Rev. 1 / 15-12-2022

FL

CMO VALVES

INSTRUCTIONS AND MAINTENANCE MANUAL

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ASSEMBLY

APPLICATION OF EUROPEAN DIRECTIVES

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

The **FL** penstock complies with the Directive on Equipment and Protective Systems for Potentially Explosive Atmospheres. In these cases the logo will appear in the identification label. This label shows the exact classification of the zone in which the penstock can be used. The user is responsible for its use in any other zone.

HANDLING

Pay special attention to the following points when handling the equipment:

- **SAFETY WARNING:** Before handling the penstock, check that the crane to be used is capable of bearing its weight.
- Do not lift the penstock or hold it by the arm. Lifting the penstock by the arm can lead to operating problems as it is not designed to withstand the penstock's weight.
- When lifting the penstock, take care not to damage the sealing joints, as this may lead to leakageduring the operation of the penstock.
- To prevent damage, especially to the anticorrosive protection, it is recommended to use soft straps tolift the **CMO Valves** retention penstocks. These straps must be secured in the top part of the body, using theholes fitted to secure the penstock and with the help of shackles.
- If the equipment is packed in wooden boxes, these must be provided with clearly marked holdingareas where the slings will be placed when securing them. In the event of two or more penstocksbeing packed together, separation and securing elements must be provided between them to preventpossible movements, knocks and friction during transport. When storing two or more penstocks in thesame box you must ensure they are correctly supported to prevent deformations. In the case ofdispatches by sea we recommend the use of vacuum bags inside the boxes to protect the equipmentfrom contact with sea water.
- Pay special attention to maintaining the correct levelling of the penstocks during loading andunloading as well as during transport to prevent deformations in the equipment. For this purpose we recommend the use of mounts or trestles.

INSTALLATION

In order to avoid personal injury and other types of damage (to the facilities, the penstock, etc.), we recommend following these instructions:

- The staff responsible for the installation or operation of the equipment must be qualified and trained.
- Use suitable Personal Protective Equipment (PPE) (gloves, safety boots, goggles, etc).
- Shut off all lines which affect the penstock and put up a warning sign to inform about the work being carried out.
- Completely isolate the penstock from the whole process. Empty the conduit or line.
- Drain all the fluid from the conduit or line through the penstock.
- Use non electrical hand tools during installation and maintenance, in according to current regulations.

Before installation, inspect the penstock to ensure no damage has occurred during transport or storage. Ensure that the penstock sealing area is clean, and check that the flap swivels without any difficulty on the lugs of the body.

If the penstock is to be installed on a flange, inspect the pipe and the installation flange, ensuring they are clean and the flange boreholes standard coincides with the penstock boreholes standard.
If the penstock is to be wall-mounted, inspect the wall to ensure it is clean and flat.

ADVANTAGE

ASPECTS TO BE CONSIDERED DURING ASSEMBLY

When mounting the penstock, it is vitally important that the turning point of the flap (body lugs) are, whatever the type of attachment or type of penstock, in the upper part of the penstock, in order to ensure that the force of gravity closes the flap.

