22
stroke +
4.5 9 13.5 18 22.5 27 31.5 36 40.5 45 49.5 54
kN

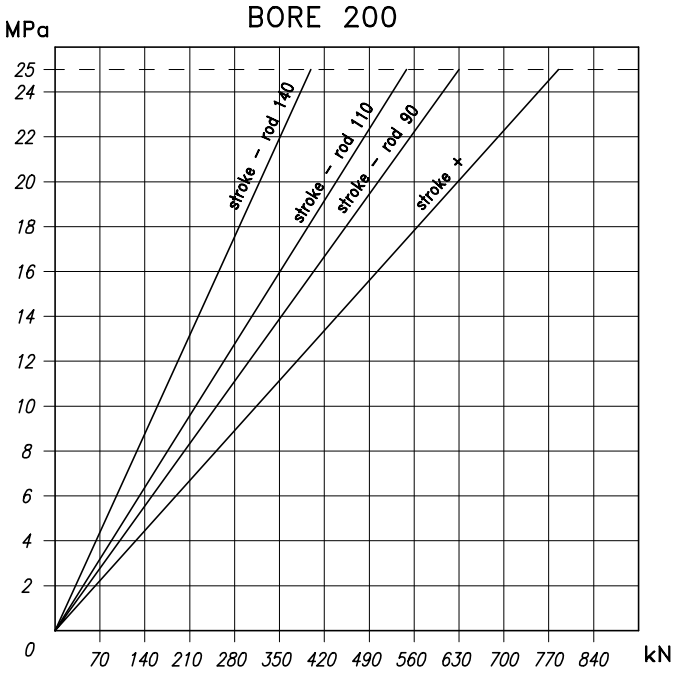

BORE 63
MPa
25
24
22
20
18
16
14
12
10
8
6
4
2
0
stroke - rod 45
stroke - rod 36
stroke - rod 28
stroke +
6.5 13 19.5 26 32.5 39 45.5 52 58.5 65 71.5 78
kN


BORE 80
MPa
25
24
22
20
18
16
14
12
10
8
6
4
2
0
stroke - rod 56
stroke - rod 45
stroke - rod 36
stroke +
10.5 21 31.5 42 52.5 63 73.5 84 94.5 105 115.5 126
kN


BORE 100
MPa
25
24
22
20
18
16
14
12
10
8
6
4
2
0
20 40 60 80 100 120 140 160 180 200 220 240
kN
stroke - rod 70
stroke - rod 56
stroke - rod 45
stroke +


BORE 125
MPa
25
24
22
20
18
16
14
12
10
8
6
4
2
0
25 50 75 100 125 150 175 200 225 250 275 300
kN
stroke - rod 90
stroke - rod 70
stroke - rod 56
stroke +


BORE 160
MPa
25
24
22
20
18
16
14
12
10
8
6
4
2
0
42 84 126 168 210 252 294 336 378 420 462 504
kN
stroke - rod 110
stroke - rod 90
stroke - rod 70
stroke +

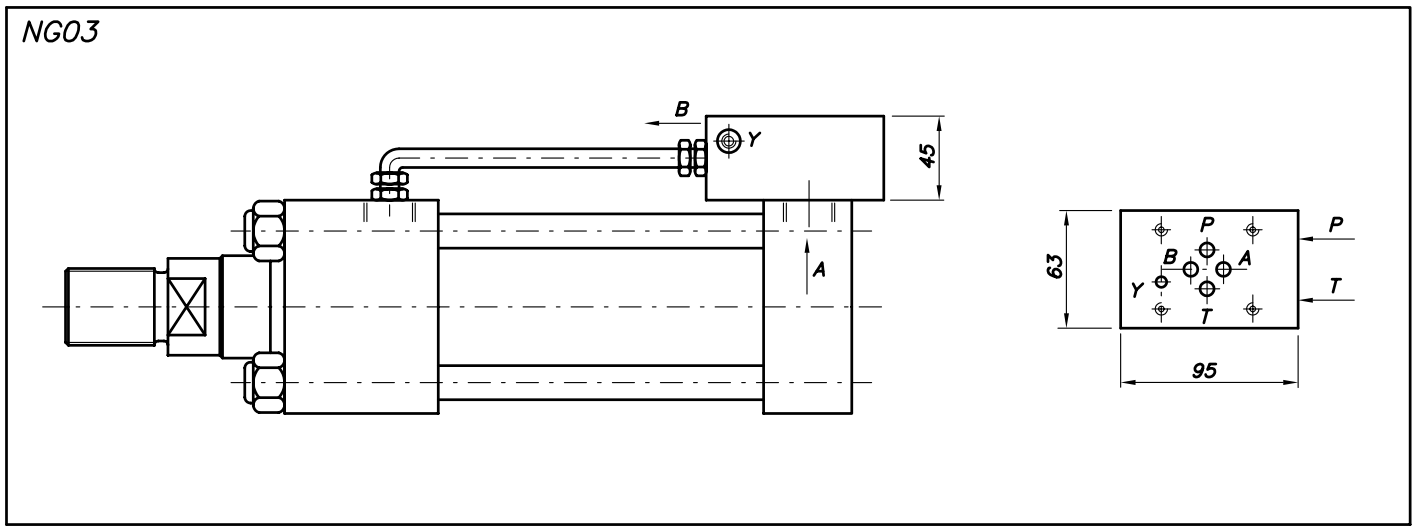

BORE 200
MPa
25
24
22
20
18
16
14
12
10
8
6
4
2
0
70 140 210 280 350 420 490 560 630 700 770 840
kN
stroke - rod 140
stroke - rod 110
stroke - rod 90
stroke +

3.1 BUILT-IN PLATES

The CH cylinders can be provided with ISO/Cetop plate (03, 05), for mounting the valves directly on the cylinder.

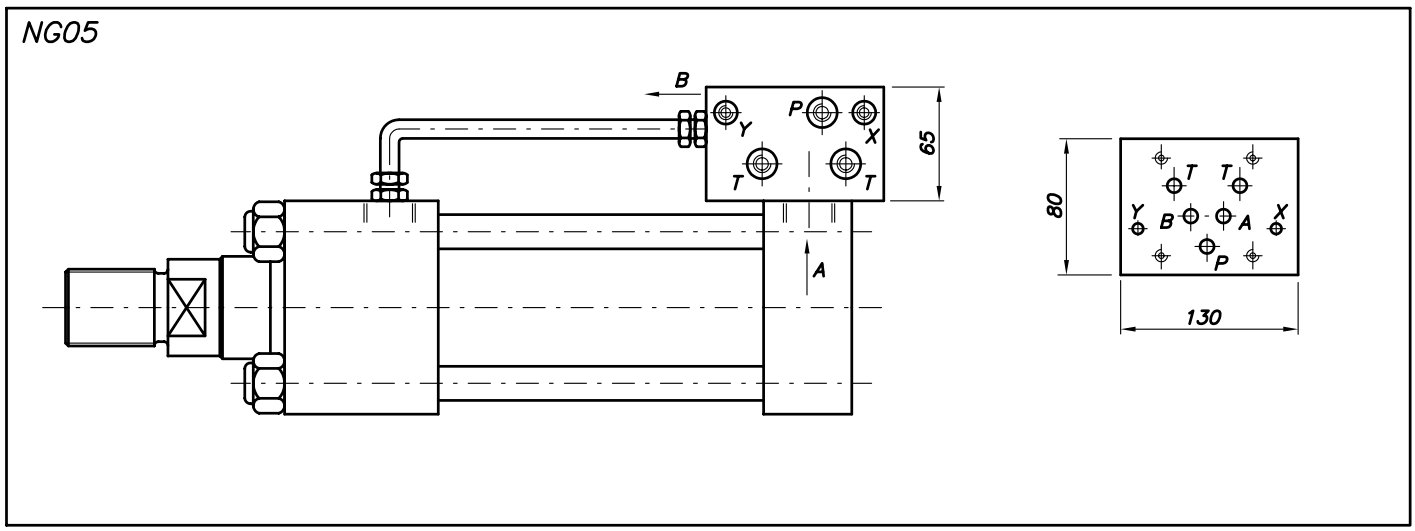
- CH cylinder with ISO/Cetop plate 03

Can be mounted on cylinders with 40 to 200mm bores (minimum stroke 100mm).
P and T connections are of 3/8" BSP type, the Y connection is of 1/8" BSP type.
For further details, contact our Technical Department



- CH cylinder with ISO/Cetop plate 05

Can be mounted on cylinders with 40 to 200mm bores (minimum stroke 150mm).
P and T connections are of ¾ P type, the X and Y connections are of 1/4" BSP type.
For further details, contact our Technical Department



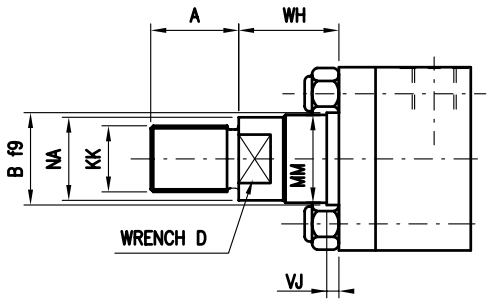
EXAMPLE: DETERMINING THE ACRONYM FOR THE ORDER

CHARACTERISTIC	DESCRIPTION	SYM.	EXAMPLE
SERIES	tie rod execution	CH	CH/50/22/.../100/EB/10 A....
BORE	indicate mm		
ROD	indicate mm		
ROD N° 2	indicate mm (piston rod only)		
STROKE	indicate mm		
EXECUTION	rear + front protruding tie rods	AP	
	front flange	FA	
	rear flange	FP	
	feet	PI	
	female hinge	CF	
	male hinge	CM	
	joint hinge	CS	
	front trunnion	OA	
	intermediate trunnion	OI	
	rear trunnion	OP	
	front protruding tie rods	TA	
	rear protruding tie rods	TP	
	front treaded holes	ZA	
	rear treaded holes	ZP	
BRAKING	without braking	0	
	front braking	1	
	rear braking	2	
	front + rear braking	3	
SPACER	without spacer	0	
	50mm	1	
	100mm	2	
	150mm	3	
	200mm	4	
SEALS	polyurethane (standard)	A	
	nitrile + PTFE (anti-friction)	B	
	viton + PTFE (high temperatures)	C	
	nitrile+carbographite(anti-friction water glycol)	E	
OPTIONS*			
ROD ENDS	type D	D	
	type F	F	
AIR VENTS	front	G	
	rear	H	
	front + rear	I	
DOUBLE ROD SEAL		L	
DRAINAGE	rod side	W	
ROD TREATMENT	heavy chromium-plated, 0.045mm thick, 100h salt mist ISO 3768	P	
	hardening and chromium-plating	T	
	Ni-CROMAX30 chromium-plated, nickel-plated, ASTM B 117 1000h	N	
PROXIM. SENSORS	front	X1	
	rear	X2	
	front + rear	X3	
HYDRAULIC PLATE	ISO/Ceto 03	NG03	
	ISO/Ceto 05	NG05	

