Rev. 05 / 12-01-2024

MC

CMO VALVES

UNIDIRECTIONAL OR BIDIRECTIONAL WALL PENSTOCK

DESCRIPTION

- Penstock for clean liquids or loaded with solids.
- Design of square or rectangular penstock.
- Possibility of unidirectional or bidirectional.
- Various seal materials available.
- Common design to install supported on walls with chemical or expansion anchors.

GENERAL APPLICATIONS:

This wall penstock is designed to be installed in orifices in walls. The orifice can be rectangular, round or square, this penstock has a 4-side seal.
This is suitable to work with clean liquids or loaded with solids. Used mainly in:

- Water treatment plants
- Irrigation
- Hydroelectric power stations
- Conduits

SIZES

From 150 x 150 up to 3000 x 3000

** Larger sizes on request.*

Check with **CMO Valves** for the general dimensions of a specific wall penstock.

WORKING (ΔP)

The maximum working pressure adapts to the needs of the customer in every project. These penstocks are designed to comply with working conditions in the place of installation.

CIVIL WORKS:

CMO Valves standard **MC** wall penstocks are designed to be secured to the wall using chemical or expansion anchors. The boreholes necessary for attachment are made when assembling, using the body of the penstock as a guide.

SEALTIGHTNESS:

The sealtightness of the **MC** wall penstocks complies with that set out in regulation DIN 19569, class 5 of leaks.

Fig. 1

APPLICATION OF EUROPEAN DIRECTIVES

See document of European Directives applicable to **CMO Valves.**

** For category and zone information, contact technical-commercial department at **CMO Valves.***

QUALITY DOSSIER

- The sealtightness of the seat area is measured with gauges.
- Material and testing certificates can be supplied on request.

ADVANTAGES

The **MC** wall penstocks are designed to work with liquids. The main elements of the **MC-**s are the body or frame, in which a through conduit or board which moves up and down and has a 4-side sealing system to prevent leakages of liquid is embedded. The stoppers are screwed onto the upper part of the body (only when manual actuator is fitted).

CMO Valves standard **MC-**s are designed for the body to be installed in the wall using chemical or expansion anchors. The interior dimension of the body passage usually coincides with the nominal diameter of the wall orifice, thereby ensuring that there is no obstruction in the passage of the fluid, allowing entirely continuous passage whenever the penstock is completely open and avoiding any buildup of residue.

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 Valves** penstock is made of AISI 304 stainless steel. This is another added advantage, as some manufacturers produce it with 13% chrome and it gets rusty very quickly.

The operating wheel is manufactured in steel. Some manufacturers supply it in common cast-iron, which can lead to breakage in the event of very high operation torque or a bang.

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 penstock 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 nodular cast iron, making them highly shock resistant. This characteristic is essential in pneumatic actuators.

