

**UNIDIRECTIONAL Knife Gate Valve**

- Unidirectional wafer-design knife gate valve.
- Monobloc cast body with interior slides for optimum movement of the through conduit during operation and seal wedges.
- Provides high flow rates with low pressure drop.
- The lower part of the body has two holes for cleaning.
- Various seal and packing materials available.
- Face-to-face distance in accordance with CMO standard.
- It has an arrow on the body indicating the flow direction.

**General applications:**

- This knife gate valve is suitable for working with dry products like powder and grain. It is completely sealtight, meaning it is recommended for toxic and hazardous fluids. It is generally used for gravity discharge of dry solids. Designed for the following applications:
- Mining                                 -Silo emptying
- Electrical power stations
- Chemical plants                 - Food industry                 - Drying plants

**Sizes:** DN50 to DN1200 (larger sizes on request).

**Working ( $\Delta P$ ):**

DN50 to DN150	3 kg/cm <sup>2</sup>
DN200 to N300:	2 kg/cm <sup>2</sup>
DN350 to N400:	1.5 kg/cm <sup>2</sup>
DN450 to N1200	1 kg/cm <sup>2</sup>

- This valve is usually mounted under a hopper, to prevent any kind of solids accumulating on the seat, the valve has a special body design and it is assembled with the body arrow in the same direction as the fluid.
- The design of the **FK** valve seat is the same as for the **A** valve, but the pressures vary to those which the **FK** valves work at.

**Standard flanges:** DIN PN10 and ANSI B 16.5 (class 150)

**Other common flanges:** - DIN PN 16                 - DIN PN 6                 - DIN PN25  
 - JIS standard                 - Australian Standard                 - British Standard

**Directives:**

- Machinery Directive: **DIR 2006/42/EC (MACHINERY)**
- Pressure Equipment Directive: **DIR 97/23/EC (PED) ART.3, P.3**
- Potential Explosive Atmospheres Directive (optional): **DIR 94/9/EC (ATEX) CAT.3 ZONE 2 and 22 GD** , for information on categories and zones please contact Tubi Valve Technical-Sales Department.

**Quality dossier:**

- All valves are tested hydrostatically at CMO and material and test certificates can be provided.
- Body test = working pressure x 1.5.
- Seal test = working pressure x 1.1.

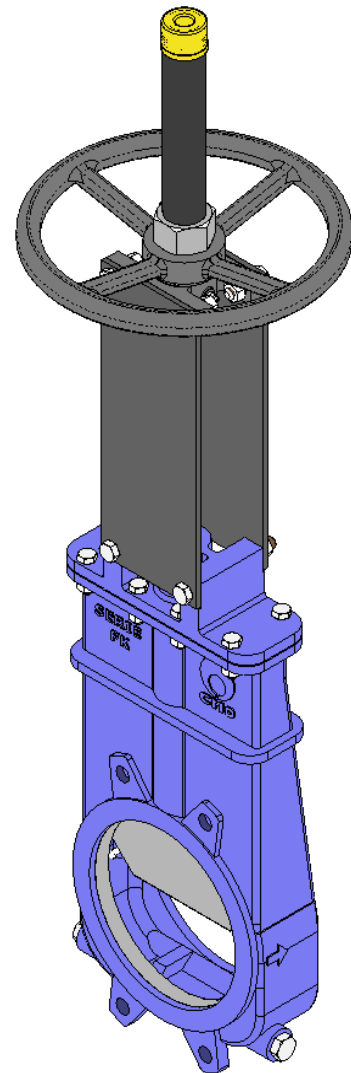


fig. 1

## Advantages of CMO "FK Model"

When a knife gate valve remains open for long periods of time and the body's internal walls are parallel a very large torque is usually required to close it. However, the inside of the body of model **FK** is cone-shaped, which provides greater space and, this way, when the valve is closed the solids stored inside it can be easily removed.

The **FK** valve is unidirectional and an arrow is marked on the body indicating the flow direction.

The stem protection hood is independent from the handwheel securing nut, this means the hood can be disassembled without the need to release the handwheel. This advantage allows regular maintenance operations to be performed, such as lubricating the stem, etc.

The stem on the CMO valve is made of 18/8 stainless steel. This is another added advantage, as some manufacturers produce it with 13% chrome and it gets rusty very quickly.

The handwheel is made of GJS-500 nodular cast iron. Some manufacturers produce them in normal cast iron which can lead to breakages in the event of very high operating torque or knocks.

The yoke has a compact design with the bronze actuator nut protected in a sealed and lubricated box. This makes it possible to move the valve with a key, even without the handwheel (in other manufacturers' products this is not possible).

The pneumatic actuator's upper and lower covers are made of GJS-400 nodular cast iron, making them highly shock resistant. This characteristic is essential in pneumatic actuators.

The pneumatic cylinder sealing joints are commercial products and can be purchased worldwide. This means it is not necessary to contact CMO every time a sealing joint is required.

STANDARD COMPONENTS LIST		
COMPONENT	CAST IRON VERSION	STAINLESS STEEL VERSION
1- Body	GJL-250	CF8M
2- Through conduit	AISI304	AISI316
3. Cover	GJL-250	CF8M
4 - Seat Seal	CARDBOARD	CARDBOARD
5- Bushing	NYLON	NYLON
6- Stop washer	AISI304	AISI316
Interior O-Ring Seal	NITRILE	NITRILE
8- Exterior O-Ring Seal	NITRILE	NITRILE
9- Seat	RCH1000	RCH1000
10 - Through conduit Stopper	F-111+BRONZE	AISI316+BRONZE
11 - Support	S275JR	S275JR
12- Screw	5.6 ZINC	A-2
13 - Washer	ST ZINC	A-2
14- Nut	5.6 ZINC	A-2
15- Screw	5.6 ZINC	A-4
16 - Washer	ST ZINC	A-4
17- Nut	5.6 ZINC	A-4
18- Threaded cap	A-2	A-4
19- Seal	EPDM	EPDM
20- Ring	AISI316	AISI316

table 1

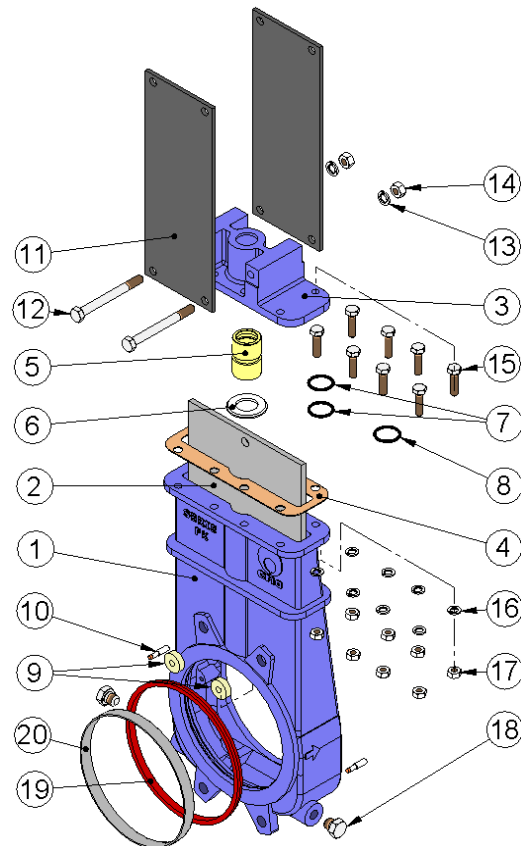


fig. 2

**DESIGN CHARACTERISTICS**
**1- BODY**

Unidirectional wafer-design knife gate valve. Monobloc cast body with guides to support the through conduit and seal wedges.

For diameters greater than DN1200 the body is machine-welded with the necessary reinforcements to resist the maximum working pressure.

Designed with full passage to provide large flows with small losses of load.

The body's internal design prevents any build-up of solids in the seal area.

The standard manufacturing materials are GJL-250 cast iron and CF8M stainless steel. Other materials, such as GJS-500 nodular cast iron, A216WCB carbon steel and stainless steel alloys (AISI316Ti, Duplex, 254SMO, Uranus B6...) are available on request. As standard, iron or carbon steel valves are painted with an anti-corrosive protection of 80 microns of EPOXY (colour RAL 5015). Other types of anti-corrosive protections are available on request.

**2- THROUGH CONDUIT**

The standard manufacturing materials are AISI304 stainless steel in valves with iron body and AISI316 stainless steel in valves with CF8M body. Other materials or combinations can be supplied to order.

The through conduit is polished on both sides to provide a smooth contact surface with the resilient seal. At the same time, the through conduit is rounded to prevent the sealing joint from being cut. Different degrees of polishing, anti-abrasion treatments and modifications are available to adapt the valves to the customer's requirements.

