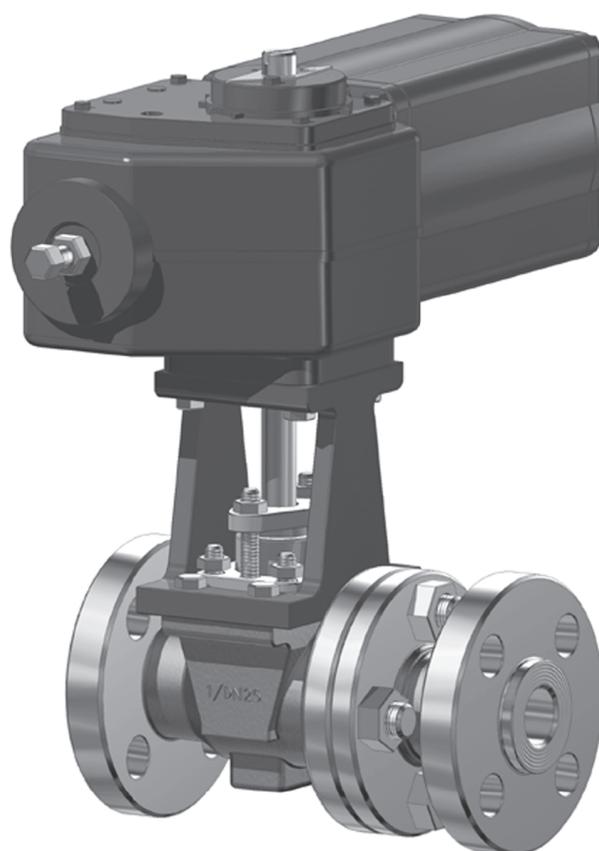


# FLANGED FULL BORE BALL VALVE

Series XU

ASME Class 600 version

Installation, Maintenance and  
Operating Instructions



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### READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the valve.  
If you require additional assistance, please contact the manufacturer or manufacturer's representative.  
Addresses and phone numbers are printed on the back cover.

### SAVE THESE INSTRUCTIONS!

Subject to change without notice.

All trademarks are property of their respective owners.

# 1 GENERAL

## 1.1 Scope of the manual

This installation, operation and maintenance manual provides essential information on XU-series ball valves. The actuators and instrumentation to be used with XU-series valves are also discussed briefly. Refer to the separate actuator and control equipment instruction manuals for further information.

**NOTE:**  
 Selection and use of the valve in a specific application requires close consideration of detailed aspects. Due to the nature of the product, this manual cannot cover all the individual situations that may occur when installing, using or servicing the valve.  
 If you are uncertain about use of the valve or its suitability for your intended purpose, please contact Metso for more information.  
 For valves in oxygen service, please see also the separate installation, maintenance and operating instructions for oxygen service (see Metso document id:10O270EN.pdf)

## 1.2 Valve description

XU-series valves are flanged full bore ball valves. The valve body is in two parts, fastened together by body-joint bolting. The ball and shaft are separate. Shaft blow-out is prevented by a shoulder machined on the shaft.

The valve is either soft or metal seated. In size 2" shaft torque is transmitted to the ball through a spline driver installed in a groove on the ball surface. In other sizes the shaft is installed straight into a groove on the ball surface.

The valve is tight in both flow directions. Tightness is provided by a pressure differential which forces the ball up against the downstream seat.

Construction details of individual valves are included in the type code shown on the valve identification plate. To interpret the type code, please refer to the type coding key in this manual.

XU-series valves are specially designed for demanding shut-off applications involving high operation cycles. They can also be used in flow control applications.

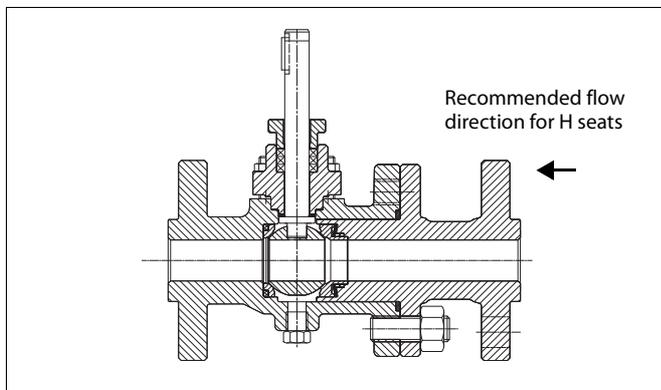


Fig. 1 Construction of XU series valve, sizes 1" and 1 1/2"

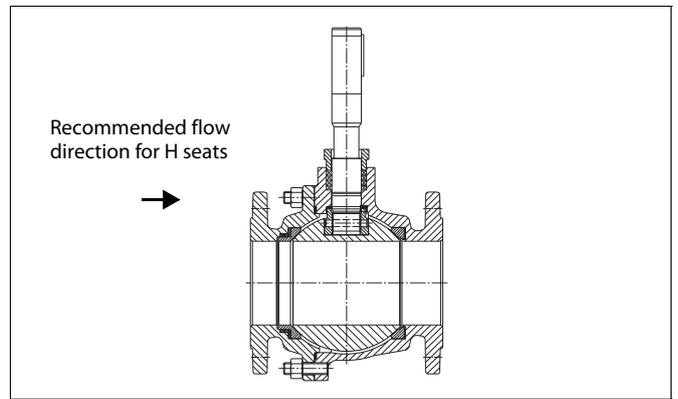


Fig. 2 Construction of XU series, size 2"

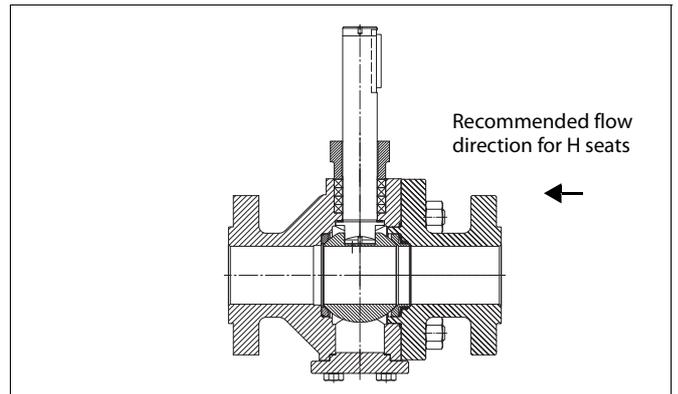


Fig. 3 Construction of XU series, sizes 3" and 4"

## 1.3 Markings

Body markings are cast or stamped on the body (see Fig. 4).