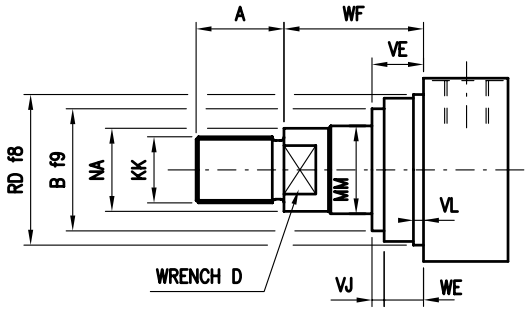
* to be reported in alphabetic order

DIMENSIONS OF THE ROD ENDS

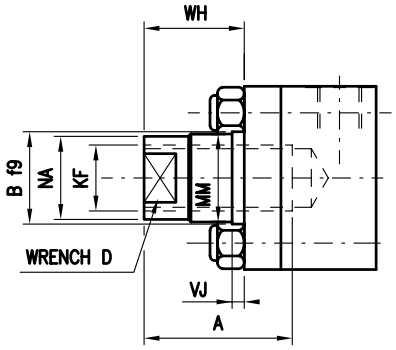
Rod end, type M and D
All, apart from FA fastening (ISO ME5)



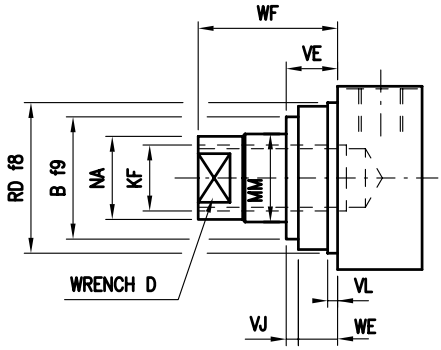
Rod end, type M and D
FA fastening (ISO ME5)



Rod end, type F
All, apart from FA fastening (ISO ME5)

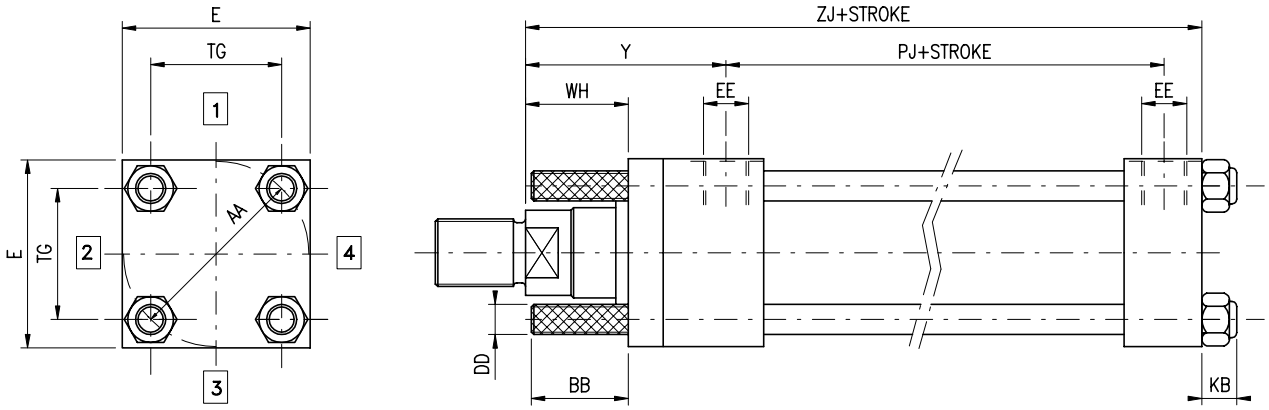


Rod end, type F
FA fastening (ISO ME5)

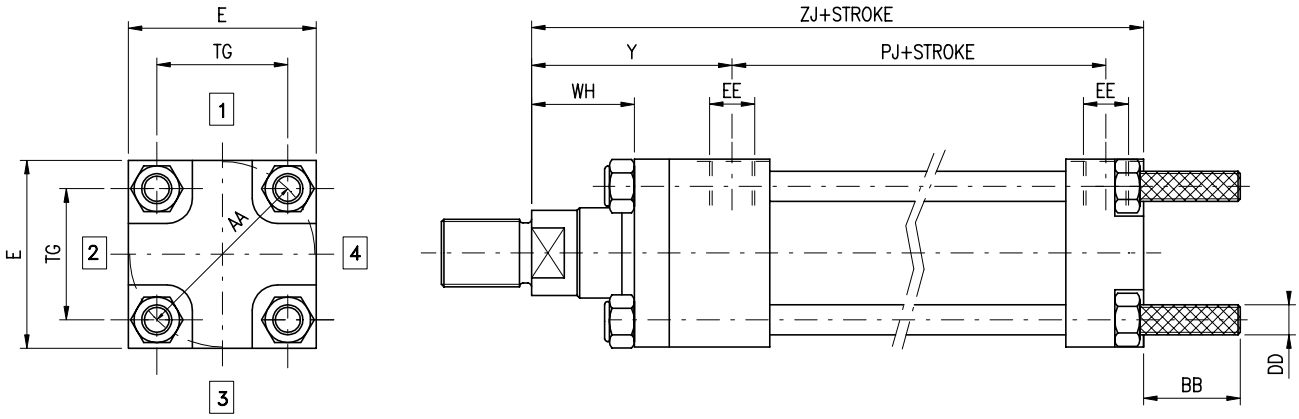


BORE	N°	MM	**Type M** ISO 6020/2 (1991)		Type D DIN 24554		Type F		B	D	NA	WF	WH	VE	VJ	FA fastening only			
	rod	rod	KK	A	KK	A	KF	A								VL_{min}	RD	VJ	WE
25	1	12	M10x1,25	14	M10x1,25	14	M8x1	14	24	10	11	25	15	16	6	3	38	6	10
	2	18	M14x1,5	18	M10x1,25	14	M12x1,25	18	30	15	17	25	15	16	6				
32	1	14	M12x1,25	16	M12x1,25	16	M10x1,25	16	26	12	13	35	25	22	12	3	42	12	10
	2	22	M16x1,5	22	M12x1,25	16	M16x1,5	22	34	18	21	35	25	22	12				
40	1	18	M14x1,5	18	M14x1,5	18	M12x1,25	18	30	15	17	35	25	22	6	3	62	12	10
	2	28	M20x1,5	28	M14x1,5	18	M20x1,5	28	42	22	26	35	25	22	12				
50	1	22	M16x1,5	22	-	-	M16x1,5	22	34	18	21	41	25	25	9	4	74	9	16
	2	36	M27x2	36	M16x1,5	22	M27x2	36	50	30	34	41	25	25	9				
	3*	28*	M20x1,5	28	M16x1,5	22	M20x1,5	28	42	22	26	41	25	25	9				
63	1	28	M20x1,5	28	-	-	M20x1,5	28	42	22	26	48	32	28	12	4	75	12	16
	2	45	M33x2	45	M20x1,5	28	M33x2	45	60	39	43	48	32	29	13		88	13	
	3*	36*	M27x2	36	M20x1,5	28	M27x2	36	50	30	34	48	32	29	13				
80	1	36	M27x2	36	-	-	M27x2	36	50	30	34	51	31	29	9	4	82	9	20
	2	56	M42x2	56	M27x2	36	M42x2	56	72	48	54	51	31	29	9		105		
	3*	45*	M33x2	45	M27x2	36	M33x2	45	60	39	43	51	31	29	9				
100	1	45	M33x2	45	-	-	M33x2	45	60	39	43	57	35	32	10	5	92	10	22
	2	70	M48x2	63	M33x2	45	M48x2	63	88	62	68	57	35	32	10		125		
	3*	56*	M42x2	56	M33x2	45	M42x2	56	72	48	54	57	35	32	10				
125	1	56	M42x2	56	-	-	M42x2	56	72	48	54	57	35	32	10	5	105	10	22
	2	90	M64x3	85	M42x2	56	M64x3	85	108	80	88	57	35	32	10		150		
	3*	70*	M48x2	63	M42x2	56	M48x2	63	88	62	68	57	35	32	10				
160	1	70	M48x2	63	-	-	M48x2	63	88	62	68	57	32	32	7	5	125	7	25
	2	110	M80x3	95	M48x2	63	M80x3	95	133	100	108	57	32	32	7		170		
	3*	90*	M64x3	85	M48x2	63	M64x3	85	108	80	88	57	32	32	7				
200	1	90	M64x3	85	-	-	M64x3	85	108	80	88	57	32	32	7	5	150	7	25
	2	140	M100x3	112	M64x3	85	M100x3	112	163	128	138	57	32	32	7		210		
	3*	110*	M80x3	95	M64x3	85	M80x3	95	133	100	108	57	32	32	7				

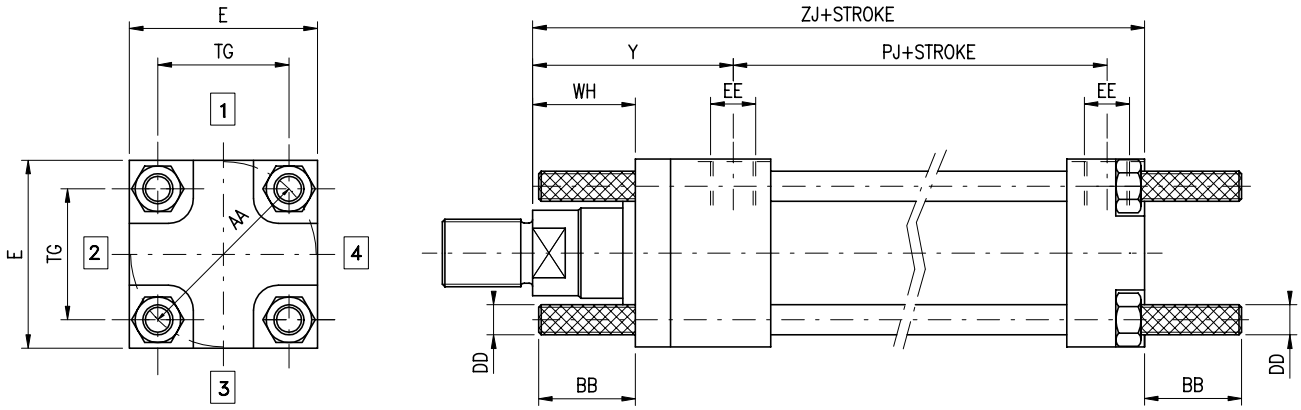
* Diameters not provided for by ISO-DIN



TA: (ISO type MX3)