**3- SEAT: (sealtight)**

Six types of seats are available according to the working application:

**-Seat 1:** Metal / metal seal. This type of seal does not include any kind of resilient seal and the estimated leakage (considering water as the test fluid) is 1.5% of the pipe flow.

**-Seat 2:** Standard metal/rubber seal. This type of seal includes a resilient seal which is fixed to the inside of the body via an AISI316 stainless steel retaining ring.

**-Seat 3:** Metal / rubber seal with reinforced ring. This type of seal includes a resilient seal which is fixed to the inside of the body by way of a reinforced ring with two functions (to protect the valve from abrasion and clean the through conduit when working with solids that can stick to the through conduit).

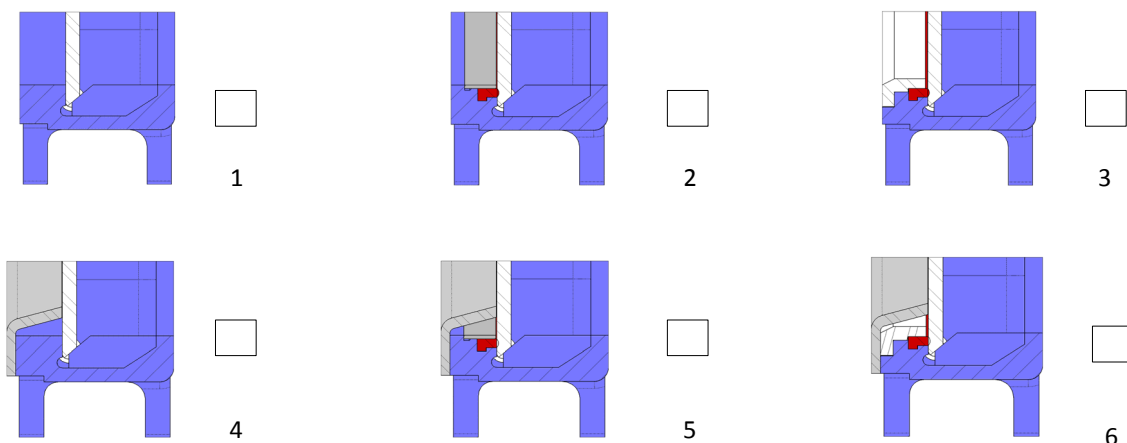


fig. 3

- **Seats 4, 5 and 6:** The same as seats 1, 2 and 3 but including a deflector. The deflector is a cone-shaped ring located at the valve's entrance with two functions (to protect the valve from abrasion and guide the flow to the centre of the valve).

\***Note:** Three materials are available for the reinforced ring and the deflector: Steel CA-15, CF8M and Ni-hard.

## Resilient seat materials

### EPDM

This is the standard resilient seat fitted on CMO valves. It can be used in many applications, however, it is generally used for water and products diluted in water at temperatures no higher than 90°C\*. It can also be used with abrasive products and it provides the valve with 100% watertight integrity.

### NITRILE

It is used in fluids containing fats or oils at temperatures no higher than 90°C\*. It provides the valve with 100% watertight integrity.

### VITON


Suitable for corrosive applications and continuous high temperatures of up to 190°C and peaks of 210°C. It provides the valve with 100% watertight integrity.

### SILICONE

Mainly used in the food industry and for pharmaceutical products with temperatures no higher than 200°C. It provides the valve with 100% watertight integrity.

### PTFE

Suitable for corrosive applications and pH between 2 and 12. Does not provide the valve with 100% watertight integrity. Estimated leakage: 0.5% of the tube flow.

 **Note:** In some applications other types of resilient materials are used, such as hypalon, butile or natural rubber. Please contact us if you require one of these materials.

## 4- GASKET

The gasket is the area of the valve where the greatest sealtight integrity must be reached to avoid leakages to the atmosphere, in the CMO FK valves, this area is between the body bonnet and the rod. There are two types of gasket:

- **Bushing with sealing joints:** This type of seal (fig.4) achieves sealtightness by way of nylon bushing located between the body and the rod. This bushing is introduced inside the cover, until it comes up against the protrusion in the upper section, whilst a washer is located on the lower section; this becomes trapped when fastening the cover and the body, preventing the bushing from moving. This bushing has two interior O-rings to guarantee sealtightness between the rod and the bushing, and an exterior O-ring to guarantee the absence of leakages between the bushing and the body cover. This system is recommended for valves that operate with liquids.

See Table 2 for the different types of seal materials.

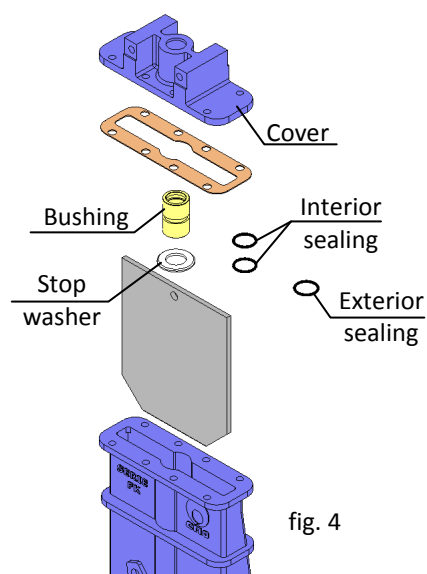


fig. 4

- **Gasket with packing glands:** The CMO packing gland seal comprises several packing lines (the number of lines depends on the size of the valve), which are pressured against the cover and the rod by way of bushing and a gland flange, which provides the sealtightness necessary between the body cover and the rod, preventing any type of leakage into the atmosphere. It is located in an easily accessible place and can be replaced without dismantling the valve from the pipeline. This type of gasket is recommended when the valve works at high temperatures or with specific types of aggressive fluids. Below we indicate various types of gasket available according to the use to be given to the valve:

**GREASED COTTON (Recommended for hydraulic services)**

This gasket is composed of braided cotton fibres soaked in grease both inside and out. It is for general use in hydraulic applications in both pumps and valves.

**DRY COTTON**

This gasket is composed of cotton fibres. It is for general use in hydraulic applications with solids.

**COTTON + PTFE**

This gasket is composed of braided cotton fibres soaked in PTFE both inside and out. It is for general use in hydraulic applications in both pumps and valves.

**SYNTHETIC + PTFE**

This gasket is composed of braided synthetic fibres soaked in PTFE both inside and out. It is for general use in hydraulic applications in both pumps and valves and in all types of fluids, especially corrosive ones, including concentrated and oxidising oils. It is also used in liquids with solid particles in suspension.

**GRAPHITE**

This gasket is composed of high-purity graphite fibres. A diagonal braiding system is used and it is impregnated with graphite and lubricant which helps to reduce porosity and improve operation.

It has a wide range of applications as graphite is resistant to steam, water, oils, solvents, alkali and most acids.

**CERAMIC FIBRE**

This gasket is composed of ceramic material fibres. Its main applications are with air or gas at high temperatures and low pressures.

SEAT/SEALS			GASKET			
Material	Max. T. (°C)	Applications	Material	P(bar)	Max. T. (°C)	pH
Metal/Metal	>250	High temperature/Low sealtightness	Greased cotton	10	100	6-8
EPDM (E)	90 *	Non-mineral oils, acids and water.	Dry cotton (AS)	0,5	100	6-8
Nitrile (N)	90 *	Hydrocarbons, oils and greases	Cotton + PTFE	30	120	6-8
Viton (V)	190	Hydrocarbons and solvents	Synthetic + PTFE	100	-200+270	0-14
Silicone (S)	200	Food Products	Graphite	40	650	0-14
PTFE (T)	250	Resistant to corrosion	Ceramic Fibre	0,3	1400	0-14

NOTE: More details and other materials available to order.

\* → EPDM and nitrile: is possible until serving temperature Max.: 120°C under request.

table 2

## 5- STEM

The stem on the CMO valve is made of 18/8 stainless steel. This characteristic provides high resistance and excellent corrosion-resistant properties.

The valve design can be rising stem or non-rising stem. When a rising stem is required for the valve, a stem hood is supplied to protect the stem from contact with dust and dirt, besides keeping it lubricated.

## 6- PACKING GLAND

Only those valves which are expressly ordered with the gasket with packing gland option are fitted with a packing gland; CMO standard FK valves do not have a packing gland but rather a bushing with seals system, as described in gasket section number 4.

Whenever the valve is ordered with the gasket with packing gland option, uniform force and pressure can be applied to the gasket to guarantee sealtightness.

As standard, valves with cast iron body include steel packing glands, whilst valves with stainless steel body have AISI steel packing glands.

