

**MODEL**

**EX with bonnet**



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

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# **EX with bonnet**

## **Knife Gate Valve**

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### **EX with Bonnet Knife Gate Valve**

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## 0. INTRODUCTION

The EX model knife gate is a uni-directional wafer valve designed for general industrial service applications. The design of the body and seat assures non-clogging shut-off with suspended solids. The bonnet assures a tight seal to atmosphere for use with hazardous gases or steam, and reduces packing maintenance. It also reduces the torque required for valve operation.

The EX valve complies with the following European directives:

- 2006/42/EC: Machinery Directive

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

- 2014/68/EU: Pressure Equipment Directive
- 2014/34/EU: 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 2014/68/EU 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.



### **Special requirements for ATEX valves:**

The EX valve may also comply with the directive regarding equipment and protective systems for their use in explosive atmospheres. In these cases, the logotype (see below) shall appear on the identification label of the valve. This label shows the exact classification of the zone where the valve can be used. The user will be liable for its use in any other zone.

This directive only applies in the following atmospheric conditions:

- $0,8 \text{ bar} \leq P \leq 1,2 \text{ bar}$
- $- 20^{\circ}\text{C} < T < 60^{\circ}\text{C}$

Any increase in temperature due to frictional warmth is negligible, since the relative speed of the moving parts is extremely low.

The risk analysis associated to this directive does not take into account the fluid that goes through the valve, even when such fluid produces an explosive atmosphere. The user must take into account the risks that the fluid generates, such as:

- Heating of the valve surface.
- Generation of electrostatic charges caused by displacement of the fluid.
- Shock waves caused by the installation (water hammer), internal crashes generated by the pellets or the risks due to foreign bodies susceptible of being present in the installation.



ATEX logotype

## 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 you 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.

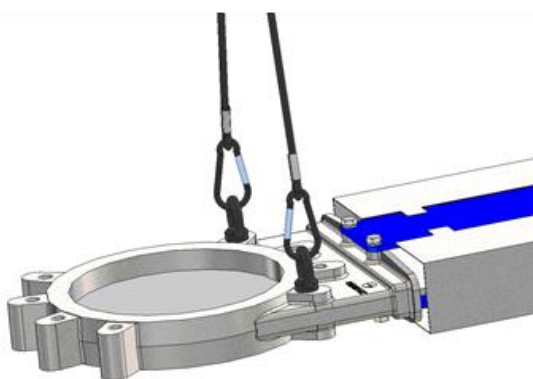


Fig. 1 Handling with eyebolts

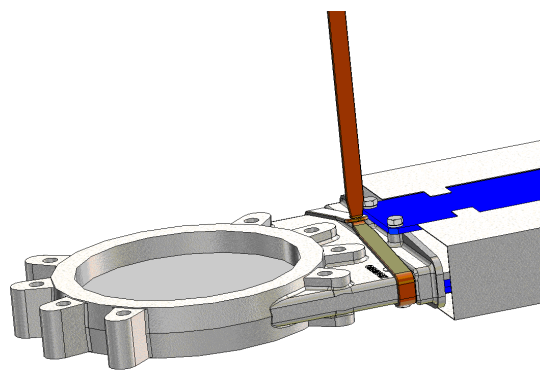


Fig. 2 Handling with soft straps

## 2. INSTALLATION



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



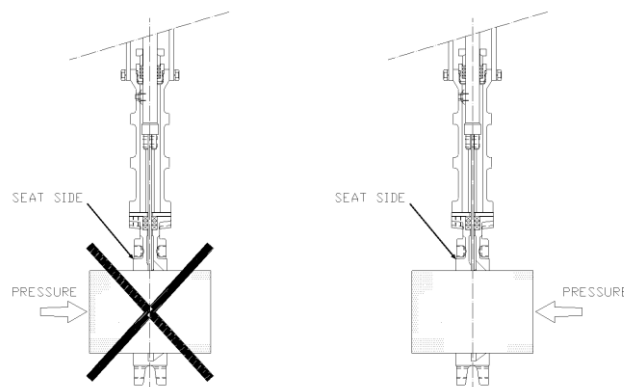
### Special requirements for ATEX valves:

- Make sure the valve is ATEX marked according to the requested zone and it includes all anti-static devices.
- During installation and maintenance operations, use hand tools (non-electric) which do not generate any potential ignition source such as sparks
- Personnel shall have a Working Authorization for explosive classified areas
- Check continuity between the body of the valve and the pipe (test in accordance with EN 12266-2 Standard, annex B, points B.2.2.2. and B.2.3.1).
- This check must be done every time the valve has been removed from the line, serviced, and put back to the line.
- The knife gate valve, included hand operated valves, must be always earthed, i.e., the electrical resistance to earth must be  $< 10^6 \Omega$ . The integration of the slide knife in the electrically conducting circuit should be checked regularly as required by the operation instructions.

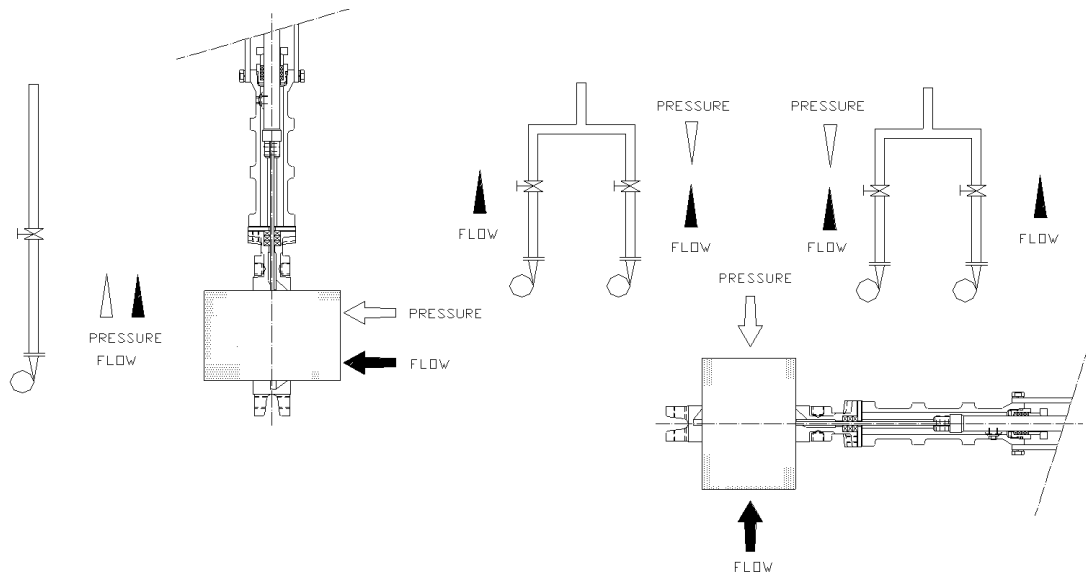


Before installation, inspect the valve body and components for any damage that may have occurred during shipping or storage. Make sure the internal cavities within the valve body are clean. Inspect the pipeline and mating flanges, making sure the pipe is free of foreign material and that the flanges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

The valve is unidirectional. It should be installed with pressure exerted against the seat. The words "SEAT SIDE" are marked on the valve body to indicate the position of the valve seat. Installation and the correct orientation with respect to the direction of the flow is the responsibility of the user.



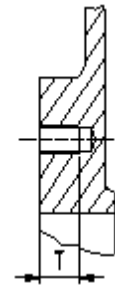
It should be noted that the direction of flow and differential pressure, do not always coincide.



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.