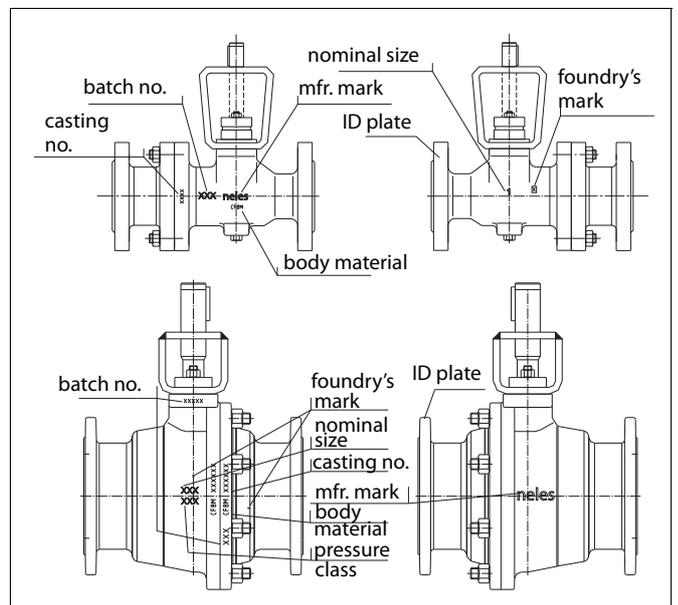


Fig. 4 Valve markings

The identification plate (Fig. 5) is attached to the flange. Identification plate markings are:

1. Body material
2. Shaft material
3. Trim material
4. Seat material
5. Max and min operating temperature
6. Max shut-off pressure differential / temperature
7. Pressure class
8. Type designation
9. Valve manufacturing parts list no.
10. Model

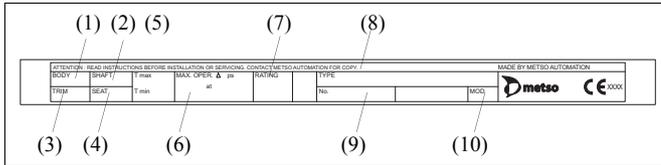


Fig. 5 Identification plate

## 1.4 Specifications

Face-to-face:	ASME B16.10 Table 4, long pattern
Pressure rating:	ASME Class 600 PN 64 and PN 100
Max. pressure differential	see Figs. 6 and 7
Temperature range:	see Figs. 6 and 7
Flow direction:	free (H-seat always in inlet side)
Tightness: metal seated	ASME Class V tightness, ISO 5208 leakage rate C
soft seated	ISO 5208 leakage rate A
Dimensions:	see tables on pages 19–22
Weights:	see tables on pages 19–22

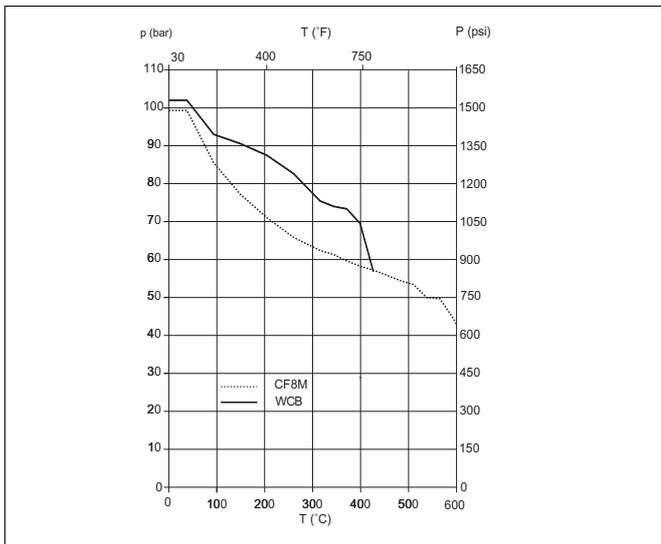


Fig. 6 Valve body ratings, ASME 600

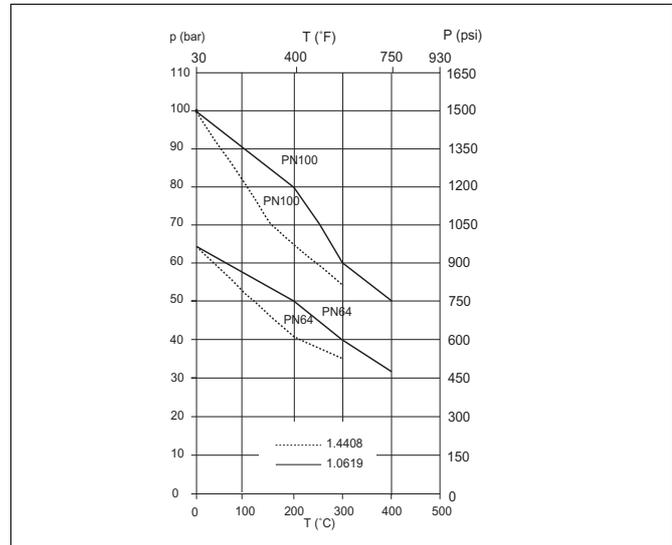


Fig. 7 Valve body ratings, PN 64 / PN 100

## 1.5 Valve approvals

XU-series ball valves meet the requirements set by ASME B 16.34.

Fire safety characteristics are designed according to API 607 (H seat).

## 1.6 CE marking

The valve meets the requirements of the European Directive 2014/68/EU relating to pressure equipment, and has been marked according to the Directive.

## 1.7 Recycling and disposal

Most valve parts can be recycled if sorted according to material.

Most parts have material marking. A material list is supplied with the valve. In addition, separate recycling and disposal instructions are available from the manufacturer. A valve can also be returned to the manufacturer for recycling and disposal against a fee.

