

## KNIFE-GATE VALVES

## F SERIES

23/04/2013

### UNIDIRECTIONAL Knife Gate Valve

- Unidirectional wafer-design knife gate valve.
- One-piece cast body with guides to support gate and seat wedges.
- Provides high flow rates with low pressure drop.
- Various seat and packing materials available.
- Face-to-face dimension 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 generally used for gravity discharge of dry solids. Designed for the following applications:
- Mining                      -Silo emptying                      - Electrical power stations
- -Chemical plants                      -Food Industry

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

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

|                 |                        |
|-----------------|------------------------|
| DN50 to DN150   | 3 kg/cm <sup>2</sup>   |
| DN200 to DN300: | 2 kg/cm <sup>2</sup>   |
| DN350 to DN400: | 1.5 kg/cm <sup>2</sup> |
| DN450 to DN1200 | 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 **F** valve seat is the same as for the **A** valve, but the pressures vary to those working the **F** valves.

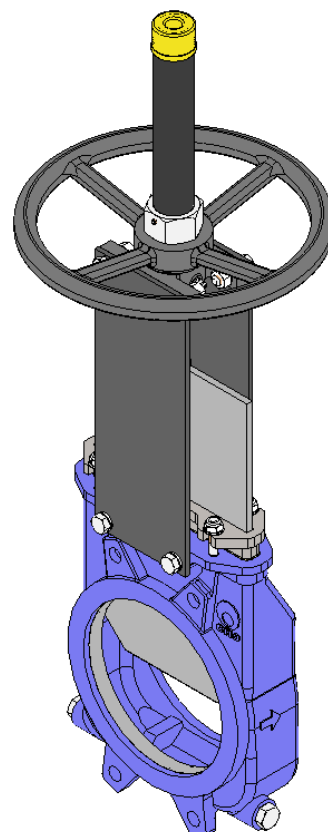


Fig. 1

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

**Other Common Flanges:** - ANSI 125 - DIN PN16 - DIN PN6 - DIN PN25 - BS "D" and "E"  
- Others on request

#### 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 further information on categories and zones please contact the CMO Technical-Commercial Dept.

#### Quality Dossier:

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

C.M.O.

Amategui Aldea 142, 20400 Txarama-Tolosa (SPAIN)

TEC-F.EN07

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### Advantages of CMO's "Model F"

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 **F** 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 **F** 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 is 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's o-ring seals are commercial products and can be purchased worldwide. This means it is not necessary to contact CMO every time a seal is required.

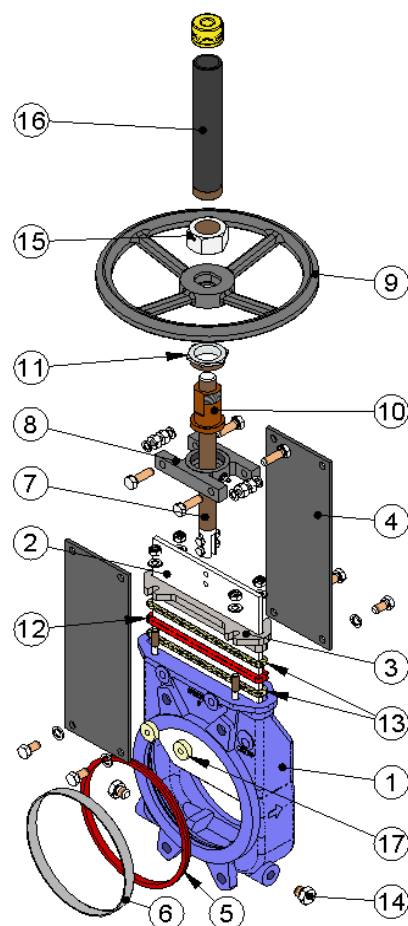


Fig. 2

| STANDARD COMPONENTS LIST    |                   |                         |
|-----------------------------|-------------------|-------------------------|
| COMPONENT                   | CAST IRON VERSION | STAINLESS STEEL VERSION |
| 1- Body                     | GJL-250           | CF8M                    |
| 2- Gate                     | AISI304           | AISI316                 |
| 3- Packing gland            | GJS-450           | CF8M                    |
| 4- Support plates           | S275JR            | S275JR                  |
| 5- O-ring seal              | EPDM              | EPDM                    |
| 6- Ring                     | AISI316           | AISI316                 |
| 7- Stem                     | AISI303           | AISI303                 |
| 8- Yoke                     | ACERO             | ACERO                   |
| 9- Handwheel                | GJS-500           | GJS-500                 |
| 10- Stem nut                | BRONZE            | BRONZE                  |
| 11- Stop nut                | F-111             | F-111                   |
| 12- Packing seal            | EPDM              | EPDM                    |
| 13- Packing                 | SYNT + PTFE       | SYNT + PTFE             |
| 14- Threaded cap (optional) | A-2               | A-4                     |
| 15- Nut                     | STEEL             | STEEL                   |
| 16- Hood                    | STEEL             | STEEL                   |
| 17- Guide                   | RCH1000           | RCH1000                 |

Table 1

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## KNIFE-GATE VALVES

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### DESIGN CHARACTERISTICS

#### 1- BODY

Unidirectional wafer-design knife gate valve. One-piece cast body with guides to support gate and seat wedges.

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

Full port designed to provide high flow rates with low pressure drop.

The body's internal design prevents any build up of solids in the seat 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- GATE

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 on request.

The gate is polished on both sides to provide a smooth contact surface with the resilient seat. At the same time, the gate is rounded to prevent the seat 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: (watertight)

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

- **Seat 1:** Metal / metal seat. This type of seat does not include any kind of resilient seat and the estimated leakage (considering water as the test fluid) is 1.5% of the pipe flow.
- **Seat 2:** Standard soft-seated valve. This type of seat includes a resilient seat which is fixed to the inside of the body via an AISI316 stainless steel retaining ring.
- **Seat 3:** Soft-seated valve with reinforced socket. This type of seat includes a resilient seat which is fixed to the inside of the body via a reinforced retaining ring with two functions (to protect the valve from abrasion and clean the gate when working with solids that can stick to it).

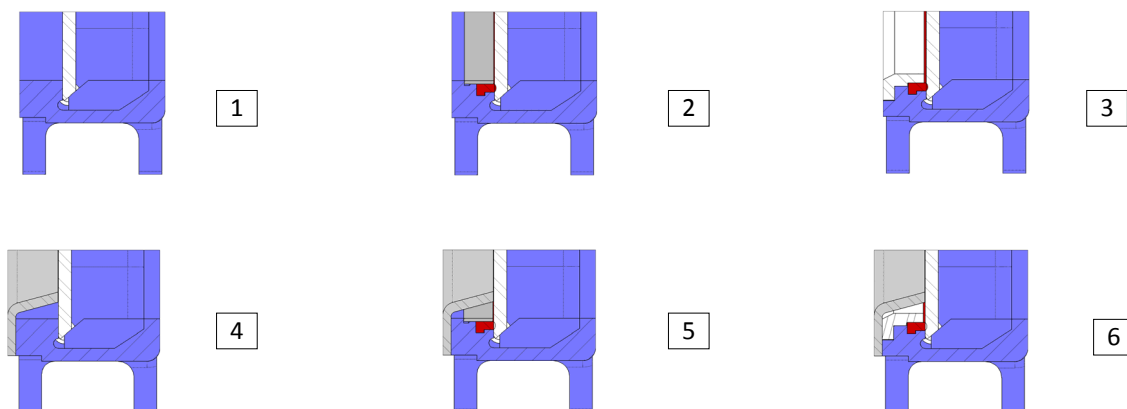


Fig. 3

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- **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 socket 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- PACKING**

CMO's standard packing is composed of three lines with a specially designed EPDM O-ring in the middle which provides watertight integrity between the body and the gate, preventing any type of leakage to the atmosphere. It is located in an easily accessible place and can be replaced without dismantling the valve from the pipeline. Below we indicate various types of packing available according to the application to be given to the valve:

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

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

#### **COTTON + PTFE**

This packing 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.

