CC
CYLINDERS SERIES

STANDARD ISO 6022

GRICES
HYDRAULIC CYLINDERS

CC CYLINDERS SERIES

STANDARD ISO 6022

CC cylinders series follows International standards **ISO 6022 and DIN 24333**.
The construction with round heads fits to the most demanding and challenging industrial actuation requests in the iron and steel industry, with continuous nominal pressure up to **25 MPa**. The choice of selected materials, the severe controls of 100% of all cylinders produced and the quality of the means of production, allows us to reach high standards of quality, reliability and enduring product performance.

The seals used, supplied by premium suppliers, grant high performance and international availability. The wide range of seals, allows us to offer cylinders for applications with different kinds of hydraulic fluids, speed, frequency and operating temperature. Our production includes the optional integration of position transducers (*see CCT series*)

Technical charachteristics:

- Standard ISO 6022 and DIN 24333
- Nominal pressure 25 MPa (continuous operation)
- Maximum pressure 32 MPa
- Bore 50-320 mm
- Stroke up to 4000 mm
- Single or double rod
- 5 Mounting styles Ref. ISO ISO MF3 - MF4 - MT4 - MP5 - EB (*basic execution*)

Options:

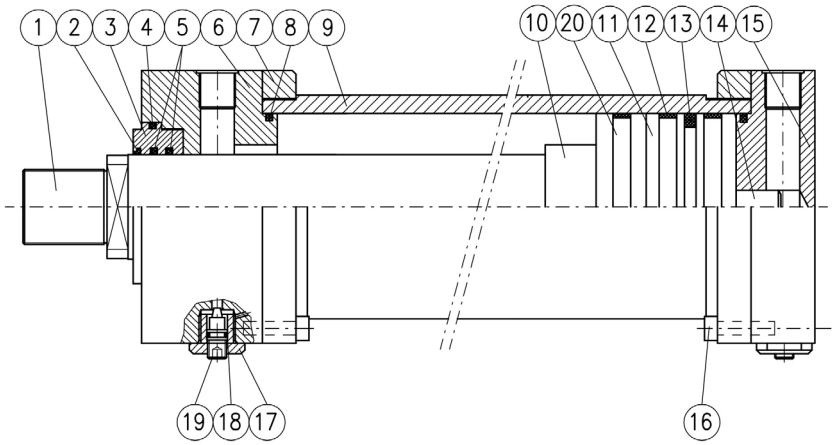
- Fixed or adjustable cushions
- Proximity sensor integrated in cylinder heads
- Magnetostrictive position transducer integrated with analogue output signal (intensity or tension) or digital output signal (SSI, CAN-open, PRODIFUB-DP or IO/LINK) (*see CCT series*)
- Air bleeds
- Rod treatment : chromed, induction hardened and chromed, nickel-chromed
- Drainage
- Subplate CETOP 03/05

Configuratore EPC

This is an innovative tool that allows the client to configure CC cylinders in a rapid and intuitive way, guiding the technician through the choices of all the options available. Once the cylinder code is defined, the EPC software provides 2D, 3D and PDF drawings, and gives the user the possibility to save projects and request offers.

With the complete access, reserved to the purchasing department, it is possible to make orders directly.
For all orders received through EPC an extra discount will be applied.

Login at: http://configuratore.grices.it/



N°	ITEM	MATERIAL
1	Rod	Chromium-plated steel
2	Dust scraper	Nitrile rubber + PTFE
3	Guide sleeve	Cast iron / Steel
4	O-Ring + anti-extrusion	Nitrile rubber + sealon
5	Rod seal	Nitrile rubber + PTFE
6	Front head	Steel
7	Counterflange	Steel
8	O-Ring + anti-extrusion	Nitrile rubber + sealon
9	Body	Steel
10	Front cushioning sleeve	Steel
11	Piston	Steel
12	Sliding guide	MCF80
13	Piston B seal	Nitrile rubber + PTFE
14	Cushioning spur	Steel
15	Rear head	Steel
16	Cilindrical head screw	Steel
17	Safety plug	Steel
18	O-Ring	Nitrile rubber
19	Adjustment needle	Steel
20	Spacer	Steel

Mounting style

EB	**FA** ISO MF3	**FP** ISO MF4	**CS** ISO MP5	**OI** ISO MT4
				

TECHNICAL CHARACTERISTICS

STANDARD 6022

CHOOSING THE PRODUCTION SERIES

In order to identify the production series, ensure 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 cushioning(*see paragraph 1.7*).

