

Criteria for choice of cylinders and electrohydraulic servocylinders

General notes - construction series - options

The new Atos range of cylinders meets the most advanced requirements for control and operation of machines and plants both in on/off or proportional control systems and in closed-loop servosystems: high functional reliability, excellent repeatability, top static and dynamic characteristics.

For information on cylinder and servocylinder size about their employment, consult table B015.

For the definition of the construction series (see sect. 10) control not to exceed the nominal pressure values shown for the different series. Overpressures occurring inside the cylinders during their employment and due to different causes (throttling, cushioning, etc.) must not exceed the max. rated pressure value of the cylinder, which corresponds to its testing pressure. The general size of the cylinders allows, however, very generous safety margins.

The module construction allows a wide range of options and customization with fast delivery, thanks to full availability of components in stock.

1 OLEODYNAMIC CYLINDERS - GENERAL CONSTRUCTION NOTES

- Piston diameters up to 400 mm;
- Pressure up to 320 bar;
- Standard strokes up to 5000 mm;
- Mass-production according to the following standards:
 ISO 6020-1; DIN-ISO 6020-1; AFNOR NFE 48-015; CNOMO E05.22.313.N (**CN** series);
 ISO 6020-2'91; DIN 24554; AFNOR NFE 48-016 (**CK** series);
 ISO 6020-3 (**big size diameter** series **CH**);
 ISO 6022: DIN 24333; AFNOR NFE 48-025 (**CC** series);
- Construction solutions aimed to max. servicing simplification;
- High safety coefficients of size;
- Low-friction seals.

2 SERVOCYLINDERS AND LINEAR SERVOACTUATORS

These derive from the hydraulic cylinders of the standard series and build-in electronic stroke transducers, well-protected from shocks and/or difficult working environment. The following ranges of transducers are available: potentiometric, inductive or magnetosonic.

They are intelligent elements, electrohydraulic axis, which can be connected directly to the hydraulic source and to the electronic control system to get smooth, fast and precise movements.

3 OPTIONS AND CONSTRUCTION VARIANTS

Different construction options are available depending on the operations, protection and reliability requirements of the plant:

- Assembly of valves or hydraulic control units;
- Surface protections for bodies and rods for difficult environments;
- Adjustable stroke-end cushioning;
- Accurate seals with mixes for synthetic fluids;
- Air bleeds;
- Inductive stroke-end sensors.

4 MODEL CODE EXAMPLE

	CK	P / 10	- 80 /	56 * 0500 -	S	3	0	8	L	20
Cylinder series CK CH CC CN see sect. 10 Eventual: servocylinder transducer Eventual: incorporated subplates: see 6.2 Bore diameter [mm] Rod diameter [mm] Stroke [mm] Attachments, see proper technical tables									Drawing number Eventual: Options: see 5.6, 6.3, 6.4 Seals: see 5.5 Spacers: see 5.4 Cushioning: see 6.1	

5 GENERAL CONSTRUCTION CHARACTERISTICS

5.1 Bodies

Depending on their bore, bodies are drawn from tubes obtained from different processes, as shown in the table below. Internal surfaces are lapped. Diameter tolerance: H8, roughness Ra ≤ 0,4 μm

CYLINDER SERIES	ROD	MATERIAL	Rs [N/mm ²]
CK, CH	25÷200	drawn and stressed carbon-steel	≥ 450
	>200	rolled carbon-steel	≥ 360
CC	80÷100	drawn and stressed carbon-steel	≥ 450
	>100	rolled carbon-steel	≥ 360

5.2 Rods

Rods are screwed to pistons and made in various materials, depending on their diameter and on the construction series, as shown in the table below. Surfaces are chrome-plated. Diameter tolerance f7; roughness: Ra ≤ 0,25 μm

CYLINDERS SERIES	Ø RODS [mm]	MATERIAL	Rs [N/mm ²]	CHROME THICK [mm]
CK, CH	12÷90	Hardened and tempered carbon-steel	≥ 700	≥ 0,020
	≥ 110	Carbon-steel	≥ 360	≥ 0,045
CC	36÷90	Hardened and tempered carbon-steel	≥ 700	≥ 0,020
	≥ 110	Carbon-steel	≥ 360	≥ 0,045

Options for rod surface processing

K = NIKROM processing: nickel and chrome-plating - resistance in saline mist 350 h, up to ISO 3768 and DIN 50021

T = induction surface hardening and plating

Versions of AISI 304, 316 and 420 or equivalent are available on request. Consult our technical office.