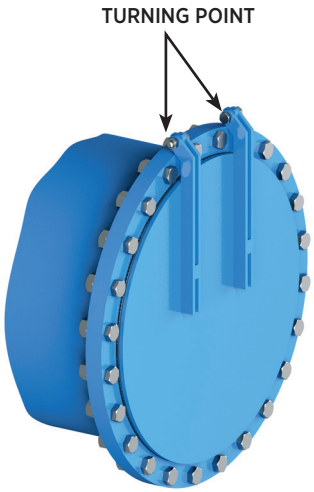


Fig. 1

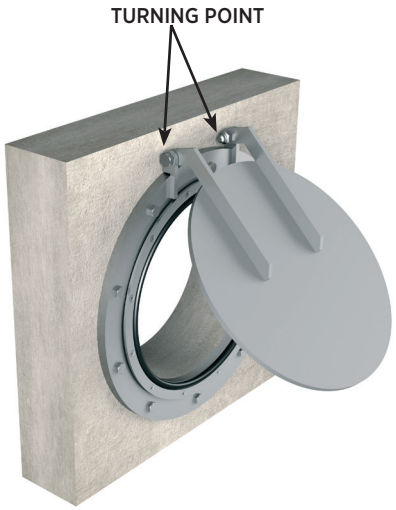


Fig. 2

Fig. 3

The **FL** penstock is unidirectional, and is always installed in such a manner that the fluid which comes from a conduit or line first passes through the body of the penstock and then pushes on the flap. Physically it cannot be mounted in any other way, with the single assembly option therefore guaranteed to be the correct one.

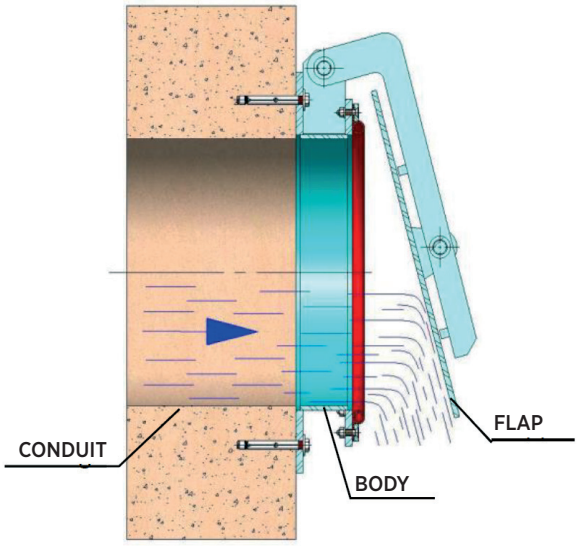


Fig. 4

Since each of these penstocks is designed to comply with the operating conditions of each installation, there are several options to install the **FL** penstock.

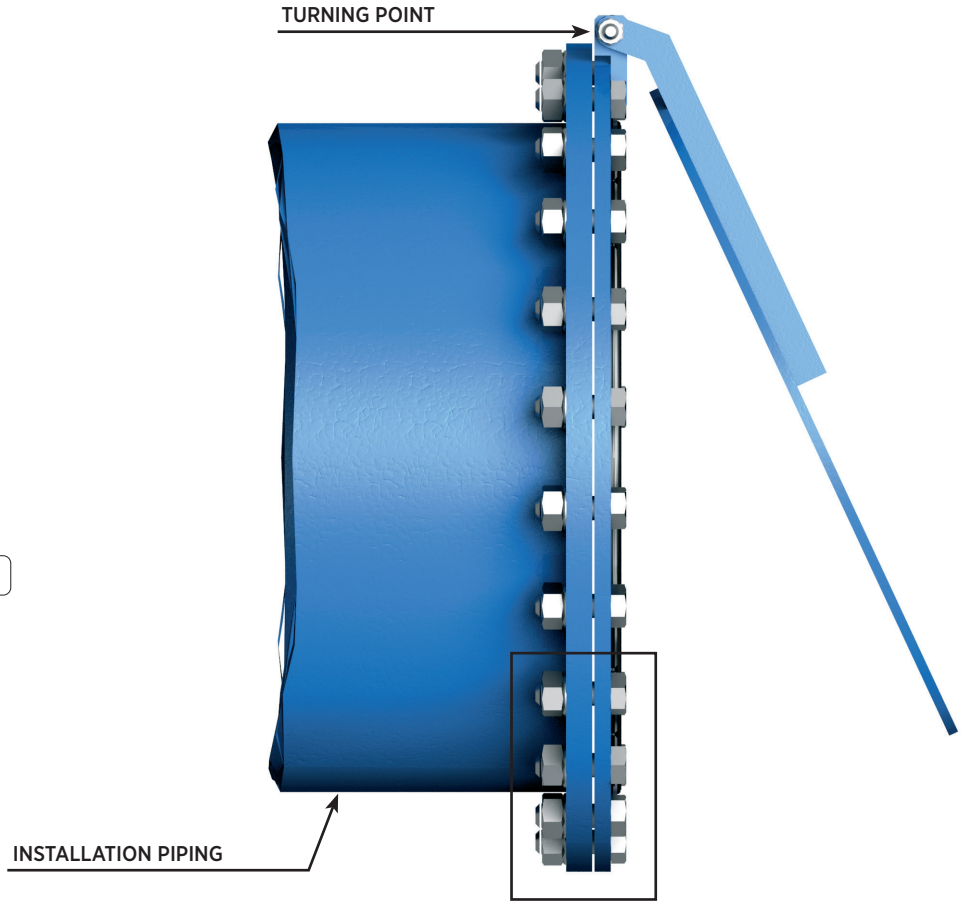
The most notable are the two most common options: one is bolted to an existing flange and the other is mounted on a wall and secured with anchors.