## 1.8 Safety precautions

### CAUTION:

#### Do not exceed the valve performance limitations!

Exceeding the limitations marked on the valve may cause damage and lead to uncontrolled pressure release. Damage or personal injury may result.

### CAUTION:

#### Do not dismantle the valve or remove it from the pipeline while the valve is pressurized!

Dismantling or removing a pressurized valve will result in uncontrolled pressure release. Always isolate the relevant part of the pipeline, release the pressure from the valve and remove the medium before dismantling the valve.

Be aware of the type of medium involved. Protect people and the environment from any harmful or poisonous substances. Make sure that no medium can enter the pipeline during valve maintenance.

Failure to do this may result in damage or personal injury.

### CAUTION:

#### Beware of the ball cutting movement!

Keep hands, other parts of the body, tools and other objects out of the open flow port. Leave no foreign objects inside the pipeline. When the valve is actuated, the ball functions as a cutting device. Close and detach the actuator pressure supply pipeline for valve maintenance. Failure to do this may result in damage or personal injury.

### CAUTION:

#### Beware of noise emission!

The valve may produce noise in the pipeline. The noise level depends on the application. It can be measured or calculated using the Metso Nelprof computer program. Observe the relevant work environment regulations on noise emission.

### CAUTION:

#### Beware of extreme temperatures!

The valve body may be very hot or very cold during use. Protect people against cold injuries or burns.

### CAUTION:

#### When handling the valve or the valve package, bear in mind its weight!

Never lift the valve or valve package by the actuator, positioner, limit switch or their piping.

Place the lifting ropes securely around the valve body (see Fig. 9).

Damage or personal injury may result from falling parts. The weights are shown on pages 19–22.

### CAUTION:

#### Follow the proper procedures when handling and servicing oxygen valves.

## 2 TRANSPORTATION, RECEPTION AND STORAGE

Check the valve and the accompanying device for any damage that may have occurred during transport.

Store the valve carefully. We recommend storing indoors in a dry place.

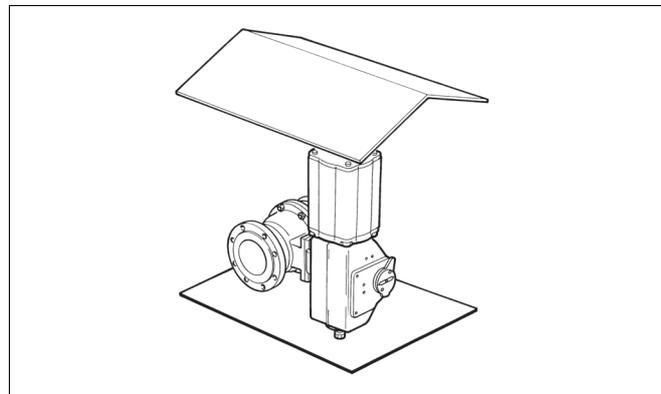


Fig. 8 Storing the valve

Do not remove the flow port protectors until installing the valve.

Move the valve to its intended location just before installation.

The valve is usually delivered in the open position.

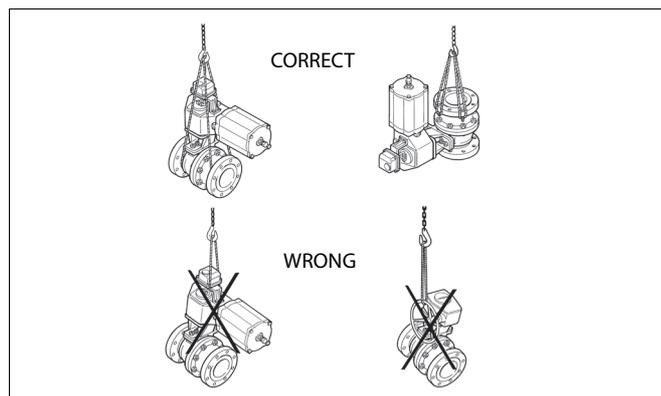


Fig. 9 Lifting the valve

## 3 INSTALLATION AND USE

### 3.1 General

Remove the flow bore protectors and check that the valve is clean inside. Clean the valve if necessary.

### 3.2 Installing in the pipeline

### CAUTION:

#### When handling the valve or the valve package as a whole, bear in mind the weight of the valve or the entire package!

Flush the pipeline carefully before installing the valve. Make sure the valve is entirely open when flushing. Foreign particles, such as sand or pieces of welding electrode, will damage the ball and seats.

**NOTE:**

Use screws, nuts, bolts and gaskets equivalent to the fastenings used elsewhere in the pipeline. Center the flange gaskets carefully when fitting the valve between flanges.

**NOTE:**

Do not attempt to correct pipeline misalignment by means of flange bolting.

The valve may be installed in any position and offers tightness in both directions. However we do not recommend installing the valve with the actuator on the underneath side because dirt in the pipeline may then enter the body cavity and damage the gland packing. The position to be avoided is shown in Fig. 10.

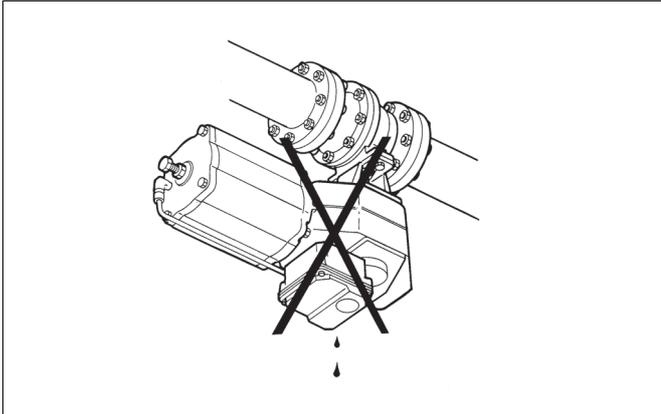


Fig. 10 Avoid this mounting position

It may be necessary to firmly support the pipeline in order to protect the valve from excess stress. Sufficient support will also reduce pipeline vibration and thus ensures proper functioning of the positioner.

To facilitate servicing, it is preferable that the valve be supported by the body, using pipe clamps and supports. Do not fasten supports to the flange bolting or to the actuator, see Fig. 11.