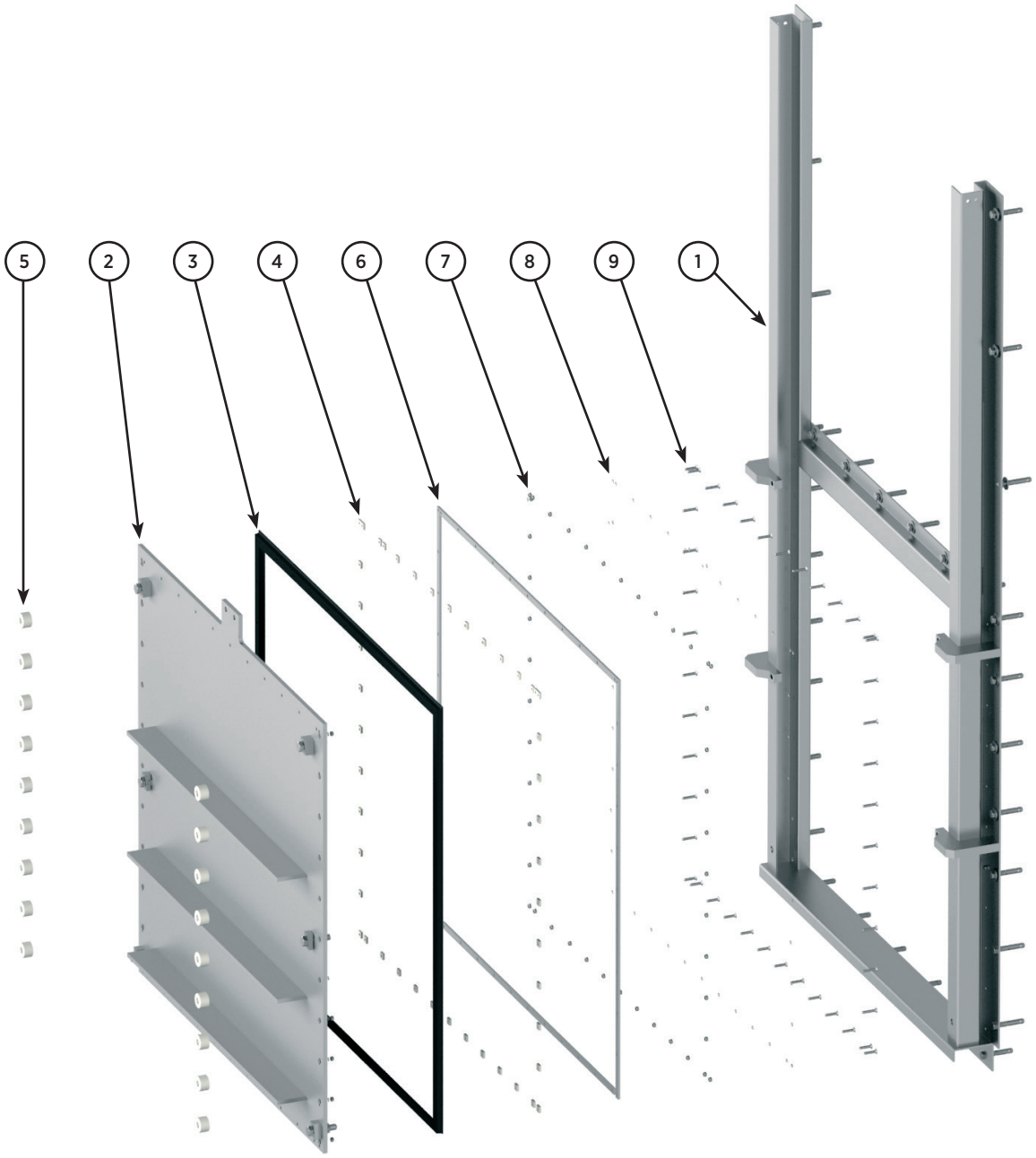


Fig. 2

COMPONENTS LIST

POS	COMPONENTS	VERSION S275JR	VERSION AISI304	VERSION AISI316
1	BODY	S275JR	AISI304	AISI316
2	GATE	S275JR	AISI304	AISI316
3	SEAL	EPDM	EPDM	EPDM
4	SLIDE	HD-500	HD-500	HD-500
5	SLIDE	HD-500	HD-500	HD-500
6	FLANGE SEAL	AISI304	AISI304	AISI316
7	NUT	5.6 ZINC	A2	A4
8	WASHER	5.6 ZINC	A2	A4
9	SCREW	5.6 ZINC	A2	A4

Note: Other materials and finishes, contact **CMO Valves.**

Table 1

DESIGN CHARACTERISTICS

1. BODY

The body or frame is mechanically welded, manufactured in one single piece. Constructed with foldable profiles to prevent any deformation and to increase robustness. The side profiles have a gap throughout the length (in order to slide the through conduit), obtained by way of several folds (without welding), thus ensuring the body does not have any leakage.

The body has at least an approximate height of twice the through conduit, in order to house it when the penstock is completely open. The upper part is fitted with end stoppers (when manual actuator is fitted) in order to delimit the longitudinal movement of the through conduit.

The standard body is designed to be mounted supported on the wall using chemical or expansion anchors, meaning no type of housing is required in the civil work. As the body is designed in line with the dimensions of the wall orifice, there are no protrusions and passage is entirely continuous. When the wall orifice is at ground level, the penstock can be mounted with the base embedded in the concrete (fig. 33) or screwed down using chemical or expansion anchors (fig. 32), in which case it must be remembered that the channel passage is slightly narrower.

The bodies can be square or rectangular.
The material used is usually stainless steel AISI304 or AISI316, although carbon steel S275JR can also be used. In accordance with the conditions the penstock will be subject to, there are other special materials available to order, such as AISI316Ti, Duplex, 254SMO, Uranus B6, Aluminium, etc. As a rule, iron or carbon steel penstocks are painted with an anti-corrosive protection of 80 microns of EPOXY (colour RAL 5015), although other types of anti-corrosive protections are also available.

Fig. 3

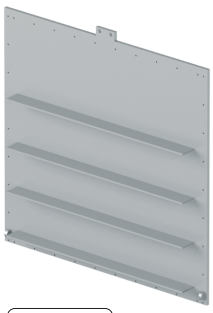


Fig. 4

2. GATE

The through conduit manufacture material is usually the same as that used for the body, although it can also be supplied to order with other materials or combinations.

Depending on the dimensions of the penstock, some reinforcements are often welded on to the through conduit (as shown in fig. 4) in order to achieve the necessary rigidity. The stem is connected to the upper part of the through conduit, with its longitudinal movement making the penstock open or close. The four-side seal is secured to the through conduit with stainless steel flanges.

3. SEAT

The standard seal in this type of penstocks comprises four rubber rims on the four different sides; these rubber rims are secured to the through conduit using stainless steel flanges. The sealtightness complies with that set out in regulation DIN 19569, class 5 of leaks.

Depending on the work application, the following options can be chosen from:

FAVOURABLE UNIDIRECTIONAL (fig. 5 y 6)

This type of penstock is used when the fluid direction pressures the penstock against the wall. The seals used in this type of penstocks are of musical note type.

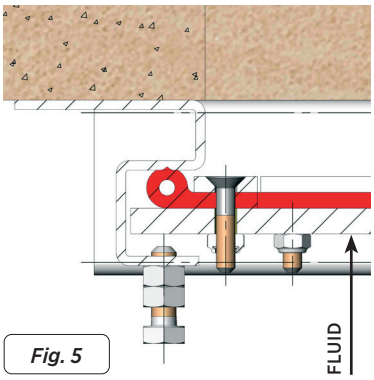


Fig. 5

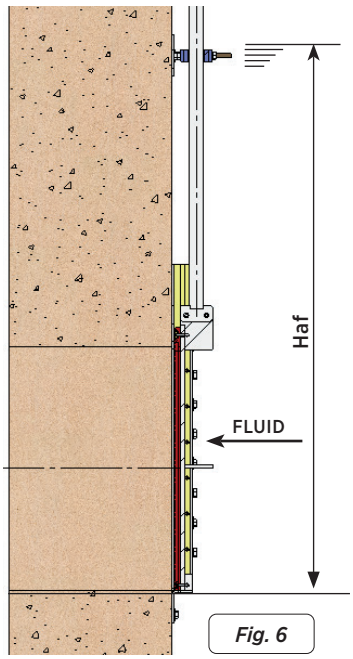


Fig. 6

UNFAVOURABLE UNIDIRECTIONAL: (fig. 7 y 8)

This type of penstock is used when the fluid direction always tends to separate the penstock from the wall. In this case the design of the penstock is identical to bidirectional.