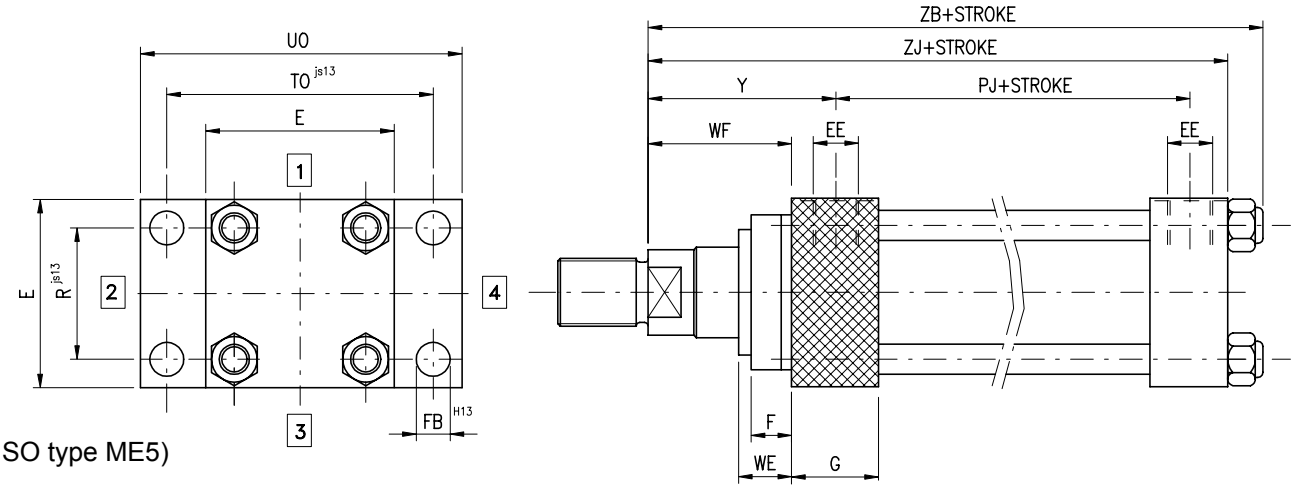
TP: (ISO type MX2)



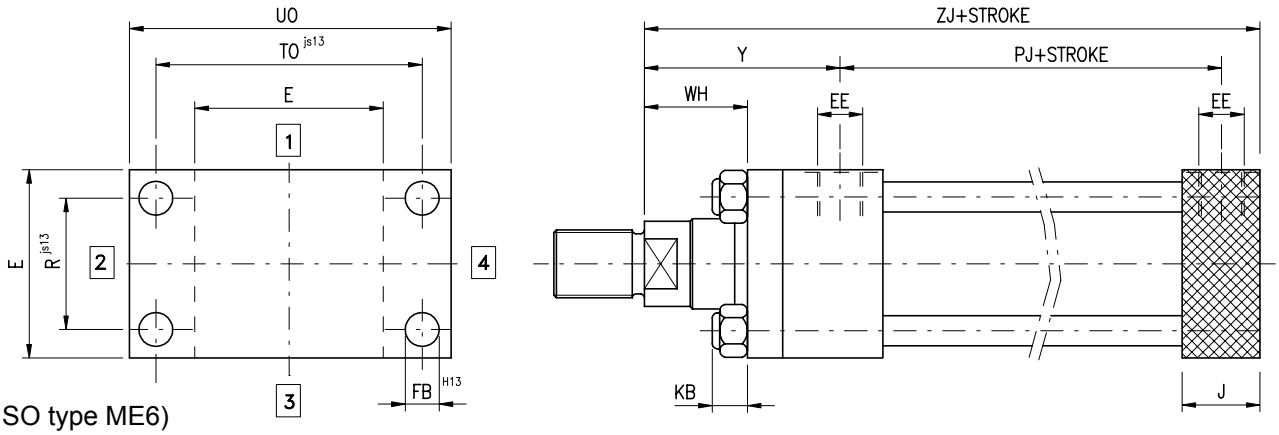
AP: (ISO type MX1)

Bore	AA	BB	DD	E	EE	KB	TG	WH	ZJ	Y	PJ
25	40	19	M5x0,8	40*	1/4"	6,8	28,3	15	114	50	53
32	47	24	M6x1	45*	1/4"	7,8	33,2	25	128	60	56
40	59	35	M8x1	60	3/8"	10,6	41,7	25	153	62	73
50	74	46	M12x1,25	75	1/2"	14,8	52,3	25	159	67	74
63	91	46	M12x1,25	90	1/2"	14,8	64,3	32	168	71	80
80	117	59	M16x1.5	115	3/4"	18	82,7	31	190	77	93
100	137	59	M16X1,5	126	3/4"	18	96,9	35	203	82	101
125	178	81	M22x1,5	165	1"	25	125,9	35	232	86	117
160	219	92	M27x2	196	1"	30,8	154,9	32	245	86	121
200	269	115	M30x2	240	1 1/4"	33,2	190,2	32	299	98	158,5

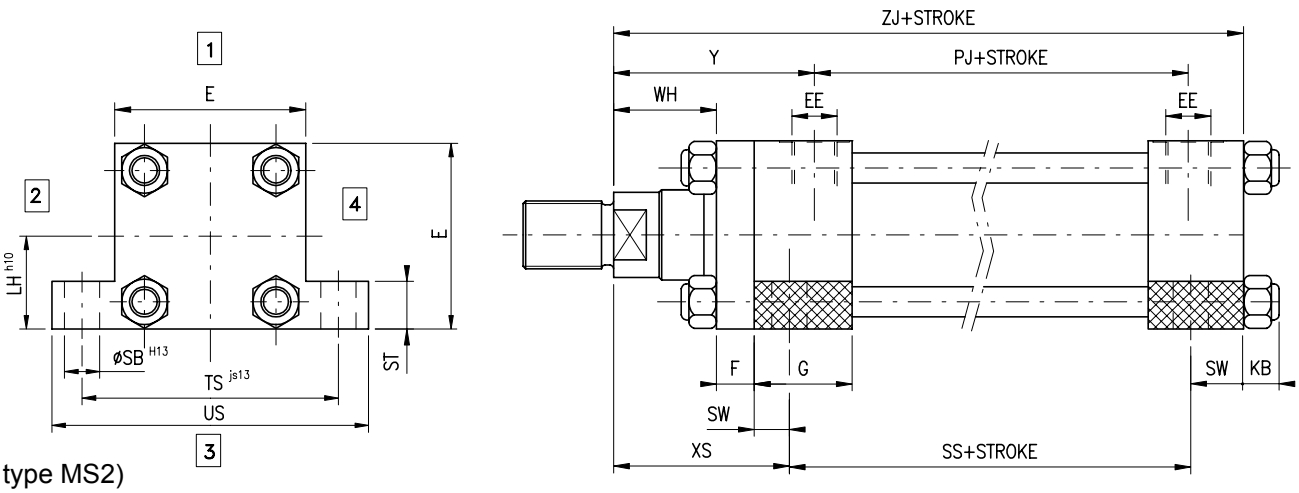
* On 25 and 32 bore cylinders, the head is increased by 5mm to house the connection



FA: (ISO type ME5)



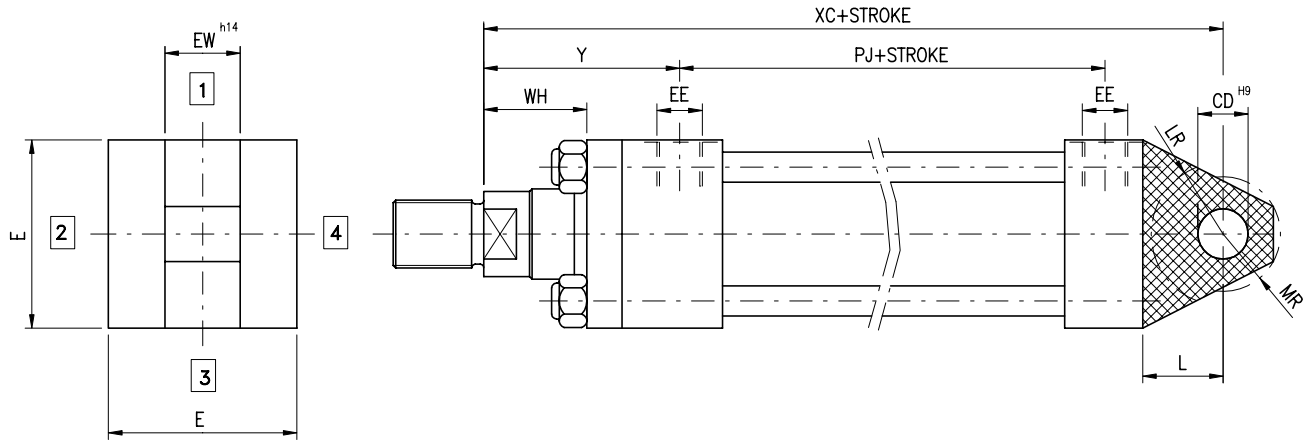
FP: (ISO type ME6)



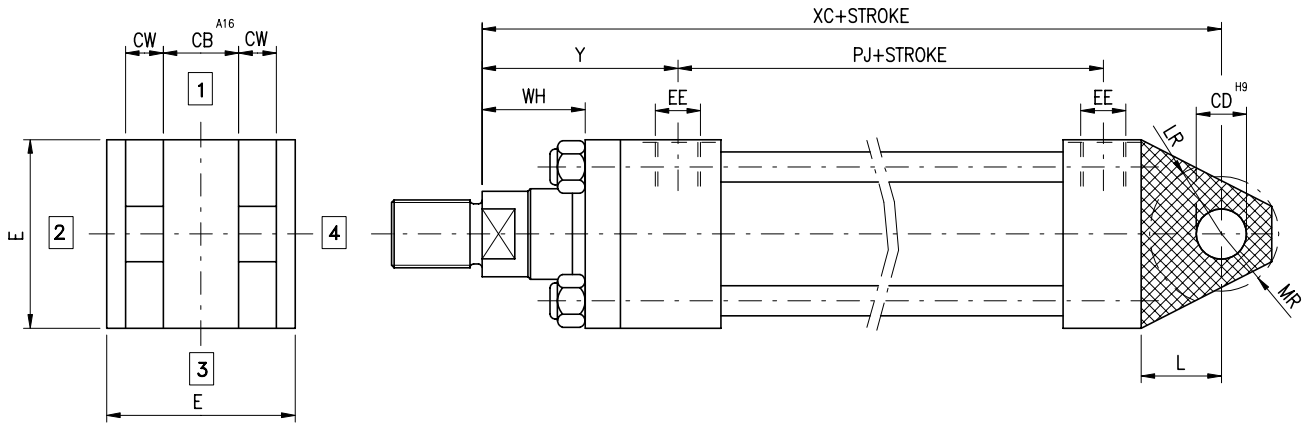
PI: (ISO type MS2)