## 7- ACTUATORS

All types of actuators can be supplied, with the advantage that thanks to the CMO design they are fully interchangeable. This design allows customers to change the actuators themselves and no extra assembly accessories are required. A design characteristic of CMO S.L. valves is that all actuators are interchangeable.

### Manual:

- Handwheel with rising stem
- Handwheel with non-rising stem
- Chainwheel
- Lever
- Gears
- Others (square nut,...)

### Automatic:

- Electric actuator
- Pneumatic cylinder
- Hydraulic cylinder



fig. 5

### Wide range of accessories available:

- Mechanical stoppers
- Locking devices
- Emergency manual actuators
- Electrovalves
- Positioners Limit switches
- Proximity switches
- Straight floor stands (fig. 6)
- Leaning floor stand (fig. 5)
- ...

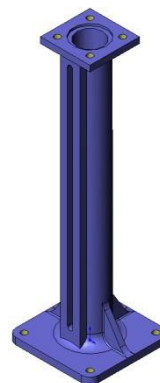
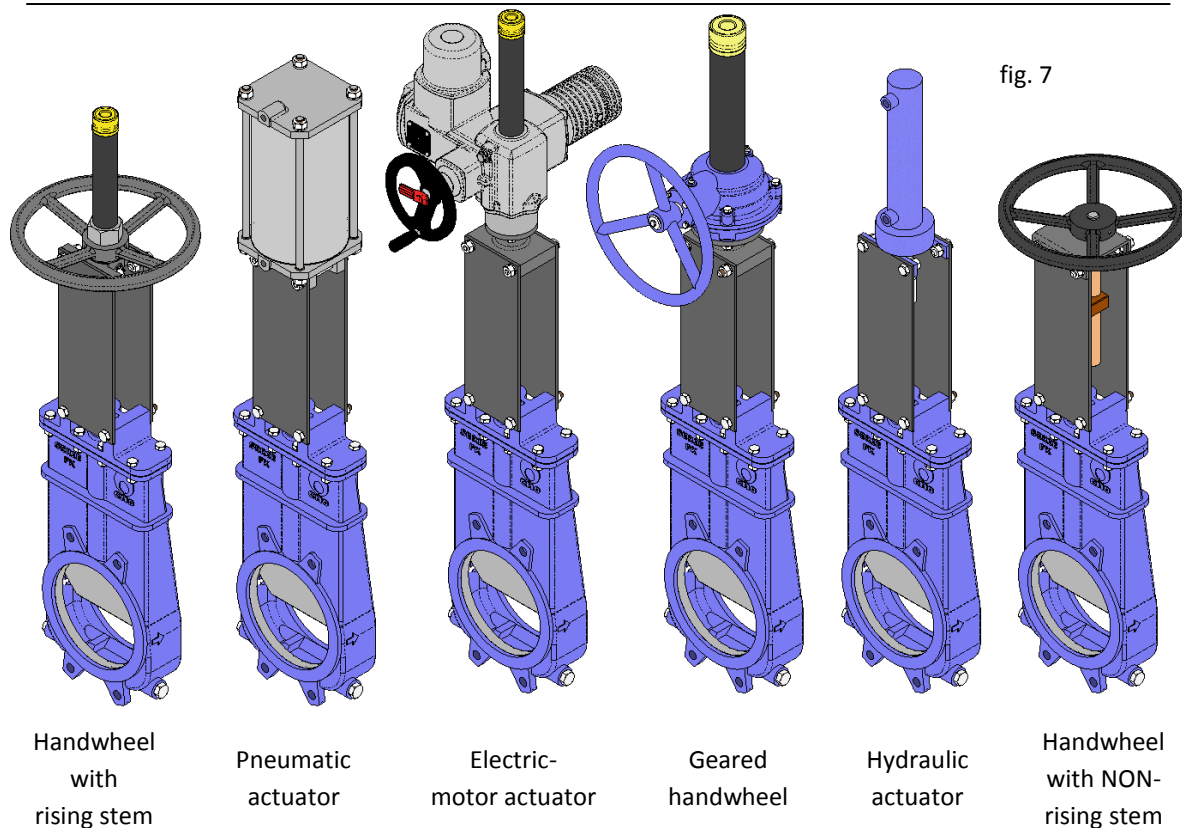


fig. 6

Stem extensions have also been developed, allowing the actuator to be located far away from the valve, to suit all needs. Please consult our technicians beforehand.



## ACCESSORIES AND OPTIONS

Different accessories are available to adapt the valve to specific working conditions such as:

### Mirror polished through conduit:

The mirror polished through conduit is especially recommended in the food industry and, as standard, in applications in which solids can stick to the through conduit. It is an alternative to ensure the solids slide off and do not stick to the through conduit.

### PTFE lined through conduit:

As with the mirror polished through conduit, it improves the valve's resistance to products that can stick to the through conduit.

### Stellited Through conduit:

Stellite is added to the through conduit's internal circle to protect it from abrasion.

### Scraper in the gasket:

Its function is to clean the through conduit during the opening movement and prevent possible damage to the gasket.

### Air injections in the gasket:

By injecting air in the gasket, an air chamber is created which improves the sealtightness.

**Cased body:**

Recommended in applications in which the fluid can harden and solidify inside the valve's body. An external jacket keeps the body temperature constant, preventing the fluid from solidifying.

**Flushing holes in the body:**

Several holes are drilled in the body to flush air, steam or other fluids out with the aim of cleaning the valve seat before sealing.

**Mechanical limit switches, inductive switches and positioners:**

Limit switches or inductive switches are installed to indicate precise valve position, as well as positioners to indicate continuous position (fig. 8).

**Solenoid valves (Fig. 8)**

For air distribution to pneumatic actuators.

**Connection boxes, wiring and pneumatic piping**

Units supplied fully assembled with all the necessary accessories.

**Stroke limiting mechanical stops:**

They allow the stroke to be mechanically adjusted, limiting the valve run.

**Mechanical locking system:**

Allows the valve to be mechanically locked in a set position for long periods.

**Emergency manual actuator (hand wheel / gear box) (Fig. 8):**

Allows manual operation of the valve in the event of power or air failure.

**Triangular (V-Notch) and pentagonal diaphragm with indication rule:**

Recommended for applications in which it is necessary to regulate the flow, it allows flow control according to the valve's opening percentage.

**Interchangeable actuators:**

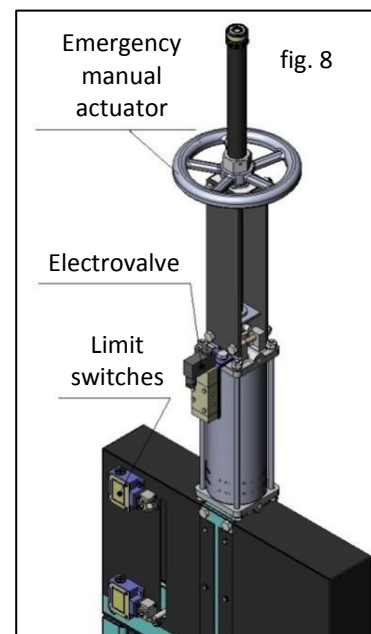
All actuators are easily interchangeable.

**Actuator or yoke support:**

Made of EPOXY-coated steel (or stainless steel to order), its robust design gives it great rigidity in order to resist the most adverse operation conditions.

**Epoxy coating:**

All cast iron and carbon steel bodies and components on CMO valves are EPOXY coated, giving the valves great resistance to corrosion and an excellent finish. CMO's standard colour is blue RAL-5015.





**TYPES OF EXTENSION**

When the valve needs to be operated from a distance, the following different types of actuators can be fitted:

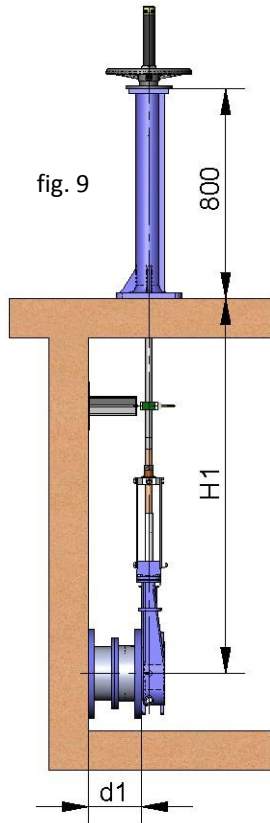


fig. 9

**1 - Extension: Floor Stand.**

This extension is performed by coupling a spindle to the stem. By defining the length of the spindle, the desired extension is achieved. A floor stand is normally installed to support the actuator.