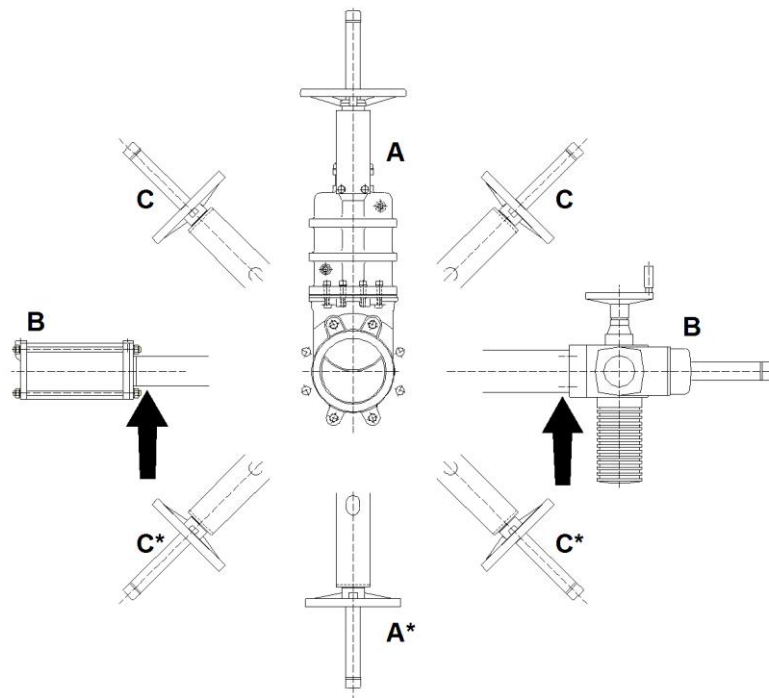
The following table gives the maximum torque values for the valve fixing bolts. Also shown is the maximum depth (T) allowed for the tapped blind bolt holes drilled into the valve body.

DN (mm)	T (mm)	Torque (N.m)
50-100	11	60
125	11	70
150-200	14	70
250-300	18	110
350	22	150
400	24	150
450-500	24	190
600	24	230
700	20	230
800-900	20	280
1000	20	340



The valve can be mounted in any position with regard to the pipe. However, it is advisable to place it vertically in horizontal pipeline (A) if the installation allows it. (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.*

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 electrical and/or pneumatic connections have been properly made.

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 solved by tightening the gland follower (5) during installation.



The operation of automated valves is limited only with fitted gate covers to fulfil 2006/42/EC (machinery Directive).

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

### 3. ACTUATORS



The operation of automated valves is limited only with fitted gate covers to fulfil 2006/42/EC (machinery Directive).



#### Special requirements for ATEX valves:

- Allowed actuator for ATEX zones: pneumatic, hydraulic and electric motor. Hand operated and bare shaft valves are out of the scope of this Directive, but for installation and maintenance, same requirements for explosive areas valves shall apply.
- Make sure these actuators are ATEX marked according to the requested zone.
- Maximum travel speed of the gate must equal or below 1 m/s

#### 3.1. HANDWHEEL

Turn the hand wheel (11) anticlockwise to open the valve. Turn the hand wheel clockwise to close the valve.

#### 3.2. LEVER

To operate the valve with this device, first loosen the locking clamp located on the top of the yoke (9). Then either open or close the valve by moving the lever in the desired direction. Finally, fix the position of the lever with the locking clamp.

#### 3.3. 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.

#### 3.4. 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

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



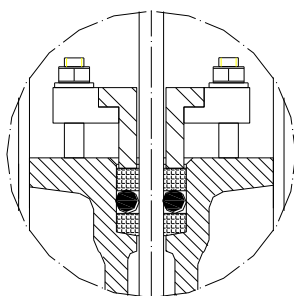
To avoid personal injury or damage to property from the release of process fluid:

- 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.