Bore	E	EE	F	FB	G	J	KB	LH	R	SB	SS	ST	SW	TO	TS	UO	US	WE	WF	WH	XS	ZB	ZJ	Y	PJ
25	40*	1/4"	10	5,5	25	25	6,8	19	27	6,6	73	8,5	8	51	54	65	72	16	25	15	33	121	114	50	53
32	45*	1/4"	10	6,6	25	25	7,8	22	33	9	73	12,5	10	58	63	70	84	22	35	25	45	136	128	60	56
40	60	3/8"	10	11	38	38	10,6	31	41	11	98	12,5	10	87	83	110	103	22	35	25	45	164	153	62	73
50	75	1/2"	16	14	38	38	14,8	37	52	14	92	19	13	105	102	130	127	25	41	25	54	174	159	67	74
63	90	1/2"	16	14	38	38	14,8	44	65	18	86	26	17	117	124	145	161	29	48	32	65	183	168	71	80
80	115	3/4"	20	18	45	45	18	57	83	18	105	26	17	149	149	180	186	29	51	31	68	208	190	77	93
100	126	3/4"	22	18	45	45	18	63	97	26	102	32	22	162	172	200	216	32	57	35	79	221	203	82	101
125	165	1"	22	22	58	58	25	82	126	26	131	32	22	208	210	250	254	32	57	35	79	257	232	86	117
160	196	1"	25	26	58	58	30,8	101	155	33	130	38	29	253	260	300	318	32	57	32	86	276	245	86	121
200	240	1 1/4"	25	33	76	76	33,2	122	190	39	172	44	35	300	311	360	381	32	57	32	92	332	299	98	158,5

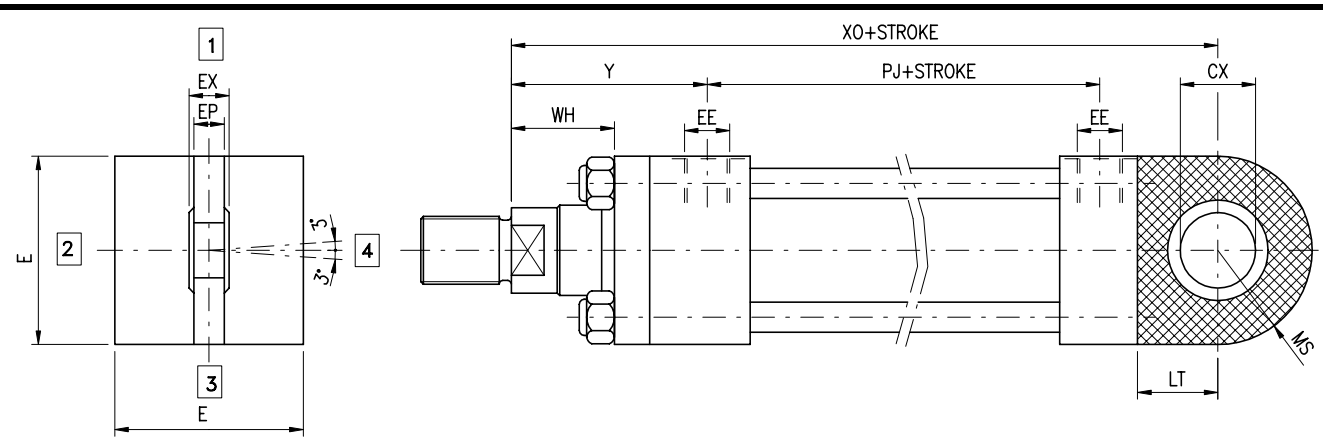
* On 25 and 32 bore cylinders, the head is increased by 5mm to house the connection



CM: (ISO type MP3)



CF: (ISO type MP1)

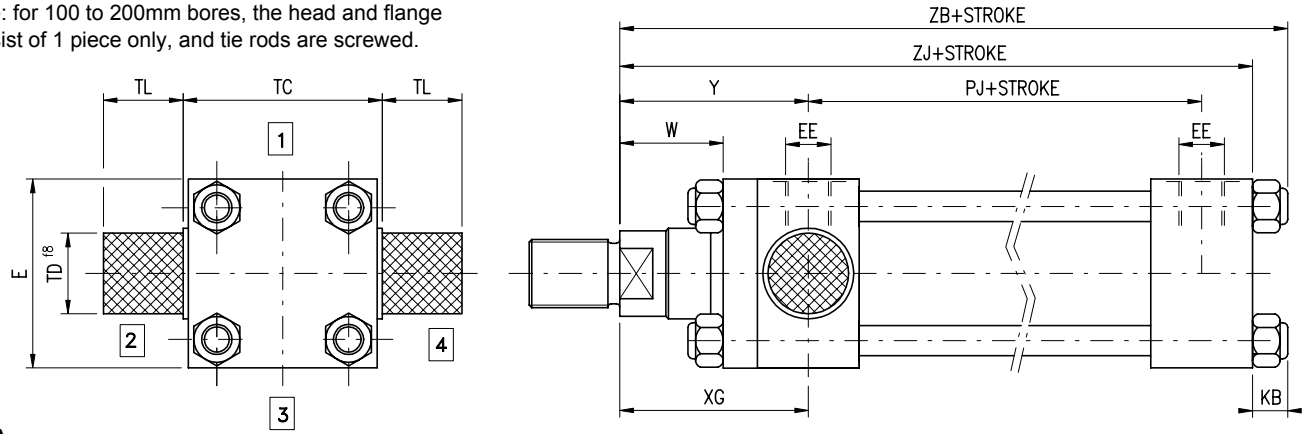


CS: (ISO type MP5)

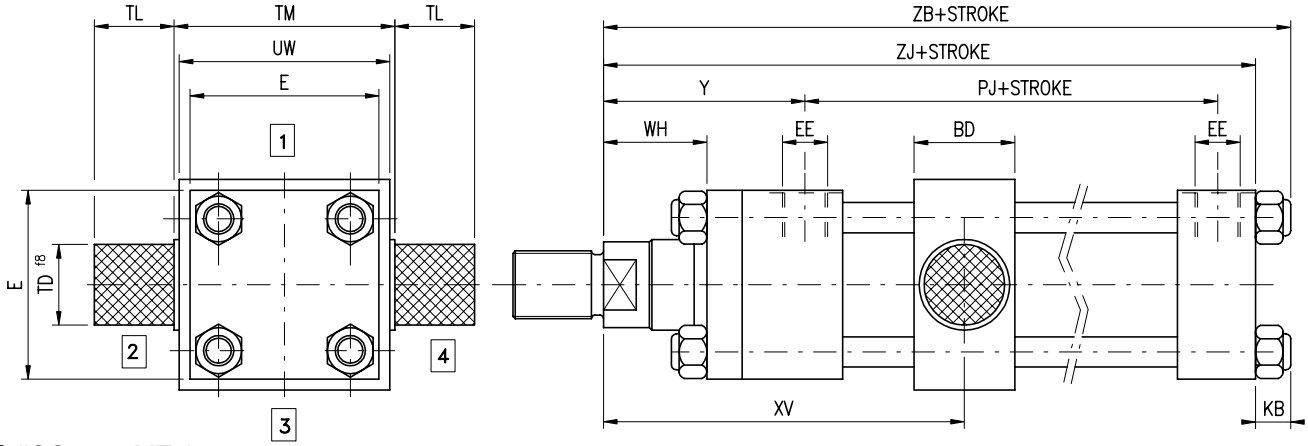
Bore	CB	CD	CW	CX	E	EE	EP	EW	EX	L	LR	LT	MR	MS	WH	XC	XO	Y	PJ
25	12	10	6	12	40*	1/4"	8	12	10	13	12	16	12	20	15	127	130	50	53
32	16	12	8	16	45*	1/4"	11	16	14	19	17	20	17	22,5	25	147	148	60	56
40	20	14	14	20	60	3/8"	13	20	16	19	17	25	17	29	25	172	178	62	73
50	30	20	15	25	75	1/2"	17	30	20	32	29	31	29	33	25	191	190	67	74
63	30	20	15	30	90	1/2"	19	30	22	32	29	38	29	40	32	200	206	71	80
80	40	28	20	40	115	3/4"	23	40	28	39	34	48	34	50	31	229	238	77	93
100	50	36	25	50	126	3/4"	30	50	35	54	50	58	50	62	35	257	261	82	101
125	60	45	30	60	165	1"	38	60	44	57	53	72	53	80	35	289	304	86	117
160	70	56	35	80	196	1"	47	70	55	78	59	107	59	98	32	308	337	86	121
200	80	70	40	100	240	1 1/4"	57	80	70	97	78	131	78	120	32	381	415	98	158,5

* On 25 and 32 bore cylinders, the head is increased by 5mm to house the connection

Note: for 100 to 200mm bores, the head and flange consist of 1 piece only, and tie rods are screwed.