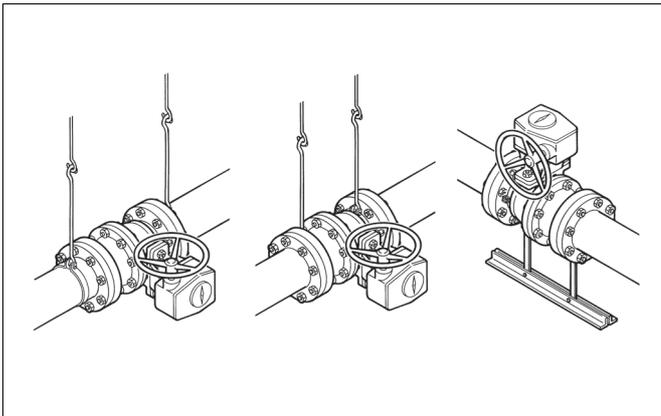


Fig. 11 Supporting the valve

### 3.2.1 Valve insulation

If necessary, the valve may be insulated. Insulation must not continue above the upper level of the valve body, see Figure 12.

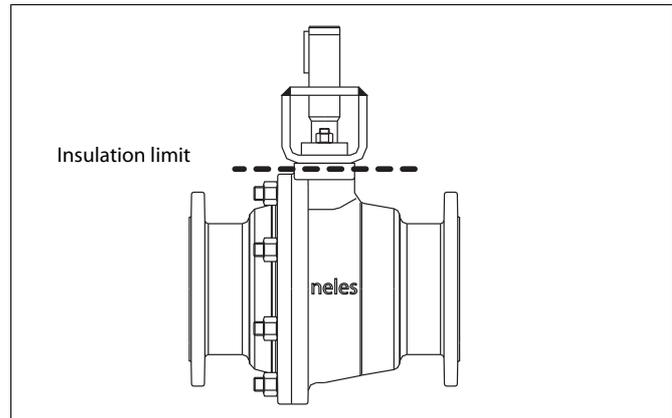


Fig. 12 Insulation of the valve

### 3.3 Actuator

**NOTE:**

When installing the actuator on the valve, make sure that the valve package functions properly. Detailed information on actuator installation is given in Section 6 or in the separate actuator instructions.

The valve open/closed position is indicated as follows:

- by an indicator on the actuator  
or
- by a groove at the end of the ball shaft (parallel to the ball flow opening).

If there is any uncertainty about the indicator, check the ball position by the groove.

The actuator should be installed in a manner that allows plenty of room for its removal.

The upright position is recommended for the actuator cylinder.

The actuator must not touch the pipeline, because pipeline vibration may interfere with its operation.

In certain cases it may be considered advantageous to provide additional support to the actuator. These cases will normally be associated with large actuators, extended shafts, or where severe vibration is present. Please contact Metso's Automation business for advice.

### 3.4 Commissioning

Ensure that there is no dirt or foreign objects left inside the valve or pipeline. Flush the pipeline carefully. Make sure that the valve is entirely open when flushing.

Ensure that all nuts, pipings, and cables are properly fastened.

Check that the actuator, positioner, and switch are correctly adjusted. Actuator adjustment is explained in Section 6. To adjust the accompanying device refer to the separate control equipment instruction manuals.

## 4 MAINTENANCE

### CAUTION:

Observe the safety precautions mentioned in Section 1.8 before maintenance!

### CAUTION:

When handling the valve or the valve package as a whole, bear in mind the weight of the valve or the entire package!

### 4.1 Maintenance general

Although Metso's Neles valves are designed to work under severe conditions, proper preventative maintenance can significantly help to prevent unplanned downtime and in real terms reduce the total cost of ownership. Metso recommends inspecting the valves at least every five (5) years. The inspection and maintenance interval depends on the actual application and process condition. The inspection and maintenance intervals can be specified together with your local Metso experts. During this periodic inspection the parts detailed in the Spare Part Set should be replaced. Time in storage should be included in the inspection interval.

Maintenance can be performed as presented below. For maintenance assistance, please contact your local Metso office. The part numbers in the text refer to the exploded view and to the parts list in Section 10, unless otherwise stated.

### NOTE:

When sending goods to the manufacturer for repair, do not disassemble them. Clean the valve carefully and flush the valve internals. For safety reasons, inform the manufacturer of the type of medium used in the valve (include material safety datasheets (MSDS)).

### NOTE:

In order to ensure safe and effective operation, always use original spare parts to make sure that the valve functions as intended.

### NOTE:

For safety reasons, replace pressure retaining bolting if the threads are damaged, have been heated, stretched or corroded.

### 4.2 Replacing the gland packing while the valve is in the pipeline

### CAUTION:

Do not dismantle the valve or remove it from the pipeline while the valve is pressurized!

### CAUTION:

For safety reasons the retainer plates (42) **MUST** always be installed (size 2") as shown in 9.2 

The V-ring gland packing requires no regular tightening. The gland packing tightness is provided by the pipeline pressure together with gland pressure against the packing rings. In graphite gland packings, tightness is ensured by contact between the gland (9) and the packing rings.

The gland packing (69) must be changed if leakage occurs even after the hex nuts (18) have been tightened. The V-ring gland packing must be tightened with care because excess force may damage the V-rings.

- Make sure that the valve is not pressurized.
- Detach the actuator and bracket according to the instructions in Section 4.4.
- Remove the key (10).
- Remove the hexagon nuts (18), disc spring sets (150), one stud (14) and retainer plates (42, size 2" only) and gland (9).
- Remove the packing rings (69) from around the shaft using a knife or other pointed instrument. Make sure that there is no damage to the shaft or the counterbore. Please note that the thrust ring (67) may come off as you remove the packing. It should be placed back in its position before installing the new packing.
- Clean the packing ring counterbore.
- Place the new packing rings (69) over the shaft (5). The gland (9) may be used for pushing the rings into the counterbore. Do not damage packing rings in the shaft keyway. See Fig. 14. Screw down the removed stud.
- Deform the packing rings first by tightening the gland nuts without disc springs to the torque  $T_t$ , see the value from Table 1.
- Remove the gland nuts and one stud, mount the retainer plates (42, size 2" only) and the removed stud and place the disc spring sets (150) on the gland studs. Tighten the nuts (18) so that the disc springs are compressed to the height  $H_c$ , see Table 1. Lock the nuts with locking compound e.g. Loctite 221. See Fig. 14.
- Check for leakage when the valve is pressurized.

