

**MODEL**

**CR**



## **INSTALLATION, OPERATION & MAINTENANCE MANUAL**

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### **CR Knife Gate Valve**



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## 0. INTRODUCTION

The CR model knife gate is a heavy duty valve designed for handling difficult applications. This valve is suitable for rejects removal applications, like junk or sand traps of pulpers, high consistency cleaners... or as silo outlet with solid material.

The two piece body with round inlet and square outlet (larger than the inlet) assures non-jamming.

The CR valve complies with the following European directives:

- Machinery Directive

When applicable it can also comply with the following additional directives:

- Pressure Equipment Directive
- Potentially Explosive Atmospheres (ATEX)

It is the user's liability to clearly inform the maximum working conditions (PS, TS), medium (gas or liquid) and dangerousness group (1 or 2) and if the fluid is unstable to properly classify the valve according to the PED directive.

ORBINOX offers, supplies and certifies valves according to the information received from the customer. The customer is liable to make sure this information is accurate and according to specific working conditions requirements where the valve will be installed.

**For EU Directives and other Certificates, please see the document:  
Directives & Certificates Compliance - Knife Gate Valves - IOM**

## 1. HANDLING

The valves are packed according to the appropriate transport standards. If you receive the packing damaged, please inform the transport company in writing and contact your ORBINOX representative.



When handling an ORBINOX valve please pay attention to the following points:

- **DO NOT ATTACH LIFTING GEAR TO THE VALVE ACTUATORS OR GATE GUARDS.**  
They are not designed to bear the weight, and could easily be damaged.
- **DO NOT LIFT THE VALVE BY THE VALVE BORE.**  
This can cause damage to the seating surfaces and seals.
- Check that selected lifting gear is rated to carry the weight of the valve. The valve can be handled using eyebolts, soft straps or slings.

- **EYEBOLTS:** make sure the eyebolts have the same thread as the bolt holes and they are all well secured. Ideally when using lifting gear to move an ORBINOX valve, it should be supported by two or more eyebolts screwed into the tapped fixing holes in the valve body.
- **SOFT STRAPS:** with the valve in the closed position, the straps should be placed between the gland area and the bore such that the valve is balanced.

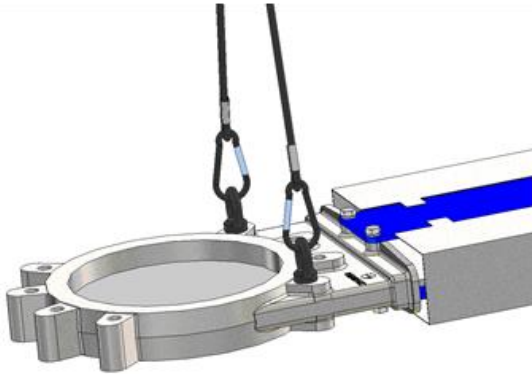


Fig. 1 Handling with eyebolts

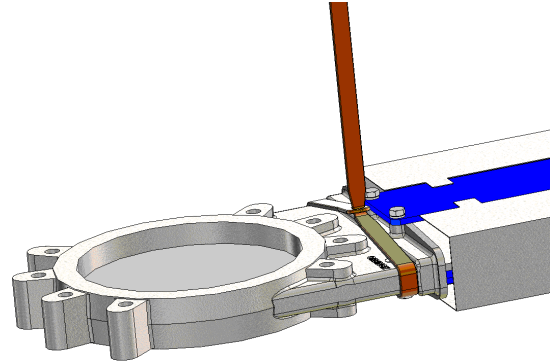
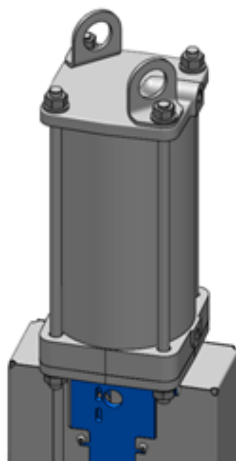


Fig. 2 Handling with soft straps

PNEUMATIC ACTUATED VALVES (Non-standard valves shall be checked case by case)