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### SYNTHETIC + PTFE

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

| SEAT/SEALS   |              |                                | PACKING          |        |              |      |
|--------------|--------------|--------------------------------|------------------|--------|--------------|------|
| Material     | Max. T. (°C) | Applications                   | Material         | P(bar) | Max. T. (°C) | pH   |
| Metal/Metal  | >250         | High T./Low watertight integ.  | Greased cotton   | 10     | 100          | 6-8  |
| EPDM (E)     | 90 *         | Mineral acids and oils         | Dry cotton (DC)  | 0.5    | 100          | 6-8  |
| Nitrile (N)  | 90 *         | Hydrocarbons, oils and greases | Cotton + PTFE    | 30     | 120          | 6-8  |
| Viton (V)    | 200          | Hydrocarbons and solvents      | Synthetic + PTFE | 100    | -200+270     | 0-14 |
| Silicone (S) | 200          | Food products                  | Graphite         | 40     | 650          | 0-14 |
| PTFE (T)     | 250          | Corrosion resistant            | Ceramic Fibre    | 0,3    | 1400         | 0-14 |

NOTE: Mode details and other materials available on request.

\* → 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

The packing gland allows uniform force and pressure to be applied to the packing to ensure watertight integrity.

As standard, valves with cast iron body include GJS-450 packing glands, whilst valves with stainless steel body have CF8M 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 the customer 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  
Gear Box  
Others (square nut,...)

#### Automatic:

Electric actuator  
Pneumatic cylinder  
Hydraulic cylinder

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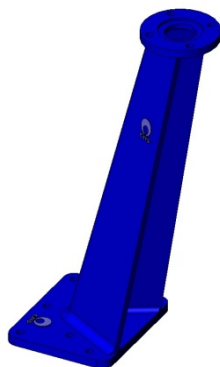


Fig. 4

### Wide Range of Accessories Available:

Mechanical stops  
Locking devices  
Emergency manual actuators  
Solenoid valves  
Positioners  
Limit switches  
Proximity switches  
Straight floor stands (Fig. 5)  
Leaning floor stand (Fig. 4)  
...

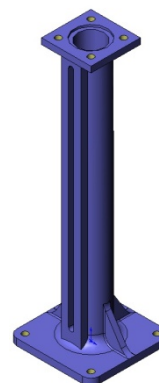
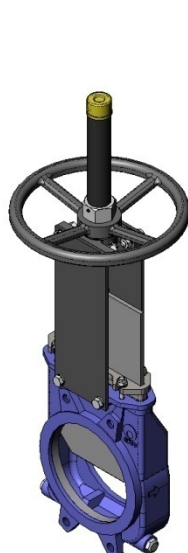
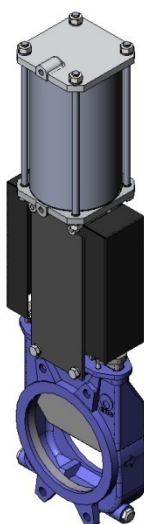


Fig. 5

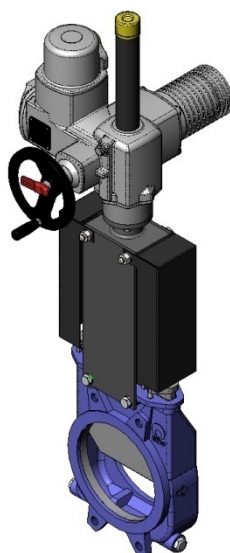
Stem extensions have also been developed, allowing the actuator to be located far away from the valve, to suit all needs. Please consult our technicians beforehand.



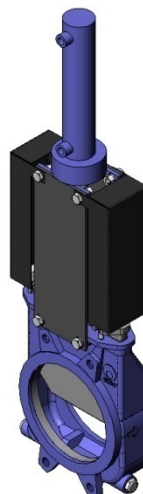
Handwheel  
rising stem



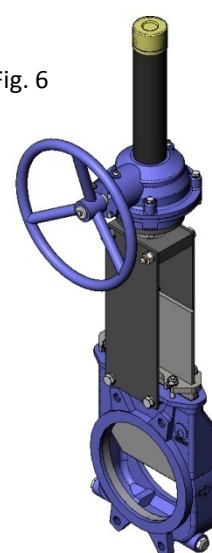
Pneumatic  
actuator



Electric-motor  
actuator



Hydraulic  
actuator



Handwheel  
gear box

Fig. 6

## ACCESSORIES AND OPTIONS

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

### Mirror Polished Gate:

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

### PTFE Lined Gate:

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

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### Stellited Gate:

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

### Scraper in the Packing:

Its function is to clean the gate during the opening movement and prevent possible damage to the packing.

### Air Injections in the Packing Gland:

By injecting air in the packing, an air chamber is created which improves the watertight integrity.

### Heating Jacket:

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 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. 7).

### Solenoid valves (Fig. 7)

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's desired run.

### Mechanical Locking Device:

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

### Emergency Manual Actuator (Hand Wheel /Gear Box) (Fig. 7):

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 application 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 on request), its robust design gives it great rigidity in order to resist the most adverse operation conditions.

### Epoxy Coating:

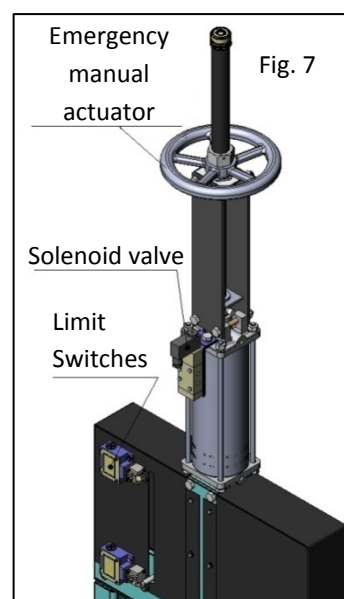
All cast iron and carbon steel bodies and components on CMO valves are EPOXY coated, giving the valves great resistance to corrosion and an excellent finish. **CMO's** standard colour is **blue** RAL-5015.

### Gate Safety Protection:

In accordance with European Safety Standards ("EC" marking), CMO automated valves are equipped with gate guards, to prevent any objects from being accidentally caught in the gate.

### Bonnet (mod. FK):

Provides total watertight integrity to the outside, reducing the packing maintenance required.

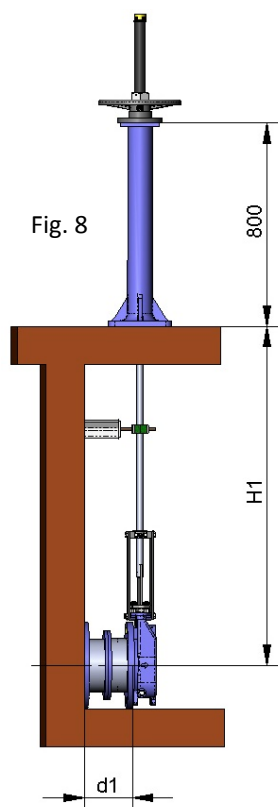


# KNIFE-GATE VALVES

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## TYPES OF EXTENSION

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



### 1- Extension: Floor Stand.

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

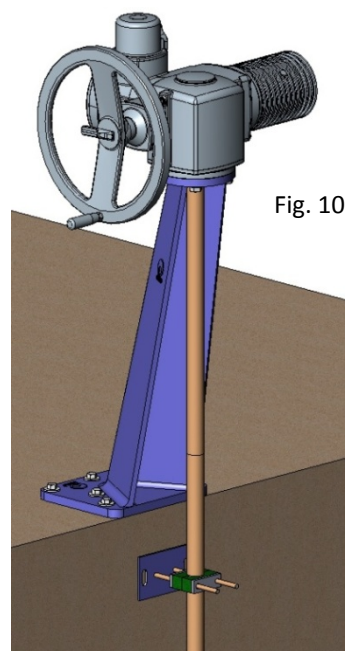
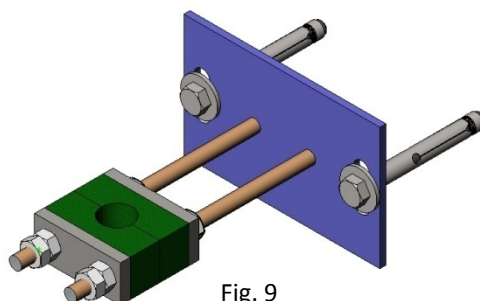
The definition variables are as follows:

**H1:** Distance from the valve's 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 (Fig. 9) is recommended every 1.5 m.
- The standard floor stand is 800 mm high (Fig.8). Other floor stand measurements available on request.
- A position indicator can be fitted to determine the valve's percentage of opening.
- Possibility of leaning floor stand (Fig.10).



| COMPONENTS LIST |                            |
|-----------------|----------------------------|
| Component       | Standard Version           |
| Stem            | AISI 303                   |
| Rod             | AISI 304                   |
| Support-Guide   | EPOXI-coated carbon steel  |
| Guide           | Nylon                      |
| Stand           | GJS-500 with EPOXI coating |

Table 3

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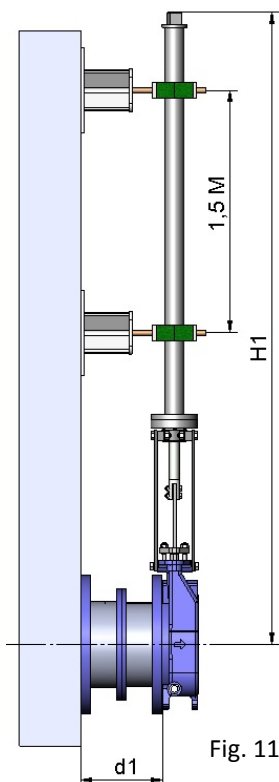


Fig. 11

### 2- Extension: Pipe (Fig. 11)

Consists of raising the actuator. The pipe will rotate in the same direction as the handwheel when the valve is operated but it always remains at the same height.

The definition variables are as follows:

**H1:** Distance from the valve's shaft to the desired 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. 12)

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. 12

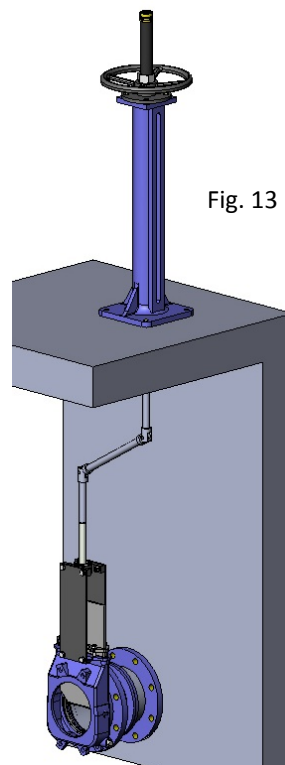
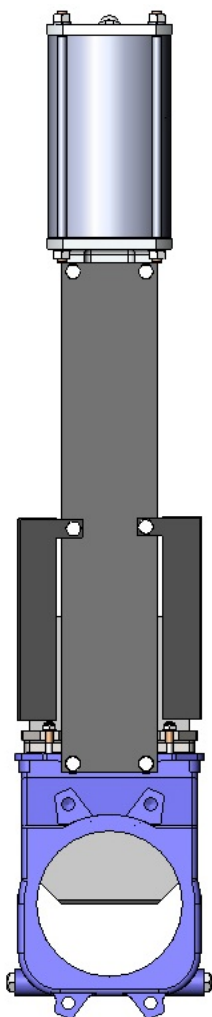


Fig. 13

### 4 - Extension: Universal Joint (Fig. 13)

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

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### HANDWHEEL with Rising Stem

- **B = Max. width** of the valve (without actuator).
- **D = Max. height** of the valve (without actuator).
- Options:
  - Locking devices.
  - Extensions: stand, pipe, plates...
  - DN higher than those give in the table.
- Actuator including:
  - Handwheel.
  - Stem.
  - Nut.
  - Stem protection hood.
- Available: DN50 to DN1200, other DN on request.
- From DN600 the actuator is with geared motor.

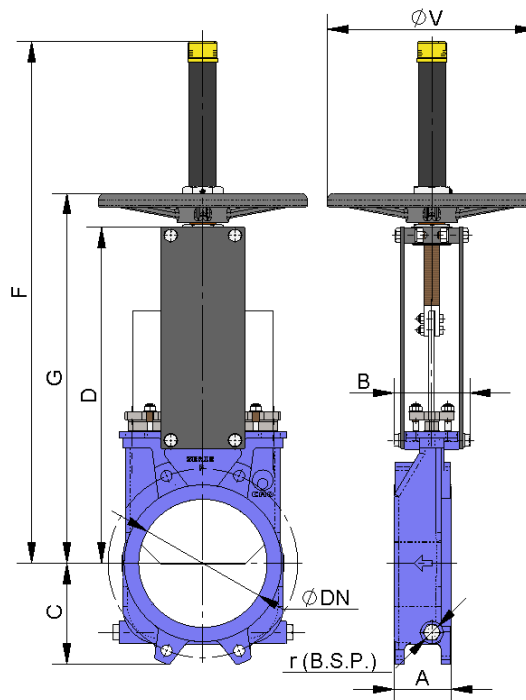


Fig. 14

| DN   | $\Delta P$<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | TORQUE<br>(Nm) | A   | B   | C   | D    | F    | G    | ØV  | r<br>(B.S.P.) |
|------|-------------------------------------|--------------|----------------|-----|-----|-----|------|------|------|-----|---------------|
| 50   | 3                                   | 360          | 0.85           | 60  | 91  | 61  | 241  | 410  | 280  | 225 | 1/4"          |
| 65   | 3                                   | 606          | 1.4            | 60  | 91  | 68  | 268  | 437  | 308  | 225 | 1/4"          |
| 80   | 3                                   | 915          | 2.2            | 64  | 91  | 91  | 294  | 463  | 333  | 225 | 1/4"          |
| 100  | 3                                   | 1428         | 3.3            | 64  | 91  | 104 | 334  | 503  | 373  | 225 | 1/4"          |
| 125  | 3                                   | 2232         | 5.2            | 70  | 101 | 118 | 367  | 586  | 407  | 225 | 3/8"          |
| 150  | 3                                   | 3211         | 7.4            | 76  | 101 | 130 | 419  | 638  | 458  | 225 | 3/8"          |
| 200  | 2                                   | 3835         | 11.2           | 89  | 118 | 158 | 525  | 816  | 578  | 325 | 3/8"          |
| 250  | 2                                   | 5984         | 17.4           | 114 | 118 | 196 | 616  | 1007 | 669  | 325 | 1/2"          |
| 300  | 2                                   | 8640         | 25.1           | 114 | 118 | 230 | 704  | 1095 | 757  | 380 | 1/2"          |
| 350  | 1,5                                 | 8862         | 35.1           | 127 | 290 | 247 | 767  | 1307 | 876  | 450 | 1/2"          |
| 400  | 1,5                                 | 11625        | 46.1           | 140 | 290 | 290 | 865  | 1405 | 974  | 450 | 1/2"          |
| 450  | 1                                   | 9949         | 39.9           | 152 | 290 | 304 | 989  | 1629 | 1098 | 450 | 1/2"          |
| 500  | 1                                   | 12280        | 49.3           | 152 | 290 | 340 | 1101 | 1741 | 1210 | 450 | 1/2"          |
| 600  | 1                                   | 17857        | 72.1           | 178 | 290 | 398 | 1307 | 2047 | 1416 | 450 | 1/2"          |
| 700  | 1                                   | 24269        | 139            | 178 | 320 | 453 | 1506 | 2401 | 1656 | --  | 1/2"          |
| 800  | 1                                   | 32180        | 186            | 178 | 320 | 503 | 1720 | 2715 | 1870 | --  | 1/2"          |
| 900  | 1                                   | 40624        | 234            | 178 | 320 | 583 | 1953 | 3043 | 2103 | --  | 1/2"          |
| 1000 | 1                                   | 50884        | 296            | 178 | 320 | 613 | 2137 | 3351 | 2287 | --  | 1/2"          |
| 1200 | 1                                   | 72949        | 423            | 203 | 340 | 728 | 2616 | 4042 | 2766 | --  | 1/2"          |