Table 1 Tightening of the gland packing

Valve size	A (mm)	Hc (mm)	Tt (Nm)
01"	20	20.4	5
1 1/2"	20	20.1	5
02", 03"	20	28.9	10
04"	25	28.8	12

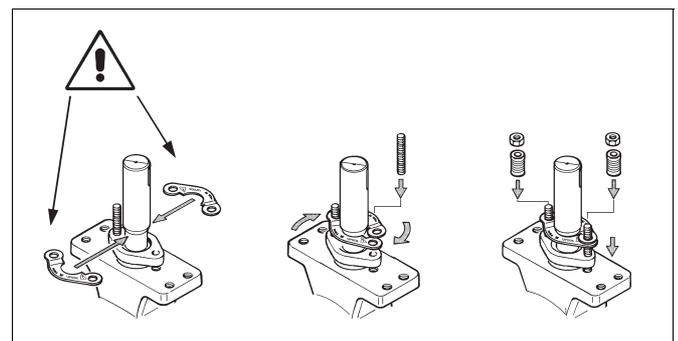


Fig. 13 Installing the retainer plates

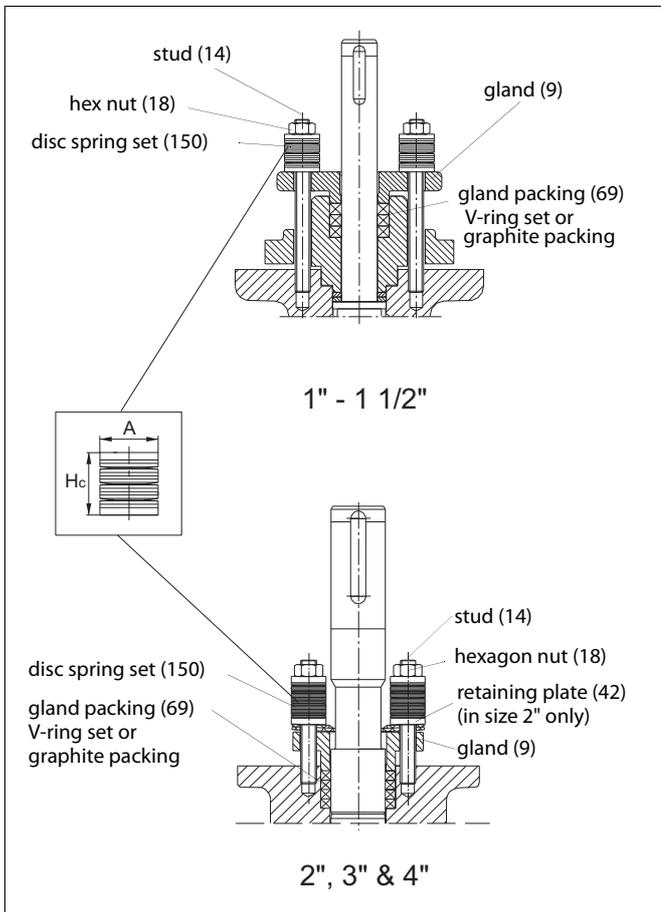


Fig. 14 Gland packing

### 4.3 Repair of a jammed or stuck valve while it is in the pipeline

Jamming may be due to the ball (3) and seats (7) becoming clogged with flow medium. They may be cleaned by turning the ball to the partly open position and flushing the pipeline. If this does not help, follow the instructions in the following sections.

### 4.4 Detaching the actuator

#### CAUTION:

**When handling the valve or the valve package as a whole, bear in mind the weight of the valve or the entire package!**

#### NOTE:

Before dismantling, carefully observe the position of the valve with respect to the actuator and positioner/limit switch so as to make sure that the package can be properly re-assembled.

It is generally most convenient to detach the actuator before removing the valve from the pipeline. If the valve is small or if it is difficult to access, it may be more practical to remove the entire package at the same time.

Note that the seats can be replaced without detaching the actuator.

- Close and detach the actuator pressure supply pipeline and remove control cables.
- Unscrew the bracket screws.
- Detach the actuator. The actuator can be removed by hand or with a special tool made for this purpose.

The tool can be ordered from the manufacturer (see Section "Tools").

- Remove the bracket and coupling.

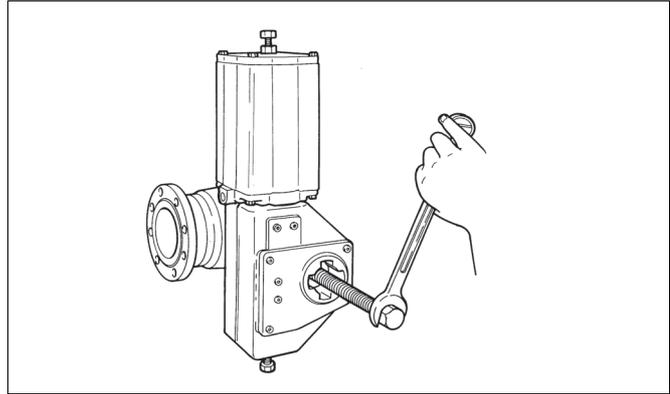


Fig. 15 Removing the actuator with an extractor

## 4.5 Removing the valve from the pipeline

#### CAUTION:

**Do not dismantle the valve or remove it from the pipeline while the valve is pressurized!**

- Make sure that the valve is not pressurized and that the pipeline is empty. Make sure that the medium cannot flow into the section where servicing is to take place.
- Support the valve carefully with a hoist. Place ropes carefully and unscrew the pipe flange bolts. See that the ropes are positioned correctly, see Fig. 9. Lift valve down.

## 4.6 Dismantling the valve

### 4.6.1 Sizes 1" - 1 1/2"

- Place the valve in a standing position on the pipe flange end so that the body cap points upwards. Use a level surface that will not scratch the pipe flanges.
- Mark the body halves for correct orientation during re-assembly.
- Remove the key (10).
- Unfasten the gland nuts (18). Remove the disc springs (150), the gland (9) and the packing rings (69).
- Unfasten the bolts of the bonnet (8). Remove the bonnet, the gasket (66), the shaft (5) and the thrust bearings (70, 71).
- Unscrew the body stud nuts (16).