Tolerances on the thread of the rod: male thread 6g, female thread 6H.

5.3 Strokes

Maximum standard strokes are:

- 3000 mm for rods up to 18 mm and for bores up to 32 mm
- 5000 mm for other bores.

For longer strokes, consult our technical office.

Select strokes a few mm longer than the working stroke to prevent the contact surfaces inside the cylinder from being used as mechanical stops.

Stroke tolerance:

0+1.2 mm for strokes up to 1000 mm

0+2.5 mm for strokes over 1000 mm

Retractors for tie-rod cylinders

For strokes longer than 1000 mm or as shown in our technical tables, one or more retractors are mounted to maintain the radial tension on the tie-rods, keeping them rigidly integral with the cylinder body.

5.4 Spacers

For strokes longer than 1000 mm special spacers are inserted (on request also for shorter strokes) to increase the length of the bore and piston guide, to protect it from overloads and premature wear. Spacers can be omitted in cylinders working in traction mode.

The table below shows the recommended dimensions depending on the stroke. For strokes longer than the ones shown in table, consult our technical office.

stroke [mm]	1001 ±1500	1501 ±2000	2001 ±2500	2501 ±3000
spacer code	2	4	6	8
length [mm]	50	100	150	200

The additional spacers implies an increase in the overall length of the cylinder.

5.5 Seals

Choose seals up to the working conditions of the system: speed and operating frequency, type and temperature of the fluid, etc. according to technical tables of the product.

Low-friction seals are available with seat according to ISO standards, fully tested and reliable also in difficult operating conditions.

type 1 = (NITRILE+POLIURETHAN); low friction, **high static and dynamic seal.**

Speed: up to 0,5 m/s. Seats according to ISO 5597 and 6195 (rod seals) and ISO 7425 (piston seals).

Fluids compatibility: mineral oils.

Temperature range: -25°C ÷ +85°C.

type 2 = (VITON+PTFE); anti-friction, **for high fluid temperature.**

Speed: up to 1 m/s. Seats according to ISO 7425 (rod and piston seals).

Fluids compatibility: mineral oils and water-glycol with water percentage not higher than 45%. **phosphate ester based fluids.**

Temperature range: up to 120°C.

type 4 = (NITRILE+PTFE); anti-friction, **for high speed.**

Speed: up to 4 m/s. Seats according to ISO 7425 (rod and piston seals).

Fluids compatibility: mineral oils and water-glycol with water percentage not higher than 45% and usually synthetic organic esters based fluids.

Temperature range: -20°C ÷ +85°C.

type 6 = (NITRILE+PTFE); anti-friction, for **single effect - pushing** applications.

Speed: up to 1 m/s. Seats according to ISO 7425 (rod and pistons seals).

Fluids compatibility: mineral oils and water-glycol with water percentage not higher than 45% and usually synthetic organic esters based fluids.

Temperature range: -20°C ÷ +85°C.

type 7 = (NITRILE+PTFE); anti-friction, for **single effect - pulling** applications.

Speed: up to 1 m/s. Seats according to ISO 7425 (rod and pistons seals).

Fluids compatibility: mineral oils and usually synthetic organic esters based fluids.

Temperature range: -20°C ÷ +85°C.

type 8 = (NITRILE+PTFE and POLIURETHAN); anti-friction.

Speed: up to 1 m/s. Seats according to ISO 7425 (rod and piston seals).

Fluids compatibility: mineral oils and usually synthetic organic esters based fluids.

Temperature range: -20°C ÷ +85°C (60°C for water-glycol).

When the simple effect seals are used, the chamber that is not under pressure must be connected to tank.

Please consult our technical office for the compatibility with other fluids not mentioned above and specify type and composition.

All the seals, static and dynamic, must be periodically replaced: proper spare kits are always available.

5.6 Draining - see figure on side

The rod-side seals drain provides:

- increased seal reliability especially in cylinders with strokes longer than 2000 mm and/or where the rod-side chamber is constantly pressurized.
- reduced friction and better repeatability for application in servosystems.