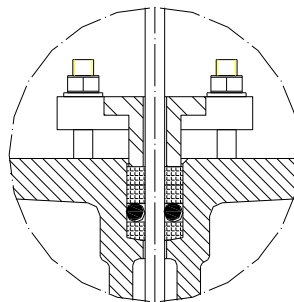


### Special requirements for ATEX valves:

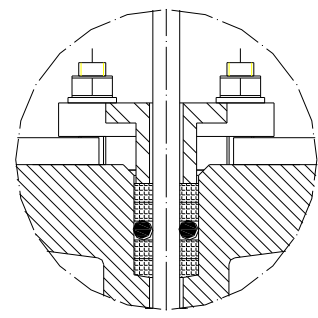
- Make sure the valve is ATEX marked according the requested zone and it includes all anti-static devices.
- Those in charge of handling and maintenance of the valve must be qualified and trained regarding ATEX
- During installation and maintenance operations, use hand tools (non-electric) which do not generate any potential ignition source such as sparks
- Personnel shall have a Working Authorization for explosive classified areas
- Periodicity of check and evaluation of valve electrical conductivity must be determined by end user according to valve working conditions. In any case, once the valve is put into operation, the packing area must be revised after the valve has been stroked 100 times or after 3 months of operation, whatever happens first. After this preliminary check, new checking periods must be determined by end user based on the results of this first check
- Clean the valve periodically to prevent dust accumulation. Do not sweep or dump the dust. Always use a vacuum cleaner system.
- Dead end service is not allowed.
- Do not apply any new coating to the valve. Should it require new coating, please contact our closest representative.
- Allowed seals: EPDM, FKM-FPM, NBR, PTFE(\*), VMQ(\*), GRAPHITE and METAL (no seal) (\*) PTFE and VMQ seals have some size restrictions. Please check with ORBINOX Technical department.
- Allowed packing: ST, stainless, copper and graphite



DN 50–600



DN 700–750



DN 800–1200

- To keep the ATEX approval, always use original spares from ORBINOX. Original order number is mandatory to receive the correct spares.
- Washer DIN 6798A (This washer guarantees continuity among carbon steel parts, coated in epoxy, yoke and body and stainless-steel guards for coating thicknesses up to 200 microns)
- After any maintenance it is mandatory to check that the valve is correctly earthed, included hand operated valves. Continuity between the valve body, the pipe, the gate, supports and guards must be tested (in accordance with EN 12266-2 Test F21 Annex B, B.2.2.2 and B.2.3.1). Packing shall be checked and pressurized for Zero leakage

### MAXIMUM FLUID TEMPERATURES

Atmosphere	
Gas/air, steam/air, and mist/air	Dust/air
80% of minimum fluid ignition temperature in °C	2/3 of minimum dust cloud ignition temperature minus 10°K, or minimum dust layer ignition temperature minus 85 °K (for layers up 5mm)

*Note: these maximum fluid temperatures apply to all categories. The differences between categories are the consideration of foreseeable malfunction cases and rare malfunctions cases*

### MAXIMUM SEAL AND PACKING TEMPERATURES

Max Temperature (°C)	SEAL					
	EPDM	FKM-FPM	NBR	GRAPHITE	PTFE	VMQ
	120	200	120	600	250	250

Max Temperature (°C)	PACKING	
	ST	GRAPHITE
	250	600

*Note: Most of the times seals maximum temperature capacity is the key limitation factor when evaluating valve maximum working temperatures. In ATEX zones these temperatures must be compared to those above related to limitation of fluids temperatures.*

*Always consider the most restrictive as maximum valve working temperature.*

The only maintenance required is to change the gland packing (4) or the seal (3) if the valve is a resilient seated type.

The life of these components will depend on the working conditions of the valve such as: pressure, temperature, abrasion, chemical action, number of operations, etc.

**4.1. Replacement of the gland packing (4):**

Although the design of the valve bonnet allows the stuffing box of the bonnet to be sealed from below, we advise that the valve is depressurised prior to beginning any maintenance.

1. Open the valve fully, to tighten the stem against the stuffing box.
2. Remove gate guards (if the valve has them).
3. Loosen the nuts of the gland follower (5) and remove it. (Photo 1)
4. Remove the old packing (4) and clean the stuffing box.
5. Insert the new packing rings (4), making sure that the ring joints alternate. (Photo 2)



Photo 1

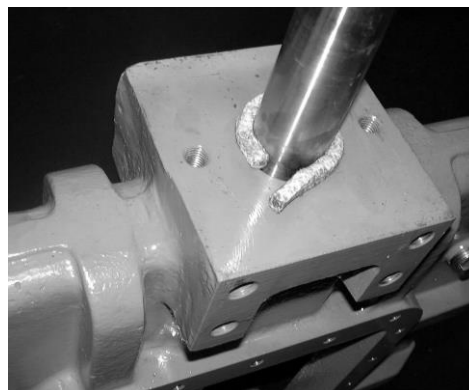


Photo 2

6. Once the necessary packing rings (4) have been inserted, proceed with a steady initial tightening, of the gland follower (5). (Photo 1)
7. Remount the gate guards (if the valve has them)
8. Carry out some operations with a loaded circuit and then re-tighten the gland follower (5) to prevent leakage.