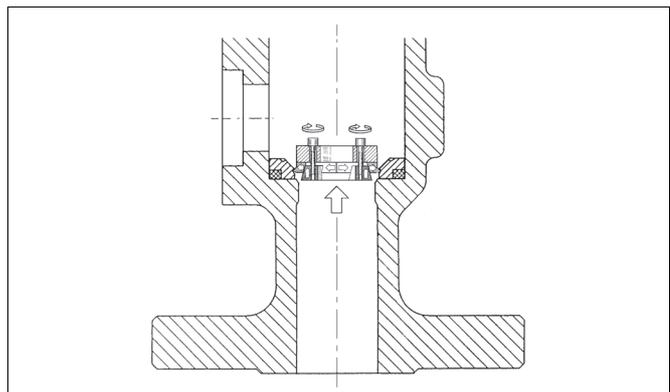


Fig. 16 Removing the locked seat

- ❑ Remove the body cap (2). If the seat (7) is not lying on the ball (3), prevent the seat from falling from the body cap and detach it later. **Don't leave your fingers between the body cap and the surface!** Stand the removed body cap on its pipe flange
- ❑ Remove the locked seat (7) using a outpulling tool, see Fig. 16. See also Section 8 'Tools'.

#### 4.6.2 Size 2"

- ❑ Place the valve in a standing position on the pipe flange end. Use a level surface that will not scratch the flanges. See that the body stud nuts (16) are facing upward.
- ❑ Mark the body halves for correct orientation during re-assembly.
- ❑ Turn the ball to the closed position.
- ❑ Remove the key (10).
- ❑ Unscrew the body stud nuts (16).
- ❑ Remove the body cap (2). If the seat (7) is not lying on the ball (3), prevent the seat from falling from the body cap and detach it later. **Don't leave your fingers between the body cap and the surface!** Stand the removed body cap on its pipe flange. See Fig. 17.

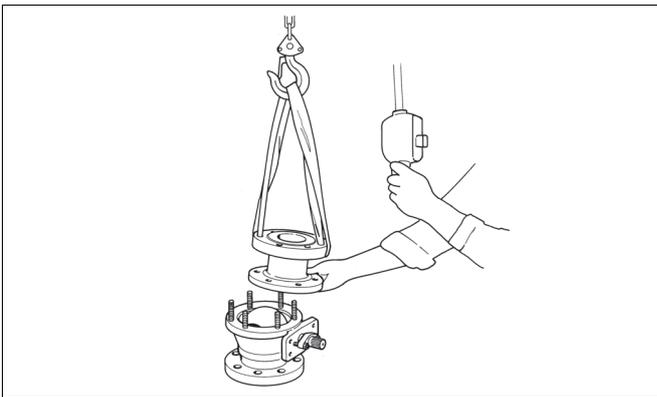


Fig. 17 Lifting the body cap

- ❑ Remove the seat from body cap if it is still in place. If the seat is locked, it must be removed using a special tool. See Fig. 18 and Section "Tools".

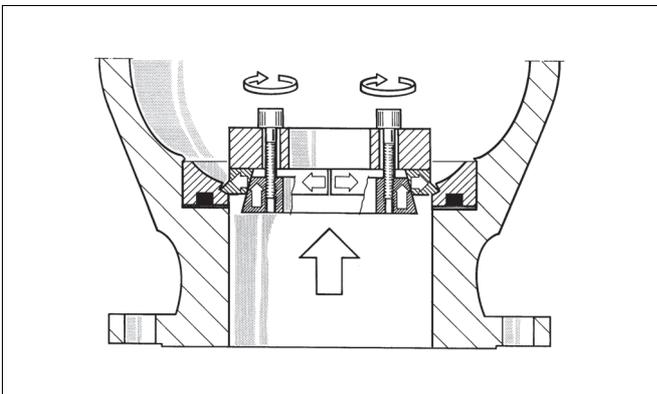


Fig. 18 Removing the locked seat

- ❑ Lift the ball (3) from the body (1) by gripping by the flow bore (small sizes) or by passing a rope through the flow bore and turning it at the same time around the flow bore axis. Handle the ball carefully and place it on a soft surface. See Fig. 19.

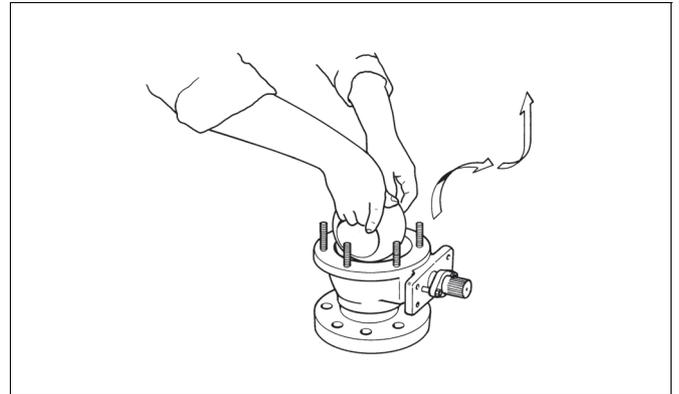


Fig. 19 Removing the ball

- ❑ Pull the spline driver (4) from the shaft (5) and remove the seat (7) from the lower body half (1).
- ❑ Remove the nuts (18), disc springs, the retaining plates and the gland (9).
- ❑ Push the shaft into the body and remove it.
- ❑ Remove thrust bearing(s) (70), secondary shaft seal (71), packing rings (69) and body gasket (65). Also remove back seals (63) in ball seats.