The device is standard in servocylinders and can be supplied as optional (**L**) for the cylinders of all the other construction series.

The 1/8" GAS draining port is usually located on the same side as the oil supplying port; connect it directly to the tank without backpressure.

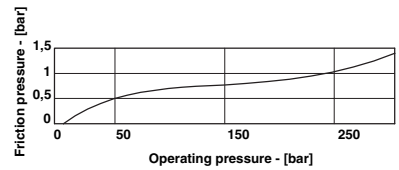
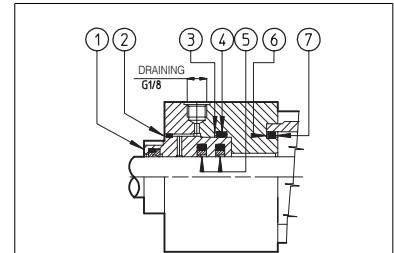


Diagram showing the pressure value equal to the friction strengths coming from the type 8 seals.



Item	Material
1 Wiper	Nitrile rubber or Viton+ PTFE
2 O-Ring	Nitrile rubber or Viton
3 Anti-extrusion ring	PTFE
4 O-Ring	Nitrile rubber or Viton
5 Rod seal	Nitrile rubber or Viton + PTFE
6 Anti-extrusion ring	PTFE
7 O-Ring	Nitrile rubber or Viton

6 OPTIONS

6.1 Stroke-end and cushioning

Stroke-end and cushioning systems are always recommended for application with vertical loads and in servosystems.

They can be supplied for all the cylinder typologies, without changing the overall dimensions.

They operate a progressive damping cushioning action that ends few mm from the internal contact surface of the cylinder and allows impact-free stopping even at high speeds and provides longer lifetime to the cylinder itself.

Cushioning is normally adjustable with proper screw, which is supplied fully tightened (max. damping). In case of masses moved and/or very low operating speeds we recommend to back them off to damp the cushioning effect.

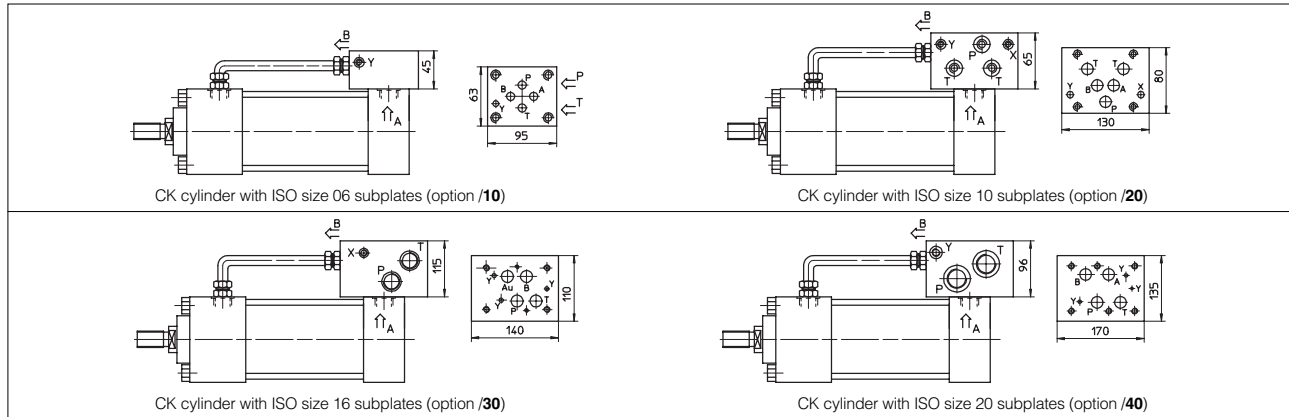
The cushioning effect is highly ensured even in case of variation of the fluid viscosity.

When stroke-end cushioning are foreseen only as safety when the control device is out of service (for example in case of servosystems), it is advisable to choose a cylinder with effective stroke longer than the operating one by the amount equal to the cushioning length. So the cushioning effect doesn't influence the movement during the operating stroke.

For cushioning length and maximum kinetic energy values that the cushioning system is able to damp, see table B015

6.2 Built-in subplates

All the cylinder can be supplied with ISO (size 06, 10, 16 and 20) subplate for mounting of the valves directly on the cylinder board.