The definition variables are as follows:

**H1:** Distance from the valve shaft to the base of the stand.

**d1:** Separation from the wall to the end of the connecting flange.

**Characteristics:**

- It can be coupled to any type of actuator.
- A stem support-guide is recommended (fig. 10) every 1.5 m.
- The standard floor stand is 800 mm high (fig. 9). Other floor stand measurements available to order.
- A position indicator can be fitted to determine the valve's percentage of opening.
- Possibility of leaning floor stand (fig. 11).

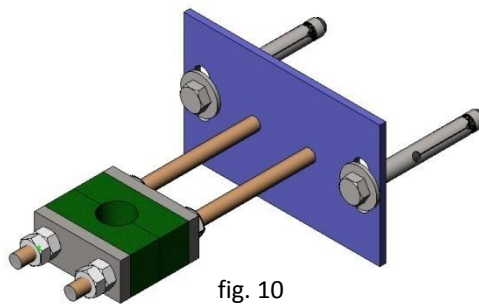


fig. 10

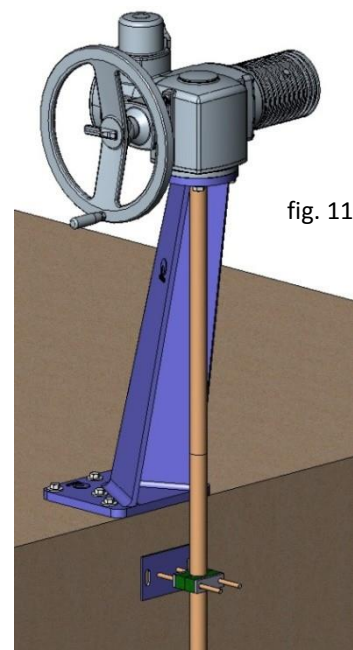


fig. 11

**COMPONENTS LIST**

Component	Standard Version
Stem	AISI 303
Stem	AISI 304
Guide-support	Carbon steel with EPOXI coating
Slide	Nylon
Floor Stand	GJS-500 with EPOXY coating

table 3

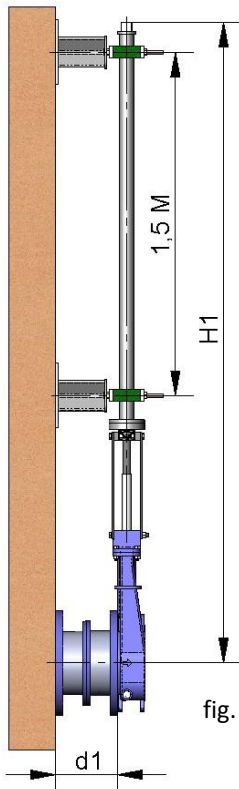


fig. 12

**2 - Extension: Pipe (fig. 12).**

Consists of raising the actuator. The pipe will rotate with the wheel or key when the valve is operated, although this will always remain at the same height.

The definition variables are as follows:

**H1:** Distance from the valve shaft to the required height of the actuator.

**d1:** Separation from the wall to the end of the connecting flange.

**Characteristics:**

- Standard actuators: Handwheel and "Square Nut".
- A pipe support-guide is recommended every 1.5m.
- The standard materials are: EPOXY coated carbon steel or stainless steel.

**3 - Extension: Extended Support Plates (fig. 13)**

When a short extension is required, it can be achieved by extending the support plates. An intermediate yoke can be fitted to reinforce the support plates structure.

fig. 13

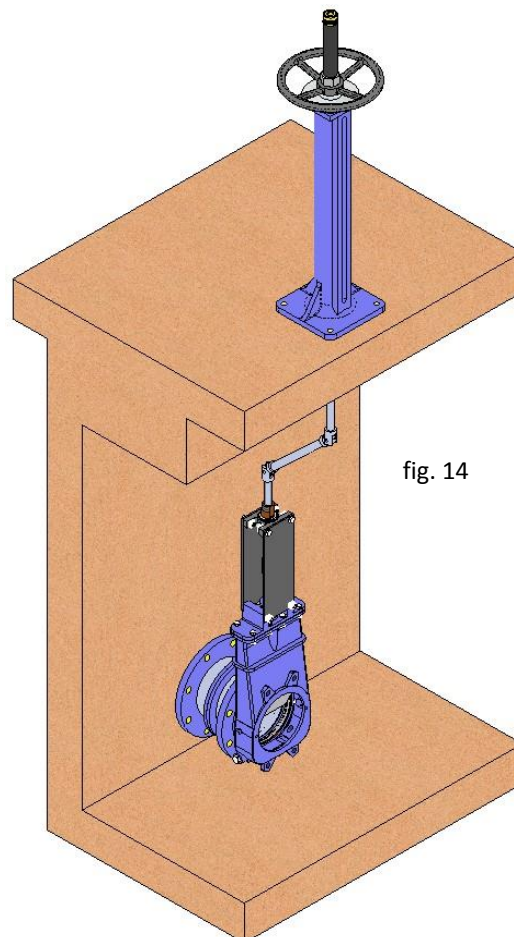
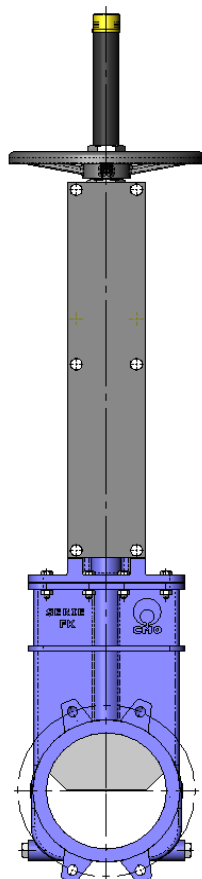


fig. 14

**4 - Extension: Cardan joint (Fig. 14)**

If the valve and the actuator are not in correct alignment, the problem can be resolved by fitting a universal joint.

## HANDWHEEL with Rising Stem

- **B = max. width** of the valve (no actuator).
- **D = max. height** of the valve (no actuator).
- Options:
  - Limiting switches.
  - Extensions: stand, pipe, plates,...
  - DN higher than those shown in the table.
- Actuator comprising:
  - Handwheel.
  - Stem.
  - Nut.
  - Stem protection hood.
- Available: DN50 to DN1200, other DN on request.
- From DN600 the actuator is with gears.

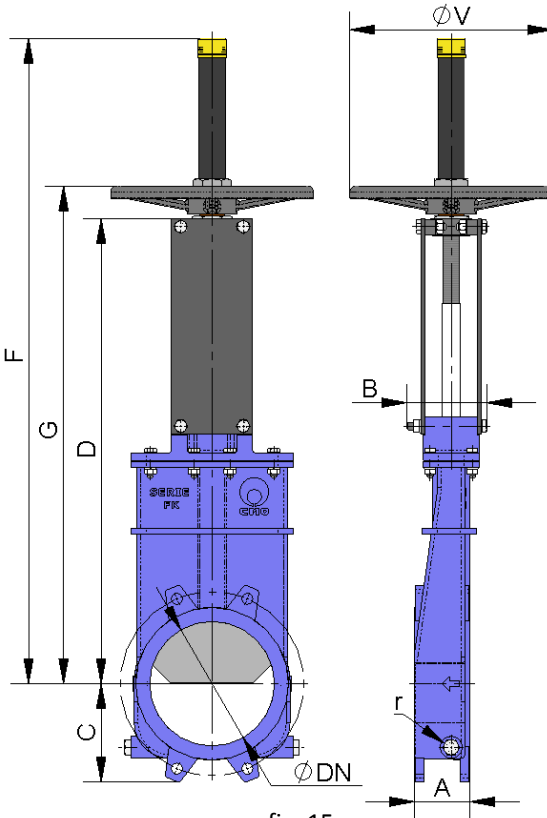


fig. 15

DN	$\Delta P$ (Kg/cm <sup>2</sup> )	DRAW (Nw)	TORQUE (Nm)	A	B	C	D	F	G	ØV	r (B.S.P.)
50	3	360	0.85	60	91	61	323	492	362	225	1/4"
65	3	606	1.4	60	91	68	362	531	401	225	1/4"
80	3	915	2.2	64	91	91	404	573	443	225	1/4"
100	3	1428	3.3	64	91	104	453	622	492	225	1/4"
125	3	2232	5.2	70	101	118	511	730	550	225	3/8"
150	3	3211	7.4	76	101	130	574	793	613	225	3/8"
200	2	3835	11.2	89	118	158	745	1036	798	325	3/8"
250	2	5984	17.4	114	118	196	880	1271	933	325	1/2"
300	2	8640	25.1	114	118	230	1005	1396	1058	380	1/2"
350	1,5	8862	35.1	127	290	255	1141	1681	1250	450	1/2"
400	1,5	11625	46.1	140	290	290	1266	1806	1375	450	1/2"
450	1	9949	39.9	152	290	306	1393	2033	1502	450	1/2"
500	1	12280	49.3	152	290	340	1529	2169	1638	450	1/2"
600	1	17857	72.1	178	290	398	1782	2522	1891	450	1/2"
700	1	24269	139	178	320	453	2105	2967	2217	--	1/2"
800	1	32180	186	178	320	503	2376	3338	2488	--	1/2"
900	1	40624	234	178	320	583	2655	3717	2767	--	1/2"
1000	1	50884	296	178	320	613	2935	4097	3047	--	1/2"
1200	1	72949	423	203	340	728	3440	4802	3552	--	1/2"

table 4

**HANDWHEEL with Non-Rising Stem**

- Suitable when no size limitations exist.
- **B = max. width** of the valve  
(no actuator).  
**D = max. height** of the valve  
(no actuator).
- Options:
  - Square nut.
  - Limiting switches.
  - Extensions: stand, pipe, plates,...
  - DN higher than those shown in the table.
- Actuator including:
  - Handwheel.
  - Stem.
  - Guide bushing on the yoke.
  - Nut.
- Available: DN50 to DN1200, other DN on request.
- From DN600 the actuator is with gears.