**4.2. Replacement of the seal (3) (only applicable to resilient seated valves):**

1. Remove the valve from the pipeline.
2. Loosen the nuts between the body (1) and the bonnet (14). (Photo 3)
3. Lift the bonnet (14), until the gate (2) is free. (Photo 4)



Photo 3



Photo 4

4. Remove the seal retainer ring (10), which supports the seals (3).
  5. Remove the worn out seals (3) and clean the seal housing.
  6. Once the new seal (3) has been cut according to size, insert it into the seat housing (making sure that the union of the seal is at the top). (Photos 5 and 6).
- If the valve has PTFE seal (3), follow the point 4.3.

### Seal lengths (L)

DN (mm) : L (mm)				
DN 50: 240	DN 125: 485	DN 300: 1040	DN 500: 1670	DN 900: 2930
DN 65: 290	DN 150: 565	DN 350: 1200	DN 600: 1970	DN 1000: 3240
DN 80: 340	DN 200: 720	DN 400: 1355	DN 700: 2330	
DN 100: 410	DN 250: 880	DN 450: 1510	DN 800: 2645	

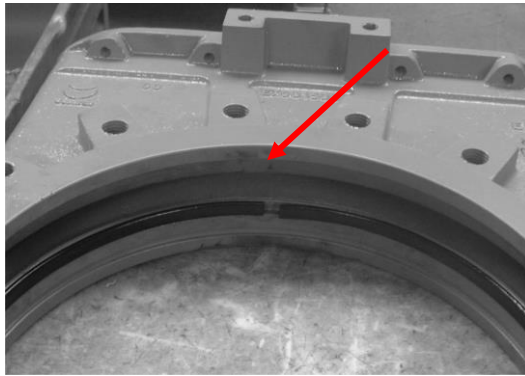


Photo 5

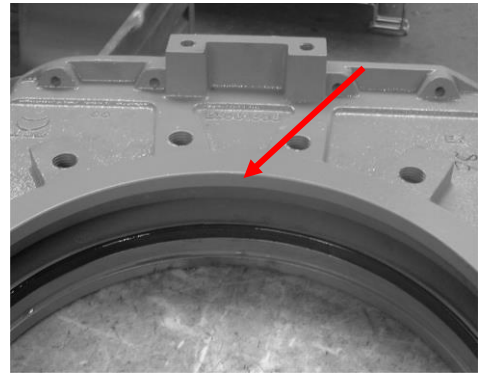


Photo 6

7. Insert the seal retainer ring (10) by hammering gently around the edge. (Photos 7 and 8)



Photo 9



Photo 10

8. Remount the bonnet onto the valve (with the gate cleaned), and bolt it onto the body (1) (Photos 4 and 3) changing the gasket (15), between body (1) and bonnet (14). (Photo 9)
9. Open and close the valve two or three times before returning it to the installation.