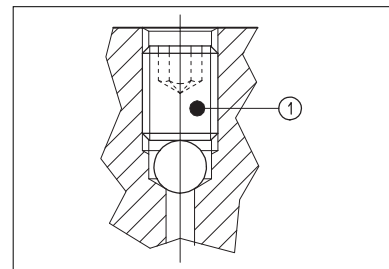


6.3 Air bleeds

They are mounted on the cylinder heads and are standard for CL series cylinders, on servocylinders and on all cylinders and servocylinders with proximity sensors and/or built-in subplates.

For CK, CH, CN and CC series cylinders air bleeds are available on request (consult the corresponding technical tables).

For a proper use of the air-bleed (see figure on side) unlock the grub screw ① with wrench for hexagonal head screws, bleed-off the air and retighten carefully, proving the seal.



6.4 Proximity sensors

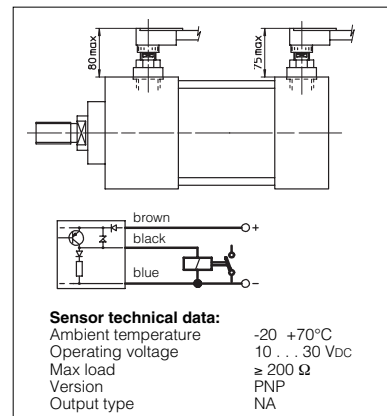
The inductive-type proximity sensors are available (on request) for the cylinder of CK and CH series and provide an electrical signal when the cylinder piston reaches the stroke-end. The inductive type proximities must always be coupled with the stroke-end cushioning.

Their functioning is based on the variation of the magnetic field (generated by the sensor itself) when a metallic detail enters its influence area, causing a change of state (on/off) of the sensor. The switching of the electrical contact is made by the cushioning piston when it reaches the sensor.

The distance from the mechanical stroke-end of the cylinder, at which the switching of the sensor electrical contact occurs, can be adjusted between 1-2 mm and 2-3 mm, changing the regulation of this last one. For the adjustment, it is necessary to locate the rod where it is desired to start the contact and rotate the sensor to obtain the LED switch-on (commutation occurred), supplied as equipment; do not force the sensor tightening to avoid damages.

The coupling of the proximity sensors with the stroke-end cushioning imposes particular executions with limitation of the damping masses and/or of the speed compared with the executions with standard cushioning.

Consult the technical table of the product for the model codes and for the construction limitations, depending on bores and attachments.



7 CYLINDERS FOR SERVOSYSTEMS

Special executions for servosystems with or without incorporated position transducer (see table B137) are available with:

- seals, guides, low-friction sealing systems for operating speeds up to 4 m/s and for high dynamic performances;
- bore/piston realized in a unic block for max operating reliability in presence of pulsing stress and/or cycle operating with frequencies higher than 20 Hz;
- short tolerances on strokes compared with standard executions and general reduction of the coupling tolerances of the mechanical details;
- rods of stainless steel and/or with proper surface processing for any working environment;
- possibility to assemble directly on cylinder board the valves that realize the electrohydraulic driving circuits.

8 FLUID AND TEMPERATURE LIMITATIONS

Cylinders and servocylinders are suitable for operation with mineral oils or other synthetic or unflammable fluids (organic esters, phosphate esters, glycol water, etc.). For possible limitations depending on compatibility of fluids with seals and transducers, consult our technical office.

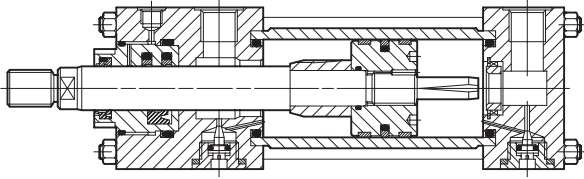
The fluid must have a viscosity included between 15 and 100 mm²/s, a temperature included between 0 and 70°C and ISO19/16 contamination class, achievable with on-line filters of at least 25 μm.

9 CAD CATALOGUE

On request it is possible to supply a software aid for CAD filing.