The seals used in this type of penstocks have two peaks.

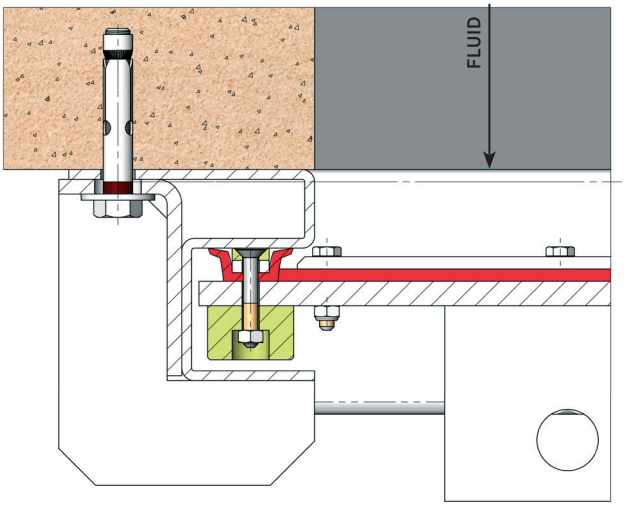


Fig. 7

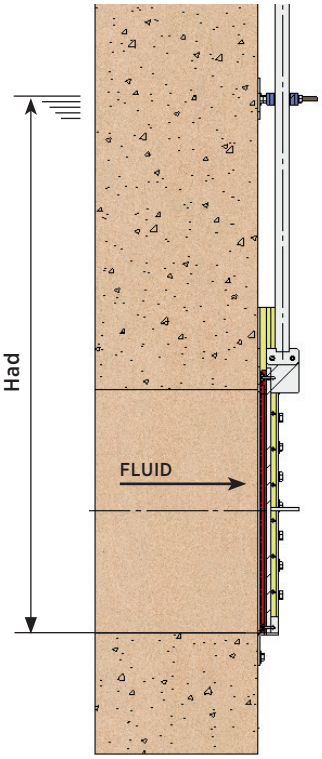


Fig. 8

BIDIRECTIONAL: (fig. 9 y 10)

This type of penstock is used when the fluid can come from one direction or another, in other words the fluid may tend to separate the penstock from the wall or pressure against the wall. In this case the design of the penstock is identical to unfavourable unidirectional.

The seals used in this type of penstocks have two peaks.

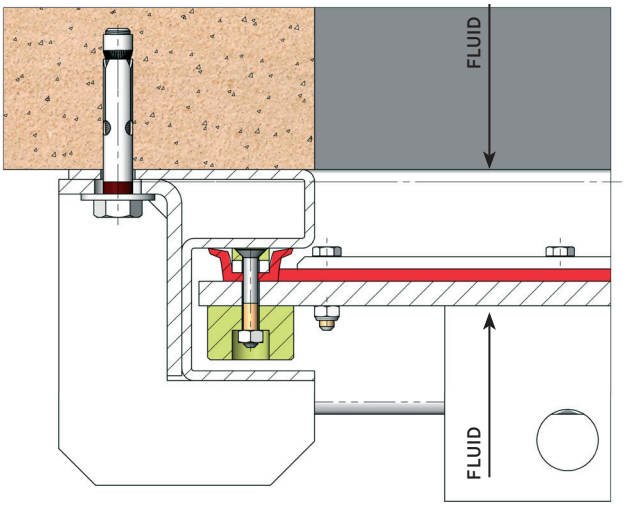


Fig. 9

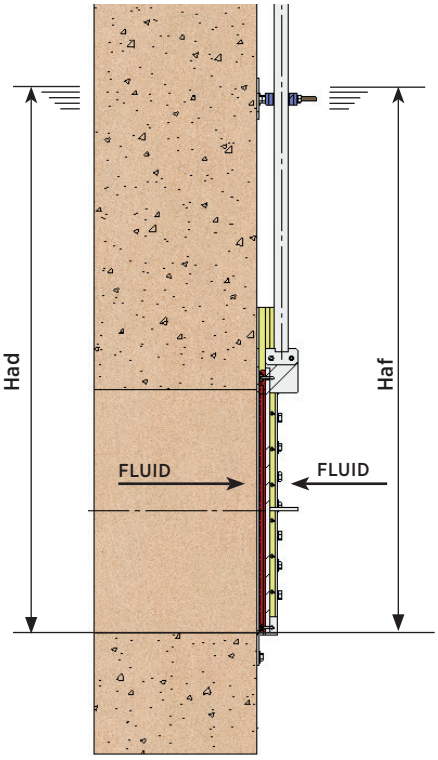


Fig. 10

Although the standard sealtight joint is EPDM, there are other types of materials in order to choose the most suitable, in accordance with the work applications for the penstock (work temperature, fluid type, etc). Described here are the characteristics ofthe most common, which are summarised below in table2:

SEALTIGHT MATERIALS

EPDM
This is the standard resilient seat fitted on the **CMO Valves** penstocks. Item can be used in many applications, however, it is generally used for water and products diluted in water at temperatures not higher than 90°C*. It can also be used with abrasive products and it provides the valve with 100% watertight integrity.

