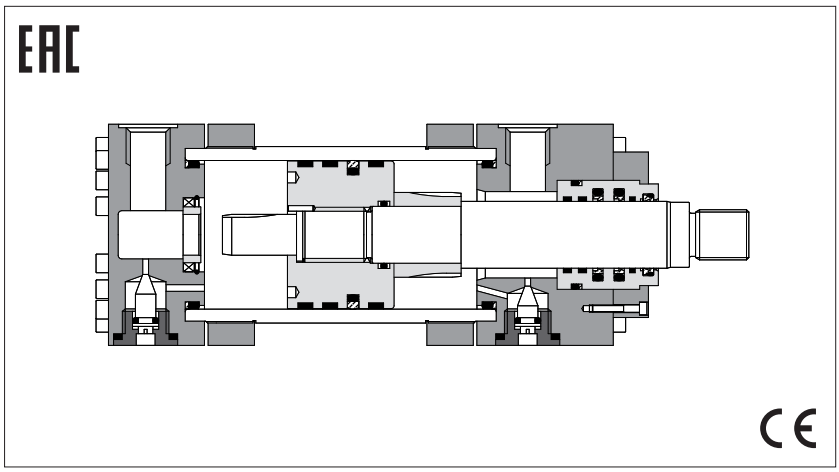
Hydraulic cylinders type CH - big bore sizes

to ISO 6020-3 - nominal pressure 16 MPa (160 bar) - max 25 MPa (250 bar)



CH big bore cylinders have engineered double acting construction, designed to suit the requirements of industrial applications: top reliability, high performances and long working life.

- Bore sizes from **250** to **400** mm
- Adjustable cushioning
- Optional built-in position transducer, **see tab. B310**
- Attachments for rods and mounting styles, **see tab. B800**

For cylinder's choice and sizing criteria **see tab. B015**

1 MODEL CODE

CH	F	-	250	/	140	*	0500	-	S	3	0	8	-	A	-	B1E3X1Z3	**

Cylinder series
CH to ISO 6020 - 3

Rod position transducer
- = omit if not requested
F = magnetosonic
M = magnetosonic programmable
N = magnetostrictive
P = potentiometric
V = inductive
Transducer available on request, contact our technical office

Bore size, see section 3
from **250** to **400** mm

Rod diameter, see sections 7
from **140** to **220** mm

Stroke, see section 4
up to **5000** mm

Mounting style, see sections 2 and 3

		REF. ISO
C	= fixed clevis	MP1
G	= front trunnion	MT1
L	= intermediate trunnion	MT4 **(3)**
N	= front flange	ME5
P	= rear flange	ME6
S	= fixed eye + spherical bearing	MX5
X	= basic execution	-

Cushioning, see section 10
0 = none
Slow adjustable
1 = rear only
2 = front only
3 = front and rear

Spacer, see section 5
0 = none **2** = 50 mm **4** = 100 mm **6** = 150 mm **8** = 200 mm

Sealing system, see section 12
2 = (FKM + PTFE) very low friction and high temperatures
8 = (NBR + PTFE) low friction

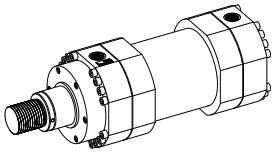
Options (2):
Rod treatment, see section 9
T = induction surface hardening and chrome plating
Air bleeds, see section 13
A = front air bleed
W = rear air bleed
Draining, see section 14
L = rod side draining
Flange oil ports, see section 6
M = front and rear SAE 6000 flange oil ports

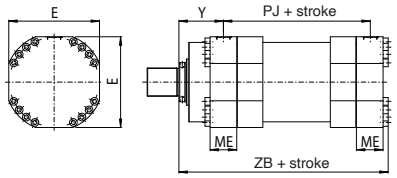
Heads' configuration (2), see section 11
Oil ports positions
B1 = front head
X1 = rear head
Cushioning adjustments positions
E3 = front head
Z3 = rear head