ORBINOX pneumatic valves (with Ø125 cylinder and above) are supplied with 2 lifting lugs for a safe handling of the valve for vertical movements

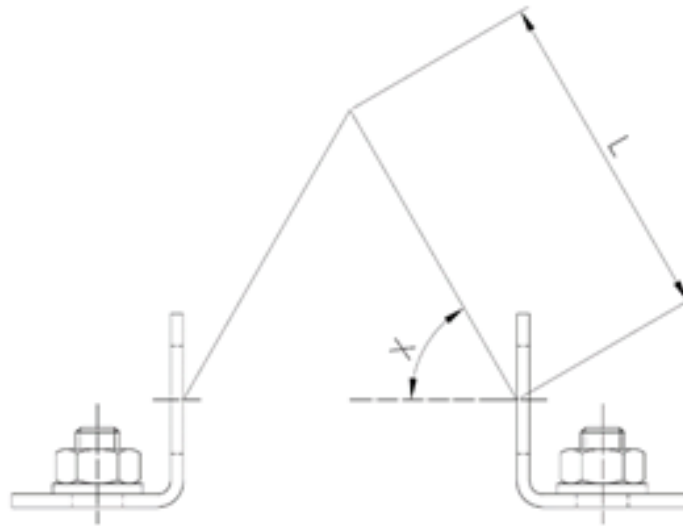


**Handling WARNING:**



Lifting lugs are not machined so they could have sharp corners; soft straps or slings are forbidden to be used with these lifting lugs

Below table shows the maximum weight of valve + pneumatic cylinder that 2 lifting lugs can hold depending on lifting chain angle (X):



CYLINDER	With 2 lifting lugs: max. weight valve + cylinder (kg.)			
	L: minimum lifting chain length			
	X: 60°		X: 75°	
	Kg.	Lmin (mm)	Kg.	Lmin (mm)
125	170	130	310	220
160	270	170	500	280
200	390	220	710	380
250	740	300	1335	500
300	1140	360	2030	600
350	1615	440	2835	720
400	2105	500	3660	830

- For horizontal movement, the valve shall be lifted mainly from the body and the yoke. See above instructions for further instructions
- Cylinder's lifting lugs can only be used during horizontal movement of the valve to help balance the valve given the weight is hold at the body lifting point (center of gravity is approx. centered on the body)
- The valve can be lowered from vertical to horizontal position when it is hanging from the cylinder's lifting lugs

Below table shows approximate weight of standard CR pneumatic valves (kg):

DN (mm)	CYL.	Kg.
DN 50	CYL 100	14
DN 80		20
DN 100		35
DN 125	CYL 125	51
DN 150		78
DN 200	CYL 160	89
DN 250	CYL 200	100
DN 300		145
DN 350	CYL 250	204
DN 400		268
DN 500	CYL 300	370
DN 600		507

## 2. INSTALLATION

**For EU Directives and other Certificates, please see the document:  
Directives & Certificates Compliance - Knife Gate Valves - IOM**

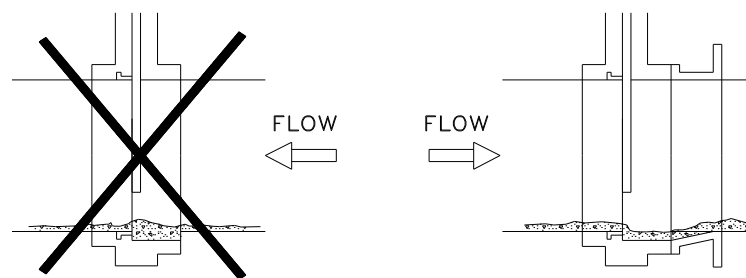


In order to avoid personal injury or damage to property when handling and installing the valve, it is important to observe the following warnings:

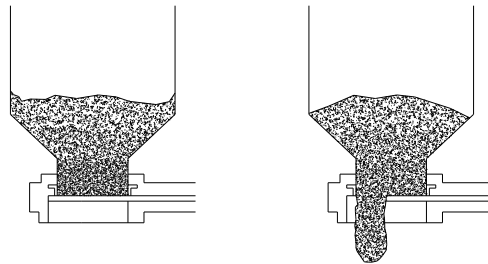
- It is the User's responsibility to verify compatibility of valve parts materials with the internal fluid
- Qualified and trained personnel must carry out the handling and maintenance of the valve
- Use suitable Individual Protection Equipment (IPE) (gloves, safety footwear...)
- Disconnect all lines affecting the valve and put up a notice notifying that work is being carried out on the valve
- Isolate the valve completely from the process
- Release process pressure
- Drain the fluid from the valve

Before installation, inspect the valve body and components for any damage that may have occurred during shipping or storage. Make sure the internal cavities within the valve body are clean. Inspect the pipeline and mating flanges, making sure the pipe is free of foreign material and that the flanges are clean.

The CR valve is unidirectional and is suitable for fluids loaded with solids. The round port should always be on the inlet side and the square port should be on the outlet side.

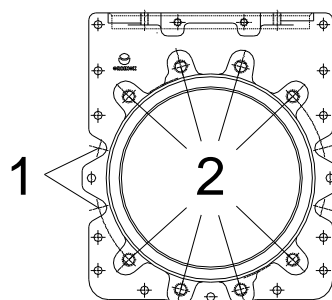


For the valve to operate correctly, it is essential to keep the sliders (7) clean. Depending on the process, this is done by injecting water or air into the valve body. To allow this, the valve body has two flush ports (8). The cleaning fluid must be supplied constantly and delivered at a pressure of 1 bar above line pressure.



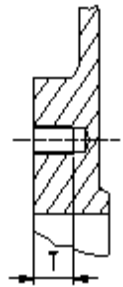
Special care should be taken to maintain the correct distance between the flanges and to ensure that they are parallel to the valve body. Incorrect alignment of the valve can cause deformations, which can lead to difficulties in operation.

Place the valve between flanges and first tighten the side bolts (1), then the upper and lower bolts (2)



The following table shows recommended torque values for the valve fixing bolts and the maximum depth (T) of blind tapped holes:

DN (mm)	T (mm)	PN-10 (EN 1092-1/2)	CL150 (ASME B16.5/B16.47 Series A)	Torque (N.m) <sup>(1)</sup>	Torque (N.m) <sup>(2)</sup>
100	11	M16	5/8" - 11 UNC	35Nm	70Nm
150	13	M20	3/4" - 10 UNC	70Nm	140Nm
200	16	M20	3/4" - 10 UNC	70Nm	140Nm
250-300	16	M20	7/8" - 9 UNC	70Nm	140Nm
400	22	M24	1" - 8 UNC	120Nm	235Nm
500	22	M24	1 1/8" - 7 UNC	120Nm	235Nm
600	22	M27	1 1/4" - 7 UNC	175Nm	350Nm



Select the recommended torque based on bolt size for other flange drilling patterns.

Make sure that cross-pattern tightening sequence is always followed.

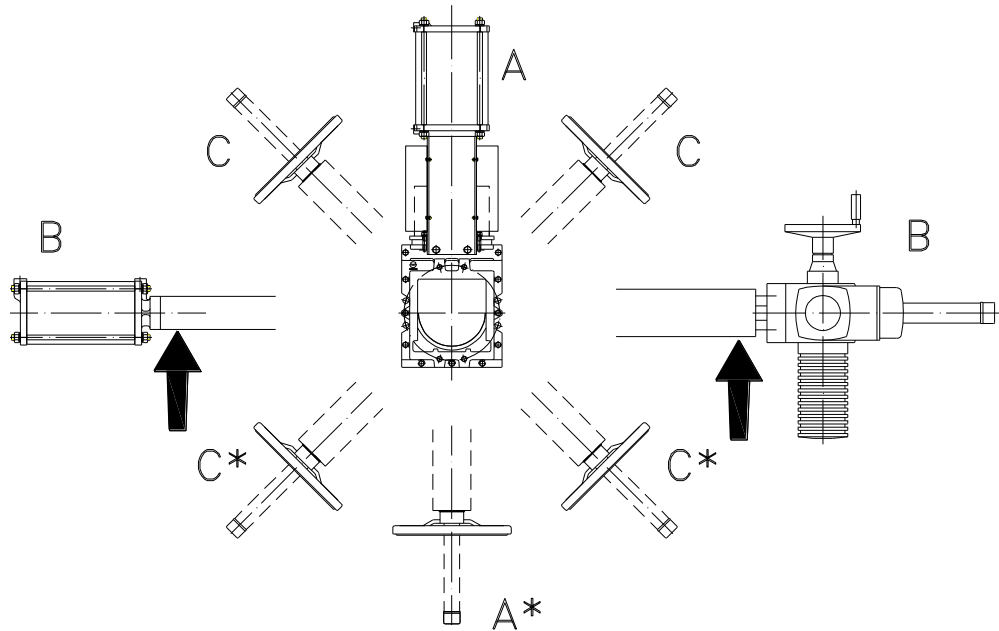
(1) GJL-250 body material. According to EN 1092-2