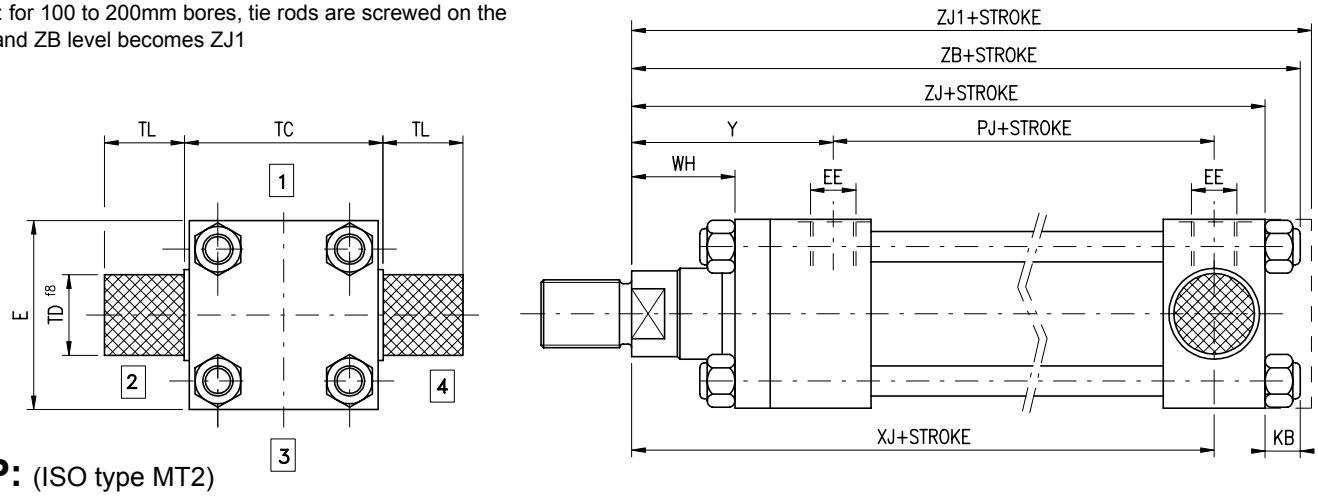


OA: (ISO type MT1)



OI: (ISO type MT4)

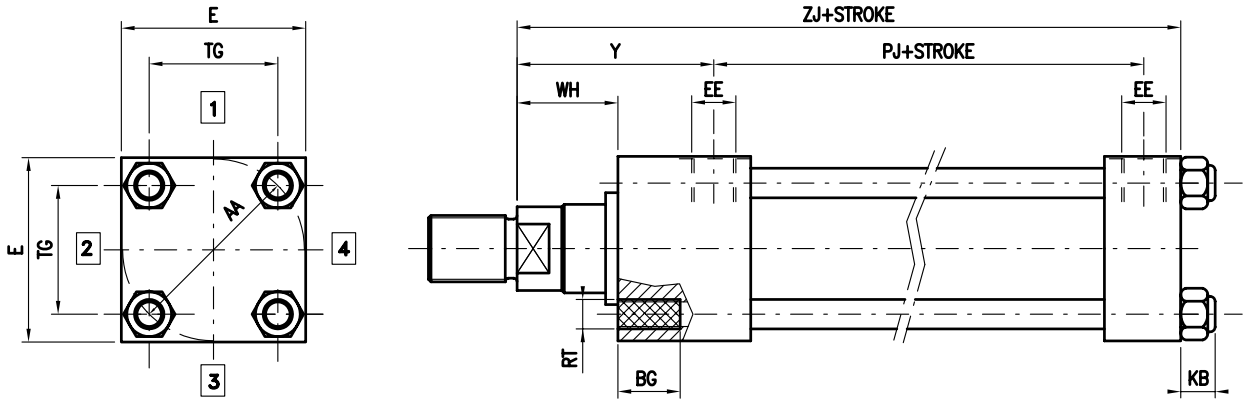
Note: for 100 to 200mm bores, tie rods are screwed on the cap and ZB level becomes ZJ1



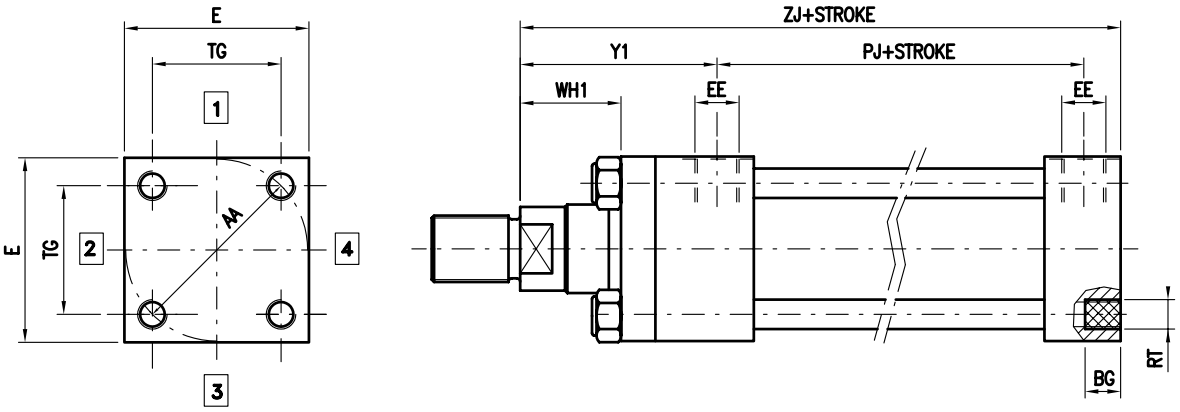
OP: (ISO type MT2)

Bore	BD	E	EE	KB	TC	TD	TL	TM	UW	WH	XG	XJ	XV_{min}	XV_{max}	ZJ	ZJ1	ZB	Y	PJ
25	20	40*	1/4"	6,8	38	12	10	48	46	15	44	101	82	72+stroke	114	-	121	50	53
32	25	45*	1/4"	7,8	44	16	12	55	53	25	54	115	96	82+stroke	128	-	136	60	56
40	30	60	3/8"	10,6	63	20	16	76	74	25	57	134	107	88+stroke	153	-	164	62	73
50	40	75	1/2"	14,8	76	25	20	89	87	25	64	140	117	90+stroke	159	-	174	67	74
63	40	90	1/2"	14,8	89	32	25	100	98	32	70	149	132	91+stroke	168	-	183	71	80
80	48	115	3/4"	18	114	40	32	127	125	31	76	168	147	99+stroke	190	-	200	77	93
100	58	126	3/4"	18	127	50	40	140	138	35	71	187	158	107+stroke	203	216	-	82	101
125	68	165	1"	25	165	63	50	178	175	35	75	209	180	109+stroke	232	244	-	86	117
160	88	196	1"	30,8	203	80	63	215	212	32	75	230	198	104+stroke	245	273	-	86	121
200	108	240	1 1/4"	33,2	241	100	80	279	276	32	85	276	226	130+stroke	299	331	-	98	158,5

* On 25 and 32 bore cylinders, the head is increased by 5mm to house the connection



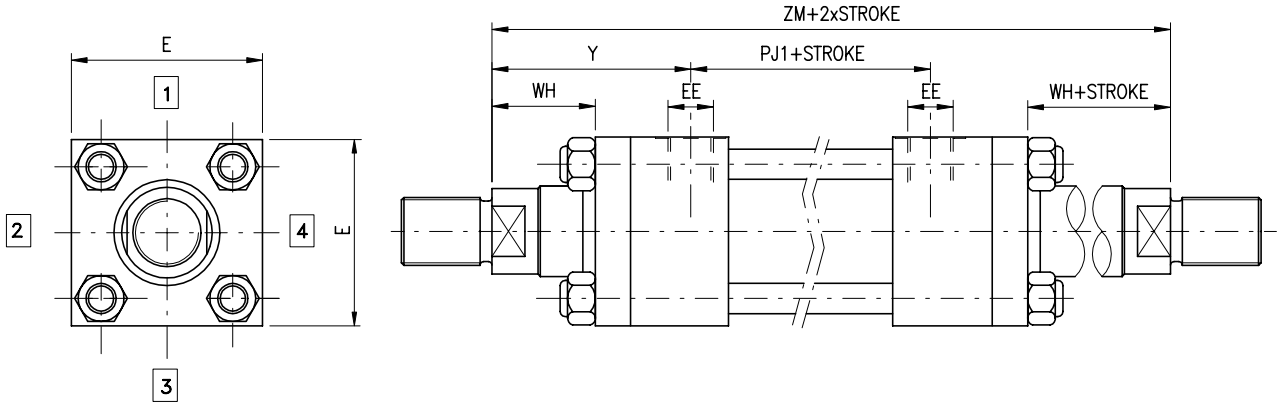
ZA



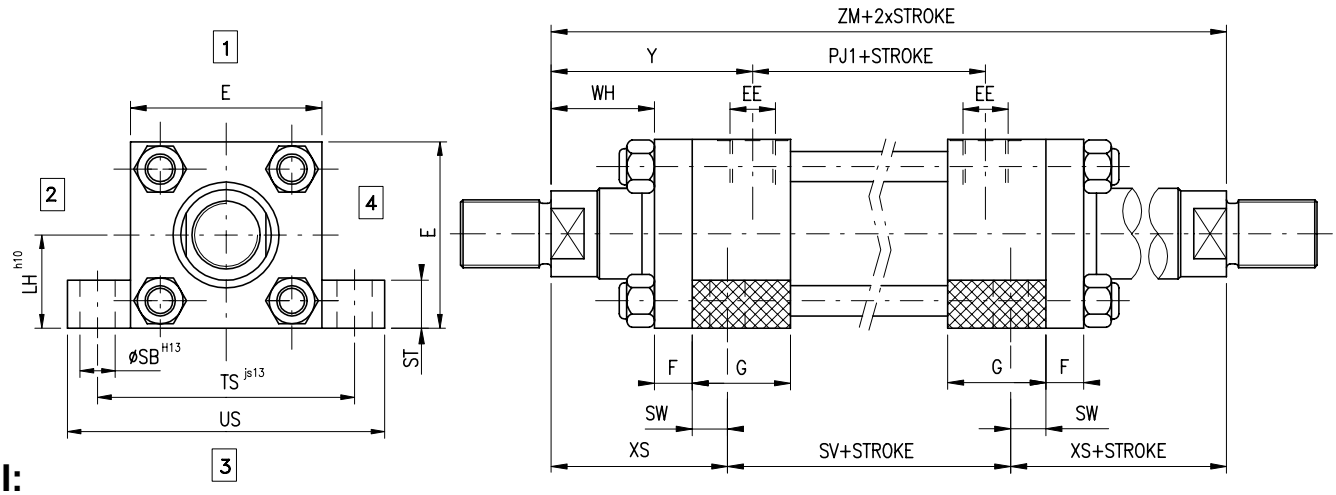
ZP

BORE	AA	BG min	E	EE	KB	RT	TG	WH	WH1	ZJ	Y	Y1	PJ
25	40	8	40*	1/4"	6,8	M5x0,8	28,3	15	15	114	50	50	53
32	47	9	45*	1/4"	7,8	M6x1	33,2	25	25	128	60	60	56
40	59	12	60	3/8"	10,6	M8x1,25	41,7	25	25	153	62	62	73
50	74	18	75	1/2"	14,8	M12x1,75	52,3	25	25	159	67	67	74
63	91	18	90	1/2"	14,8	M12x1,75	64,3	32	32	168	71	71	80
80	117	24	115	3/4"	18	M16x2	82,7	31	31	190	77	77	93
100	137	24	126	3/4"	18	M16X2	96,9	35	35	203	82	82	101
125	178	27	165	1"	25	M22x2,5	125,9	35	35	232	86	86	117
160	219	32	196	1"	30,8	M27x3	154,9	32	25	245	86	79	121
200	269	40	240	1 1/4"	33,2	M30x3,5	190,2	32	28	299	98	94	158,5