Series number **(1)**

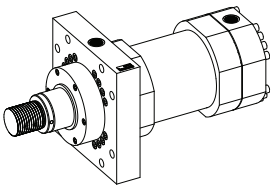
(1) For spare parts request indicate the series number printed on the nameplate only for series < 20
(2) To be entered in alphabetical order
(3) XV dimension must be indicated in the model code, see section 3

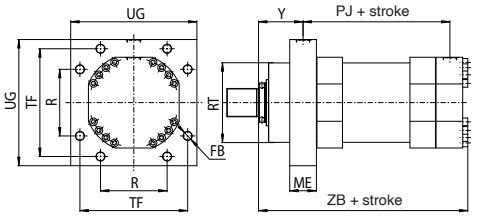
2 **MOUNTING STYLE** - for dimensions see section 3



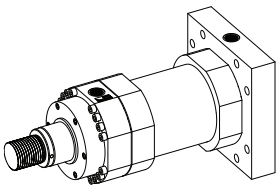


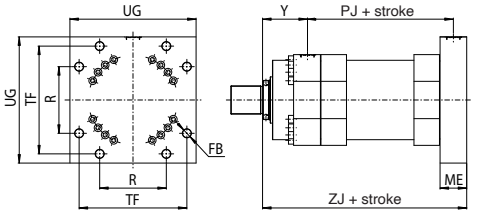
X = basic mounting



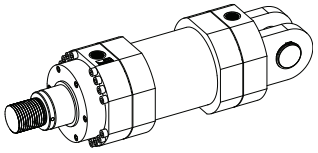


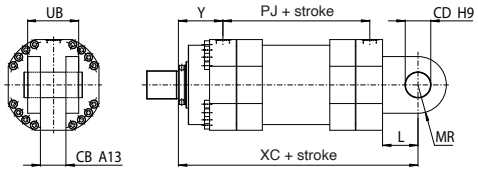
N (ISO MF5) = front flange mounting



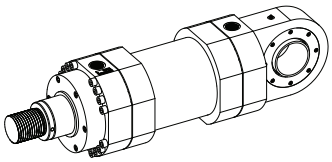


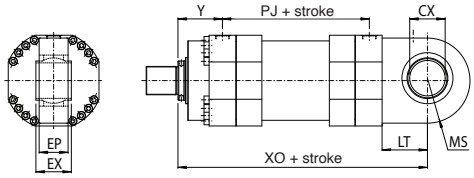
P (ISO MF6) = rear flange mounting



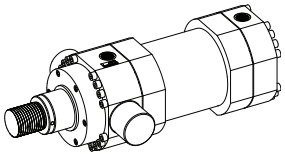


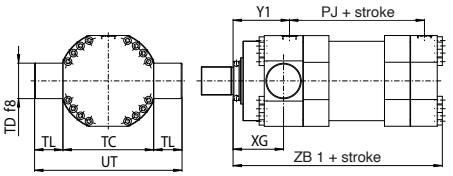
C (ISO MP1) = fixed clevis mounting - supplied with pivot pin C-145



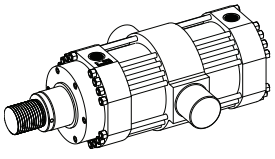


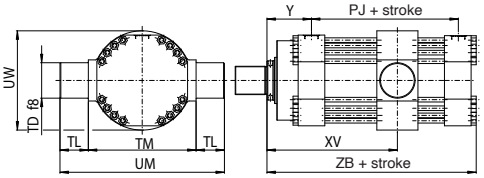
S (ISO MP5) = fixed eye with spherical bearing mounting





G (ISO MT1) = front trunnion mounting





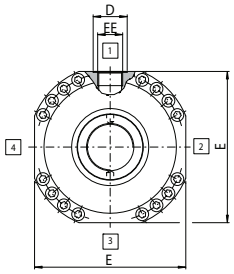
L (ISO MT4) = intermediate trunnion mounting