SEAT/SEALS		
MATERIAL	**Tª MÁX (ºC)**	**APLICATIONS**
EPDM (E)	90 * °C	Non-mineral oils, acids and water.
Nitrile (N)	90 * °C	Hydrocarbons, oils and greases
Natural Rubber	90 °C	Abrasive products
FKM (V)	200 °C	Hydrocarbons and solvents
Silicone (S)	200 °C	Food Products
PTFE (T)	250 °C	Resistant to corrosion
* **EPDM and Nitrile:** *is possible until serving temperature Max.: 120°C under request.*		
Note: *More details and other materials available to order.*		

Table. 2

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

NATURAL RUBBER
It can be used in multiple applications at temperatures no higher than 90°C with abrasive products and it provides the penstock with 100% watertight integrity.
Application: fluids in general.

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

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

5. STEM

The stem on the **CMO Valves** penstocks is made of AISI 304 stainless steel. This characteristic provides high resistance and excellent corrosion-resistant properties. The penstock design can be rising stem or non-rising stem. When a rising stem is required for the penstock, a stem hood is supplied to protect the stem from contact with dust and dirt, besides keeping it lubricated.

6. ACTUATORS

In these **MC** wall penstocks, when the height of the penstock is minimum, a yoke can be used in the upper part of the body to house the actuator (fig. 13). The same yoke will delimit the longitudinal movement of the through conduit.
To the contrary, when positioning the actuator at considerable distance from the location of the penstock, an extension can be coupled to the stem or rod and secure the actuator in a floor stand (fig. 14) or square bracket (fig. 17). In this case the body will have a stopper system to delimit the longitudinal movement of the through conduit (only in the case of manual actuators).
When starting up the actuator, it exercises the torque or draw necessary in the stem or rod, which in turn is transmitted to the through conduit to start movement.

Our wall penstocks are supplied with several types of actuator, bringing the advantage that, thanks to the design of **CMO Valves**, they can be interchanged.

This design allows customers to change the actuators themselves and no extra assembly accessories are required. The total dimensions of the penstock may vary in accordance with the type of actuator chosen.

Fig. 11
HANDWHEEL WITH NON-RISING STEM

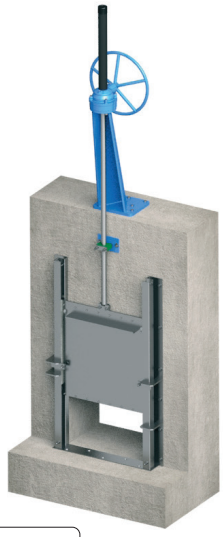


Fig. 12
HANDWHEEL WITH GEAR BOX

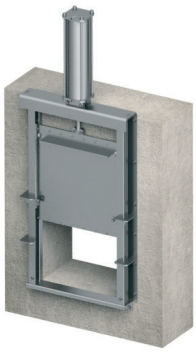


Fig. 13
PNEUMATIC

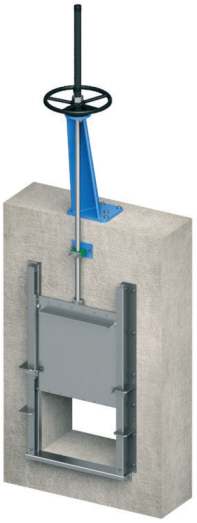


Fig. 14
HANDWHEEL WITH RISING STEM

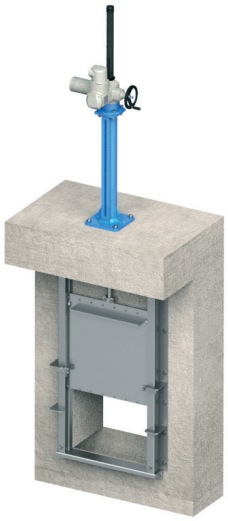


Fig. 15
ELECTRIC MOTOR

Fig. 16
HANDWHEEL SQUARE NUT

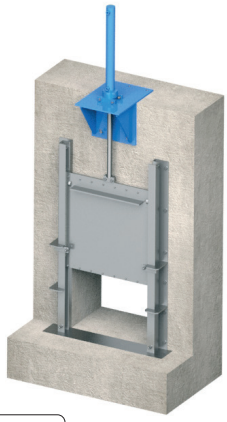


Fig. 17
HYDRAULIC

Manual Drives

- Handwheel **(*)**
- Chain handwheel **(*)**
- Lever
- Geared motor **(*)**
- Others (square stem)

Availability of Accessories

- Mechanical stoppers
- Locking devices
- Emergency manual drives
- Electrovalves
- Positioners
- Limit switches
- Proximity detectors
- Straight floor stand (Fig. 18)
- Leaning floor stand (Fig. 19)

Automatic Drives

- Electric actuator **(*)**
- D/E & S/E pneumatic cylinder
- Hydraulic cylinder

(*) Available in rising and non-rising stem versions.