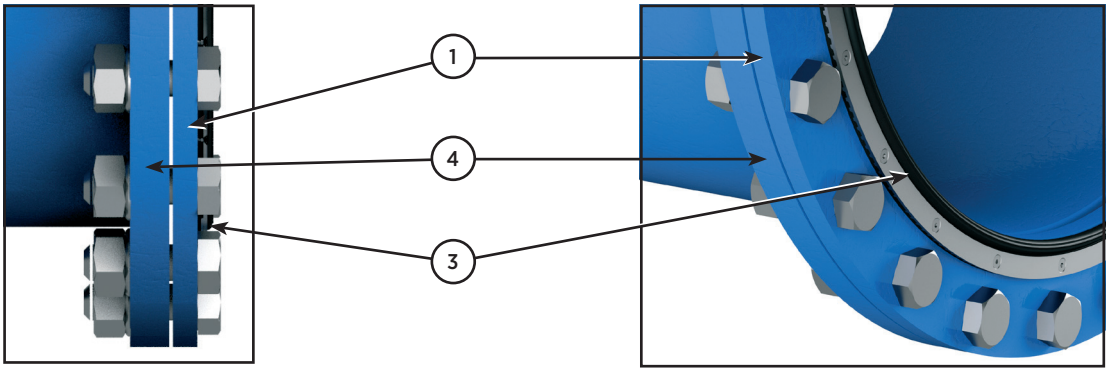
Each of these options is described in detail below.

To mount the **penstock bolted** to a flange (fig. 5), these steps should be followed:

- Position the penstock supported on the flange (4) of the installation, checking that the boreholes coincide with the penstock body (1) boreholes.
- After ensuring that the borehole coincides, remove the penstock from the flange (4).
- Clean the face of the flange where the penstock is to be mounted.
- Position a sealtight joint (3) on the flange (4), in order to ensure there are no leakages to the outsidewhere the flange and the penstock come together. The seal to be installed will be selected in linewith the working conditions inside the line (temperature, pressure, type of fluid, etc).
- Check that the penstock, the inside of the body (1) and, above all, the sealing area are clean.
- Clean the face of the body (1) supported on the flange (3).
- Position the penstock supported on the flange.
- Position the penstock so the turning point of the flap (body lugs) remains in the upper part of theinstallation.
- Ensure that the sealtight joint (3) between the flange (4)and the penstock is correctly positioned.
- After correctly positioning both the sealtight joint and the penstock, fasten the joining bolts. These bolts and nuts must be suitable for the operating conditions.
- Once all the bolts are in place, tighten crosswise with a low initial torque.
- Finally, complete the final torque in accordance with the applicable standard.
- After carrying out all these steps and before finishing the assembly process, check that the flapswivels without any difficulty on the turning point.