We recommend adopting strokes longer by a few millimetres than the working stroke, in order to prevent 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 CC

The CC hydraulic cylinders are dimensioned according to standard ISO 6022;

- 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 cushionings of rear and front end of stroke, consisting of self-centering spurs that can slow-down gradually the masses concerned, even of considerable size.
- The seals used are standard, and provide reliability and easy availability on the market. The available seals selection fits different speed, frequency, temperature and fluid conditions

1.2 RANGE OF USE OF CC CYLINDERS

Nominal pressure 25 Mpa (250 bar), recommended for normal use
Maximal pressure 32 Mpa (320 bar)

1.3 CYLINDER BODY

The cylinder body is made up of a top-quality thick steel tube, either cold drawn or hot laminated, with elevated thickness and accurate internal surface (roughness RA ≤ 0.4 micron, diameter tolerance H8)

1.4 ROD

Rods are made with top-quality steel and coated with hard chrome. This surface treatment ensures proper protection against any damage and corrosion, favouring the seals' endurance. The minimum surface finish is 0.2 micron. Rods with strong chrome filling, induction-hardened, nickel/chromium plated, inox/chromed or made of special steel, can be manufactured on demand.

1.5 HEAD

Heads are made of steel and are manufactured to ensure perfect concentricity between the cylinder body, the rod bearing and the rod. Wide inner passages are manufactured to minimize any load loss when the fluid is conveyed.

1.6 PISTON

The piston is made with a special material, specially processed to ensure a concentric guide between rod cushioning sleeve, cylinder body and head cushioning bushing. A large part of the radial surface is in contact with the cylinder body. This confers considerable stability, so that any rod bending, caused by external radial loads, is minimized.

1.7 END OF STROKE CUSHIONING

The end of stroke cushioning is usually adopted on all cylinders working at a speed > 0.1 m/sec., or when loads in vertical direction are activated. This cushioning is also a safety device in case of servo-systems control equipment failure. The ratio below makes it possible to promptly calculate, based on the cylinder bore (cushioning section), the supply pressure, the cushioning length and the working speed, as well as the mass that can be cushioned by every single cylinder. This reaction limits the overpressure value to 320 bar, protecting the cylinder's components that are under stress during braking.

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

P_1 - supply pressure (bar)
P_2 - maximum pressure 250 (bar)
V_0 - working speed (m/s)
S - cushioning section **S_1** or **S_2** (cm^2)
L_f - cushioning length **L_{f1}** or **L_{f2}** (mm)
A - piston area (cm^2)

The cushioned mass values obtained from this ratio are simply theoretical, and Grices accepts no responsibility for the use of this ratio. The data to be inserted in the ratio to calculate the mass that can be cushioned may be obtained from the following table.

Bore (mm)	50	63	80	100	125	160	200	250	320
Ø Rod (mm)	36	45	56	70	90	110	140	180	220
S_1 (cm^2) rod forward	8,2	13,8	23,8	37,8	56	102	151	177	352
S_2 (cm^2) rod backward	18,5	29,1	46,4	73,2	114	189	294	471	748
L_f (mm)	30	30	30	32	32	40	46	95	100
A (cm^2)	19,6	31,2	50,3	78,5	122,7	201,1	314,2	490,6	803,8

The standard cushioning is in position 3 (figure A); is possible to request a different cushioning position.

1.8 CUSHIONING ADJUSTMENT

For a precise cushioning adjustment, both ends of the cylinder are equipped with control valves, as shown in figure on the right.
These devices are equipped with a system that prevents their accidental removal. These devices are located on side 3.