3 INSTALLATION DIMENSIONS [mm] - see figures in section 2

Ø Bore		250	320	400
Ø Rod		140	180	220
B f9 **(4)**		163	205	245
CB A13		90	110	140
CD H9		90	110	140
CX H7		125	160	200
D (1)		58	58	69
E (2) max		320	400	500
EE (1)		G 1 1/2	G 1 1/2	G 2
EP		102	130	162
EX		125	160	200
F max **(4)**		75	75	75
FB		30	36	45
L min		125	152	195
LT min		160	200	250
ME ref		94	114	140
MR max		100	120	160
MS max		160	200	250
MT (3) [Nm]		350	680	1060
PJ ±1,5 **(6)**		218	252	320
R js13		235	283	340
RD f8 **(4)**		280	325	380
TC h14		320	400	500
TD f8		125	160	200
TF		380	472	588
TL js13		100	125	160
TM h14		380	485	605
UB		180	220	280
UG max		445	549	683
UM ref		580	735	925
UT ref		520	650	820
UW max		480	600	750
VD (4)		8	8	8
VE max **(4)**		83	83	83
WF ±2		110	110	110
XC ±1,5 **(6)**		545	627	775
XG ±2 **(6)**		178	195	215
XO ±1,5 **(6)**		580	675	830
XV (5) ±2 **(6)**	**style L minimun stroke**	20	35	26
	min	275	312	358
	max	255+stroke	273+stroke	332+stroke
Y ±2 **(6)**		157	167	180
Y1 ±2 **(6)**		199	223	260
ZB max **(6)**		460	520	625
ZB1 max **(6)**		505	580	685
ZJ ±1 **(6)**		420	475	580

NOTES TO TABLE 3

(1) **D, EE** - Oil ports and drain are threaded according to GAS standard with counterbore dimension **D** according to ISO 1179-1 (see figure below)



(2) **E** - If not otherwise specified in the figures in section 2, this value is the front and rear round heads dimension for all the mounting styles (see figure above)

(3) **MT** - Screws tightening torque. Mounting screws must be to a minimum strength of ISO 898/2 grade 12.9

(4) See figures in section 7

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

CH - 250 / 140 * 0500 - L308 - A - B1E3X1Z3
XV = 300

(6) The tolerance is valid for strokes up to 1250 mm, for longer strokes the upper tolerance is given by the max stroke tolerance in section 4

4 STROKE SELECTION

Stroke has to be selected a few mm longer than the working stroke, to prevent to use the cylinder heads as mechanical stroke-end. The table below shows the minimum stroke depending to the bore.

Minimum stroke [mm]

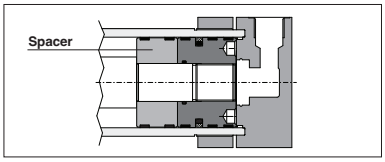
Ø Bore	250	320	400
Minimum stroke	65	70	40

Maximum stroke:
- 5000 mm

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

5 SPACER

For strokes longer than 1000 mm, proper spacers have to be introduced in the cylinder's construction to increase the rod and piston guide and to protect them from overloads and premature wear. Spacers can be omitted for cylinders working in traction mode. The introduction of spacers increases the overall cylinder's dimensions: spacers' lenght has to be added to all stroke dependent dimensions in section 3.



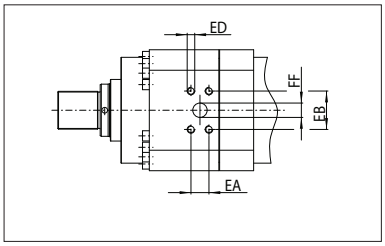
RECOMMENDED SPACERS [mm]

Stroke	1001 ÷ 1500	1501 ÷ 2000	2001 ÷ 2500	2501 ÷ 5000
Spacer code	**2**	**4**	**6**	**8**
Length	50	100	150	200

6 SAE 6000 FLANGE OIL PORTS(*) - DIMENSIONS TO ISO 6162-2 [mm]

Ø Bore	DN	EA ±0,25	EB ±0,25	ED 6g	FF 0 / -1,5
250	38	36,5	79,3	M16	38
320					
400	51	44,5	96,8	M20	51