Table 4

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Amategui Aldea 142, 20400 Txarama-Tolosa (SPAIN)

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## KNIFE-GATE VALVES

## F SERIES

### HANDWHEEL with Non-Rising Stem

- Suitable when no size limitations exist.
- **B = Max. width** of the valve (without actuator).  
**D = Max. height** of the valve (without actuator).
- Options:
  - Square nut.
  - Locking devices.
  - Extensions: stand, pipe, plates...
  - DN higher than those give in the table.
- Actuator including:
  - Handwheel.
  - Stem.
  - Guide bearings on the yoke.
  - Nut.
- Available: DN50 to DN1200, other DN on request.
- From DN600 the actuator is with geared motor.

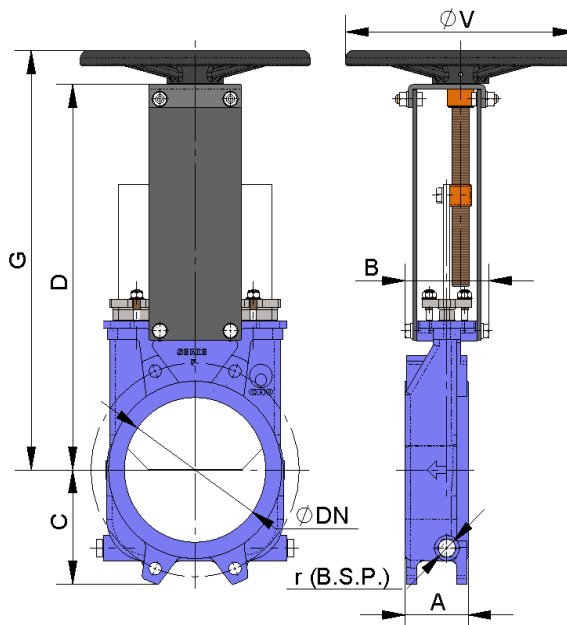


Fig. 15

| DN   | $\Delta P$<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | TORQUE<br>(Nm) | A   | B   | C   | D    | G    | ØV  | r<br>(B.S.P.) |
|------|-------------------------------------|--------------|----------------|-----|-----|-----|------|------|-----|---------------|
| 50   | 3                                   | 360          | 0.85           | 60  | 91  | 61  | 241  | 280  | 225 | 1/4"          |
| 65   | 3                                   | 606          | 1.4            | 60  | 91  | 68  | 268  | 308  | 225 | 1/4"          |
| 80   | 3                                   | 915          | 2.2            | 64  | 91  | 91  | 294  | 333  | 225 | 1/4"          |
| 100  | 3                                   | 1428         | 3.3            | 64  | 91  | 104 | 334  | 373  | 225 | 1/4"          |
| 125  | 3                                   | 2232         | 5.2            | 70  | 101 | 118 | 367  | 407  | 225 | 3/8"          |
| 150  | 3                                   | 3211         | 7.4            | 76  | 101 | 130 | 419  | 458  | 225 | 3/8"          |
| 200  | 2                                   | 3835         | 11.2           | 89  | 118 | 158 | 525  | 578  | 325 | 3/8"          |
| 250  | 2                                   | 5984         | 17.4           | 114 | 118 | 196 | 616  | 669  | 325 | 1/2"          |
| 300  | 2                                   | 8640         | 25.1           | 114 | 118 | 230 | 704  | 757  | 380 | 1/2"          |
| 350  | 1,5                                 | 8862         | 35.1           | 127 | 290 | 247 | 767  | 876  | 450 | 1/2"          |
| 400  | 1,5                                 | 11625        | 46.1           | 140 | 290 | 290 | 865  | 974  | 450 | 1/2"          |
| 450  | 1                                   | 9949         | 39.9           | 152 | 290 | 304 | 989  | 1098 | 450 | 1/2"          |
| 500  | 1                                   | 12280        | 49.3           | 152 | 290 | 340 | 1101 | 1210 | 450 | 1/2"          |
| 600  | 1                                   | 17857        | 72.1           | 178 | 290 | 398 | 1307 | 1416 | 450 | 1/2"          |
| 700  | 1                                   | 24269        | 139            | 178 | 320 | 453 | 1506 | 1656 | --  | 1/2"          |
| 800  | 1                                   | 32180        | 186            | 178 | 320 | 503 | 1720 | 1870 | --  | 1/2"          |
| 900  | 1                                   | 40624        | 234            | 178 | 320 | 583 | 1953 | 2103 | --  | 1/2"          |
| 1000 | 1                                   | 50884        | 296            | 178 | 320 | 613 | 2137 | 2287 | --  | 1/2"          |
| 1200 | 1                                   | 72949        | 423            | 203 | 340 | 728 | 2616 | 2766 | --  | 1/2"          |

Table 5



## KNIFE-GATE VALVES

## F SERIES

### CHAINWHEEL

- Widely used in raised installations with difficult access, the handwheel is fitted in vertical position.

- B = Max. width** of the valve (without actuator).
- D = Max. height** of the valve (without actuator).

- Options:
  - Locking devices.
  - Extensions: stand, pipe, plates...
  - Non-rising stem.
  - DN higher than those give in the table.

- Including:
  - Handwheel.
  - Stem.
  - Nut.
  - Hood.

- Available: DN50 to DN1200, other DN on request.

- From DN600 the actuator is with geared motor, see \* in table.