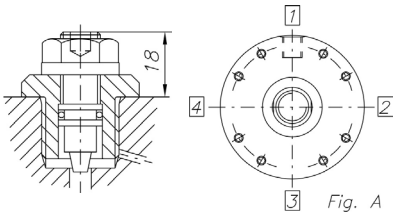
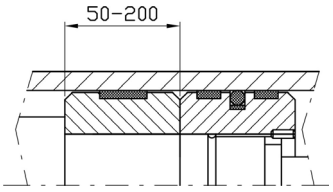


Fig. A

1.9 SPACERS

Cylinders with strokes > 1000mm should equipped with spacers of adequate design that increase the rod and piston guide, in order to reduce any overload phenomena and premature wear.
The spacer allows increase of the contact surface between piston and cylinder body, improving the system rigidity. The table below 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 a 1500	1501 a 2000	2001 a 2500	2501 a 3000
Spacer symbol	1	2	3	4
Length (mm)	50	100	150	200



1.10 SEALS

The sealing system must be chosen according to the working conditions of the cylinder: speed, fluid type and temperature. Our cylinders feature seals provided with seats conforming to the ISO 7425 norm. That allows 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 B standard: (NITRILE+PTFE)** anti-friction, not recommended when loads are to be held in position, and recommended at speeds ≤ 4 m/sec., at temperatures ranging between –10 and +75°C, operation with mineral oil or glycol water.
- **TYPE C: (VITON+PTFE)** anti-friction, not recommended when loads are to be held in position, for high-temperature fluids up to+135°C, maximum speed 4m/sec. Can be used also with phosphoric esters.

Options:

- **TYPE H: (CHEVRON)** special option recommended when loads are to be held in position.
  Contact our Technical Department for their availability.

1.11 OIL PORTS

Oil ports are BSP threaded, with boring conforming to DIN 3852/2, standard position 1 in figure A; other alternative positions can be provided on demand. Supplies with ISO 6162-2 compatible drilling for mounting SAE 6000 psi flanges are available on request (*contact our Technical Department*).
In order to reduce as much as possible any turbulence and water hammer in the cylinder's connecting pipes, 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 Ø	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
MAX. FLOW RATE (l/mm)	40	53	85	136	212	320

***SAE flanges option:** ask our technical department for availability and dimensions*

1.12 AIR BLEEDS

Air bleeds are provided on demand on both ends of the cylinder. Bleeds 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. Standard position: 2 in figure A; other alternative positions can be provided on demand.

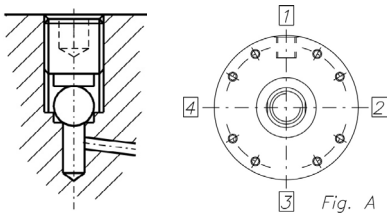


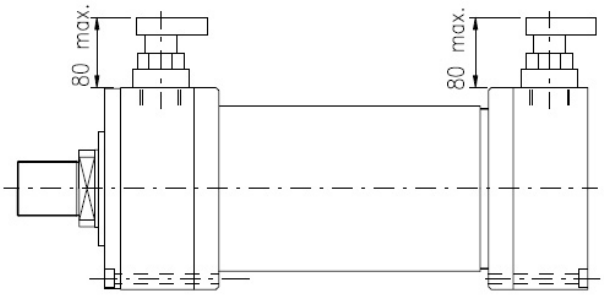
Fig. A

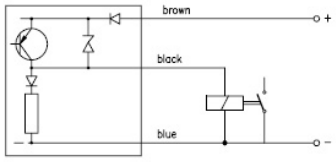
1.13 DRAINAGE

The drainage on the rod seal ensures better sealing at high speed, in particular in cylinders with strokes > 2000mm or in applications where the rod side chamber 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.