(2) other body materials. According to EN 1092-1

The valve can be mounted in any position with regard to the pipe. Normally this valve is mounted in horizontal position in a vertical pipeline. In vertical pipelines, the construction of suitable supports will be required (Please consult the technical department at ORBINOX).

With larger diameters (> 300 mm), heavy actuators (pneumatic, electric, etc.), or with the valve installed horizontally (B) or at an angle (C) on a horizontal pipeline, the installation will require the construction of suitable supports. (See the following diagram and consult the technical department at ORBINOX).





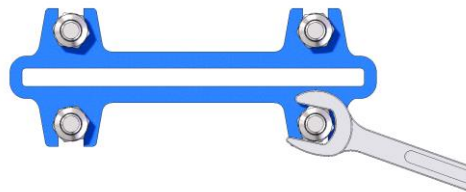
*\* For these positions please consult ORBINOX*

The installation of suitable supports is advised when significant vibrations coming from the piping are present.

In vertical pipelines, the construction of suitable supports is always required (for further information please consult the technical department at ORBINOX).

Once the valve is installed, test that the flanges have been fastened correctly and that all

First, operate the valve with no flow in the pipeline. Then test operation and valve seal with flow. It should be noted that the packing material might settle in shipping/storage, which can cause minor leakage. This can be remedied by tightening the gland follower (6) during installation. The nuts shall be tightened gradually and crosswise until the leakage stops (see the next figure). Check that there is no metal contact between the gland follower (6) and the gate (3)



If the glandfollower nuts are pulled to hard, the force needed to operate the valve will increase, the valve function will be affected and the box packing lifetime will be shortened.

The table below shows the maximum torque value for tightening the glandfollower nuts.

DN	Torque (N.m)
50 - 200	15
250 - 300	25
350 - 600	30

Once performance has been tested, the valve can be put into operation.

### 3. ACTUATORS

**For EU Directives and other Certificates, please see the document:  
Directives & Certificates Compliance - Knife Gate Valves - IOM**

#### 3.1. HANDWHEEL

To open the valve turn the handwheel anticlockwise. To close turn the handwheel clockwise.

#### 3.2. PNEUMATIC

Valves are usually supplied with a double acting pneumatic actuator although, upon request, we can supply single-acting actuators. In either case the feed pressure can vary between 3,5 and 10 bar. However, the size of the actuator for each valve has been designed for a feed pressure of 6 bar.

It is essential for a good maintenance of the cylinder that air should be well dried, filtered and lubricated. Air quality shall fulfil the following requirements:

- ISO 8573-1 Grade 5:4:3 for regular process (ON / OFF services).
- ISO 8573-1 Grade 5:3:3 for regular process at low temperature (-20 °C).
- ISO 8573-1 Grade 3:4:3 for cylinders with positioners.
- ISO 8573-1 Grade 3:3:3 for cylinders with positioners at low temperature (-20 °C)

It is recommended to actuate the cylinder 3-4 times before the start up, once it is installed in the pipeline.

#### 3.3. ELECTRIC ACTUATOR

Depending on the type or make of the electric actuator, specific instructions (i.e. a manufacturer's manual) will be supplied.