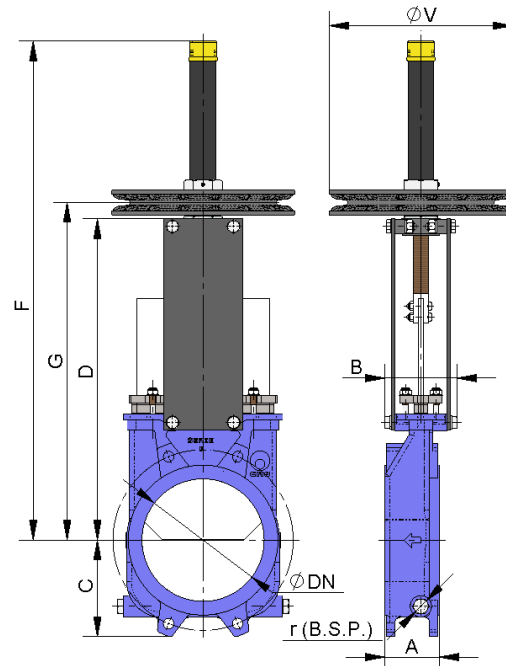


Fig. 16

| DN   | $\Delta P$<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | TORQUE<br>(Nm) | A   | B   | C   | D    | G    | F    | ØV   | r<br>(B.S.P.) |
|------|-------------------------------------|--------------|----------------|-----|-----|-----|------|------|------|------|---------------|
| 50   | 3                                   | 360          | 0.85           | 60  | 91  | 61  | 241  | 280  | 410  | 225  | 1/4"          |
| 65   | 3                                   | 606          | 1.4            | 60  | 91  | 68  | 268  | 308  | 437  | 225  | 1/4"          |
| 80   | 3                                   | 915          | 2.2            | 64  | 91  | 91  | 294  | 333  | 463  | 225  | 1/4"          |
| 100  | 3                                   | 1428         | 3.3            | 64  | 91  | 104 | 334  | 373  | 503  | 225  | 1/4"          |
| 125  | 3                                   | 2232         | 5.2            | 70  | 101 | 118 | 367  | 407  | 586  | 225  | 3/8"          |
| 150  | 3                                   | 3211         | 7.4            | 76  | 101 | 130 | 419  | 458  | 638  | 225  | 3/8"          |
| 200  | 2                                   | 3835         | 11.2           | 89  | 118 | 158 | 525  | 578  | 816  | 300  | 3/8"          |
| 250  | 2                                   | 5984         | 17.4           | 114 | 118 | 196 | 616  | 669  | 1007 | 300  | 1/2"          |
| 300  | 2                                   | 8640         | 25.1           | 114 | 118 | 230 | 704  | 757  | 1095 | 300  | 1/2"          |
| 350  | 1,5                                 | 8862         | 35.1           | 127 | 290 | 247 | 767  | 876  | 1307 | 402  | 1/2"          |
| 400  | 1,5                                 | 11625        | 46.1           | 140 | 290 | 290 | 865  | 974  | 1405 | 402  | 1/2"          |
| 450  | 1                                   | 9949         | 39.9           | 152 | 290 | 304 | 989  | 1098 | 1629 | 402  | 1/2"          |
| 500  | 1                                   | 12280        | 49.3           | 152 | 290 | 340 | 1101 | 1210 | 1741 | 402  | 1/2"          |
| 600  | 1                                   | 17857        | 72.1           | 178 | 290 | 398 | 1307 | 1416 | 2047 | 402  | 1/2"          |
| 700  | 1                                   | 24269        | 139            | 178 | 320 | 453 | 1506 | 1656 | 2401 | 402* | 1/2"          |
| 800  | 1                                   | 32180        | 186            | 178 | 320 | 503 | 1720 | 1870 | 2715 | 402* | 1/2"          |
| 900  | 1                                   | 40624        | 234            | 178 | 320 | 583 | 1953 | 2103 | 3043 | 402* | 1/2"          |
| 1000 | 1                                   | 50884        | 296            | 178 | 320 | 613 | 2137 | 2287 | 3351 | 402* | 1/2"          |
| 1200 | 1                                   | 72949        | 423            | 203 | 340 | 728 | 2616 | 2766 | 4042 | 402* | 1/2"          |

Table 6

## KNIFE-GATE VALVES

## F SERIES

### LEVER

- It is a fast actuator.
- **B = Max. width** of the valve (without actuator)  
**D = Max. height** of the valve (without actuator).
- The actuator includes:
  - Lever.
  - Rod.
  - Guide bearing.
  - External limiting switches to maintain the position.
- Available: DN50 to DN300.

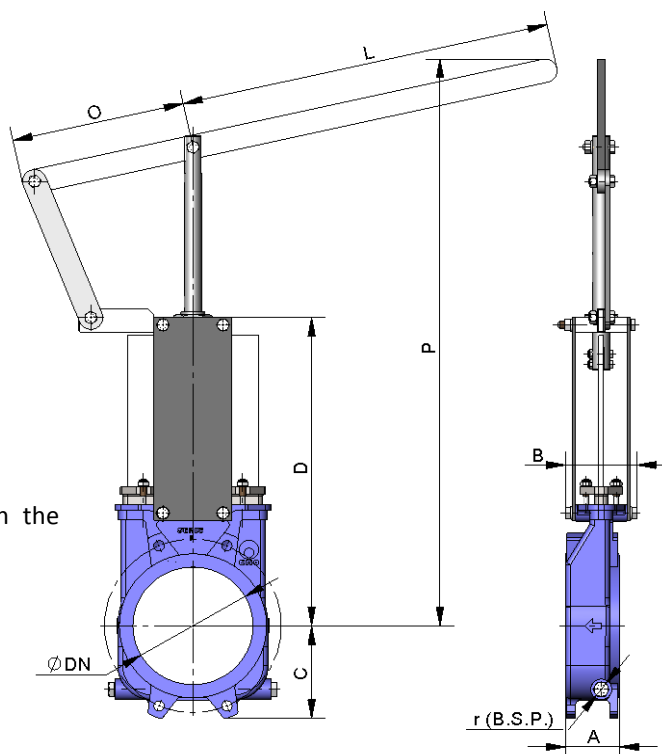


Fig. 17

| DN  | $\Delta P$<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | A   | B   | C   | D   | L   | O   | P    | r (B.S.P.) |
|-----|-------------------------------------|--------------|-----|-----|-----|-----|-----|-----|------|------------|
| 50  | 3                                   | 360          | 60  | 91  | 61  | 241 | 315 | 165 | 509  | 1/4"       |
| 65  | 3                                   | 606          | 60  | 91  | 68  | 268 | 315 | 165 | 536  | 1/4"       |
| 80  | 3                                   | 915          | 64  | 91  | 91  | 294 | 315 | 165 | 562  | 1/4"       |
| 100 | 3                                   | 1428         | 64  | 91  | 104 | 334 | 315 | 165 | 602  | 1/4"       |
| 125 | 3                                   | 2232         | 70  | 101 | 118 | 367 | 415 | 165 | 896  | 3/8"       |
| 150 | 3                                   | 3211         | 76  | 101 | 130 | 419 | 415 | 165 | 948  | 3/8"       |
| 200 | 2                                   | 3835         | 89  | 118 | 158 | 525 | 620 | 290 | 1040 | 3/8"       |
| 250 | 2                                   | 5984         | 114 | 118 | 196 | 616 | 620 | 290 | 1426 | 1/2"       |
| 300 | 2                                   | 8640         | 114 | 118 | 230 | 704 | 620 | 290 | 1514 | 1/2"       |

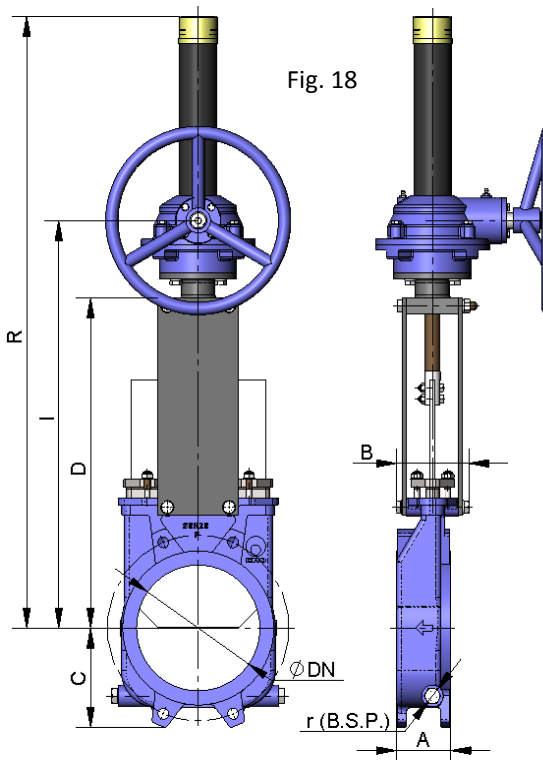
Table 7

## KNIFE-GATE VALVES

## F SERIES

### GEAR BOX

- It is recommendable for DN greater than 600.
- **B = Max. width** of the valve (without actuator).  
**D = Max. height** of the valve (without actuator).
- Options:
  - Chainwheel.
  - Locking devices.
  - Extensions: stand, pipe, plates...
  - Non-rising stem.
- Actuator including:
  - Stem.
  - Yoke.
  - Cone-shaped gear box.
  - Handwheel.
- Standard ratio = 4 to 1.
- Available: DN 50 to DN 1200, other DN on request.