1.14 PROXIMITY SENSORS

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





Technical data of the sensor:

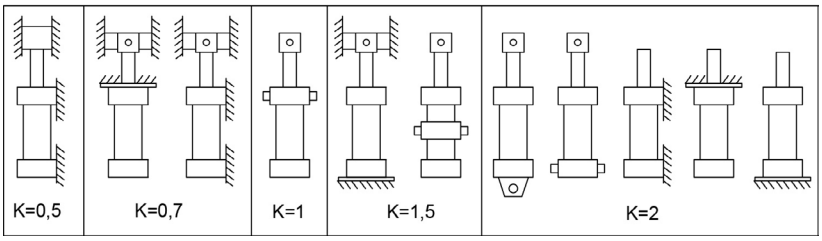
Working temperature	–25 +80 °C
Supply voltage	10–30 V cc
Load	200 mA
Execution	PNP
Output type	NA

2.1 PEAK LOAD

When the cylinder is working under compression, check the rod diameter at 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 **LV** value (virtual length, **LV = L*K**).
Graph 2 indicates the rod's minimum diameter, based on load. The point of intersection between **LV** in mm. and pushing force **F** in **KN** must be below the characteristic curve of the rod to be checked.

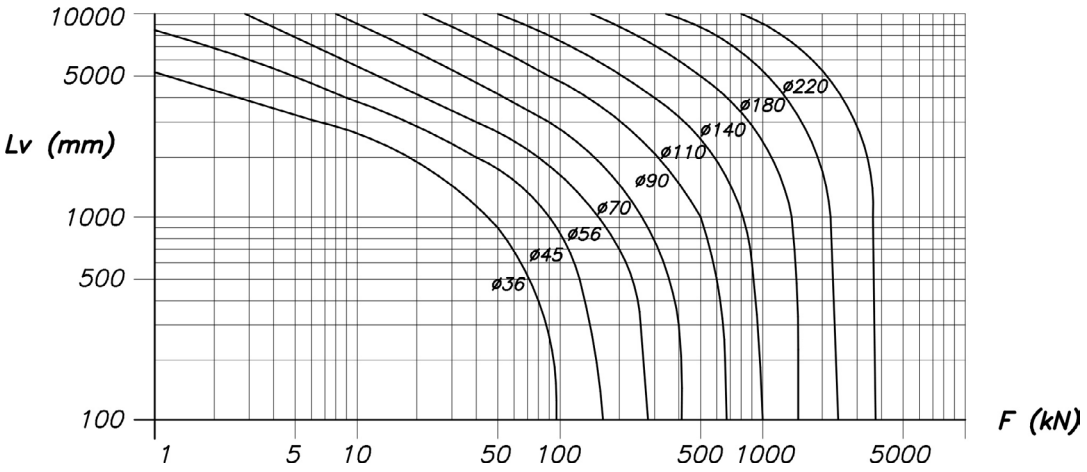
Example: cylinder **CC63/45/750/FA/00B** (front flange) employs a **40 KN**.
Table 1 shows coefficient **K**, determined by the type of restriction **K = 2**, the virtual length is **LV = L*K LV = 750*2 = 1500 mm**.

Tabella 1



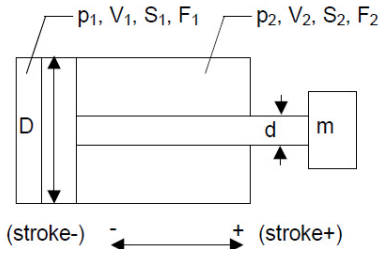
In **graph 2** you can check whether the point of intersection between **LV** and **F** is below the curve of rod Ø 45.
Once the stability condition has been met the rod Ø 45 can be adopted. If the result was negative (intersection point of **LV** and **F** over the curve) you should choose a cylinder with a larger rod.