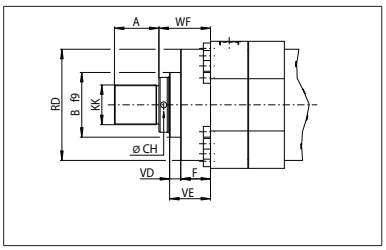
(*) out of the norm



7 ROD END DIMENSIONS [mm]

Ø Bore	250	320	400
Ø Rod	140	180	220
A	112	125	160
CH (*)	15	15	15
KK	M100x3	M125x4	M160x4

(*) n°2 holes per key
Note: for B, F, RD, VD, VE and WF dimensions see section 3



8 CYLINDER'S HOUSING FEATURES

The cylinder's housings are made in "hot rolled steel"; the internal surfaces are lapped: diameter tolerance H8, roughness Ra ≤ 0,25 μm.

9 RODS FEATURES and options

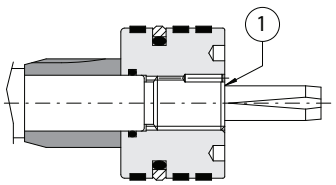
The rods materials have high strength, which provide safety coefficients higher than 4 in static stress conditions, at maximum working pressure. The rod surface is chrome plated: diameter tolerances f7; roughness Ra ≤ 0,25 μm. Corrosion resistance of 200h in neutral spray to ISO 9227 NSS.

ø Rod	Material	Rs min [N/mm²]	Chrome	
			min thickness [mm]	hardness [HV]
140	alloy-steel	450	0,020	850-1150
180÷220	carbon steell	360	0,045	

The rod and piston are mechanically coupled by a threaded connection in which the thread on the rod is at least equal to the external thread KK, indicated in the table 7. See **tab. B015** for the calculation of the expected rod fatigue life. The piston is screwed to the rod by a prefixed tightening torque in order to improve the fatigue resistance. The stop pin ① avoids the piston unscrewing. **Contact our technical office** in case of heavy duty applications.

Rod hardness can be improved selecting the option **T**:
T = Induction surface hardening and chrome plating (only for rod 140)
• 56-60 HRC (613-697 HV) hardness

ROD-PISTON COUPLING

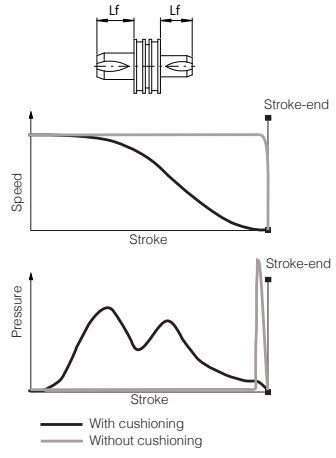


10 CUSHIONING

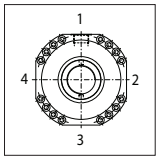
Cushioning are recommended for applications where: • the piston makes a full stroke with speed over than 0,05 m/s; • it is necessary to reduce undesirable noise and mechanical shocks; • vertical application with heavy loads. The stroke-end cushioning are hydraulic dampers specifically designed to dissipate the energy of the mass connected to the cylinder rod, by progressively increasing the pressure in the cushioning chamber and thus reducing the rod speed before the cylinder's mechanical stroke-end (see the graphics at side).
The cylinder is provided with needle valve to optimize cushioning performances in different applications. The regulating screws are supplied fully screwed in (max cushioning effect). In case of high masses and/or very high operating speeds it is recommended to back them off to optimize the cushioning effect. The adjustment screw has a special design to prevent unlocking and expulsion. The cushioning effect is highly ensured even in case of variation of the fluid viscosity.