#### 4.6.3 Sizes 3" - 4"

- ❑ Place the valve in a standing position on the pipe flange end. Use a level surface that will not scratch the flanges. See that the body stud nuts (16) are facing upward.
- ❑ Mark the body halves for correct orientation during re-assembly.
- ❑ Turn the ball to the closed position.
- ❑ Remove the key (10).
- ❑ Remove the gland studs nuts (18) and the gland (9).
- ❑ Remove the bottom flange (78) by removing the screws (13). (Bottom flange not required on all sizes).
- ❑ Remove the nuts (16) that fasten the body cap to the body.
- ❑ Lift the body cap (2) off the body studs being careful not to damage the seat (7) that is locked into the cap.
- ❑ Remove the ball by turning the shaft (5) so that the slot in the ball is in line with the body waterway, and rotate the ball (3) out of the body.
- ❑ Remove the shaft (5) and thrust washers (70, 71) by sliding the shaft down through the stuffing box and out of the body.
- ❑ Remove the shaft packing (69) from the stuffing box by means of a hooked wire or special tool.
- ❑ Remove the seat (7) and seat spring (62) from the seat recess in the body.
- ❑ Remove the seat locked in the body cap (2) by carefully grinding or chiselling off the locking points.
- ❑ Remove the seat by turning the body cap over allowing the seat to fall from the seat cavity into your hand or onto a soft object.

## 4.7 Inspection of removed parts

- ❑ Clean removed parts.
- ❑ See if the shaft (5) or thrust bearings (70, 71) are damaged.
- ❑ See if the ball (3) or seats (7) are damaged (scratched) by examining them under bright light. The ball and the seat can be replaced if necessary.
- ❑ See if the body joint flanges are damaged.

## 4.8 Replacing parts

We recommend that soft material parts be replaced whenever the valve is dismantled for servicing. Other parts may be replaced if necessary. Always use genuine spare parts to ensure proper functioning of the valve (see Section "Ordering spare parts").

## 4.9 Assembly

### 4.9.1 Sizes 1" and 1 1/2"

- ❑ Place the valve body (1) in a standing position on the pipe flange end. Use a level surface that will not scratch the flanges.

#### H seats:

- ❑ Place the back seal (63) into the seat (7), see Fig. 20, and then both parts all the way into the body counterbore.

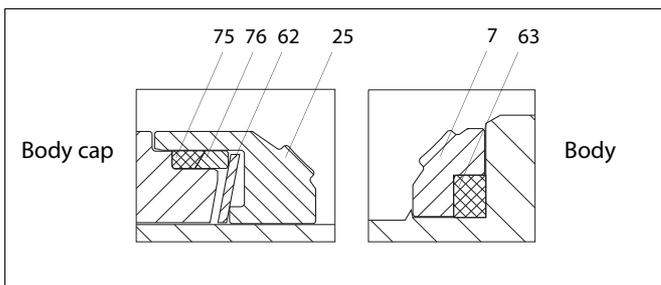


Fig. 20 H seat

- ❑ Lock the seat into the body using a special tool that can be ordered from the manufacturer. The tool is accompanied by operating instructions.
- ❑ Place the ball on the locked seat so that the slot faces the shaft entrance opening. Push the shaft (5) into the valve from outside. Make sure that the end of the shaft fits into the ball slot.
- ❑ Assemble the seat (25), spring (62), back seal (75) and back-up ring (76), see Fig. 20, and place the assembly in the body cap (2).

#### G seats:

- ❑ Place the back seal (63) into the seat (7), see Fig. 21, and then both parts all the way into the body counterbore.

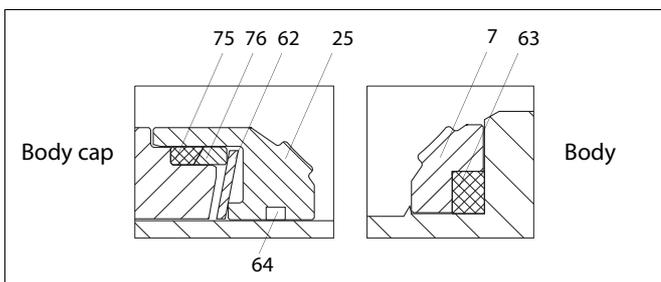


Fig. 21 G seat

- ❑ Lock the seat into the body using a special tool that can be ordered from the manufacturer. The tool is accompanied by operating instructions.
- ❑ Place the ball on the locked seat so that the slot faces the shaft entrance opening. Push the shaft (5) into the valve from outside. Make sure that the end of the shaft fits into the ball slot.
- ❑ Assemble the seat (25) with back seal (64), spring (62), back seal (75) and back-up ring (76), see Fig. 21, and place the assembly in the body cap (2).

#### J seats:

- ❑ Install back seals (63) as per Table 2 to both body halves. The seal on top of stack shall always be 1 mm thick and the others are either 1 mm or 0.4 mm.

Table 2 Seal thicknesses

Size	TU		T1		T2	
	1 mm	0.4 mm	1 mm	0.4 mm	1 mm	0.4 mm
1"	2 pcs	3 pcs	2 pcs	4 pcs	2 pcs	5 pcs
1H"	5 pcs	3 pcs	5 pcs	5 pcs	6 pcs	4 pcs
2"	7 pcs	5 pcs	9 pcs	3 pcs	10 pcs	2 pcs
3"	12 pcs	5 pcs	14 pcs	2 pcs	16 pcs	2 pcs
4"	16 pcs	1 pc	18 pcs	2 pcs	19 pcs	2 pcs

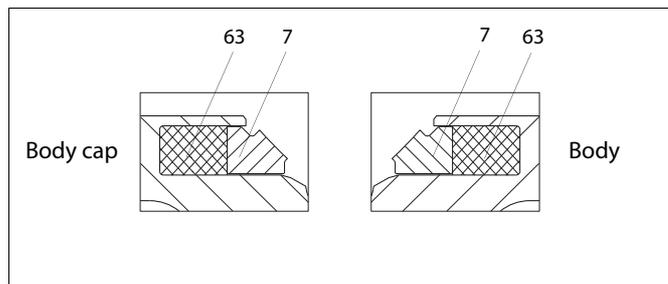


Fig. 22 J seat

- ❑ Set back seal pressing tool on top of seal stack as seen in Fig. 23.