Fig. 5





In order to install **the penstock mounted on a wall and secured using chemical or expansion anchors** (fig. 6), these steps should be followed:

- Check that the wall is completely flat, otherwise the body may become deformed and produceirreparable damage when tightening the anchoring.
- Place the penstock on the wall, ensuring the passage of the penstock coincides with the wall orifice.
- Using the holes of the body of the penstock as a guide, make the boreholes necessary in the wall for the chemical or expansion anchors.
- Remove the penstock from the wall where it is to be located and apply sealing paste such as SIKAFLEX-11FC or similar in order to prevent leakages between the body and the wall.
- Return the penstock to its location above the sealing paste and introduce the chemical or expansion anchors. These anchorings should also be suitable for the operating conditions and their measurements in accordance with the approved plans.
- Once all the chemical or expansion anchors are in place, carry out the initial tightening with low torque and crosswise.
- Once all the anchors are slightly tightened, continue with final torque in crosswise mode. Use a flat rule to carry out this tightening. Support the rule on the body and begin to tighten the anchors, and stop tightening as soon as the body begins to lose shape. Use the flat rule to prevent excessive tightening.
- The final torque must be correct with the applicable standard.
- After carrying out all these steps and before finishing the assembly process, check that the flap swivels without any difficulty on the turning point.

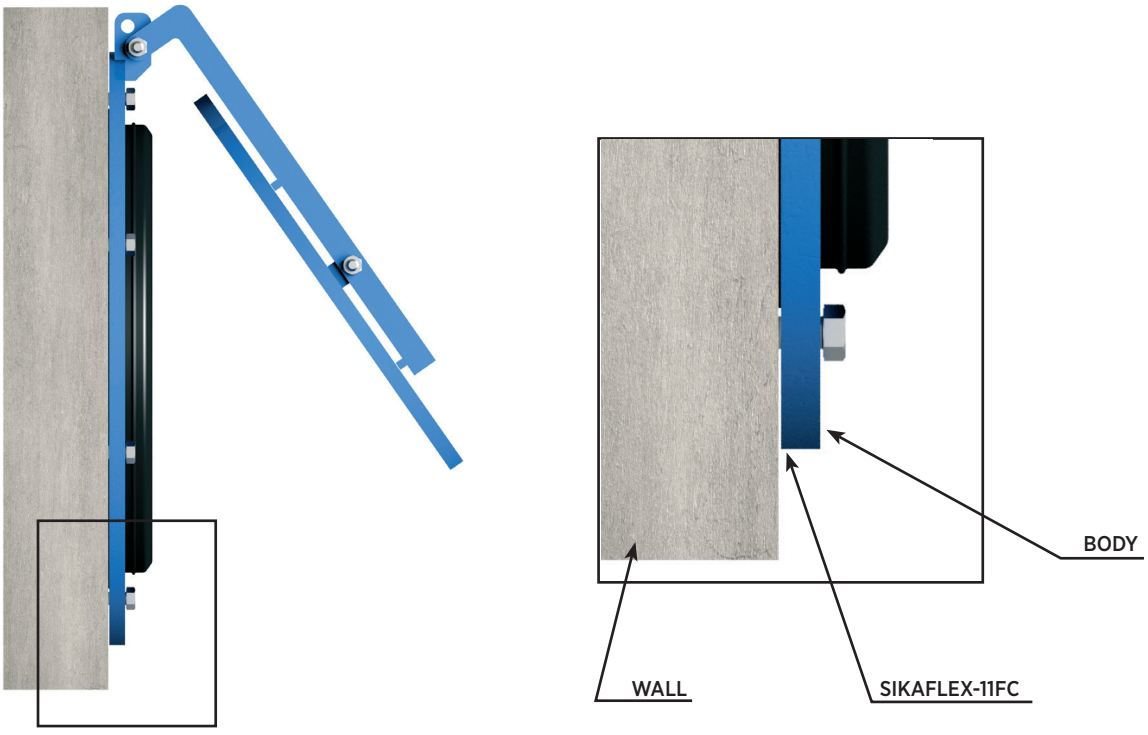


Fig. 6

These are the most common attachment options, although, as mentioned on other occasions throughout this manual, the design of these **FL** penstocks is defined in accordance with the customer's requirements in each specific project. In consequence, if you require a different attachment option, contact **CMO Valves** 's technical sales department for a bespoke project in line with your needs.