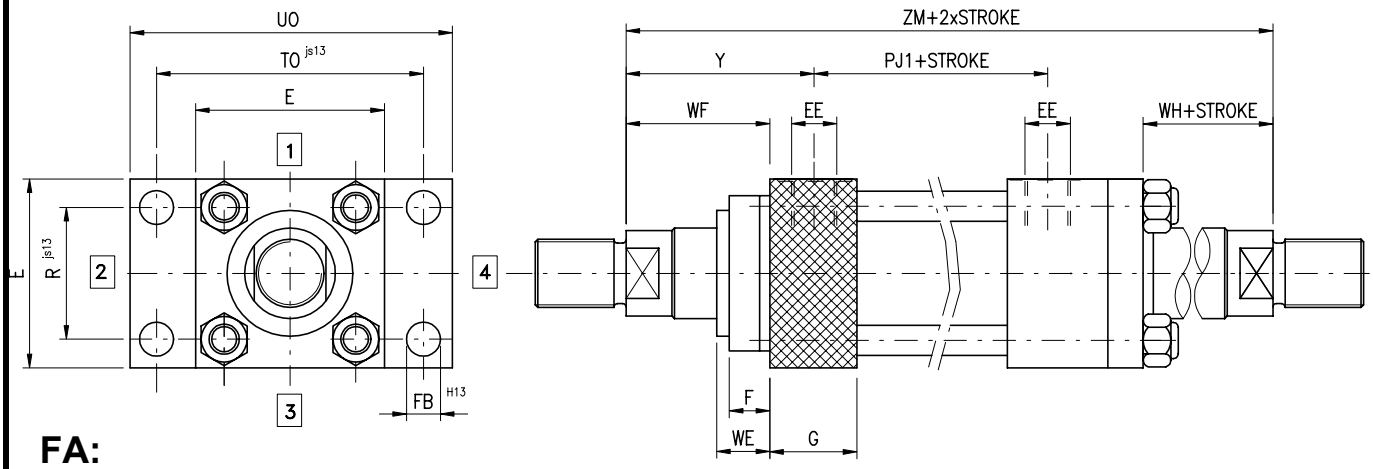
*On 25 and 32 bore cylinders, the head is increased by 5mm to house the connection.



EB:



PI:

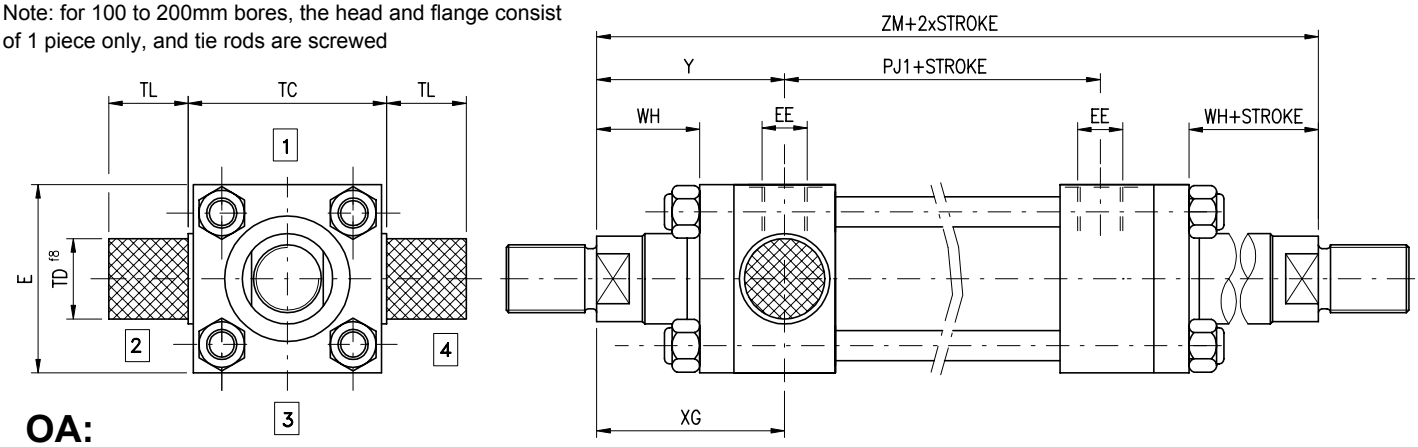


FA:

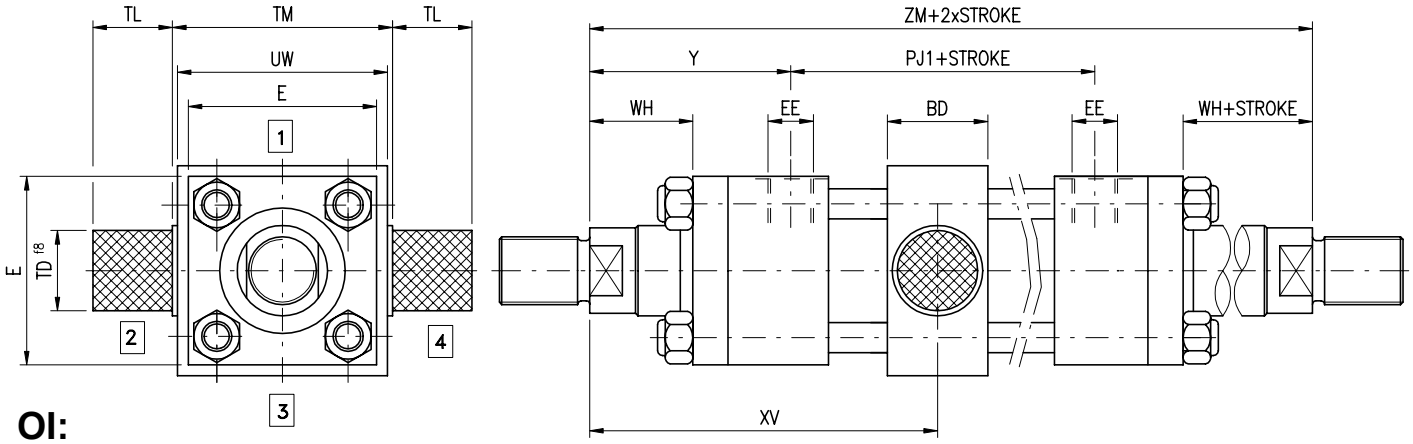
Bore	E	EE	F	FB	G	LH	R	SB	ST	SV	SW	TO	TS	UO	US	WE	WF	WH	XS	ZM	Y	PJ1
25	40*	1/4"	10	5,5	40	19	27	6,6	8,5	88	8	51	54	65	72	16	25	15	33	154	50	54
32	45*	1/4"	10	6,6	40	22	33	9	12,5	88	10	58	63	70	84	22	35	25	45	178	60	58
40	60	3/8"	10	11	45	31	41	11	12,5	105	10	87	83	110	103	22	35	25	45	195	62	71
50	75	1/2"	16	14	45	37	52	14	19	99	13	105	102	130	127	25	41	25	54	207	67	73
63	90	1/2"	16	14	45	44	65	18	26	93	17	117	124	145	161	29	48	32	65	223	71	81
80	115	3/4"	20	18	50	57	83	18	26	110	17	149	149	180	186	29	51	31	68	246	77	92
100	126	3/4"	22	18	50	63	97	26	32	107	22	162	172	200	216	32	57	35	79	265	82	101
125	165	1"	22	22	58	82	126	26	32	131	22	208	210	250	254	32	57	35	79	289	86	117
160	196	1"	25	26	58	101	155	33	38	121	29	253	260	300	318	32	57	32	86	293	86	121
200	240	1 1/4"	25	33	76	122	190	39	44	169	35	300	311	360	381	32	57	32	92	353	98	157

* On 25 and 32 bore cylinders, the head is increased by 5mm to house the connection

Note: for 100 to 200mm bores, the head and flange consist of 1 piece only, and tie rods are screwed



OA:



OI:

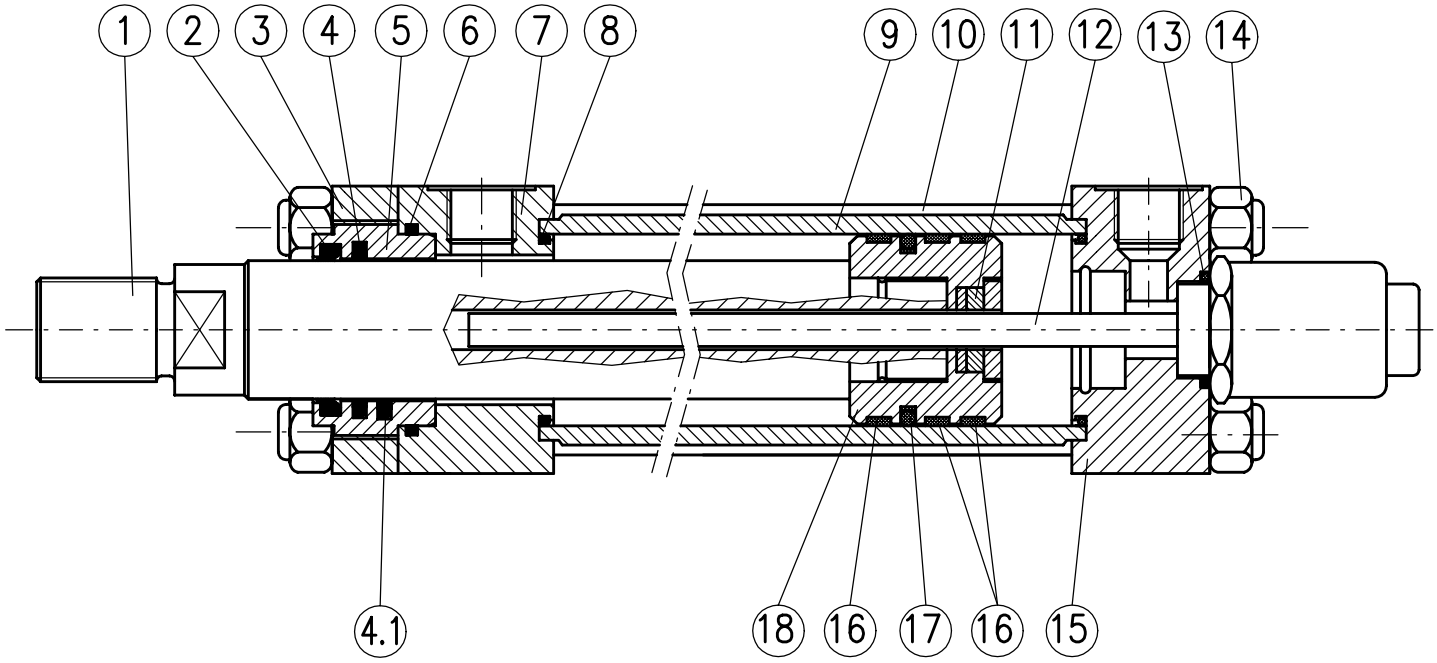
Bore	BD	E	EE	TC	TD	TL	TM	UW	WH	XG	XV_{min}	XV_{max}	ZM	Y	PJ1
25	20	40*	1/4"	38	12	10	48	46	15	44	82	72+stroke	154	50	54
32	25	45*	1/4"	44	16	12	55	53	25	54	96	82+stroke	178	60	58
40	30	60	3/8"	63	20	16	76	74	25	57	107	88+stroke	195	62	71
50	40	75	1/2"	76	25	20	89	87	25	64	117	90+stroke	207	67	73
63	40	90	1/2"	89	32	25	100	98	32	70	132	91+stroke	223	71	81
80	48	115	3/4"	114	40	32	127	125	31	76	147	99+stroke	246	77	92
100	58	126	3/4"	127	50	40	140	138	35	71	158	107+stroke	265	82	101
125	68	165	1"	165	63	50	178	175	35	75	180	109+stroke	289	86	117
160	88	196	1"	203	80	63	215	212	32	75	198	104+stroke	293	86	121
200	108	240	1 1/4"	241	100	80	279	276	32	85	226	125+stroke	353	98	157

* On 25 and 32 bore cylinders, the head is increased by 5mm to house the connection

CYLINDERS SERIES CHT

Working pressure 21 Mpa
Maximum pressure 25 Mpa
Working temperature –20 to 80°C
Stroke tolerance 0 to 1.2mm for strokes up to 1000mm, 0 to 2.5mm for longer strokes
8 bores, 40 to 200mm

ON DEMAND:
Drainage on the rod
Double rod seals
Special seals fit for a wide range of fluids and temperatures
Air vents on both ends



POS	ITEM	MATERIAL	POS	ITEM	MATERIAL
1	Rod	Chromium-plated steel	10	Tie rod	Steel
2	Dust scraper	Nitrile rubber	11	Position indicator	-
3	Flange	Steel	12	Measuring shaft	Steel
4	Rod seal	Nitrile rubber and PTFE	13	O-Ring	Nitrile rubber
4.1	2nd Rod seal (option L)	Nitrile rubber and PTFE	14	Self-braking nut	Steel
5	Guide bushing	Cast iron	15	Rear head	Steel
6	O-Ring + PBK	Nitrile rubber	16	Anti-friction slide	PTFE
7	Head	Steel	17	Piston B seal	Nitrile rubber and PTFE
8	O-Ring + PBK	Nitrile rubber	18	Piston	Steel
9	Liner	Steel	19		

LINEAR POSITION TRANSDUCERS

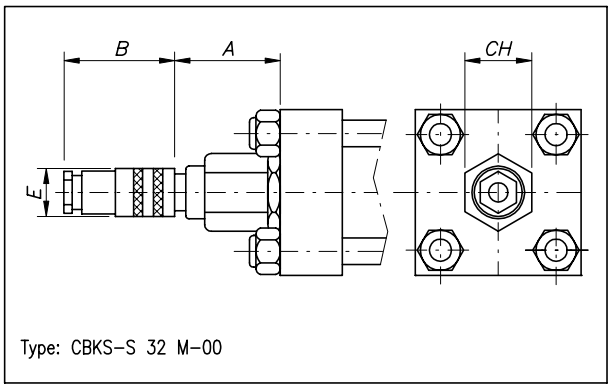
To immediately check the rod position, install a linear position transducer. Its working principle is based on the magnetorestrictive effect that causes a short elastic strain in the molecular structure of a wave guide, through the interaction of two magnetic fields, and generates a torsion pulse on the position indicator.
This pulse runs along the wave guide inside the measuring shaft, from the point of measurement to the sensor's head. The constant response time not affected by the temperature is proportional to the indicator position, and is therefore a position measure, directly converted in the sensor into an analog voltage or current output.

TECHNICAL CHARACTERISTICS	
Resolution	**0,01 mm**
Independent linearity	**±0,05 % (%of the total stroke)**
Repeatability	**±0,01 % (%of the total stroke)**
Max. speed	**2 m/sec**
Working temperature	**-20 +80 °C**
Analog signal*	**0÷10 V 10÷0 V or 4÷20 mA**
Strokes	**50÷3850 mm**
Max. transducer pressure	**35 MPa (350 Bar)**
Power supply	**24 V DC ±10 %**
Protection degree (connector installed)	**IP-67**

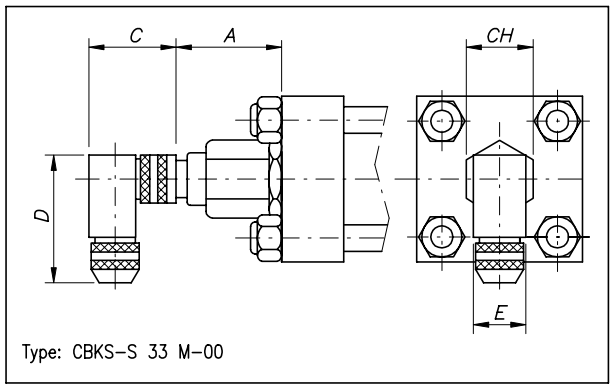
* Available in digital pulse version (for more details, contact our Technical Department)

AVAILABLE MODELS

- In TA, FA, PI, OA and OI execution, transducers can be mounted starting from 40mm bore, rod Ø 28mm; sensors are available in the version with straight or 90° connectors (see the dimensions specified below).

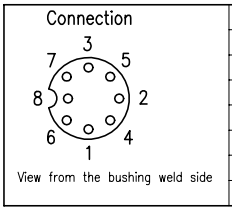


Type: CBKS-S 32 M-00



Type: CBKS-S 33 M-00

DIMENSIONS (mm)						
Type	**A**	**B**	**C**	**D**	**E**	**CH**
CBKS-S 32 M-00	74	69	-	-	18	46
CBKS-S 33 M-00	74	-	48	54	20	46

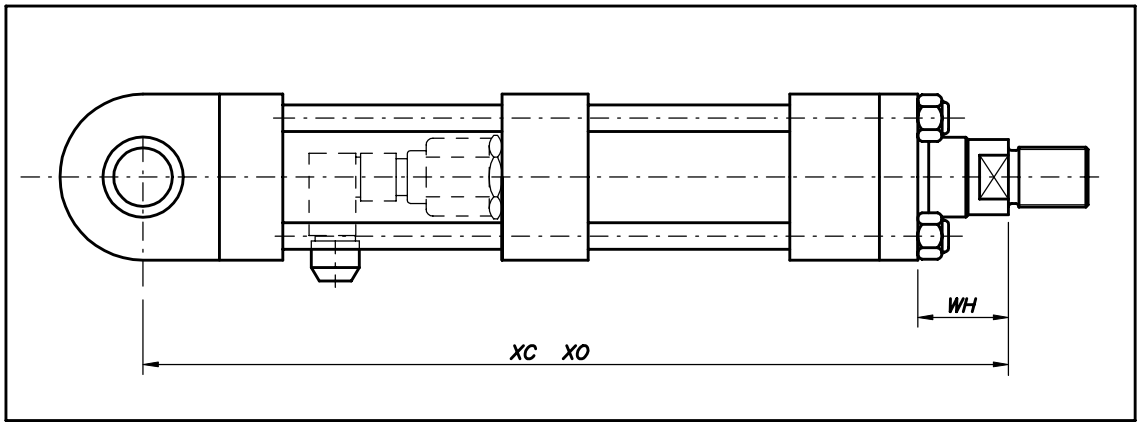


Pin	Color
1	Yellow
2	Grey
3	Pink
5	Green
6	Blue
7	Brown
8	White

The volume of cylinders with transducers are increased compared to ISO tables, as specified below.

Bore	40	50	63	80	100	125	160	200
ZJ (mm)	187	193	200	270	221	242	255	299

- In CF, CM and CS execution, transducers can be mounted starting from 63mm bore, fitting the sensor into a distance pipe, as shown in the figure below.



The cylinder volumes are increased compared to ISO tables, according to the dimensions indicated below.

Bore	63	80	100	125	160	200
WH	32	31	35	35	32	32
XC	444	494	536	575	607	694
XO	450	503	540	590	636	728

AP, FP and TP execution is not available.