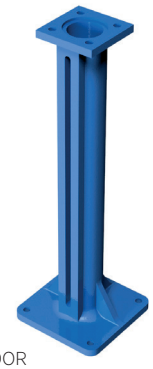


Fig. 18
LEANING FLOOR STANDS.

Fig. 19
STRAIGHT FLOOR STANDS.

ACCESSORIES AND OPTIONS

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

DIFFERENT ACCESSORIES ARE AVAILABLE TO ADAPT THE PENSTOCK TO SPECIFIC WORKING CONDITIONS SUCH AS (FIG. 20):

Limit switches or inductive switches are installed to indicate precise penstock position, as well as positioners to indicate continuous position.

SOLENOID VALVES (fig. 20):

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:

Allow the stroke to be mechanically adjusted, limiting the penstock run.

MECHANICAL LOCKING DEVICE:

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

EMERGENCY MANUAL ACTUATOR (HAND WHEEL / GEAR BOX):

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

INTERCHANGEABLE ACTUATORS:

All actuators are easily interchangeable.

EPOXY COATING:

All carbon steel components and bodies of **CMO Valves** penstocks are EPOXY coated, giving them great resistance to corrosion and an excellent surface finish.
CMO Valves standard colour is blue RAL-5015.

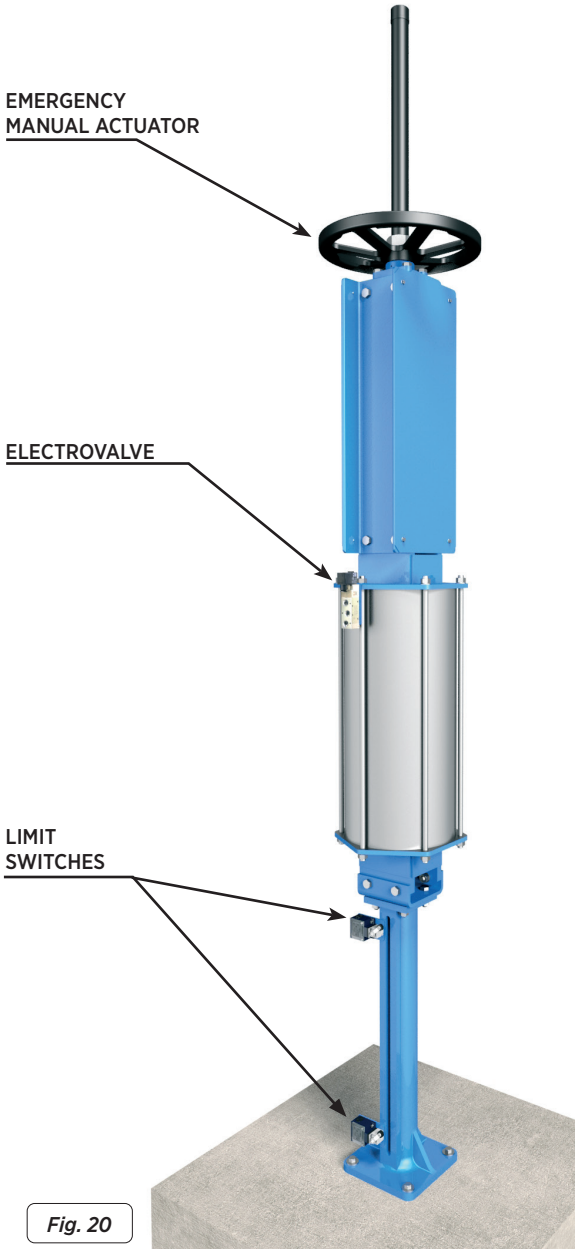


Fig. 20

TYPES OF EXTENSION

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

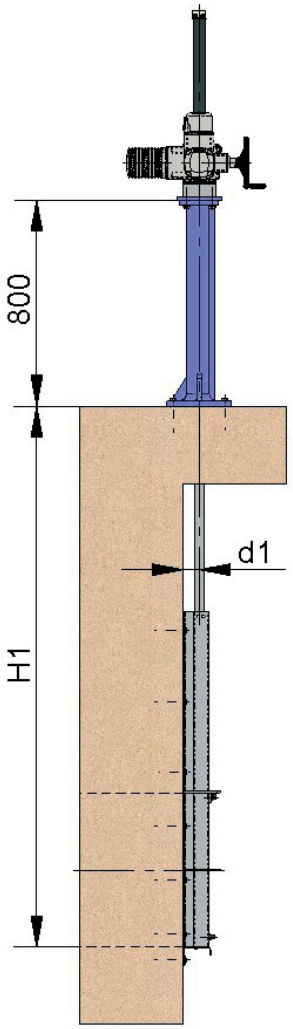


Fig. 21

STANDARD OPERATION STAND.

1- FLOOR STAND

This extension is done by coupling a spindle to the stem. The desired extension is achieved by defining the length of the spindle. A floor stand is normally installed to support the drive.

The definition variables are as follows:

H1 = Distance from valve centre to 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 drive.
- We recommend a stem guide bracket every 1.5 m
- The standard floor stand is 800 mm high.
- Option to use a position indicator to determine the valve's percentage of opening.
- Leaning stand available to order
- Other floor stand measurements available on request.