Ø Bore		250	320	400
Ø Rod		140	180	220
Cushioning length [mm]	Lf front	50	60	70
	Lf rear	56	64	64

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



11 POSITION OF THE OIL PORTS AND CUSHIONING ADJUSTMENTS

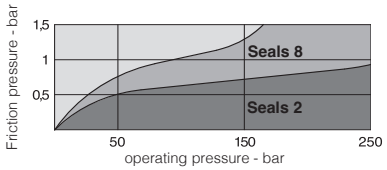


FRONT HEAD: **B1** = oil port position; **E3** = cushioning adjustment position
REAR HEAD: **X1** = oil port position; **Z3** = cushioning adjustment position.
The oil ports and cushioning adjustment positions are only available, respectively, on sides 1 and 3 (see the figure at side).

Example of model code: CH-250/140 *0100-S301 - A - **B1E3X1Z3**

12 SEALING SYSTEM FEATURES

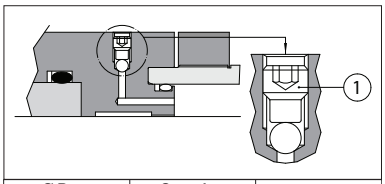
The sealing system must be choosen according to the working conditions of the system: speed, operating frequencies, fluid type and temperature. Additional verifications about minimum in/out rod speed is warmly suggested, see **tab. B015**.
Special sealing system for low temperatures, high frequencies (up to 20 Hz), long working life and heavy duty are available, see **tab. TB020**. All the seals, static and dynamic, must be periodically replaced: proper spare kits are available, see section 18. Contact our technical office for the compatibility with other fluids not mentioned below and specify type and composition. See section 15 for fluid requirements.



Sealing system	Material	Features	Max speed [m/s]	Fluid temperature range	Fluids compatibility	ISO Standards for seals	
						Piston	Rod
2	FKM + PTFE	**very low friction and high temperatures**	4	-20°C to 120°C	Mineral oils HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606 fire resistance fluids HFA, HFB, HFC (water max 45%), HFD-U, HFD-R	ISO 7425/1	ISO 7425/2
8	PTFE + NBR	**low friction**	1	-20°C to 85°C	Mineral oils HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606 fire resistance fluids HFA, HFC (water max 45%), HFD-U	ISO 7425/1	ISO 7425/2

13 AIR BLEEDS

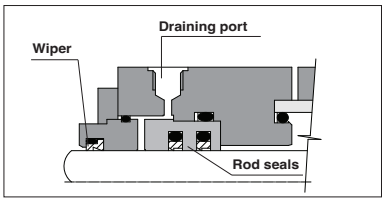
CODES: **A** = front air bleed; **W** = rear air bleed
The air in the hydraulic circuit must be removed to avoid noise, vibrations and irregular cylinder's motion: air bleed valves are recommended to realize this operation easily and safely.
Air bleeds are positioned on side 3, see section 11.
For a proper use of the air-bleed (see figure on side) unlock the grub screw ① with a wrench for hexagonal head screws, bleed-off the air and retighten as indicated in table at side.



Ø Bore	Screwing	Tightening torque
250	M8 x 10	20 Nm
320 - 400	M12 x 20	30 Nm

14 DRAINING

CODE: **L** = rod side draining
The rod side draining reduces the seals friction and increases their reliability; it is mandatory for cylinders with strokes longer than 2000 mm, with rod side chamber constantly pressurized and for servocylinders.
The draining is positioned on the same side of the oil port, between the wiper and the rod seals (see figure at side). It is recommended to connect the draining port to the tank without backpressure. Draining port is G1/8.