EXAMPLE: DETERMINING THE ACRONYM FOR THE ORDER

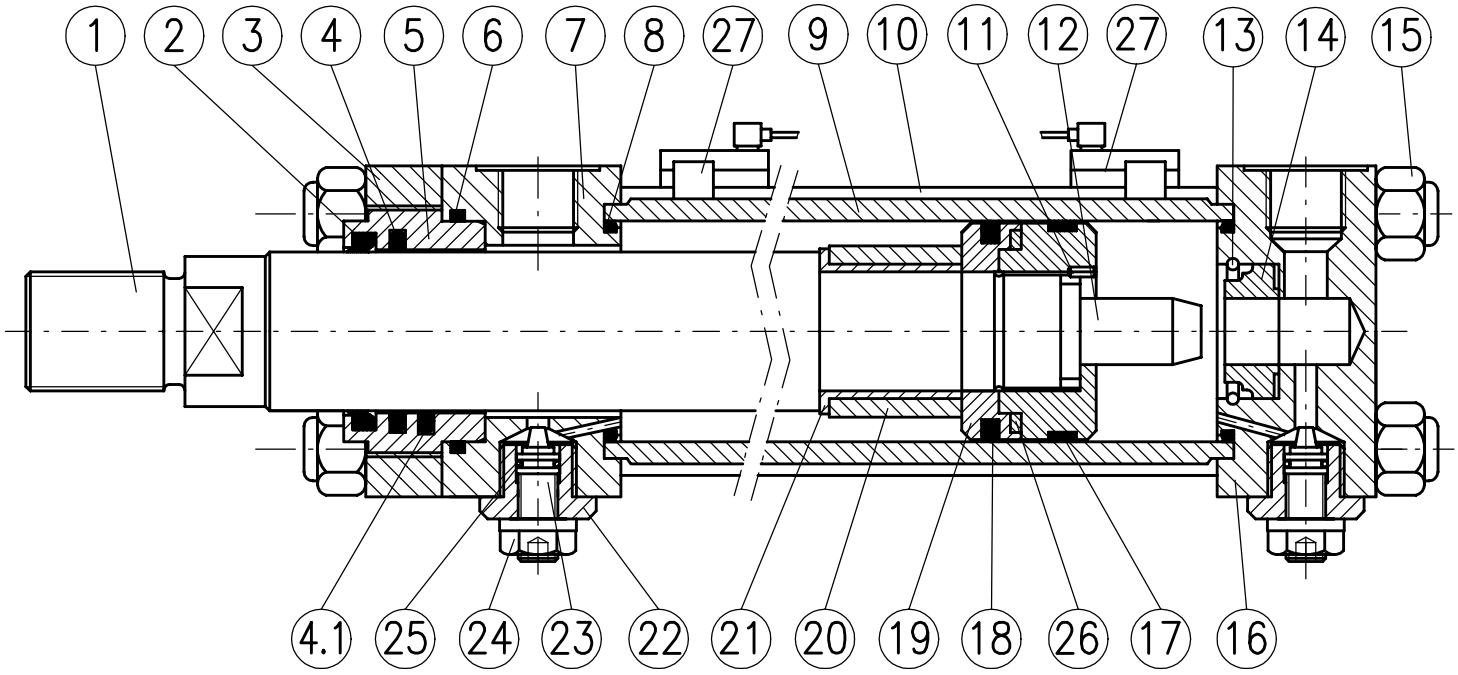
CHARACTERISTIC	DESCRIPTION	SYM.	EXAMPLE
SERIES	tie rod execution with transducers	CHT	CHT/50/36/100/FA/00BUT…
BORE	indicate mm		
ROD	indicate mm		
STROKE	indicate mm		
EXECUTION	front flange	FA	
	feet	PI	
	female hinge	CF	
	male hinge	CM	
	joint hinge	CS	
	front trunnion	OA	
	intermediate trunnion	OI	
	rear trunnion	OP	
	front protruding tie rods	TA	
	front treaded holes	ZA	
BRAKING	without braking	0	
SPACER	without spacer	0	
	50mm	1	
	100mm	2	
	150mm	3	
	200mm	4	
SEALS	nitrile+PTFE (anti-friction)	B	
TRANSDUCER OUTPUT	Tension 0-10 V	UT	
	Current 4-20 Ma	UC	
OPTIONS*			
ROD ENDS	type D	D	
	type F	F	
AIR VENTS	front	G	
	rear	H	
	front + rear	I	
DOUBLE ROD SEAL		L	
DRAINAGE	rod side	W	
ROD TREATMENT	heavy chromium-plated, 0.045mm thick, 100h salt mist ISO 3768	P	
	hardening and chromium-plating	T	
	Ni-CROMAX30 chromium-plated, nickel-plated, ASTM B 117 1000h	N	
CONNECTOR	straight CBKS-S 32 M-00	Y1	
	90° CBKS-S 33 M-00	Y2	

* to be reported in alphabetic order

CYLINDERS SERIES CHM

Working pressure 12 Mpa
Maximum pressure 16 Mpa
Working temperature –10 to 80°C
Stroke tolerance 0 to 1.2mm for strokes up to 1000mm, 0 to 2.5mm for longer strokes
6 bores, 25 to 100mm
up to 3 rods per bore

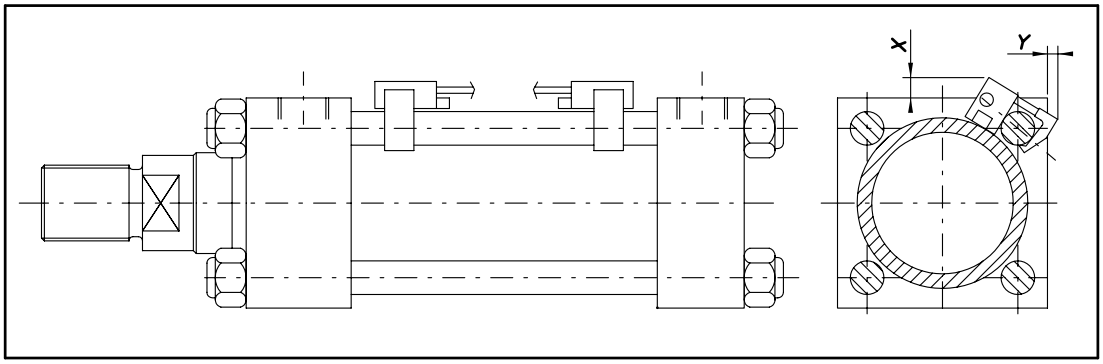
ON DEMAND:
End of stroke braking, adjustable on both ends
Drainage on the rod
Double rod seals
Air vents on both ends



POS	ITEM	MATERIAL	POS	ITEM	MATERIAL
1	Rod	Chromium-plated steel	14	Rear brake bushing	Bronze
2	Dust scraper	Polyurethane	15	Self-braking nut	Steel
3	Flange	Steel	16	Rear head	Steel
4	Rod seal	Polyurethane/PTFE	17	Anti-friction slide	PTFE
4.1	2nd Rod seal (option L)	Polyurethane/PTFE	18	Piston seal	PTFE nitrile rubber./polyuret.
5	Guide bushing	Cast iron	19	Piston	Nonmagnetic steel
6	O-Ring + PBK	Nitrile rubber + polyuret.	20	Front brake bushing	Steel
7	Head	Steel	21	Spacer	Steel
8	O-Ring + PBK	Nitrile rubber + polyuret.	22	Safety plug	Steel
9	Liner	Nonmagnetic steel	23	Adjustment needle	Steel
10	Tied rod	Steel	24	Locknut	Steel
11	Safety pin	Steel	25	O-Ring	Nitrile rubber
12	Brake spur	Steel	26	Position indicator	-
13	Rear flashing ring	Steel	27	Switch	-

ADJUSTABLE POSITION SENSORS

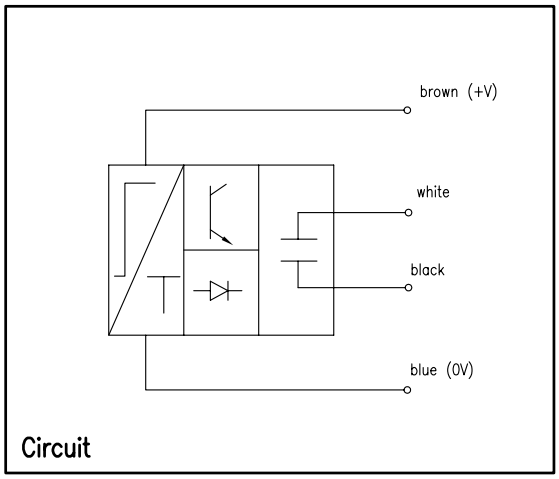
The sensors mounted on the cylinder liner detect the presence of the magnetic field created by the magnet inside the cylinder. The sensor is a switch and accordingly must be always mounted in series to a load (of inductive, resistive or capacitive type), without exceeding the limits of its electrical characteristics. The LED sensors work at a minimum voltage of 20V, because of their display circuit. Sensors are provided with 3 m long cable.



The sensor dimensions are indicated in the table on the right, and must be added to dimensions E, specified for series CH.

BORE	25	32	40	50	63	80	100
X (mm)	28,5	29	26	24	21	14,5	19
Y (mm)	16	17	15,5	14,5	10,5	6,5	10,5

TECHNICAL CHARACTERISTICS		
PARAMETER	**Unit**	**SFM01**
Nominal voltage DC	V	24 ±20%
Visual signal led	-	SI
Relè output	-	SI
PNP output	-	SI
NPN output	-	SI
Reverse polarity protection	-	SI
Short circuit protection	-	SI
Inductive load protection	-	SI
Power supply noise protection	-	SI
Electrical nominale life (worst case)	n	200.000
Mechanical nominal life (worst case)	n	10E7
Position repeatability const. temp.	mm	0,1
Hysteresis		0,3
Switch off time (15-80ms)	-	SI
Max working temperature	°C	70
Protection level	-	IP67
Max. admitted current	A	1 30W
Deleted	msec	15
Cable armoured 4x0.25	-	-



Circuit

AVAILABLE MODELS

- The OI execution is not available. Any other execution is manufactured with 25 to 100mm bore.

EXAMPLE: DETERMINING THE ACRONYM FOR THE ORDER

CHARACTERISTIC	DESCRIPTION	SYM.
SERIES	Tie rod execution, with magnetic sensors	CHM
BORE	indicate mm	
ROD	indicate mm	
ROD No. 2	indicate mm (piston rod only)	
STROKE	indicate mm	
EXECUTION	rear + front protruding tie rods	AP
	front flange	FA
	rear flange	FP
	feet	PI
	female hinge	CF
	male hinge	CM
	joint hinge	CS
	front trunnion	OA
	rear trunnion	OP
	front protruding tie rods	TA
	rear protruding tie rods	TP
	front treaded holes	ZA
	rear treaded holes	ZP
BRAKING	without braking	0
	front braking	1
	rear braking	2
	front + rear braking	3
SPACER	without spacer	0
	50mm	1
	100mm	2
	150mm	3
	200mm	4
SEALS	elastomer + nitrile (standard)	A
	nitrile + PTFE (anti-friction)	B
OPTIONS*		
ROD ENDS	type D	D
	type F	F
AIR VENTS	front	G
	rear	H
	front + rear	I
DOUBLE ROD SEAL		L
DRAINAGE	rod side	W
ROD TREATMENT	heavy chromium-plated, 0.045mm thick, 100h salt mist ISO 3768	P
	hardening and chromium-plating	T
	Ni-CROMAX30 chromium-plated, nickel-plated, ASTM B 117 1000h	N
SWITCHES	SFM01	KPN
N° of SWITCHES	indicate quantity	

EXAMPLE

CHM/50/22/.../50/AP/10 A...

* To be reported in alphabetic order