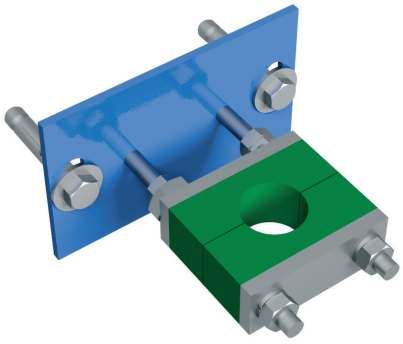


Fig. 22

STEM GUIDE BRACKET

COMPONENT LIST

COMPONENT	STANDARD VERSION
Stem	AISI 304
Rod	AISI 304
Support-Guide	Carbon steel with EPOXY coating
Guide	PA6
Stand	GJS500-7 with EPOXY coating

Table. 3

LEANING STAND.

Fig. 23

2.- PIPE

This consists of raising the drive. The pipe will rotate in the same direction as the wheel when the valve is operated. The valve always remains at the same height.

The definition variables are as follows:

H1 = Distance from valve centre to base of the stand

d1 = Separation from the wall to the end of the connecting flange

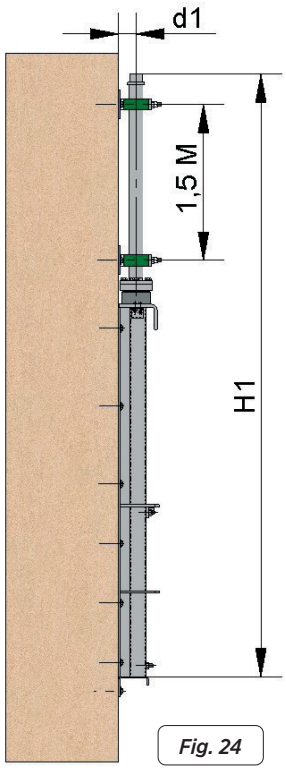


Fig. 24

CHARACTERISTICS:

- Standard drives: handwheel and top square.
- A pipe guide bracket is recommended every 1.5 m.
- The standard materials are: EPOXY-coated carbon steel and stainless steel.

3.- EXTENDED BODY GUIDES

When an extension is required, it can be achieved by extending the guides of the body. An intermediate yoke can be fitted to reinforce the body guides structure.

Fig. 25

4.- CARDAN JOINT

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

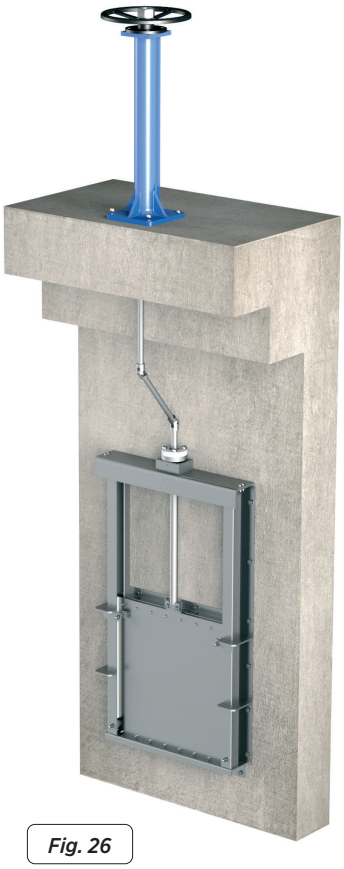


Fig. 26

GENERAL DIMENSIONS

In order to define an **MC** wall penstock, we need to know the width and height of the penstock, the fluid direction and the fluid load on each side of the penstock. We also need to know the height from the floor (Hs).
The levels A and B will be used to refer to the width and height variables, whilst the designation mode will be **A x B (Width x Height)**. The dimensions range from 150 x 150 up to 3000 x 3000 (larger dimensions upon request). These penstocks may be square or rectangular, meaning they do not need to have the same width (A) and height (B). Each level is described in fig. 27:

- **Level A:** This is used to define the width of the penstock.
- **Level B:** This is used to define the height of the penstock.
- **Level Hs:** This is used to define the height from the orifice base to the floor.
- **Level Hm:** This is used to define the distance from the floor to where the actuator is located. This level (Hm) is usually 800 mm, allowing a person to comfortably handle the penstock.
- **Level Bm:** This is used to define the distance from the base of the penstock through to the upper part of the body. This level must be at least twice the height of the penstock (B) plus 105 mm (in order for the penstock to open completely).
- **Level Hc:** This is used to define the total height of the actuator. This level (Hc) is usually the height of the penstock (B) plus 200 mm. If the penstock has a non-rising stem actuator, the Hc level is reduced, and will have an approximate value of 300 mm (depending on the actuator installed).
- **Level Am:** This is used to define the maximum width covered by the body. This level (Am) is usually the width of the penstock (A) plus 200 mm.
- **Level Haf:** This is used to define the unfavourable fluid load (when the fluid direction pressures the penstock against the wall), the Haf level defines the maximum fluid level measured from the base of the orifice.
- **Level Had:** This is used to define the unfavourable fluid load (when the fluid direction tends to separate the penstock from the wall), the Had level defines the maximum fluid level measured from the base of the orifice.