## 4. MAINTENANCE

### For EU Directives and other Certificates, please see the document: Directives & Certificates Compliance - Knife Gate Valves - IOM

The valve must not undergo any modifications without a previous agreement with ORBINOX. ORBINOX shall not be liable for any damages that may arise due to the use of non original parts or components



To avoid personal injury or damage to property from the release of process fluid:

- Those in charge of handling and maintenance of the valve must be qualified and trained in valve operations.
- Use appropriate personal protection equipment (gloves, safety shoes, etc).
- Shut off all operating lines to the valve and place a warning sign.
- Isolate the valve completely from the process.
- Release process pressure.
- Drain the process fluid from the valve.

CR valves do not require any maintenance other than the replacement of the packing (5) and the sealing sleeve (4).

The life-time of these tight sealing elements will depend on the service conditions of the valve such as pressure, temperature, abrasion, chemical attack and number of operations.

All the elements subjected to erosion, especially in abrasive services, are easily replaceable: gate (3), sliders (7), sleeve (4).

#### 4.1. Replacement of the packing (5):

1. Depressurise the circuit and place the valve in closed position.
2. Release the gate guards (for valves with automatic actuator only).
3. Release the spindle or stem (10) from the gate (3). (Photo 1)
4. Release the screws of the yoke (9) and remove it (without releasing the actuator).
5. Release the nuts of the gland follower (6) and remove it. (Photo 2)
6. Remove the old packing (5) and clean the stuffing box.
7. Insert the new packing, making sure that the ring joints alternate (the first one on one side of the gate, the next one on the other side, and so on).
8. Once the necessary packing rings have been inserted, proceed with a steady initial tightening of the gland follower (6).
9. Place the yoke (9) (with the actuator) and screw it.
10. Fix the spindle or stem (10) to the gate (3). (Photo 1)
11. Place the gate guards (only for valves with automatic actuator).
12. Carry out some operations with a loaded circuit and retighten the gland follower (6) just enough to prevent any leakage



Photo 1

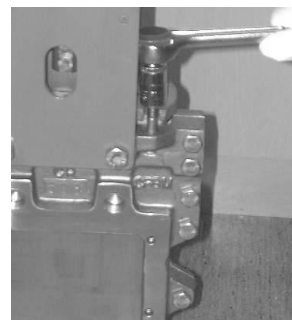


Photo 2

#### 4.2. Replacement of the sealing sleeve (4):

1. Remove the valve from the pipeline.
2. Set the gate (3) in the open position.
3. Release the 2 screws that keep the sleeve attached to the body.
4. Remove the old sleeve.
5. Insert the new sleeve (4) (with the sliders (7) in their position) and screw it.
6. Install the valve onto the pipeline and screw the connecting flanges.
7. Operate the valve a couple of times before leaving it in the required position for the process.

#### 4.3. Lubrication:

In manual valves, it is recommended to lubricate the stem twice a year, removing the protection cap and refilling the cap up to half its volume with a calcium based grease of the following characteristics: insoluble to water, low ash content and excellent adherence.