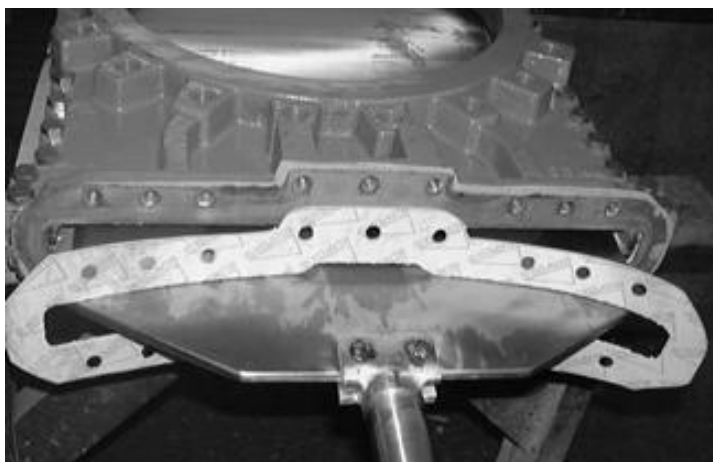


Photo 9

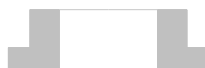


Photo 10

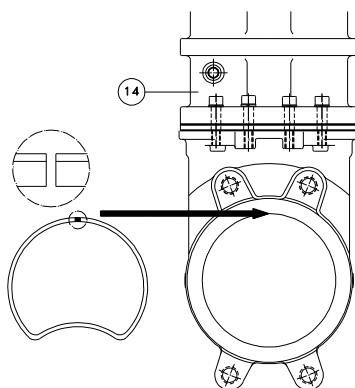
### 4.3. Replacement of the PTFE seal (3):

Follow the same procedure as point 4.2 but with following notes:

1. To obtain a tighter shut off in stainless steel valves, the machined housing of the seat is sealed with plastic glue. This is not necessary in cast iron valves.  
With the seal in this position:



2. Make a circle; joining the ends and making a heart-shaped form (see the following diagram).
3. Insert both ends of the seal in the upper side of the machined housing of the seat (adjacent to bonnet (14)), and pushing the arched part with a finger, insert the seal into the housing. If the diameter of the valve is small ( $DN \leq 150$ ), a vice can be used.



#### **4.4. Replacement of the gland packing (7), in valves with “intermediate packing” (see detail C in Parts List & Drawing):**

1. Remove the valve from the pipeline.
2. Loosen the nuts between body (1) and bonnet (14). (Photo 3)
3. Lift the bonnet (14) of the valve until the gate (2) is free. (Photo 4)
4. Remove the retaining plate (17) and gaskets (15).
5. Remove the old packing (7) and clean the stuffing box.
6. Insert new packing (7), making sure that the packing joints alternate (first one side of the gate, the next on the other side and so on). (Photo 10)
7. Once the necessary packing (7) has been inserted, change the upper and lower gaskets (15) and remount the retaining plate. (Photo 9)
8. Remount the bonnet onto the valve, and bolt it into the body (1) (Photo 4 and 3).

#### **4.5. Lubrication:**

Twice a year, it is recommended to remove the protection cap (12) and fill up the stem protector (13) halfway with a calcium-based grease with the following characteristics: highly water resistant, low ash content, and excellent adherence.

#### **4.6. Replacement of the valve:**



##### **Special requirements for ATEX valves**

To replace the whole valve:

1. The same valve with exactly the same certificates must be ordered to ORBINOX. When placing this order, it is customer liability to clearly indicate that the new ordered valve is a replacement of a certified valve.
2. It is user's liability to ensure that all requirements in the “maintenance” chapter are fulfilled
3. Loose the bolts than joint the actuator to the slide
4. Loose the yoke to body bolts
5. Reassemble the valve

#### **4.7. Replacement of the actuator:**



##### **Special requirements for ATEX valves**

To replace the actuator:

1. The same actuator with exactly the same certificates must be ordered to ORBINOX. When placing this order, it is customer liability to clearly indicate that the new actuator is a replacement of a certified valve
2. It is user's liability to ensure that all requirements in the “maintenance” chapter are fulfilled
3. Loose the bolts than joint the actuator to the yoke
4. Reassemble the valve

## 5. FLUSH-PORTS

The valves come fitted with flush-ports (16) to allow connection to a cleaning system to flush the bonnet with water or air. The ports are plugged with threaded metal plugs. These can be removed for connection to a cleaning system, or for flushing the bonnet in the event of a blockage.