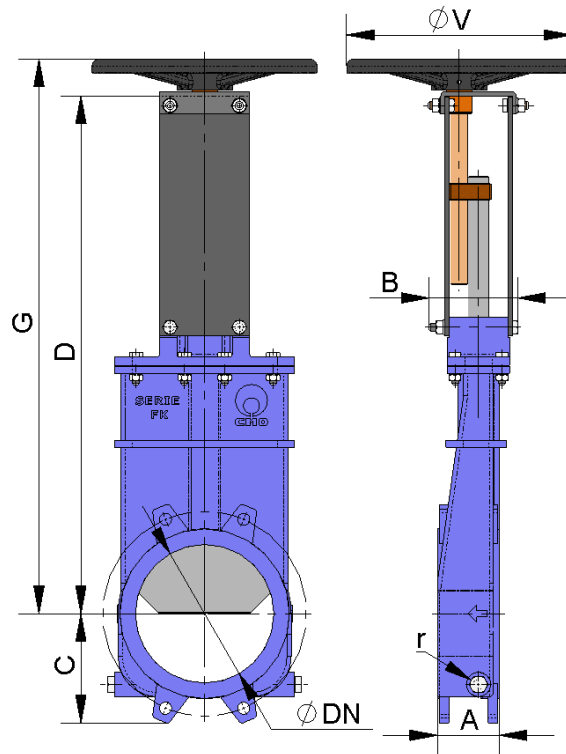


fig. 16

DN	$\Delta P$ (Kg/cm <sup>2</sup> )	DRAW (Nw)	TORQUE (Nm)	A	B	C	D	G	ØV	r (B.S.P.)
50	3	360	0.85	60	91	61	323	362	225	1/4"
65	3	606	1.4	60	91	68	362	401	225	1/4"
80	3	915	2.2	64	91	91	404	443	225	1/4"
100	3	1428	3.3	64	91	104	453	492	225	1/4"
125	3	2232	5.2	70	101	118	511	550	225	3/8"
150	3	3211	7.4	76	101	130	574	613	225	3/8"
200	2	3835	11.2	89	118	158	745	798	325	3/8"
250	2	5984	17.4	114	118	196	880	933	325	1/2"
300	2	8640	25.1	114	118	230	1005	1058	380	1/2"
350	1,5	8862	35.1	127	290	255	1141	1220	450	1/2"
400	1,5	11625	46.1	140	290	290	1266	1345	450	1/2"
450	1	9949	39.9	152	290	306	1393	1472	450	1/2"
500	1	12280	49.3	152	290	340	1529	1608	450	1/2"
600	1	17857	72.1	178	290	398	1782	1861	450	1/2"
700	1	24269	139	178	320	453	2105	2170	--	1/2"
800	1	32180	186	178	320	503	2376	2446	--	1/2"
900	1	40624	234	178	320	583	2655	2725	--	1/2"
1000	1	50884	296	178	320	613	2935	3005	--	1/2"
1200	1	72949	423	203	340	728	3440	3510	--	1/2"

table 5

## CHAINWHEEL

- Widely used in raised installations with difficult access, the handwheel is fitted in vertical position.
- **B = max. width** of the valve (no actuator).
- **D = max. height** of the valve (no actuator).
- Options:
  - Limiting switches.
  - Extensions: stand, pipe, plates,...
  - Non-rising stem.
  - DN higher than those shown in the table.
- Including:
  - Handwheel.
  - Stem.
  - Nut.
  - Hood.
- Available: DN50 to DN1200, other DN on request.
- From DN600 the actuator is with gears, see \* in table.

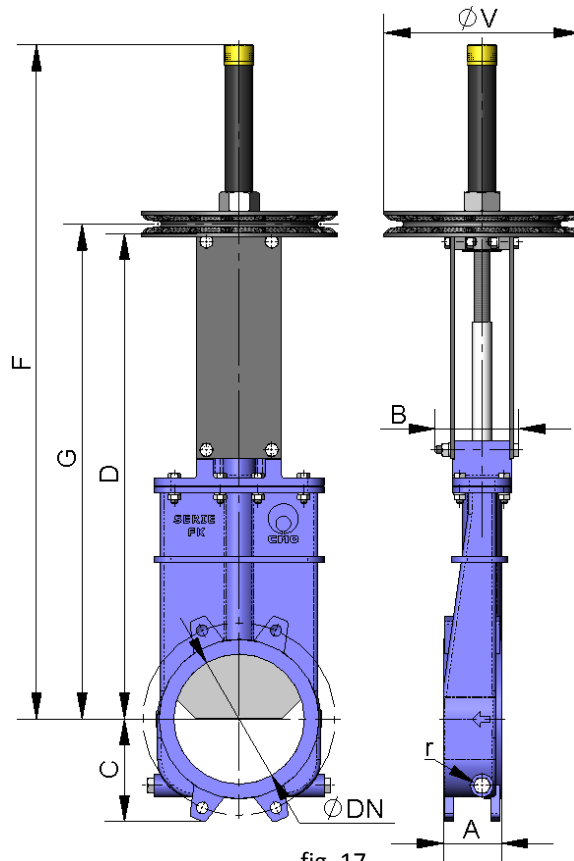


fig. 17

DN	$\Delta P$ (Kg/cm <sup>2</sup> )	DRAW (Nw)	TORQUE (Nm)	A	B	C	D	F	G	$\phi V$	r (B.S.P.)
50	3	360	0.85	60	91	61	323	492	362	225	1/4"
65	3	606	1.4	60	91	68	362	531	401	225	1/4"
80	3	915	2.2	64	91	91	404	573	443	225	1/4"
100	3	1428	3.3	64	91	104	453	622	492	225	1/4"
125	3	2232	5.2	70	101	118	511	730	550	225	3/8"
150	3	3211	7.4	76	101	130	574	793	613	225	3/8"
200	2	3835	11.2	89	118	158	745	1036	798	300	3/8"
250	2	5984	17.4	114	118	196	880	1271	933	300	1/2"
300	2	8640	25.1	114	118	230	1005	1396	1058	300	1/2"
350	1,5	8862	35.1	127	290	255	1141	1681	1250	402	1/2"
400	1,5	11625	46.1	140	290	290	1266	1806	1375	402	1/2"
450	1	9949	39.9	152	290	306	1393	2033	1502	402	1/2"
500	1	12280	49.3	152	290	340	1529	2169	1638	402	1/2"
600	1	17857	72.1	178	290	398	1782	2522	1891	402	1/2"
700	1	24269	139	178	320	453	2105	3035	2205	402*	1/2"
800	1	32180	186	178	320	503	2376	3406	2476	402*	1/2"
900	1	40624	234	178	320	583	2655	3785	2755	402*	1/2"
1000	1	50884	296	178	320	613	2935	4165	3035	402*	1/2"
1200	1	72949	423	203	340	728	3440	4870	3540	402*	1/2"

table 6

**LEVER**

- It is a fast actuator.
- **B = max. width** of the valve (no actuator).  
**D = max. height** of the valve (no actuator).
- The actuator includes:
  - Lever.
  - Rod.
  - Guide bearing.
  - Limiting switches to maintain the position.
- Available: DN50 to DN300, other DN on request.