| DN   | $\Delta P$<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | TORQUE<br>(Nm) | A   | B   | C   | D    | I    | R    | r<br>(B.S.P.) |
|------|-------------------------------------|--------------|----------------|-----|-----|-----|------|------|------|---------------|
| 50   | 3                                   | 360          | 0.85           | 60  | 91  | 61  | 241  | 365  | 537  | 1/4"          |
| 65   | 3                                   | 606          | 1.4            | 60  | 91  | 68  | 268  | 392  | 564  | 1/4"          |
| 80   | 3                                   | 915          | 2.2            | 64  | 91  | 91  | 294  | 418  | 590  | 1/4"          |
| 100  | 3                                   | 1428         | 3.3            | 64  | 91  | 104 | 334  | 458  | 630  | 1/4"          |
| 125  | 3                                   | 2232         | 5.2            | 70  | 101 | 118 | 367  | 491  | 663  | 3/8"          |
| 150  | 3                                   | 3211         | 7.4            | 76  | 101 | 130 | 419  | 543  | 715  | 3/8"          |
| 200  | 2                                   | 3835         | 11.2           | 89  | 118 | 158 | 525  | 649  | 943  | 3/8"          |
| 250  | 2                                   | 5984         | 17.4           | 114 | 118 | 196 | 616  | 740  | 1033 | 1/2"          |
| 300  | 2                                   | 8640         | 25.1           | 114 | 118 | 230 | 704  | 828  | 1121 | 1/2"          |
| 350  | 1,5                                 | 8862         | 35.1           | 127 | 290 | 247 | 767  | 891  | 1305 | 1/2"          |
| 400  | 1,5                                 | 11625        | 46.1           | 140 | 290 | 290 | 865  | 989  | 1403 | 1/2"          |
| 450  | 1                                   | 9949         | 39.9           | 152 | 290 | 304 | 989  | 1113 | 1677 | 1/2"          |
| 500  | 1                                   | 12280        | 49.3           | 152 | 290 | 340 | 1101 | 1225 | 1788 | 1/2"          |
| 600  | 1                                   | 17857        | 72.1           | 178 | 290 | 398 | 1307 | 1428 | 1995 | 1/2"          |
| 700  | 1                                   | 24269        | 139            | 178 | 320 | 453 | 1506 | 1658 | 2401 | 1/2"          |
| 800  | 1                                   | 32180        | 186            | 178 | 320 | 503 | 1720 | 1872 | 2715 | 1/2"          |
| 900  | 1                                   | 40624        | 234            | 178 | 320 | 583 | 1953 | 2105 | 3043 | 1/2"          |
| 1000 | 1                                   | 50884        | 296            | 178 | 320 | 613 | 2137 | 2290 | 3351 | 1/2"          |
| 1200 | 1                                   | 72949        | 423            | 203 | 340 | 728 | 2616 | 2802 | 4042 | 1/2"          |

Table 8

## KNIFE-GATE VALVES

## F SERIES

### 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 consult manufacturer.
- 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.

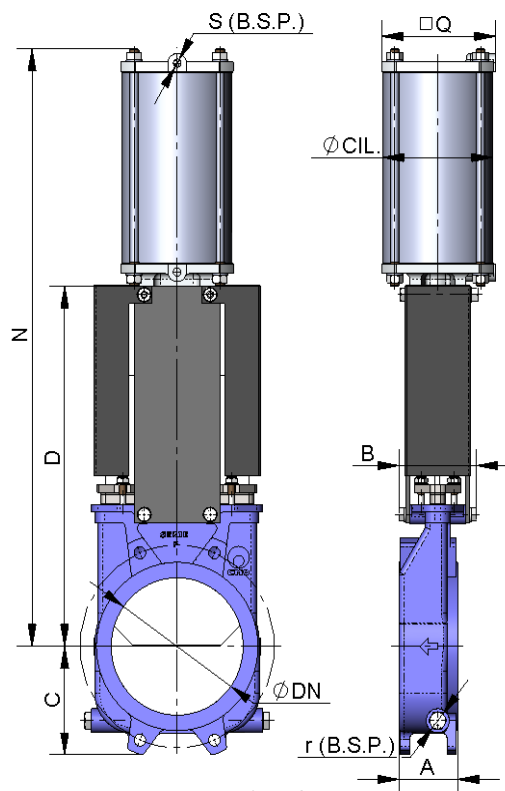


Fig. 19

| DN   | ΔP<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | A   | B   | C   | D    | N    | Q   | Ø<br>CYL | Ø<br>STEM | S<br>(B.S.P.) | r<br>(B.S.P.) |
|------|-----------------------------|--------------|-----|-----|-----|------|------|-----|----------|-----------|---------------|---------------|
| 50   | 3                           | 360          | 60  | 91  | 61  | 241  | 416  | 90  | 80       | 20        | 1/4"          | 1/4"          |
| 65   | 3                           | 606          | 60  | 91  | 68  | 268  | 456  | 90  | 80       | 20        | 1/4"          | 1/4"          |
| 80   | 3                           | 915          | 64  | 91  | 91  | 294  | 498  | 90  | 80       | 20        | 1/4"          | 1/4"          |
| 100  | 3                           | 1428         | 64  | 91  | 104 | 334  | 562  | 110 | 100      | 20        | 1/4"          | 1/4"          |
| 125  | 3                           | 2232         | 70  | 101 | 118 | 367  | 636  | 135 | 125      | 25        | 1/4"          | 3/8"          |
| 150  | 3                           | 3211         | 76  | 101 | 130 | 419  | 717  | 135 | 125      | 25        | 1/4"          | 3/8"          |
| 200  | 2                           | 3835         | 89  | 118 | 158 | 525  | 874  | 170 | 160      | 30        | 1/4"          | 3/8"          |
| 250  | 2                           | 5984         | 114 | 118 | 196 | 616  | 1036 | 215 | 200      | 30        | 3/8"          | 1/2"          |
| 300  | 2                           | 8640         | 114 | 118 | 230 | 704  | 1182 | 215 | 200      | 30        | 3/8"          | 1/2"          |
| 350  | 1,5                         | 8862         | 127 | 290 | 247 | 767  | 1381 | 270 | 250      | 40        | 3/8"          | 1/2"          |
| 400  | 1,5                         | 11625        | 140 | 290 | 290 | 865  | 1530 | 270 | 250      | 40        | 3/8"          | 1/2"          |
| 450  | 1                           | 9949         | 152 | 290 | 304 | 989  | 1676 | 382 | 300      | 45        | 1/2"          | 1/2"          |
| 500  | 1                           | 12280        | 152 | 290 | 340 | 1101 | 1839 | 382 | 300      | 45        | 1/2"          | 1/2"          |
| 600  | 1                           | 17857        | 178 | 290 | 398 | 1307 | 2145 | 382 | 300      | 45        | 1/2"          | 1/2"          |
| 700  | 1                           | 24269        | 178 | 320 | 453 | 1506 | 2481 | 444 | 350      | 45        | 1/2"          | 1/2"          |
| 800  | 1                           | 32180        | 178 | 320 | 503 | 1720 | 2798 | 444 | 350      | 45        | 1/2"          | 1/2"          |
| 900  | 1                           | 40624        | 178 | 320 | 583 | 1953 | 3167 | 508 | 400      | 50        | 1/2"          | 1/2"          |
| 1000 | 1                           | 50884        | 178 | 320 | 613 | 2137 | 3451 | 508 | 400      | 50        | 1/2"          | 1/2"          |
| 1200 | 1                           | 72949        | 203 | 340 | 728 | 2616 | 4133 | 508 | 400      | 50        | 1/2"          | 1/2"          |

Table 9

C.M.O.