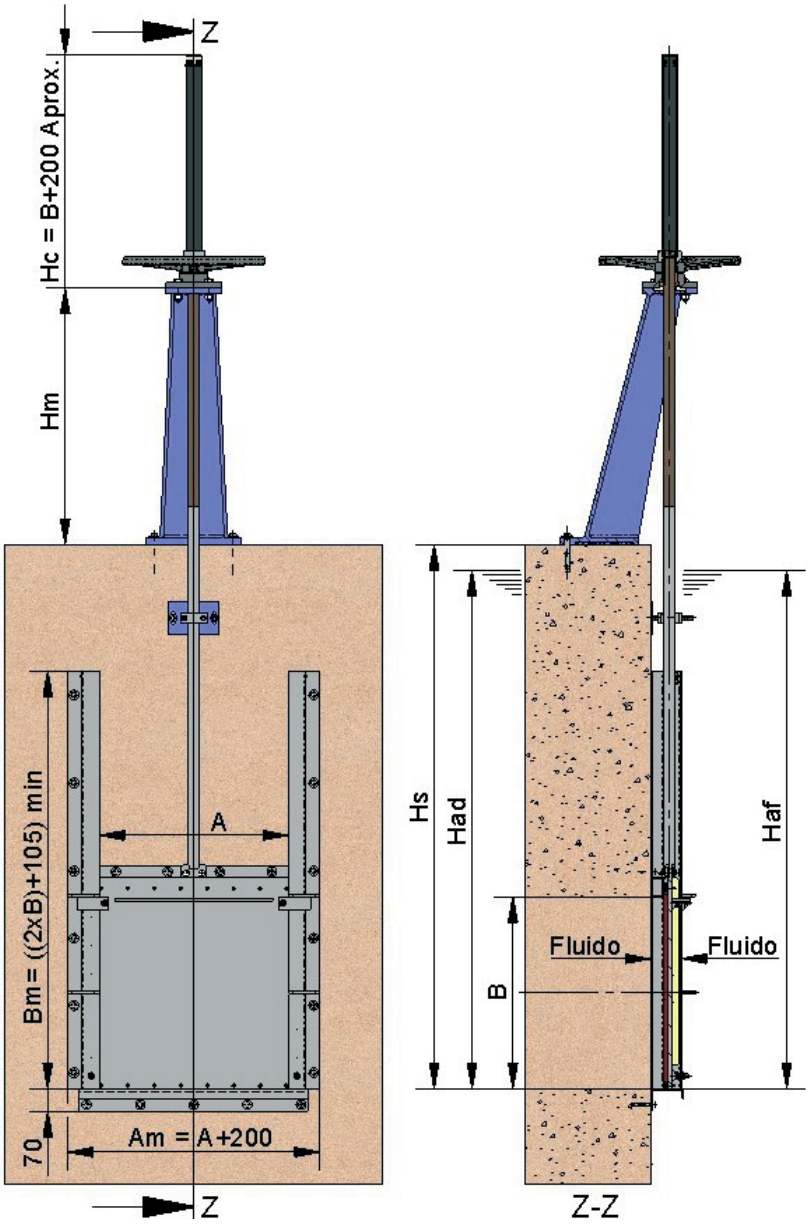
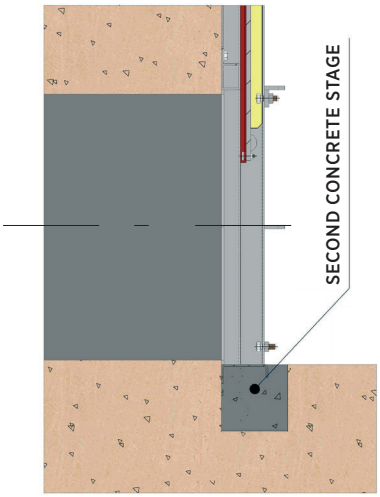


Fig. 27

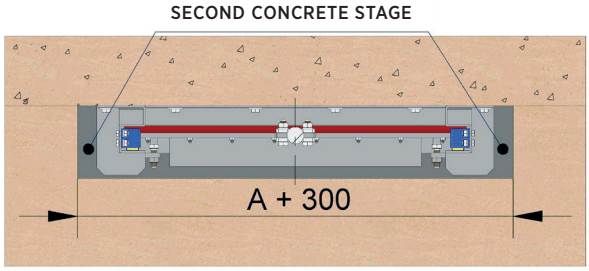
When the wall orifice is at ground level, the penstock cannot be mounted in the usual manner (the entire penstock supported on the wall using chemical or expansion anchors). For this reason there are two variants of the standard version, which in these cases allow the penstocks to be satisfactorily installed.

The penstock can be mounted with the base embedded in the concrete. To mount it in this way, it is necessary to make housing in the base in order to introduce the penstock and carry out subsequent concreting.



SIDE VIEW

Fig. 28



PLAN VIEW

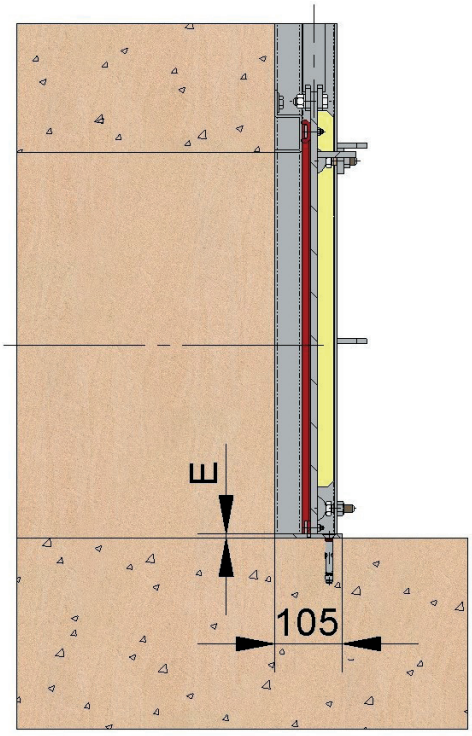
Fig. 29

When the civil work is constructed and does not have the housing necessary to mount with the base already concreted, the penstock can be constructed with a flat base and secured with chemical or expansion anchors (fig. 30).