Graph 2



2.2 PRACTICAL UNIT OF MEASUREMENT

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



PUSHING FORCE (STROKE +)

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

PUSHING SPEED (STROKE +)

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

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

PULLING FORCE (STROKE -)

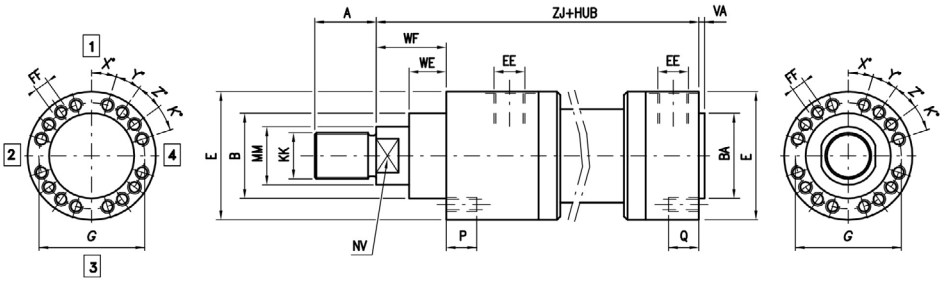
$F_2=(p_2 \cdot S_2)$ (Kg)

PULLING SPEED (STROKE -)

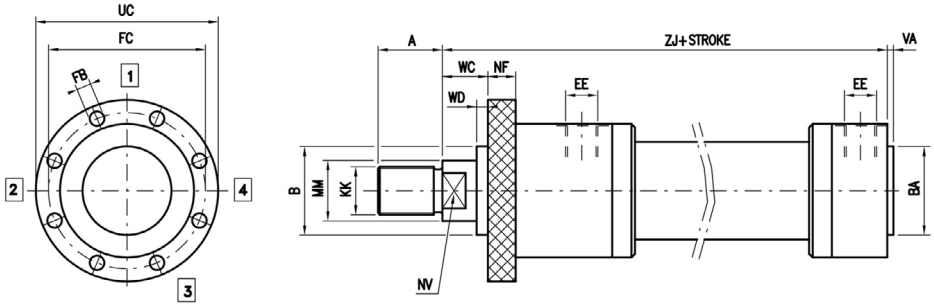
$V_2=Q/(6 \cdot S_2)$ (m/s)