The penstock can be installed secured to a wall with anchors or bolted to a flange; in all cases the following must be taken into account:

- The equipment must be firmly secured in the installation.
- As regards scaffolding, ladders and other auxiliary elements to be used during assembly, follow thesafety recommendations indicated in this dossier.
- Once the equipment has been assembled, make sure that there are no elements which can interfere with the flap movement.
- The assembly of the equipment must be coordinated with the site's control and safety staff and no modifications are permitted in the equipment's external indication elements (limit switches, positioners, etc.).

ASSEMBLY POSITIONS

This type of penstocks can be mounted on a vertical flange (fig. 7) located at the end of a horizontal pipe, or mounted on a vertical wall (fig. 8) in which there is a square, round or rectangular orifice. Whatever the type of installation, the position of the penstock is vertical.

This **FL** penstock is a retention penstock which is designed for use as end of line, meaning it is always assembled at the end of a facility.

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Fig. 7

Fig. 8

Once the penstock has been installed, check that all bolts, nuts and anchorings have been correctly tightened.

All **CMO Valves** penstocks are tested at its facilities, although the penstock may have become damaged during transport or assembly. Once installed, it is very important to check that the penstock works correctly, making sure that the flap swivels on its turning point without any difficulty, that it sits perfectly on the seal when the penstock is closed, etc.

If the penstock has electrical accessories or you are in an ATEX zone, earth connections must be made once the penstock is in place but before operating it.
If you are in an ATEX zone, check the continuity between the different elements of the penstock (EN 12266-2, annex B, points B.2.2.2. and B.2.3.1.). Check the earth connection of the penstock.

ACTUATOR

These **FL** penstocks do not have an actuator system, but rather are automatic. It is the fluid which opens or closes the penstock.

When the fluid comes from inside the pipe to the outside, it pushes on the flap which swivels on the turning point and opens the penstock. The degree of opening will be proportional to the pressure of the fluid: the greater the pressure, the more the penstock will open (fig. 9).

When the fluid comes from the extractor towards the piping, it pushes the flap against the body, pressing on the elastomer seal in order to achieve sealtight integrity. The greater the fluid pressure, the more the flap presses against the body, thus ensuring sealtight integrity at all times (fig. 10).