In this case a fl at rim will be secured to the base of the civil work, where the penstock can make the lower seal. The thickness of this rim (level E) varies in accordance with the width of the penstock (A), as defi ned in table 4.

LOWER RIM (BASE)	
PENSTOCK WIDTH (A)	BASE RIM THICKNESS (E)
150 - 1000 mm	6 mm
1100 - 2000 mm	8 mm
2000 - 3000 mm	10 mm

Table. 4



SIDE VIEW

Fig. 30

FASTENING OPTIONS

As described above, the most common system to mount these wall penstocks is by supporting them on the wall and securing with chemical or expansion anchors (fig. 31), although, as can be seen in fig. 32 and 33, there are other assembly options.

Whatever the fastening option, the upper and side profiles are always secured with chemical or expansion anchors. For this reason, it is very important that the wall is completely flat, otherwise the body may become deformed and produce irreparable damage when tightening the anchoring.

It is therefore recommended to use a flat rule when screwing down the body. Support the rule on the body and begin to tighten the anchor screws, and stop tightening as soon as the body begins to deform.

- In order to mount the penstock using chemical or expansion anchors (the most common way), place the penstock completely open on the wall, ensuring the passage of the penstock coincides with the orifice of the wall. Using the holes of the body of the penstock as a guide, make the boreholes in the wall for the chemical or expansion anchors. Remove the penstock and apply sealing paste such as SIKAFLEX-11FC or similar where the penstock is to be located, in order to prevent leakages between the body and the wall. Return the penstock to its location and screw down using the chemical or expansion anchors. Take care to screw crosswise, using a flat rule and without excessive force, in order to ensure the penstock does not become deformed. This procedure can be used both for flat base (fig. 32) and standard penstocks (fig. 31).

- In order to mount the penstock with the base embedded in the concrete (fig. 33), the civil work must have housing in the ground (fig. 28 and fig. 29). Once the penstock is in position in the housing, align it with regards to the wall orifice, ensuring that the base of the penstock is level with the civil work, thus ensuring that there is no protrusion in the base and guaranteeing entirely continuous passage. Make the boreholes necessary for the upper and side profiles, using the holes of the body of the penstock as a guide. Remove the penstock and apply sealing paste such as SIKAFLEX-11FC or similar where the penstock is to be located on the wall, in order to prevent leakages between the body and the wall. Return the penstock to its location and screw down with chemical or expansion anchors using the usual procedure, namely with the help of a flat rule, screwing crosswise and without excessive force.

This is followed by thesecond stage of concreting, which involves filling in the housing of the base, ensuring there is no protrusion in the passage of the fluid.

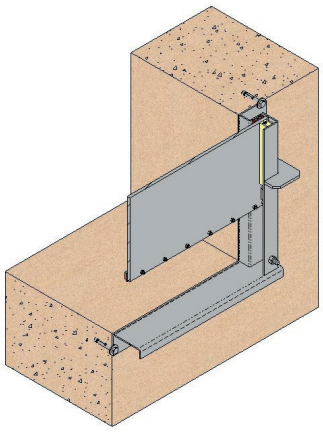


Fig. 31

SECURED TO THE WALL USING CHEMICAL OR EXPANSION ANCHORS (STANDARD)

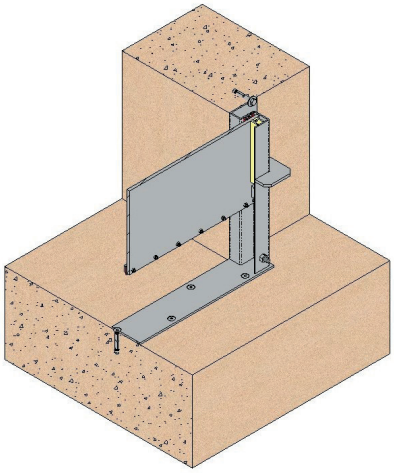


Fig. 32

FLAT BASE

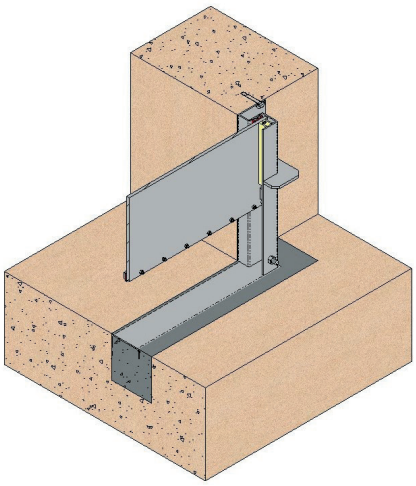


Fig. 33

BASE WITH HOUSING

Note: The concrete installation must be smooth, flat and level, and carried out in accordance with applicable technical standards and regulations, using materials of sufficient strength to meet the mechanical requirements of the **MC** valve.

As part of its ongoing product and service improvement process, **CMO Valves** reserves the right to alter the data and content of this document at its discretion at any time without notice. The publication of the latest revision renders all previous documents invalid.

Installation and Maintenance Manual available at **www.cmovalves.es.**

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