## 6. 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

## 7. ENVIRONMENTAL CONSIDERATIONS

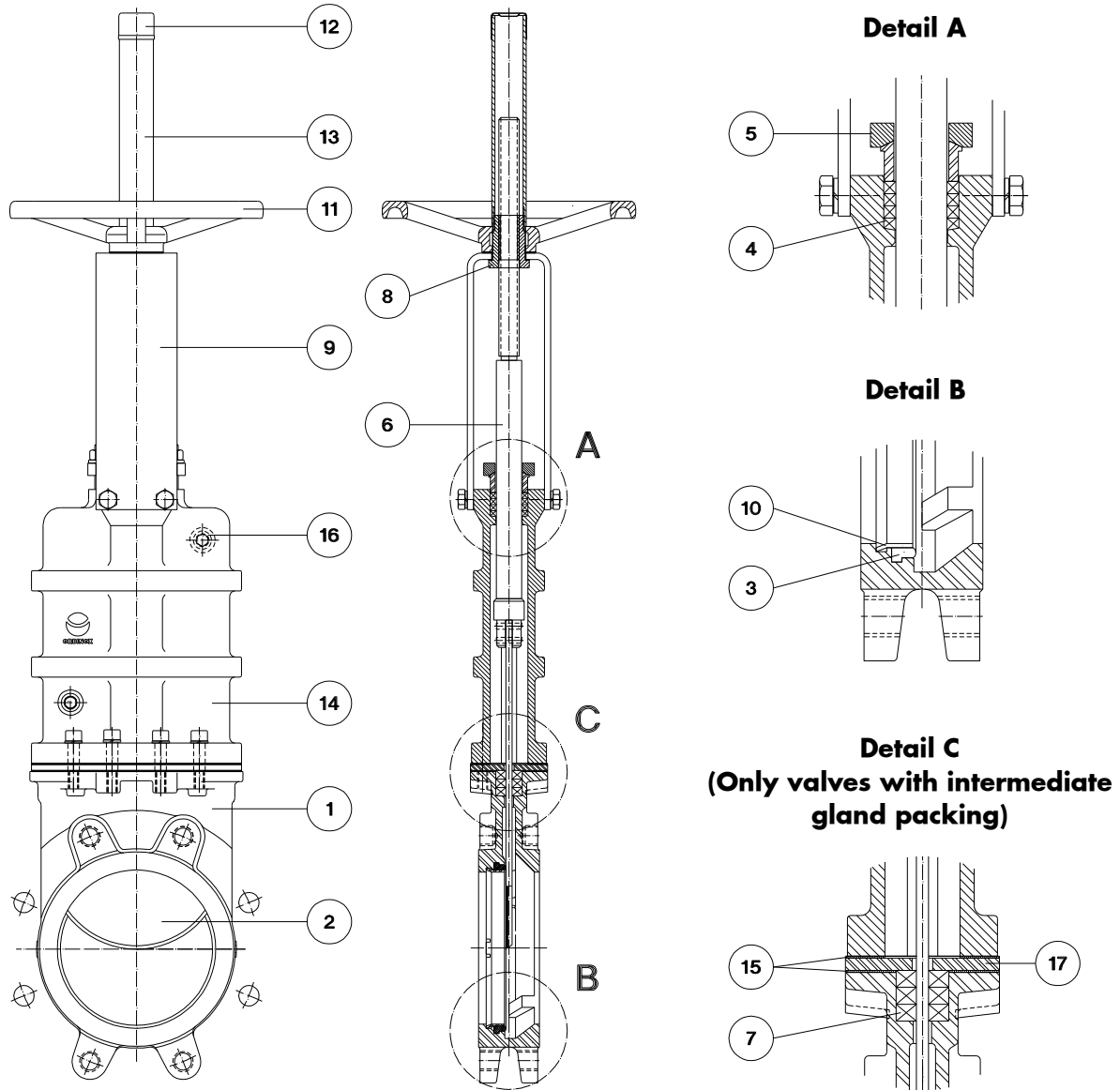
- The packaging is made from environmentally friendly materials. Dispose of the packaging through the available recycling channels
- The valve is designed and manufactured with materials that can be recycled by specialised recycling firms. Once the life of the product is expired, you have to consider 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

MODEL

# EX with bonnet



## 8. PARTS LIST & DRAWINGS



1. BODY	10. SEAL RETAINER RING
2. GATE	11. HANDWHEEL
3. SEAL	12. CAP
4. PACKING RING	13. STEM PROTECTOR
5. GLAND FOLLOWER	14. BONNET
6. STEM	15. GASKETS
7. INTERMEDIATE PACKING	16. FLUSH-PORTS
8. NUT	17. RETAINING PLATE
9. YOKE	