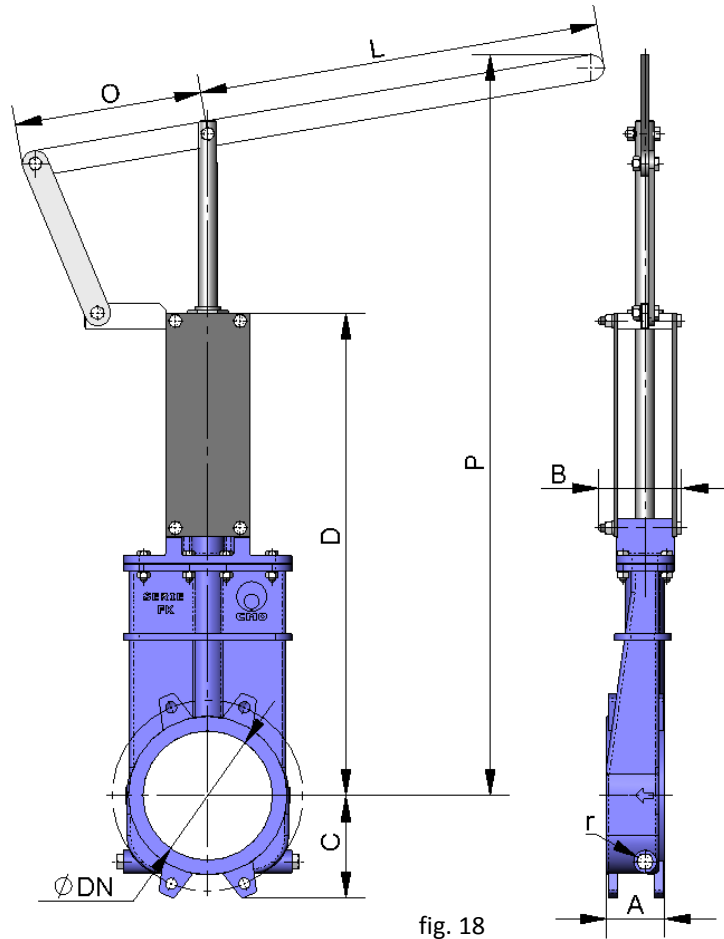


fig. 18

DN	$\Delta P$ (Kg/cm <sup>2</sup> )	DRAW (Nw)	A	B	C	D	L	O	P	r (B.S.P.)
50	3	360	60	91	61	323	325	155	586	1/4"
65	3	606	60	91	68	362	325	155	620	1/4"
80	3	915	64	91	91	404	325	155	659	1/4"
100	3	1428	64	91	104	453	325	155	724	1/4"
125	3	2232	70	101	118	511	425	155	1046	3/8"
150	3	3211	76	101	130	574	425	155	1111	3/8"
200	2	3835	89	118	158	745	620	290	1247	3/8"
250	2	5984	114	118	196	880	620	290	1670	1/2"
300	2	8640	114	118	230	1005	620	290	1804	1/2"

table 7

## GEARS

- It is recommendable for DN greater than 600.
- **B = max. width** of the valve (no actuator).  
**D = max. height** of the valve (no actuator).
- Options:
  - Chainwheel.
  - Limiting switches.
  - Extensions: stand, pipe, plates,...
  - Non-rising stem.
- Actuator comprising:
  - Stem.
  - Yoke.
  - Cone-shaped gear box.
  - Handwheel.
- Standard reduction ratio = 4 to 1.
- Available: DN 50 to DN 1200, other DN on request.

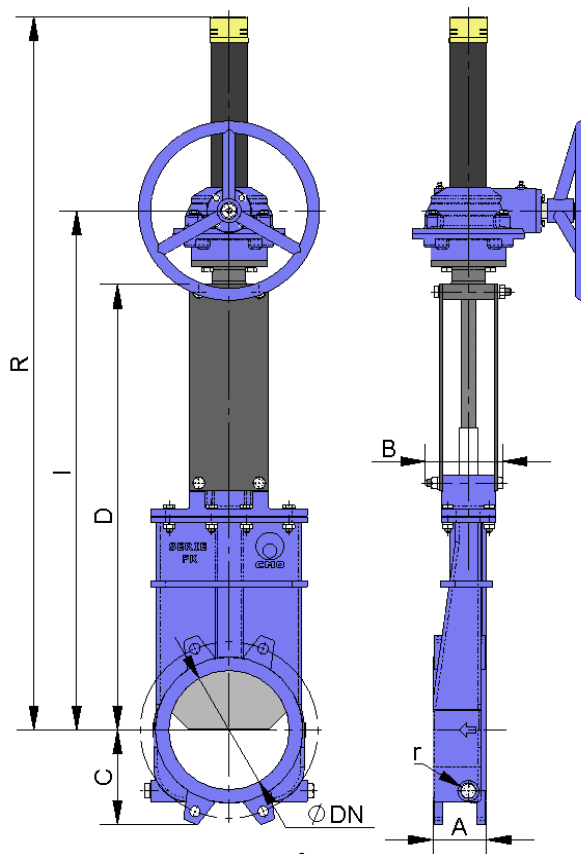


fig. 19

DN	$\Delta P$ (Kg/cm <sup>2</sup> )	DRAW (Nw)	TORQUE (Nm)	A	B	C	D	I	R	r (B.S.P.)
50	3	360	0.85	60	91	61	323	447	620	1/4"
65	3	606	1.4	60	91	68	362	486	659	1/4"
80	3	915	2.2	64	91	91	404	528	701	1/4"
100	3	1428	3.3	64	91	104	453	577	750	1/4"
125	3	2232	5.2	70	101	118	511	635	808	3/8"
150	3	3211	7.4	76	101	130	574	698	871	3/8"
200	2	3835	11.2	89	118	158	745	869	1164	3/8"
250	2	5984	17.4	114	118	196	880	1004	1299	1/2"
300	2	8640	25.1	114	118	230	1005	1129	1424	1/2"
350	1,5	8862	35.1	127	290	255	1141	1265	1680	1/2"
400	1,5	11625	46.1	140	290	290	1266	989	1805	1/2"
450	1	9949	39.9	152	290	306	1393	1390	2082	1/2"
500	1	12280	49.3	152	290	340	1529	1653	2218	1/2"
600	1	17857	72.1	178	290	398	1782	1903	2471	1/2"
700	1	24269	139	178	320	453	2105	2257	3000	1/2"
800	1	32180	186	178	320	503	2376	2528	3371	1/2"
900	1	40624	234	178	320	583	2655	2807	3745	1/2"
1000	1	50884	296	178	320	613	2935	3088	4149	1/2"
1200	1	72949	423	203	340	728	3440	3626	4866	1/2"

table 8

**DOUBLE-ACTING PNEUMATIC CYLINDER**

- The air supply pressure to the pneumatic cylinder is a minimum of 6 Kg/cm<sup>2</sup> and a maximum of 10 Kg/cm<sup>2</sup>, the air must be dry and lubricated.
- 10 Kg/cm<sup>2</sup> is the maximum admissible air pressure. For air pressures below 6 Kg/cm<sup>2</sup>, please check with CMO.
- For DN50 to DN300 valves, the cylinder's jacket and covers are made of aluminium, the rod is AISI304, the piston is rubber-coated steel and the O-ring seals are made of nitrile.
- For valves larger than DN300 the covers are made of nodular cast iron or carbon steel.
- On request, we can also supply the actuator made entirely of stainless steel, especially for installation in corrosive atmospheres.
- **B = max. width** of the valve (without actuator).  
**D = max. height** of the valve (without actuator).
- Available: DN50 to DN1200, other DN on request.