GATE OPEN

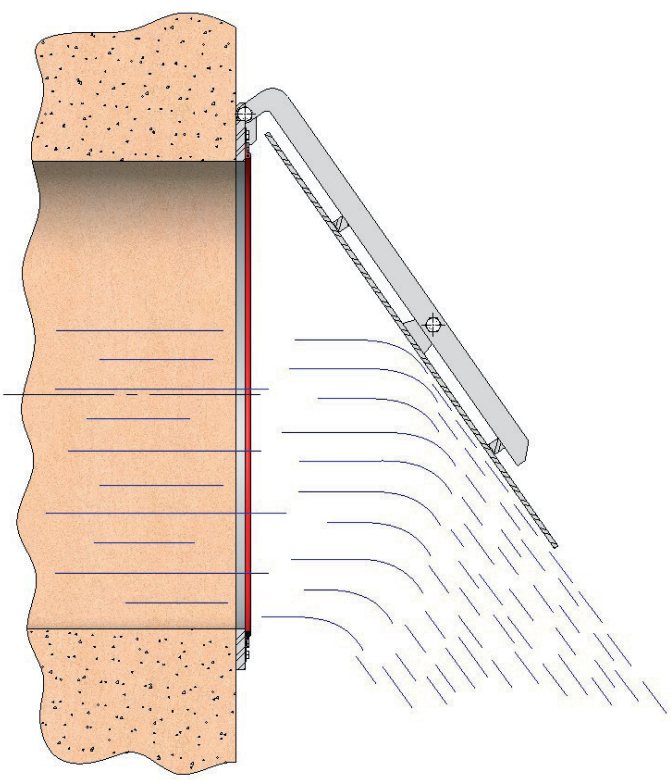

Fig. 9

GATE CLOSED

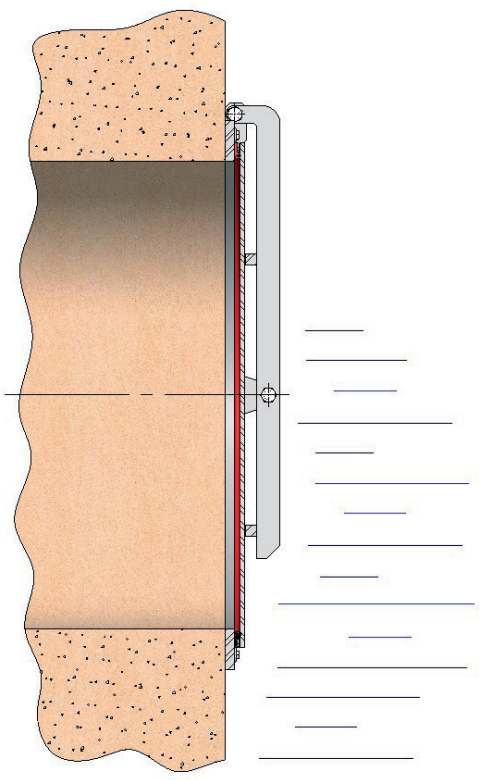

Fig. 10

MAINTENANCE

CMO Valves will not be liable if the penstocks suffer any damage due to improper handling or without proper authorisation. The penstocks must not be modified except under express authorisation from **CMO Valves**. The following instructions should be followed in order to avoid personal injury or material damage when carrying out maintenance tasks:

- The staff responsible for the maintenance or operation of the equipment must be qualified and trained.
- Use suitable Personal Protective Equipment (PPE) (gloves, safety boots, goggles, etc.).
- Shut off all lines which affect the penstock and put up a warning sign to inform about the work being carried out.
- Completely isolate the penstock from the whole process. Empty the conduit or line.
- Drain all the fluid from the conduit or line through the penstock.
- Use non-electrical hand tools during maintenance, in according to current regulations.

The only maintenance required in this type of penstocks is to change the rubber sealing joint. It is recommended to check the seal regularly every 6 months, although the working life of the seals will depend on the operating conditions of the penstock, such as: pressure, temperature, number of operations, type of fluid and others. These joints are bolted with flanges; both the flanges and the bolts are made of stainless steel, and can be reused several times.

In an ATEX zone, electrostatic charges may be present inside the penstock, which can cause a risk of explosion. The user will be responsible for carrying out appropriate actions in order to minimise the risks.
The maintenance staff must be informed about the risks of explosion and ATEX training is recommended.

Regular cleaning of the penstock to prevent accumulation of dust.
Avoid re-painting the products supplied.

LUBRICATION

The only point of the penstock which requires lubrication is the turning point, which we recommend greasing about twice a year.

After the maintenance and in an ATEX zone, you must check the electrical continuity between the pipe and the rest of the valve's components, such as the body, flap, stem, etc. Standard EN 12266-2, Annex B, points B.2.2.2. and B.2.3.1.).

IMPORTANT SAFETY ASPECTS

- In order to work in ideal safety conditions, both the electrical and magnetic elements must be idle. The electrical control cabinets must also be out of service. The maintenance staff must be up to date with the safety regulations and work can only start under orders from the site's safety staff.
- The safety areas must be clearly marked, avoiding the use of auxiliary equipment (ladders, scaffolding, etc.) in moving parts, in order to produce the movement of the flap.
- Before starting maintenance work on the penstock, secure the flap in open position using more than one system, thus ensuring it will stay in place in the event of failure.