Amategui Aldea 142, 20400 Txarama-Tolosa (SPAIN)

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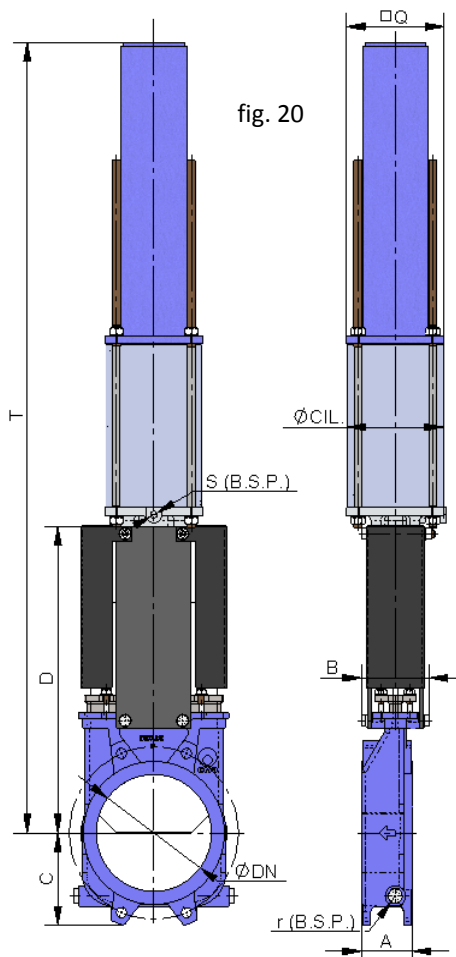
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## KNIFE-GATE VALVES

## F SERIES

### 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 consult manufacturer.
- 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 valves 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 a 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.



| DN  | ΔP<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | A   | B   | C   | D   | Q   | T    | Ø<br>CYL | Ø<br>STEM | S<br>(B.S.P.) | r<br>(B.S.P.) |
|-----|-----------------------------|--------------|-----|-----|-----|-----|-----|------|----------|-----------|---------------|---------------|
| 50  | 3                           | 360          | 60  | 91  | 61  | 241 | 135 | 781  | 125      | 25        | 1/4"          | 1/4"          |
| 65  | 3                           | 606          | 60  | 91  | 68  | 268 | 135 | 806  | 125      | 25        | 1/4"          | 1/4"          |
| 80  | 3                           | 915          | 64  | 91  | 91  | 294 | 135 | 833  | 125      | 25        | 1/4"          | 1/4"          |
| 100 | 3                           | 1428         | 64  | 91  | 104 | 334 | 135 | 873  | 125      | 25        | 1/4"          | 1/4"          |
| 125 | 3                           | 2232         | 70  | 101 | 118 | 367 | 170 | 909  | 160      | 30        | 1/4"          | 3/8"          |
| 150 | 3                           | 3211         | 76  | 101 | 130 | 419 | 170 | 960  | 160      | 30        | 1/4"          | 3/8"          |
| 200 | 2                           | 3835         | 89  | 118 | 158 | 525 | 215 | 1355 | 200      | 30        | 3/8"          | 3/8"          |
| 250 | 2                           | 5984         | 114 | 118 | 196 | 616 | 270 | 1844 | 250      | 40        | 3/8"          | 1/2"          |
| 300 | 2                           | 8640         | 114 | 118 | 230 | 704 | 270 | 2005 | 250      | 40        | 3/8"          | 1/2"          |

Table 10

C.M.O.

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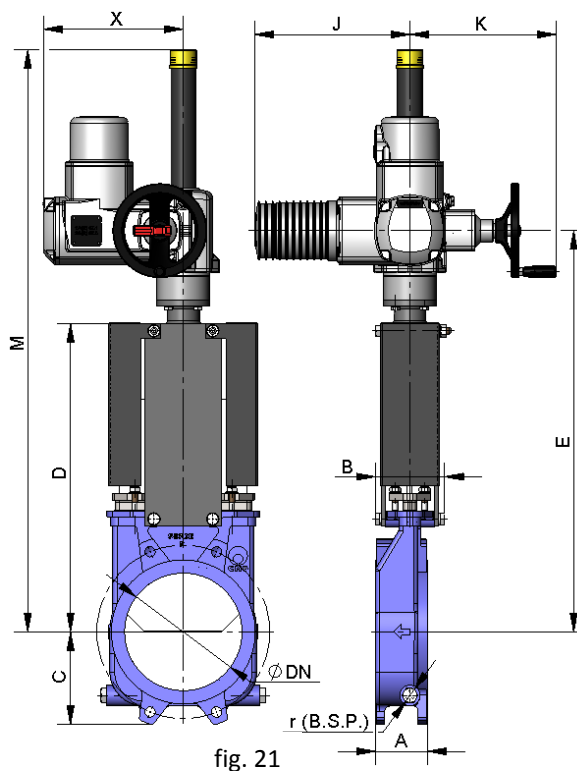
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## KNIFE-GATE VALVES

## F SERIES

### 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 switches.
- Options:
  - Different types and brands.
  - Non-rising stem.
- ISO 5210 / DIN 3338 Flanges.
- Available: DN50 to DN1200, other DN on request.
- From DN450 the motor is assisted with a gear box.



| DN   | $\Delta P$<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | TORQUE<br>(Nm) | A   | B   | C   | D    | E    | J   | K   | M    | X   | r<br>(B.S.P.) |
|------|-------------------------------------|--------------|----------------|-----|-----|-----|------|------|-----|-----|------|-----|---------------|
| 50   | 3                                   | 360          | 0.85           | 60  | 91  | 61  | 241  | 400  | 265 | 250 | 581  | 237 | 1/4"          |
| 65   | 3                                   | 606          | 1.4            | 60  | 91  | 68  | 268  | 426  | 265 | 250 | 607  | 237 | 1/4"          |
| 80   | 3                                   | 915          | 2.2            | 64  | 91  | 91  | 294  | 452  | 265 | 250 | 632  | 237 | 1/4"          |
| 100  | 3                                   | 1428         | 3.3            | 64  | 91  | 104 | 334  | 492  | 265 | 250 | 672  | 237 | 1/4"          |
| 125  | 3                                   | 2232         | 5.2            | 70  | 101 | 118 | 367  | 525  | 265 | 250 | 705  | 237 | 3/8"          |
| 150  | 3                                   | 3211         | 7.4            | 76  | 101 | 130 | 419  | 577  | 265 | 250 | 757  | 237 | 3/8"          |
| 200  | 2                                   | 3835         | 11.2           | 89  | 118 | 158 | 525  | 683  | 265 | 250 | 988  | 237 | 3/8"          |
| 250  | 2                                   | 5984         | 17.4           | 114 | 118 | 196 | 616  | 774  | 265 | 250 | 1089 | 237 | 1/2"          |
| 300  | 2                                   | 8640         | 25.1           | 114 | 118 | 230 | 704  | 862  | 265 | 250 | 1190 | 237 | 1/2"          |
| 350  | 1,5                                 | 8862         | 35.1           | 127 | 290 | 247 | 767  | 937  | 282 | 250 | 1302 | 247 | 1/2"          |
| 400  | 1,5                                 | 11625        | 46.1           | 140 | 290 | 290 | 865  | 1035 | 282 | 250 | 1458 | 247 | 1/2"          |
| 450  | 1                                   | 9949         | 39.9           | 152 | 290 | 304 | 989  | 1153 | 265 | 250 | 1754 | 382 | 1/2"          |
| 500  | 1                                   | 12280        | 49.3           | 152 | 290 | 340 | 1101 | 1265 | 265 | 250 | 1866 | 382 | 1/2"          |
| 600  | 1                                   | 17857        | 72.1           | 178 | 290 | 398 | 1307 | 1471 | 265 | 250 | 2073 | 382 | 1/2"          |
| 700  | 1                                   | 24269        | 139            | 178 | 320 | 453 | 1506 | 1698 | 282 | 256 | 2391 | 413 | 1/2"          |
| 800  | 1                                   | 32180        | 186            | 178 | 320 | 503 | 1720 | 1912 | 282 | 256 | 2705 | 413 | 1/2"          |
| 900  | 1                                   | 40624        | 234            | 178 | 320 | 583 | 1953 | 2145 | 282 | 256 | 3033 | 413 | 1/2"          |
| 1000 | 1                                   | 50884        | 296            | 178 | 320 | 613 | 2137 | 2329 | 282 | 256 | 3328 | 413 | 1/2"          |
| 1200 | 1                                   | 72949        | 423            | 203 | 340 | 728 | 2616 | 2852 | 282 | 256 | 4047 | 462 | 1/2"          |