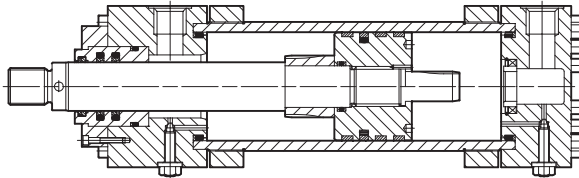
For further information, consult our technical office.

SERIES CK/CH - Tab. B137



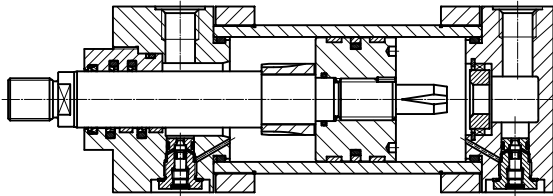
- ISO 6020-2'91, DIN 24554, AFNOR NFE 48-016 standards;
- nominal pressure 160 bar - max. pressure 250 bar;
- ten piston diameters, from 25 to 200 mm;
- construction typology: square head assembled with tie-rods (CK series) or counterflanges (CH series);
- different rod versions;
- typical application fields: injection and blow moulding machines, machine tools, steel plants, off-shore and on board installations;

SERIES CH GREAT DIAMETERS - Tab. B160



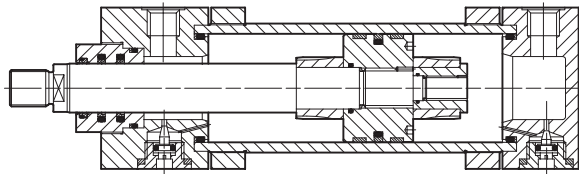
- ISO 6020-3 standard;
- nominal pressure 160 bar - max. pressure 250 bar;
- three piston diameters, from 250 to 400 mm;
- construction typology: round heads assembled with counterflanges or tie-rods;
- typical application fields: great plants, sheet machines, steel plants;

SERIES CN - Tab. B180



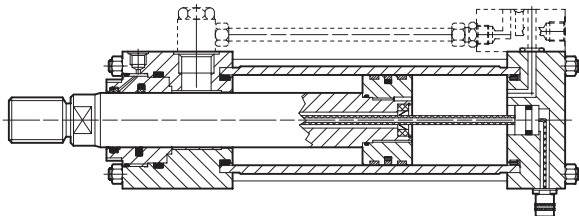
- ISO 6020-1; DIN-ISO 6020-1; AFNOR NFE 48-015; CNOMO E05.22.313.N;
- nominal pressure 160 bar - max. pressure 250 bar;
- seven piston diameters, from 50 to 200 mm;
- construction typology: round heads with counterflanges;
- typical application fields: steel plants, sheet steel processing, plastic injection machines;

SERIES CC - Tab. B241



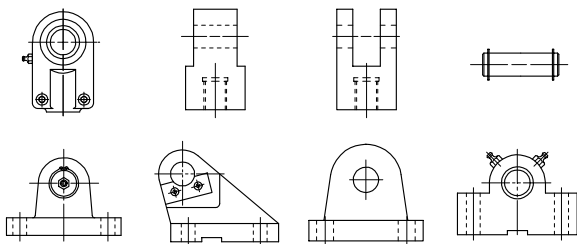
- ISO 6022; DIN 24333; AFNOR NFE 48-025 standards;
- nominal pressure 250 bar - max. pressure 320 bar;
- twelve piston diameters, from 50 to 400 mm;
- construction typology: round heads with counterflanges;
- typical application fields: automotive, steel plants and generally for heavy duty;

SERVOCYLINDERS - Tab. B310



- derived from cylinders of CK, CH, CC series, they maintain the same construction characteristics:
 - C*P = with potentiometric transducer
 - C*V = with LVDT inductive transducer
 - C*F = with magnetosonic transducer
 - C*M = with magnetosonic transducer

ACCESSORIES - Tab. B500



- C136 = clevis for rods with swivel, according to ISO 6982
- C146 = clevis for rods with swivel, according to ISO 8133/DIN 24555
- C141 = rod clevis (female), according to ISO 8133
- C151 = clevis male according to ISO 8133
- C124 = support 180° according to DIN 24556
- C134 = support according to ISO 8132
- C144 = free male clevis according to ISO 8133 standard
- C154 = support trunnion according to ISO 8132
- C145 = axis