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

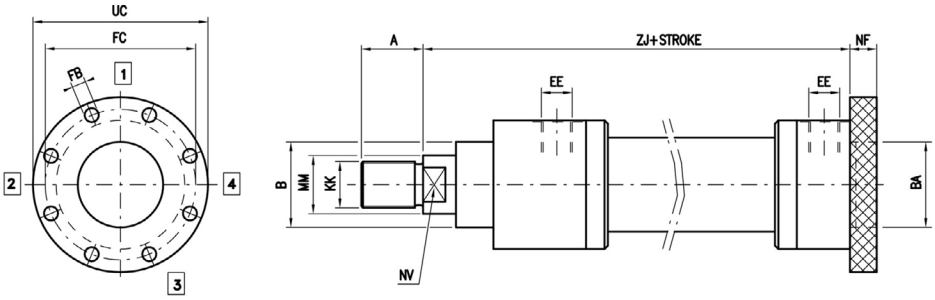
EB Base



FA ISO type MF3

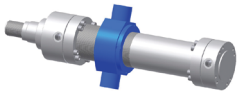


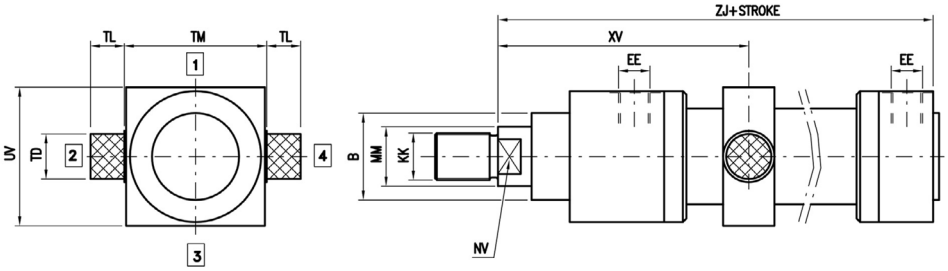
FP ISO type MF4



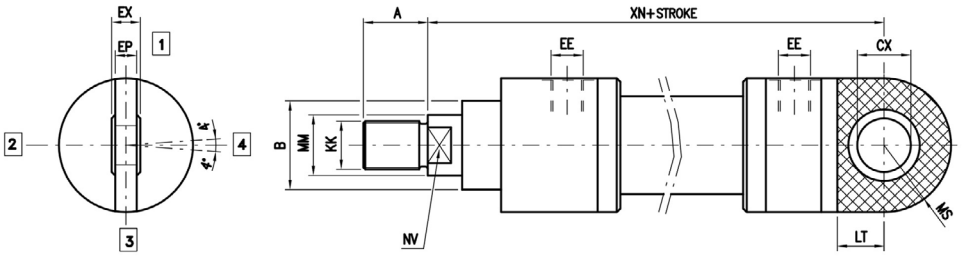
BORE	MM	KK	A	B	BA	E	EE	FB	FC	FF	G	GF	K°	NF	NV	P	Q	UC	VA	VD	WC	WE	WF	X°	Y°	Z°	ZJ	ZP
50	36	M27x2	36	63	63	108	1/2"	14	132	M8	84	84	0°	25	28	16	16	165	4	4	22	29	47	32,5°	25°	0°	240	265
63	45	M33x2	45	75	75	124	3/4"	14	150	M8	100	100	0°	28	36	21	21	180	5	4	25	32	53	32°	26°	0°	270	298
80	56	M42x2	56	90	90	148	3/4"	18	180	M10	120	120	0°	32	46	20	20	220	5	4	28	36	60	35°	20°	0°	300	332
100	70	M48x2	63	110	110	175	1"	22	212	M12	148	148	0°	36	60	25	25	260	6	5	32	41	68	35°	20°	0°	335	371
125	90	M64x3	85	132	132	210	1"	22	250	M16	180	180	0°	40	75	30	28	295	6	5	36	45	76	35°	20°	0°	390	430
160	110	M80x3	95	160	160	270	1 1/4"	26	315	M16	230	230	0°	45	95	45	35	370	7	5	40	50	85	25°	20°	20°	460	505
200	140	M100x3	112	200	200	330	1 1/4"	33	385	M20	288	288	0°	56	120	40	38	460	8	5	45	61	101	25°	20°	20°	540	596
250	180	M125x4	125	250	250	410	1 1/2"	39	475	M24	370	370	0°	63	_	45	45	540	8	8	50	71	113	25°	20°	20°	640	703
320	220	M160x4	160	320	320	510	1 1/2"	45	600	M30	450	450	15°	80	_	66	66	680	8	8	56	88	136	22,5°	15°	15°	750	830

OI ISO type MT4





CS ISO type MP5



BORE	MM	KK	B	CX	EE	EP	EX	LT	MS	NV	TD	TL	TM	UV	ZJ	XN	XV min	XV+max stroke
50	36	M27x2	63	32	1/2"	27	32	40	40	28	32	25	112	112	240	305	177	120
63	45	M33x2	75	40	3/4"	35	40	50	50	36	40	32	125	135	270	348	206	140
80	56	M42x2	90	50	3/4"	40	50	63	63	46	50	40	150	162	300	395	236	155
100	70	M48x2	110	63	1"	52	63	71	80	60	63	50	180	196	335	442	277	170
125	90	M64x3	132	80	1"	60	80	90	100	75	80	63	224	250	390	520	321	190
160	110	M80x3	160	100	1 1/4"	80	100	112	125	95	100	80	280	270	460	617	398	220
200	140	M100x3	200	125	1 1/4"	102	125	160	160	120	125	100	335	320	540	756	452	250
250	180	M125x4	250	160	1 1/2"	130	160	200	200	_	160	125	425	_	640	903	500	270
320	220	M160x4	320	200	1 1/2"	162	200	250	250	_	200	160	530	_	750	1080	630	280

EXAMPLE OF ORDER ACRONYM

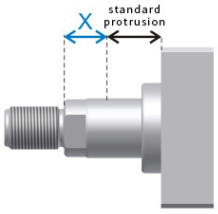
CC/50/36/530/OI00B0I000Q1324R13240XV...