15 FLUID REQUIREMENTS

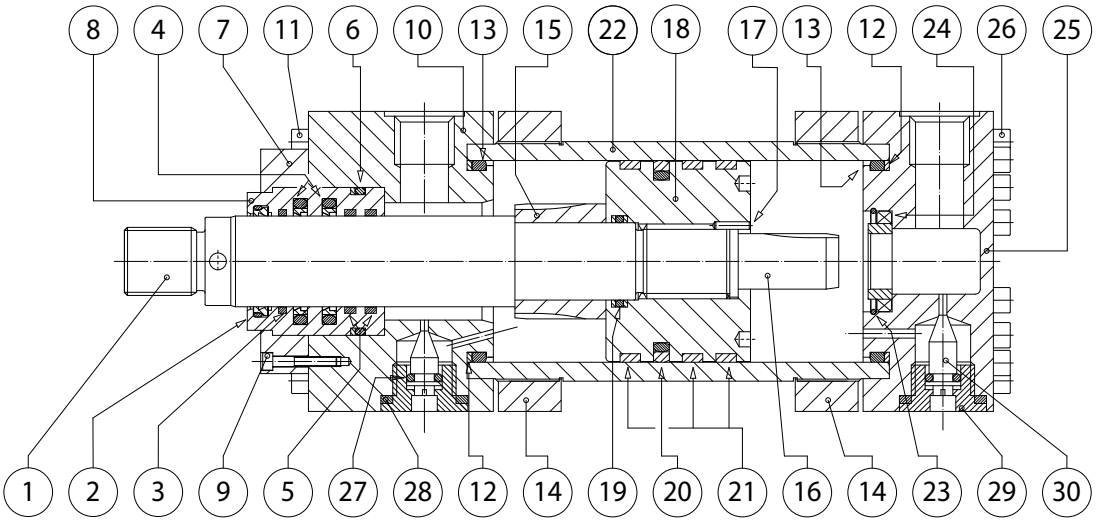
Cylinders and servocylinders are suitable for operation with mineral oils with or without additives (**HH, HL, HLP, HLP-D, HM, HV**), fire resistant fluids (**HFA** oil in water emulsion, 90-95% water and 5-10% oil; **HFB** water in oil emulsion, 40% water; **HFC** water glycol, max 45% water) and synthetic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

16 CYLINDERS MASSES [kg] (tolerance ± 5%)

		MASS FOR STYLE X single rod		ADDITIONAL MASSES according to mounting styles and options						
Ø Bore [mm]	**Ø Rod** [mm]	Stroke 100 mm	Each 100 mm more	Styles **C, S**	Style **G**	Style **L**	Styles **N, P**	Front cushioning	Rear cushioning	Each 50 mm spacer
250	**140**	324	27	55	9	110	83	8,5	19	28
320	**180**	485	41	82	16	160	142	11	27	44
400	**220**	902	71	155	34	360	275	17	45	72,4

Note: the masses related to the other options, not indicated in the table, don't have a relevant influence on the cylinder's mass

17 CYLINDER SECTION



POS.	DESCRIPTION	MATERIAL	POS.	DESCRIPTION	MATERIAL	POS.	DESCRIPTION	MATERIAL
1	Rod	Chrome plated steel	11	Screw	Steel (grade 12.9)	21	Piston guide ring	PTFE
2	Wiper	NBR / FKM + PTFE	12	Anti-extrusion ring	PTFE	22	Cylinder housing	Steel
3	Rod guide ring	PTFE	13	O-ring	NBR + PTFE	23	Toroidal ring	Steel
4	Rod seal	NBR + PTFE	14	Counterflange	Steel	24	Rear cushioning sleeve	Bronze
5	Rod guide ring	PTFE	15	Front cushioning piston	Steel	25	Rear head	Steel
6	O-Ring + Anti-extrusion ring	NBR / FKM + PTFE	16	Rear cushioning piston	Steel	26	Screw	Steel (grade 12.9)
7	Flange	Steel	17	Screw stop pin	Steel	27	O-Ring + Anti-extrusion ring	NBR / FKM + PTFE
8	Rod bearing	Steel	18	Piston	Steel	28	Seal	FKM
9	Screw	Steel (grade 12.9)	19	O-Ring + Anti-extrusion ring	NBR / FKM + PTFE	29	Cushioning adjustment plug	Steel
10	Front head	Steel	20	Piston seal	NBR / FKM + PTFE	30	Cushioning adjustment screw	Steel

18 SPARE PARTS - SEE TABLE SP-B160

Example for seals spare parts code

G 8 - **C H** - **250** / **140**

- **G 8** — Sealing system
- **C H** — Cylinder series
- **250** — Bore size [mm]
- **140** — Rod diameter [mm]