Taking into account the recommendations indicated, the maintenance operations carried out in this type of equipment are shown below:

REPLACING THE SEALING JOINT

1. Make sure there is absolutely no pressure or fluid in the facility.
2. Place the flap (2) in completely open position.
3. Secure the flap (2) in this position using more than one system.
4. Unscrew and remove the screws (8) from the flange (4) and the seal (3).
5. Remove the flange seal (4) and finally the deteriorated seal (3).
6. Clean the seal housing (3).
7. Fit a new sealing joint (3) with the same dimensions as the old one.
8. Return the flange (4), checking that it is correctly fitted and the seal (3) has not been damaged in the process.
9. Remove the systems to secure the flap (2) in open position, and carefully position it in closed position.
10. Before starting up the installation, check that the flap (2) swivels freely on its turning point; also check that the flap (2) sits perfectly on the closing seal (3) when the penstock is closed.

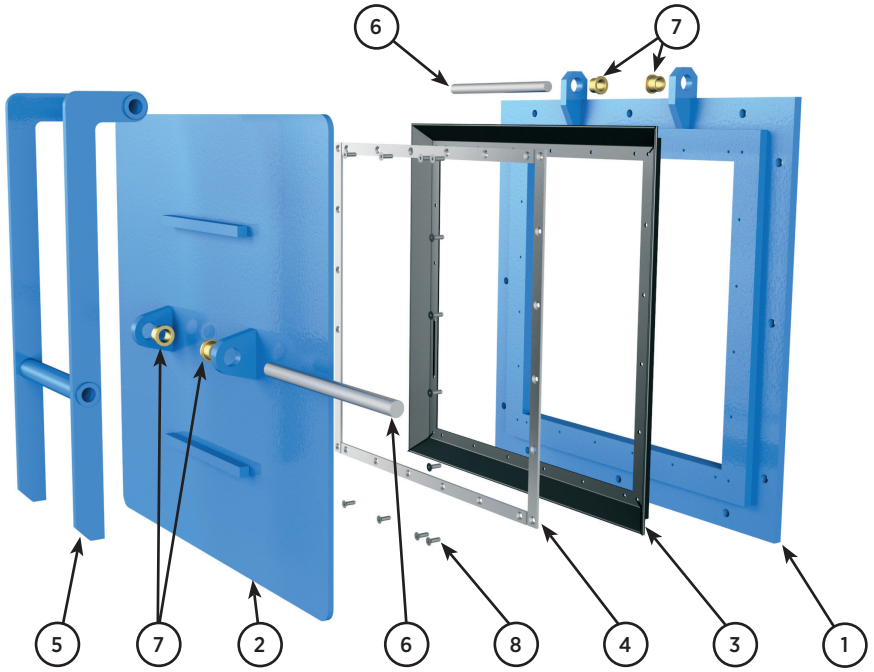

Fig. 6

Note: During the assembly of the new sealing joint, it is recommended to apply petroleum jelly to the joint to facilitate the assembly process and the correct operation of the penstock (do not use oil or grease); table 1 below shows details of the petroleum jelly used by **CMO Valves**:

PETROLEUM JELLY		
Saybolt Colour	ASTM D-156	15
Melting point (ºC)	ASTM D-127	60
Viscosity at 100ºC	ASTM D-445	5
Penetration 25ºC mm./ 10	ASTM D-937	165
Silicone content	None	
Pharmacopea BP	OK	

Table. 1

STORAGE

To ensure the penstock is in optimum conditions of use after long periods of storage, we recommend storing it in a well-ventilated place at temperatures below 30ºC.

It is not advisable, but, if stored outside, the penstock must be covered to protect it from heat and direct sunlight, with good ventilation to prevent humidity. The following aspects must be considered for storage purposes:

- The storage place must be dry and under cover.
- It is not recommended to store the equipment outdoors with direct exposure to adverse weather conditions, such as rain, wind, etc. Even when the equipment is packaged.
- This recommendation is even more important in areas with high humidity and saline environments. Wind can carry dust and particles which can come into contact with the penstock's moving parts and this can lead to operating difficulties.
- The equipment must be stored on a flat surface to avoid loss of shape.
- If the equipment is stored without suitable packaging it is important to keep the penstock's moving parts greased, for this reason it is recommended to carry out regular checks and lubrication.
- Likewise, if there are any machined surfaces without surface protection it is important for some form of protection to be applied to prevent the appearance of corrosion.