CHARACTERISTIC	DESCRIPTION	SYM.	EXAMPLE
SERIES	Execution ISO 6022	**CC**	CC
BORE	Indicate in mm		CC/**50**/
ROD	Indicate in mm		CC/50/**36**/
STROKE	Indicate in mm		CC/50/36/**530**/
EXECUTION	Base	**EB**	CC/50/36/530/**OI**
	Front flange	**FA**	
	Rear flange	**FP**	
	Joint hinge	**CS**	
	Intermediate trunnion	**OI**	
CUSHIONING	None	**0**	CC/50/36/530/OI**0**
	Front cushioning	**1**	
	Rear cushioning	**2**	
	Front + rear cushioning	**3**	
SPACER	None	**0**	CC/50/36/530/OI0**0**
	50 mm	**1**	
	100 mm	**2**	
	150 mm	**3**	
	200 mm	**4**	
SEALS	Nitrile + ptfe (anti-friction) standard	**B**	CC/50/36/530/OI00**B**
	Viton + ptfe (high temperatures)	**C**	
ROD END	Type M (standard)	**0**	CC/50/36/530/OI00B**0**
	Type F	**F**	
AIR BLEEDS	None	**0**	CC/50/36/530/OI00B0**I**
	Front	**G**	
	Rear	**H**	
	Front + rear	**I**	
DRAINAGE	None	**0**	CC/50/36/530/OI00B0I**0**
	Rod side	**W**	
ROD TREATMENT	Standard chromium-plated	**0**	CC/50/36/530/OI00B0I0**0**
	Heavy chromium-plated, 0.045mm thick, 100h salt mist ISO 3768	**P**	
	Hardening and chromium-plating	**T**	
	Ni-CROMAX30 chromium-plated, nickelplated, ASTM B 117 1000h	**N**	
PROXIMITY SENSOR	None	**0**	CC/50/36/530/OI00B0I00**0**
	Front	**X1**	
	Rear	**X2**	
	Front + rear	**X3**	

FRONT HEAD					
POS. OIL PORTS	Side **1**	Side **2**	Side **3**	Side **4**	CC/50/36/530/OI00B0I000**Q1**
POS. CUSHIONING	**0** if not requested				CC/50/36/530/OI00B0I000Q1**3**
	Side **1**	Side **2**	Side **3**	Side **4**	
POS. AIR BLEED	**0** if not requested				CC/50/36/530/OI00B0I000Q13**2**
	Side **1**	Side **2**	Side **3**	Side **4**	
POS. SENSOR	**0** if not requested				CC/50/36/530/OI00B0I000Q132**4**
	Side **1**	Side **2**	Side **3**	Side **4**	

REAR HEAD					
POS. OIL PORTS	Side **1**	Side **2**	Side **3**	Side **4**	CC/50/36/530/OI00B0I000Q1324**R1**
POS. CUSHIONING	**0** if not requested				CC/50/36/530/OI00B0I000Q1324R1**3**
	Side **1**	Side **2**	Side **3**	Side **4**	
POS. AIR BLEED	**0** if not requested				CC/50/36/530/OI00B0I000Q1324R13**2**
	Side **1**	Side **2**	Side **3**	Side **4**	
POS. SENSOR	**0** if not requested				CC/50/36/530/OI00B0I000Q1324R132**4**
	Side **1**	Side **2**	Side **3**	Side **4**	
***EXTRA ROD X QUOTE**	Indicate mm				CC/50/36/530/OI00B0I000Q1324R1324**0**
XV QUOTE	Indicate mm (only version MT4)				CC/50/36/530/OI00B0I000Q1324R1340**XV...**

**Specify the possible extra-rod (X) size in addition to the standard rod protrusion:*



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Configure your cylinder in a quick and intuitive way choosing all the available options.

Note

The indicated operating pressures are efficient for smooth applications without blows. For extreme loads or high operating pressures with high frequency, is necessary to use mounting styles and thread-rod links designed to be stress-resistant.
For further information contact our Technical Department.