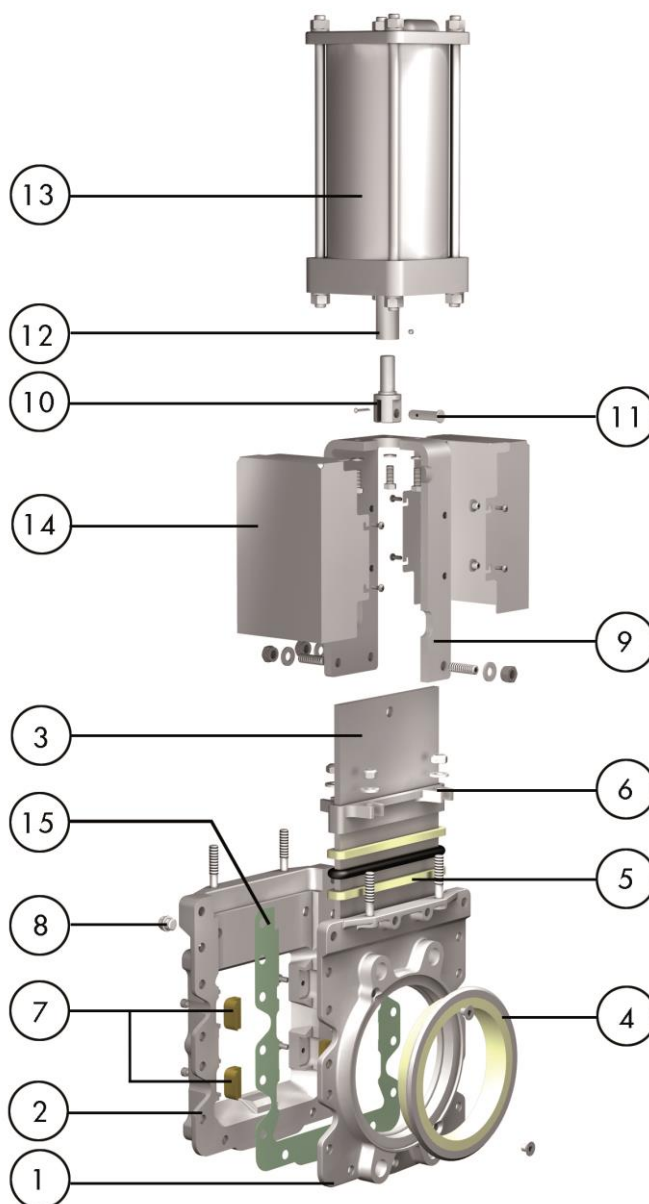
## 5. STORAGE

- For long storage periods keep the valves indoors in a safe and dry place and protect it from any impact and or vibrations
- Storing temperatures: -10°C to +40°C
- Valves must be stored in either full open or full closed position
- For any component installed in the valves, electric motors, solenoid valves, etc, please refer to their own instructions manuals

## 6. ENVIRONMENTAL CONSIDERATIONS

- The packaging is made from environmentally friendly materials. Dispose of the packaging through the available recycling channels
- The valve is designed and manufactured with materials that can be recycled by specialised recycling firms. Once the life of the product is expired, you have to consider a proper disposal of the product in order to prevent any negative impact on the environment and allows for the recycling of valuable commodities
- Please follow the local environmental rules in your country for proper disposal

## 7. PARTS LIST & DRAWINGS



1. BODY	9. YOKE
2. COUNTERBODY	10. CLEVIS
3. GATE	11. PIN
4. SLEEVE	12. PISTON ROD
5. PACKING	13. CYLINDER
6. GLAND FOLLOWER	14. GATE GUARDS
7. SLIDERS	15. GASKET
8. CAP	

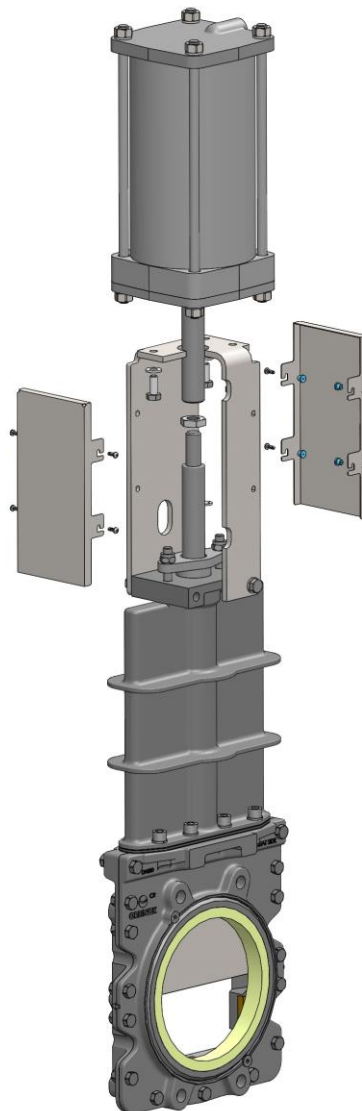
## 8. BONNETED DESIGN

### 8.1. Long Yoke design

#### 8.1.1 REPLACEMENT OF THE PNEUMATIC CYLINDER

This bonneted solution is designed with a piston rod extension which is accessible through the yoke (8), so the cylinder (9) can be directly disassembled from the valve. Procedure:

1. Remove the yoke protections (10) to access the piston rod extension
2. Release the cylinder piston rod from the extension
3. Remove the cylinder-yoke bolts



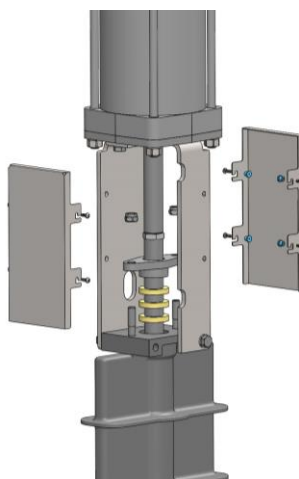
See Maintenance Manual of ORBINOX Pneumatic Cylinders for further information

### 8.1.2 REPLACEMENT OF THE GLAND PACKING (6)



Make sure the valve is depressurized prior to start any valve body maintenance

1. Open the valve fully
2. Remove the yoke protections (10) to access the gland follower
3. Loosen the nuts of the gland follower (7) and lift it to have access to the packing (6)
4. Remove the old packing (6) and clean the stuffing box
5. Insert the new packing rings (6)
6. Reinstall gland follower and yoke protections (10)
7. If scraper is to be replaced, first release the pneumatic cylinder (9) from the valve



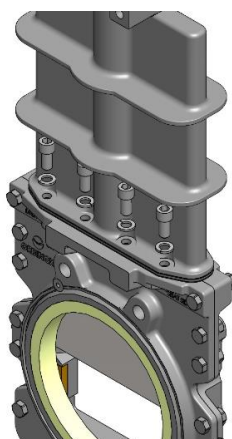
*Note: Gland packing (6) can be replaced under pressure only if gate is fully open and actuator locks the gate in that position.*

### 8.1.3 REPLACEMENT OF THE INTERMEDIATE PACKING (1)

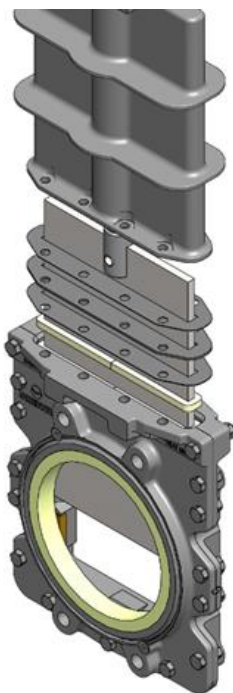


Make sure the valve is depressurized prior to start any valve body maintenance

1. Lift the gate to open position by means of the pneumatic actuator (9)
2. Loosen the nuts between body and bonnet (4)



3. Lift the valve's bonnet (4) until the gate is free
4. Remove the retaining plate (3) and body-bonnet gaskets (2)



5. Remove the old packing (1) and clean the body stuffing box
6. Insert the new packing (1)
7. If upper and lower body-bonnet gaskets (2) are to be replaced, first release the piston rod from the gate
8. Reinstall the bonnet (4) and tighten it to the body

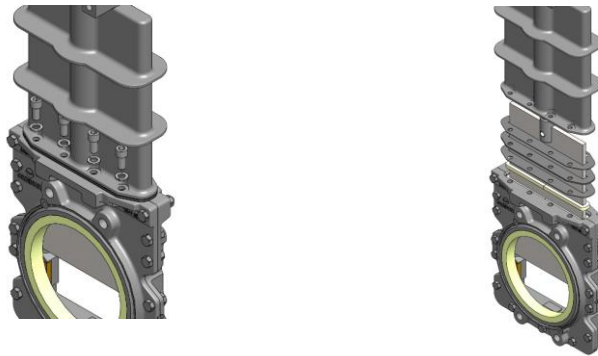


## 8.2. Short Yoke design

### 8.2.1 REPLACEMENT OF THE PNEUMATIC CYLINDER (9)

This bonneted solution is designed with a single long piston rod to reduce total valve's height dimension (for locations with little available space). This arrangement does not allow removing the assembled pneumatic cylinder(9) from the valve in one single piece. It is necessary to free the piston rod from the gate. Procedure:

1. Open de bonnet (4) and loose the piston rod from the gate (see 8.1.3)



2. Disassemble the cylinder parts at the valve to access and free the piston rod



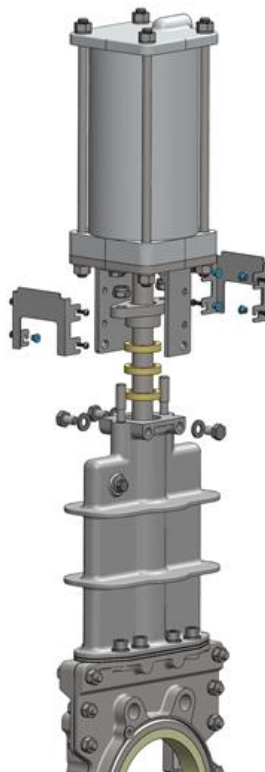
3. Once the piston rod is free from the piston, pull from below, through the bonnet (4)
4. Remove the remaining parts of the cylinder from the valve yoke (8)

### 8.2.2 REPLACEMENT OF THE GLAND PACKING (6)



Make sure the valve is depressurized prior to start any valve body maintenance

1. Open the valve fully
2. Disassemble the yoke (8) from the bonnet (4) and pull yoke (8) and actuator (9) long enough to allow access to packing (6) by lifting the packing gland (7)
3. Loosen the nuts of the gland follower (7) and lift it to have access to the packing (6)
4. Remove the old packing (6) and clean the stuffing box
5. Insert the new packing rings (6)
6. Reinstall gland follower (7) and tighten the yoke (8) to the body
7. If scraper is to be replaced, first release the pneumatic cylinder (9) from the valve



*Note: Gland packing can be replaced under pressure only if gate is fully open and actuator locks the gate in that position.*

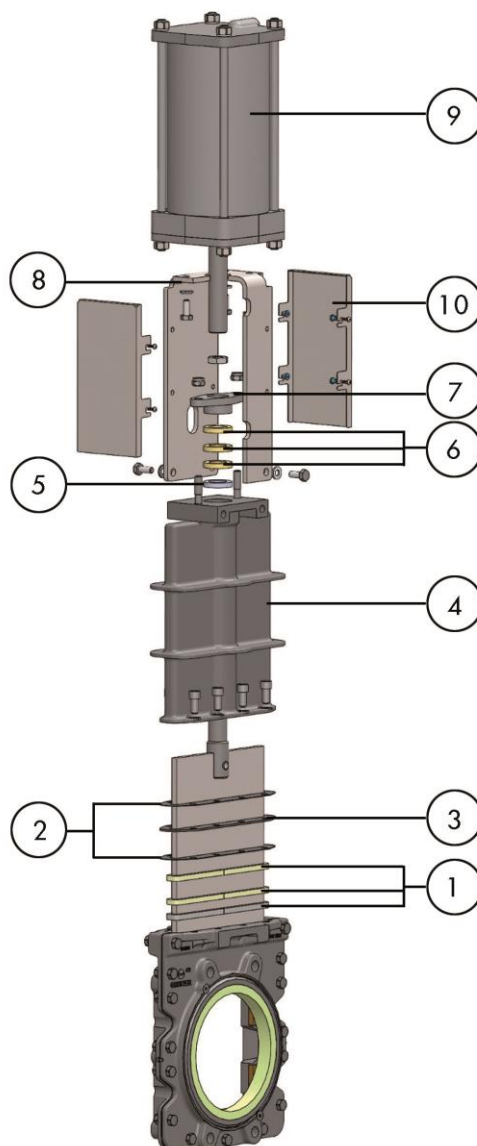
### 8.2.1 REPLACEMENT OF THE INTERMEDIATE PACKING



Make sure the valve is depressurized prior to start any valve body maintenance

Same procedure as in 8.1.3

**9. PARTS LIST & DRAWINGS BONNETED VALVE**



1. INTERMEDIATE PACKING	6. GLAND PACKING
2. GASKETS	7. GLAND FOLLOWER
3. RETAINING PLATE	8. YOKE
4. BONNET	9. CYLINDER
5. SCRAPER	10. GATE GUARDS