COMPONENTS LIST

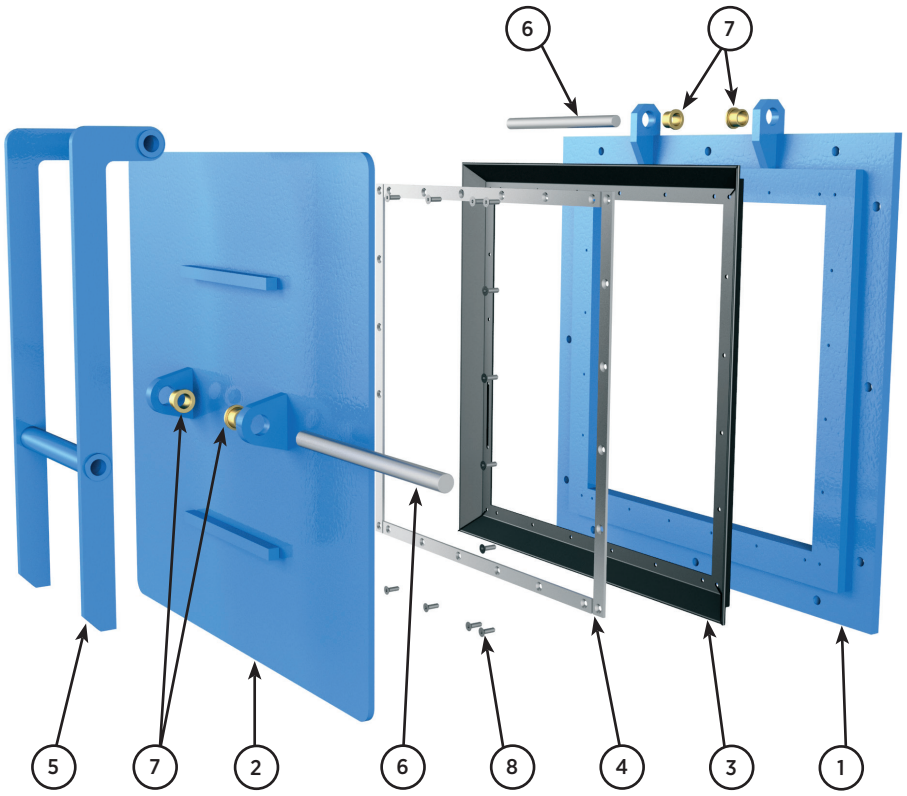

Fig. 7

POS.	DESCRIPCTION
1	BODY
2	FLAP
3	SEAL
4	FLANGE SEAL
5	ARM
6	SHAFT
7	BUSHING
8	SCREWS AND BOLTS

Table. 2

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CMO VALVES

QMS CERTIFIED BY LRQA
Approval number ISO9001 0035593

CMO VALVES
HEADQUARTERS MAIN OFFICES & FACTORY

Amategi Aldea, 142
20400 Tolosa
Gipuzkoa (Spain)

Tel.: (+34) 943 67 33 99

cmo@cmovalves.com
www.cmovalves.com

CMO VALVES
MADRID

C/ Rumania, 5 - D5 (P.E. Inbisa)
28802 Alcalá de Henares
Madrid (Spain)

Tel.: (+34) 91 877 11 80

cmomadrid@cmovalves.com
www.cmovalves.com

CMO VALVES
FRANCE

5 chemin de la Brocardière
F-69570 DARDILLY
France

Tel.: (+33) 4 72 18 94 44

cmofrance@cmovalves.com
www.cmovalves.com