Table 11

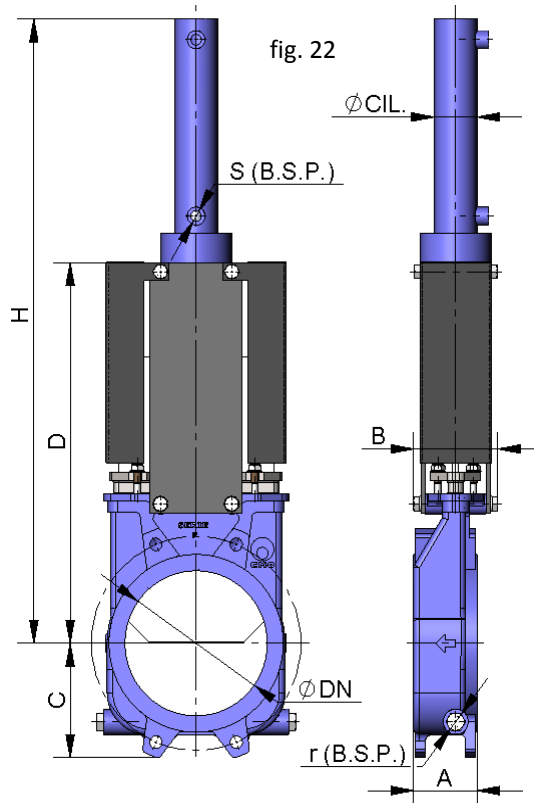


## KNIFE-GATE VALVES

## F SERIES

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

- **B = anchura máx.** de la válvula (sin accionamiento).  
**D = altura máx.** de la válvula (sin accionamiento).
- El accionamiento hidráulico está compuesto por:
  - Hydraulic cylinder.
  - Yoke.
- Available: DN50 to DN1200.
- Different types and brands available according to customer's requirements.



| DN   | $\Delta P$<br>(Kg/cm <sup>2</sup> ) | DRAW<br>(Nw) | A   | B   | C   | D    | H    | Ø<br>CYL | Ø<br>STEM | S<br>(B.S.P.) | Oil<br>Cap<br>(dm <sup>3</sup> ) | r<br>(B.S.P.) |
|------|-------------------------------------|--------------|-----|-----|-----|------|------|----------|-----------|---------------|----------------------------------|---------------|
| 50   | 3                                   | 360          | 60  | 91  | 61  | 241  | 457  | 25       | 18        | 3/8"          | 0.03                             | 1/4"          |
| 65   | 3                                   | 606          | 60  | 91  | 68  | 268  | 500  | 25       | 18        | 3/8"          | 0.03                             | 1/4"          |
| 80   | 3                                   | 915          | 64  | 91  | 91  | 294  | 560  | 25       | 18        | 3/8"          | 0.04                             | 1/4"          |
| 100  | 3                                   | 1428         | 64  | 91  | 104 | 334  | 620  | 32       | 22        | 3/8"          | 0.09                             | 1/4"          |
| 125  | 3                                   | 2232         | 70  | 101 | 118 | 367  | 683  | 32       | 22        | 3/8"          | 0.11                             | 3/8"          |
| 150  | 3                                   | 3211         | 76  | 101 | 130 | 419  | 755  | 40       | 28        | 3/8"          | 0.20                             | 3/8"          |
| 200  | 2                                   | 3835         | 89  | 118 | 158 | 525  | 926  | 50       | 28        | 3/8"          | 0.42                             | 3/8"          |
| 250  | 2                                   | 5984         | 114 | 118 | 196 | 616  | 1077 | 50       | 28        | 3/8"          | 0.52                             | 1/2"          |
| 300  | 2                                   | 8640         | 114 | 118 | 230 | 704  | 1246 | 50       | 28        | 3/8"          | 0.62                             | 1/2"          |
| 350  | 1,5                                 | 8862         | 127 | 290 | 247 | 767  | 1376 | 50       | 28        | 3/8"          | 0.73                             | 1/2"          |
| 400  | 1,5                                 | 11625        | 140 | 290 | 290 | 865  | 1532 | 63       | 36        | 3/8"          | 1.31                             | 1/2"          |
| 450  | 1                                   | 9949         | 152 | 290 | 304 | 989  | 1707 | 63       | 36        | 3/8"          | 1.47                             | 1/2"          |
| 500  | 1                                   | 12280        | 152 | 290 | 340 | 1101 | 1869 | 63       | 36        | 3/8"          | 1.62                             | 1/2"          |
| 600  | 1                                   | 17857        | 178 | 290 | 398 | 1307 | 2176 | 80       | 45        | 3/8"          | 3.12                             | 1/2"          |
| 700  | 1                                   | 24269        | 178 | 320 | 453 | 1506 | 2525 | 80       | 45        | 3/8"          | 3.62                             | 1/2"          |
| 800  | 1                                   | 32180        | 178 | 320 | 503 | 1720 | 2839 | 100      | 56        | 1/2"          | 6.44                             | 1/2"          |
| 900  | 1                                   | 40624        | 178 | 320 | 583 | 1953 | 3172 | 100      | 56        | 1/2"          | 7.25                             | 1/2"          |
| 1000 | 1                                   | 50884        | 178 | 320 | 613 | 2137 | 3496 | 125      | 70        | 1/2"          | 10.25                            | 1/2"          |
| 1200 | 1                                   | 72949        | 203 | 340 | 728 | 2616 | 4175 | 125      | 70        | 1/2"          | 15.1                             | 1/2"          |

Table 12

## KNIFE-GATE VALVES

## F SERIES

### INFORMATION ON FLANGE DIMENSIONS

#### EN 1092-2 PN10

| DN   | $\Delta P$<br>(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

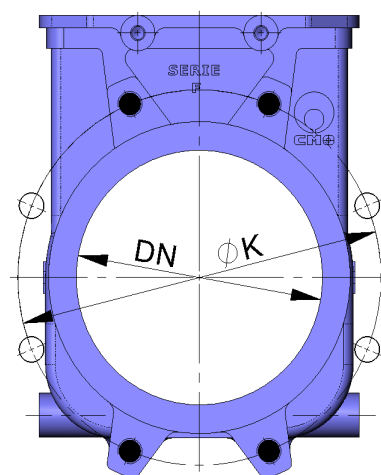


fig.23

- BLIND TAPPED HOLE
- THROUGH HOLE

#### ANSI B16, class 150

| DN     | $\Delta P$<br>(Kg/cm <sup>2</sup> ) | ●  | ○ | R<br>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

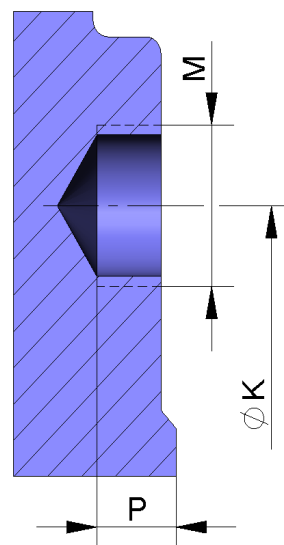


fig. 24