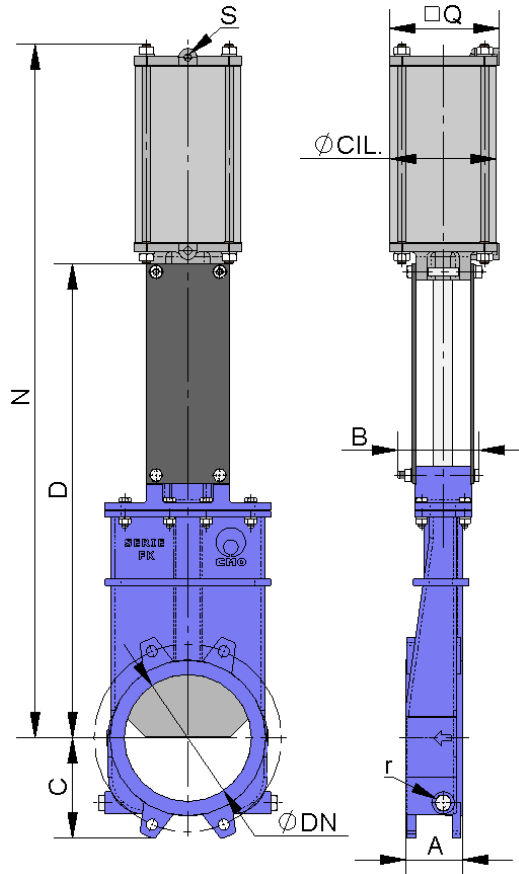


fig. 20

DN	ΔP (Kg/cm <sup>2</sup> )	DRAW (Nw)	A	B	C	D	N	Q	Ø CYL.	Ø STEM	S (B.S.P.)	r (B.S.P.)
50	3	360	60	91	61	323	498	90	80	20	1/4"	1/4"
65	3	606	60	91	68	362	550	90	80	20	1/4"	1/4"
80	3	915	64	91	91	404	608	90	80	20	1/4"	1/4"
100	3	1428	64	91	104	453	680	110	100	20	1/4"	1/4"
125	3	2232	70	101	118	511	774	135	125	25	1/4"	3/8"
150	3	3211	76	101	130	574	866	135	125	25	1/4"	3/8"
200	2	3835	89	118	158	745	1090	170	160	30	1/4"	3/8"
250	2	5984	114	118	196	880	1287	215	200	30	3/8"	1/2"
300	2	8640	114	118	230	1005	1462	215	200	30	3/8"	1/2"
350	1,5	8862	127	290	255	1141	1724	270	250	40	3/8"	1/2"
400	1,5	11625	140	290	290	1266	1899	270	250	40	3/8"	1/2"
450	1	9949	152	290	306	1393	2081	382	300	45	1/2"	1/2"
500	1	12280	152	290	340	1529	2267	382	300	45	1/2"	1/2"
600	1	17857	178	290	398	1782	2620	382	300	45	1/2"	1/2"
700	1	24269	178	320	453	2105	3085	444	350	45	1/2"	1/2"
800	1	32180	178	320	503	2376	3455	444	350	45	1/2"	1/2"
900	1	40624	178	320	583	2655	3870	508	400	50	1/2"	1/2"
1000	1	50884	178	320	613	2935	4249	508	400	50	1/2"	1/2"
1200	1	72949	203	340	728	3440	4957	508	400	50	1/2"	1/2"

table 9



## SINGLE-ACTING PNEUMATIC CYLINDER

- The air supply pressure to the pneumatic cylinder is a minimum of 6 Kg/cm<sup>2</sup> and a maximum of 10 Kg/cm<sup>2</sup>, the air must be dry and lubricated.
- 10 Kg/cm<sup>2</sup> is the maximum admissible air pressure. For air pressures below 6 Kg/cm<sup>2</sup>, please check with CMO.
- Available for opening or closing in case of air supply failure (spring opening or closing).
- The jacket is made of aluminium, the covers of nodular cast iron or carbon steel, the rod of AISI304, the piston of rubber-coated steel, the O-ring seals of nitrile and the spring is made of steel.
- The **actuator design is spring activated** for <sup>table 9</sup> <sub>VALVES</sub> with diameters **up to DN300**. For larger diameters the actuator contains a double-acting cylinder and an air tank which stores the volume of air necessary to perform the last movement in the event of an air supply failure.
- **B = max. width** of the valve (without actuator).  
**D = max. height** of the valve (without actuator).
- Available: DN50 to DN300, other DN on request.
- Please see the "CMO Pneumatic Actuators" catalogue if you require further information.

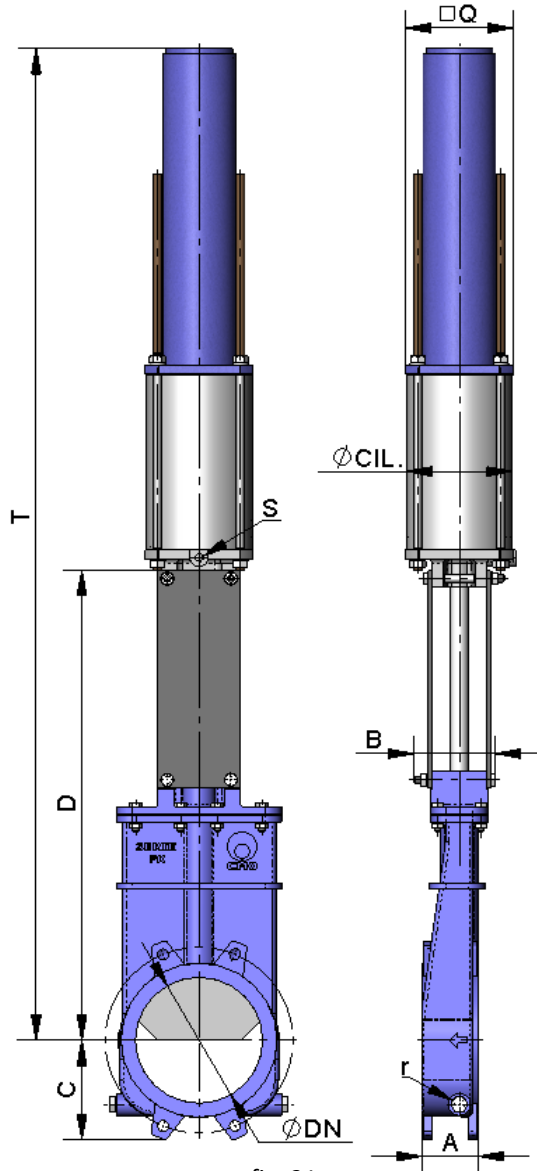


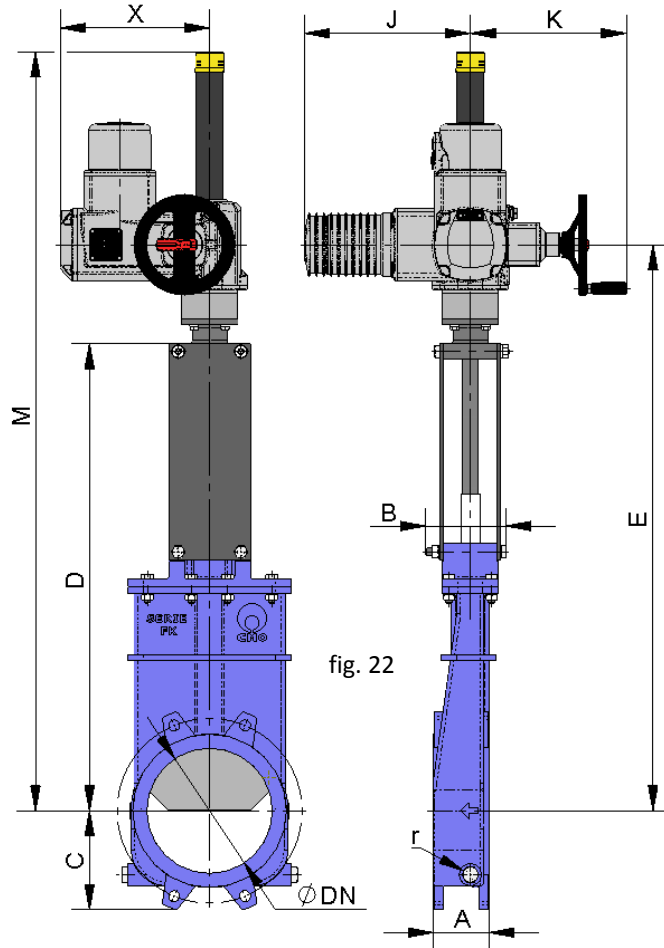
fig. 21

DN	ΔP (Kg/cm <sup>2</sup> )	DRAW (Nw)	A	B	C	D	Q	T	Ø CYL.	Ø STEM	S (B.S.P.)	r (B.S.P.)
50	3	360	60	91	61	323	135	863	125	25	1/4"	1/4"
65	3	606	60	91	68	362	135	900	125	25	1/4"	1/4"
80	3	915	64	91	91	404	135	943	125	25	1/4"	1/4"
100	3	1428	64	91	104	453	135	992	125	25	1/4"	1/4"
125	3	2232	70	101	118	511	170	1054	160	30	1/4"	3/8"
150	3	3211	76	101	130	574	170	1116	160	30	1/4"	3/8"
200	2	3835	89	118	158	745	215	1577	200	30	3/8"	3/8"
250	2	5984	114	118	196	880	270	2109	250	40	3/8"	1/2"
300	2	8640	114	118	230	1005	270	2306	250	40	3/8"	1/2"

table 10

## ELECTRIC ACTUATOR

- This actuator is automatic and includes the following parts:
  - Electric motor.
  - Stem.
  - Yoke.
- The electric motor includes:
  - Emergency manual handwheel.
  - Limit switches.
  - Torque limiters.
- Options:
  - Different types and brands.
  - Non-rising stem.
- ISO 5210 / DIN 3338 Flanges.
- Available: DN50 to DN1200, other DN on request.
- From DN500 the motor is assisted with a gear box.



DN	$\Delta P$ (Kg/cm <sup>2</sup> )	DRAW (Nw)	TORQUE (Nm)	A	B	C	D	E	J	K	M	X	r (B.S.P.)
50	3	360	0.85	60	91	61	323	479	265	250	674	238	1/4"
65	3	606	1.4	60	91	68	362	518	265	250	713	238	1/4"
80	3	915	2.2	64	91	91	404	560	265	250	755	238	1/4"
100	3	1428	3.3	64	91	104	453	609	265	250	804	238	1/4"
125	3	2232	5.2	70	101	118	511	667	265	250	862	238	3/8"
150	3	3211	7.4	76	101	130	574	730	265	250	925	238	3/8"
200	2	3835	11.2	89	118	158	745	903	265	250	1209	238	3/8"
250	2	5984	17.4	114	118	196	880	1038	265	250	1344	238	1/2"
300	2	8640	25.1	114	118	230	1005	1163	265	250	1469	238	1/2"
350	1,5	8862	35.1	127	290	255	1141	1281	283	254	1648	248	1/2"
400	1,5	11625	46.1	140	290	290	1266	1406	283	254	1823	248	1/2"
450	1	9949	39.9	152	290	306	1393	1578	283	254	2160	248	1/2"
500	1	12280	49.3	152	290	340	1529	1714	283	254	2296	248	1/2"
600	1	17857	72.1	178	290	398	1782	1967	265	250	2549	422	1/2"
700	1	24269	139	178	320	453	2105	2297	283	254	3000	422	1/2"
800	1	32180	186	178	320	503	2376	2568	283	254	3371	422	1/2"
900	1	40624	234	178	320	583	2655	2847	283	254	3745	425	1/2"
1000	1	50884	296	178	320	613	2935	3127	283	254	4149	425	1/2"
1200	1	72949	423	203	340	728	3440	3676	389	340	4866	480	1/2"

Table 11

## HYDRAULIC ACTUATOR (Oil pressure: 135 Kg/cm<sup>2</sup>)

- **B = max. width** of the valve (without actuator).
- **D = max. height** of the valve (without actuator).
- The hydraulic actuator includes:
  - Hydraulic cylinder.
  - Yoke.
- Available: DN50 to DN1200.
- Different types and brands available according to customer's requirements.

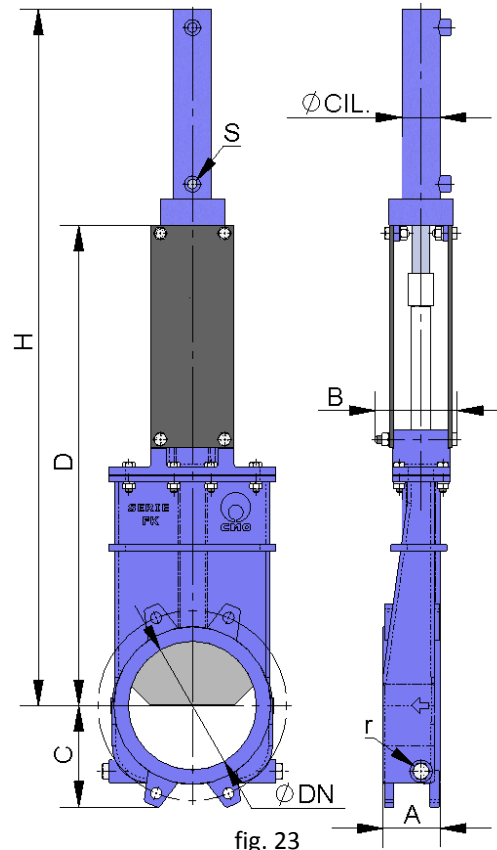


fig. 23

DN	$\Delta P$ (Kg/cm <sup>2</sup> )	DRAW (Nw)	A	B	C	D	H	Ø CYL.	Ø STEM	S (B.S.P.)	Oil Cap. (dm <sup>3</sup> )	r (B.S.P.)
50	3	360	60	91	61	323	539	25	18	3/8"	0.03	1/4"
65	3	606	60	91	68	362	593	25	18	3/8"	0.03	1/4"
80	3	915	64	91	91	404	670	25	18	3/8"	0.04	1/4"
100	3	1428	64	91	104	453	739	32	22	3/8"	0.09	1/4"
125	3	2232	70	101	118	511	827	32	22	3/8"	0.11	3/8"
150	3	3211	76	101	130	574	906	40	28	3/8"	0.20	3/8"
200	2	3835	89	118	158	745	1146	50	28	3/8"	0.42	3/8"
250	2	5984	114	118	196	880	1331	50	28	3/8"	0.52	1/2"
300	2	8640	114	118	230	1005	1545	50	28	3/8"	0.62	1/2"
350	1,5	8862	127	290	255	1141	1720	50	28	3/8"	0.73	1/2"
400	1,5	11625	140	290	290	1266	1895	63	36	3/8"	1.31	1/2"
450	1	9949	152	290	306	1393	2112	63	36	3/8"	1.47	1/2"
500	1	12280	152	290	340	1529	2297	63	36	3/8"	1.62	1/2"
600	1	17857	178	290	398	1782	2650	80	45	3/8"	3.12	1/2"
700	1	24269	178	320	453	2105	3124	80	45	3/8"	3.62	1/2"
800	1	32180	178	320	503	2376	3495	100	56	1/2"	6.44	1/2"
900	1	40624	178	320	583	2655	3874	100	56	1/2"	7.25	1/2"
1000	1	50884	178	320	613	2935	4294	125	70	1/2"	10.25	1/2"
1200	1	72949	203	340	728	3440	4995	125	70	1/2"	15.1	1/2"

table 12

**INFORMATION ON FLANGE DIMENSIONS**
**EN 1092-2 PN10**

DN	$\Delta P$ (Kg/cm <sup>2</sup> )	●	○	Metric	P	ØK
50	3	4	-	M 16	8	125
65	3	4	-	M 16	8	145
80	3	4	4	M 16	10	160
100	3	4	4	M 16	10	180
125	3	4	4	M 16	10	210
150	3	4	4	M 20	12	240
200	2	4	4	M 20	10	295
250	2	8	4	M 20	12	350
300	2	8	4	M 20	12	400
350	1,5	12	4	M 20	21	460
400	1,5	12	4	M 24	21	515
450	1	16	4	M 24	21	565
500	1	16	4	M 24	21	620
600	1	16	4	M 27	20	725
700	1	20	4	M 27	25	840
800	1	20	4	M 30	22	950
900	1	24	4	M 30	21	1050
1000	1	24	4	M 33	21	1160
1200	1	28	4	M 36	30	1380

table 13

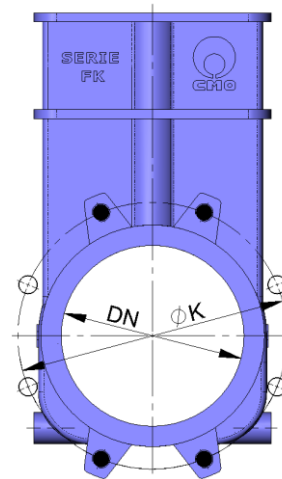


fig. 24

- BLIND TAPPED HOLE
- THROUGH HOLE

**ANSI B16, class 150**

DN	$\Delta P$ (Kg/cm <sup>2</sup> )	●	○	R UNC	P	ØK
2"	3	4	-	5/8"	8	120,6
2 1/2"	3	4	-	5/8"	8	139,7
3"	3	4	-	5/8"	10	152,4
4"	3	4	4	5/8"	10	190,5
5"	3	4	4	3/4"	10	215,9
6"	3	4	4	3/4"	12	241,3
8"	2	4	4	3/4"	10	298,4
10"	2	8	4	7/8"	12	361,9
12"	2	8	4	7/8"	12	431,8
14"	1,5	8	4	1"	21	476,2
16"	1,5	12	4	1"	21	539,7
18"	1	12	4	1 1/8"	21	577,8
20"	1	16	4	1 1/8"	21	635
24"	1	16	4	1 1/4"	20	749,3
28"	1	24	4	1 1/4"	25	863,6
32"	1	24	4	1 1/2"	21	977,9
36"	1	28	4	1 1/2"	21	1085,9
40"	1	32	4	1 1/2"	21	1200,2

table 14

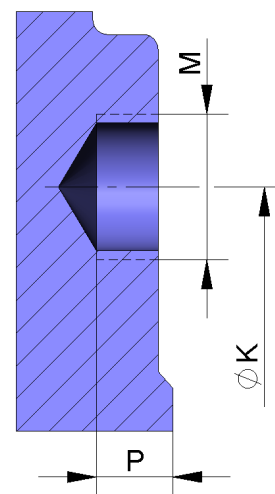


fig. 25