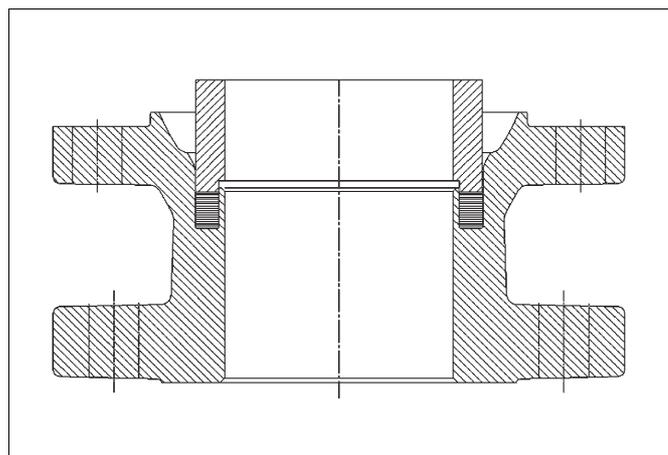


Fig. 23 Compressing the J seat

- ❑ Compress back seal stack with pressing tool using forces found on the Table 3. Avoid damaging sealing faces of the flange during compression. Let the compression of the back seal stack effect about 5 minutes. Repeat same procedure to the other body half.

Table 3 Compression force

Valve size	Tool ID	Force (kN / lbf·ft)		
		TU	T1	T2
1"	F08561	8 / 1800	16 / 3600	25 / 5620
1H"	F08559	17 / 3822	35 / 7870	50 / 11240
2"	F07700	20 / 4497	39 / 8770	60 / 13500
3"	F07698	35 / 7869	70 / 15740	100 / 22480
4"	F07517	50 / 11241	105 / 23600	150 / 33720

- ❑ Set body seat to its cavity.
- ❑ Add bearings, spline driver, locking pin, shaft and key.
- ❑ Install the ball.
- ❑ Set the other seat on top of the ball.
- ❑ Add body gasket.
- ❑ Lift the body cap on top of body and smoothly attach body halves.
- ❑ Tighten at least 2 body flange joint nut at opposite sides.
- ❑ Lift the valve under the clamp and compress body flanges together (metal to metal contact).
- ❑ Operate the valve and if the torque is reasonable (operable with hand lever), tighten all body flange nuts. Use V-ring set during operation.
- ❑ Measure the torque and compare it to values in Table 4.

Table 4 Operating torque

Size	Torque (Nm / lbf·ft)		
	TU	T1	T2
1"	10 ± 2 / 8 ± 2	15 ± 2 / 12 ± 2	20 ± 2 / 16 ± 2
1H"	20 ± 4 / 15 ± 3	30 ± 4 / 22 ± 3	40 ± 4 / 30 ± 3
2"	30 ± 7 / 23 ± 6	45 ± 7 / 34 ± 6	60 ± 7 / 46 ± 6
3"	70 ± 14 / 52 ± 11	100 ± 14 / 78 ± 11	140 ± 14 / 104 ± 11
4"	150 ± 20 / 111 ± 15	220 ± 20 / 166 ± 15	300 ± 20 / 222 ± 15

- ❑ If the measured torque meets the value given in the table, finish the assembly (see below). If the measured torque exceeds these limits, dismantle body flange joint and lift body cap on the table (do not drop seat).
- ❑ Remove from body cap back seal stack one 0.4 mm thick shim. Repeat the assembly as described earlier (up from item 11). If the torque is still too high remove one 0.4 mm shim from body back seal stack. Continue until appropriate torque is achieved. Accordingly, if the torque is too low, add one 0.4 mm shim.
- ❑ Finish the assembly, see below. Do not forget to change the V-ring set back to graphite rings.
- ❑ Tightness requirement meets ISO 5208 Rate D. Test pressure is 6 bar with air. If the valve leak exceeds the allowable limits, relap seats, check the torque and measure tightness again. **(NOTE: Torque values on Table 3 do not include torque caused by graphite packing).**

**All versions:**

- ❑ Slip the thrust bearings (70) onto the shaft and push them against the shaft shoulder. Put the bonnet gasket (66) in its groove, replace the bonnet (8) and tighten the studs (13). Tighten the nuts (18) of the studs (13) evenly to achieve uniform compression of the gasket (66).
- ❑ Place the body gasket (65) into the body, on the shoulder at the foot of the threads.
- ❑ Mount the body cap and seat assembly onto the body. Fasten the body nuts (16). Tighten the nuts gradually, always switching to other side of the valve after every nut. The recommended torques are given in Table 5.

Table 5 Recommended tightening torques

Recommended tightening torques (Nm)			
Valve size	Thread	Stainless steel	Carbon steel
1", 2"	5/8" or M16	114-133	118-140
1 1/2"	3/4" or M20	173-203	184-214
3"	7/8 UNC	214-251	280-329
4"	1 UNC	310-360	490-580

NOTE: Threads must be well lubricated. If studs and nuts are unlubricated and have been used before, torques must be about 50 % higher.

- ❑ Push the packing rings (69) into their place in the bonnet (8). Tighten the studs (14). Place the gland (9) on the packing (69). See section 4.2 for packing assembly instructions.
- ❑ Mount the key (10).
- ❑ Check the gland packing for leakage when the valve is pressurized.
- ❑ Install the valve in the pipeline, as carefully and accurately as when removed it. Note the instructions in Section 3.

**4.9.2 Size 2"**

**CAUTION:**  
**For safety reasons the retainer plates (42) MUST always be installed as shown in 9.2.**

Place the valve body on its pipe flange. Use a surface that does not damage the pipe flanges.

**S seats:**

- ❑ Place the back seal (63) in the ball seat (7); see Fig. 24. Place the seat in the body (1).

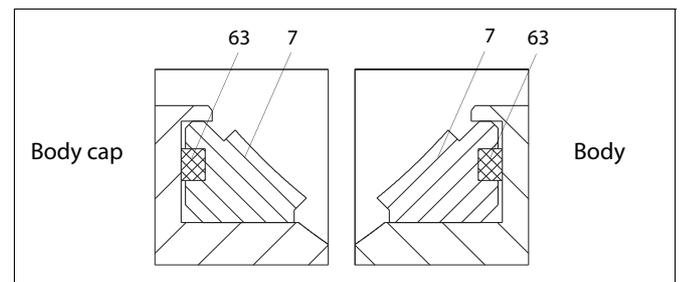


Fig. 24 S seat (2")

**K seats:**

- ❑ Place the back seal (63) into the body counterbore. Then place the seat (7) into the body counterbore, see Fig. 25.
- ❑ Lock the seat into the body using a special tool. See Section 4.9.4 for instructions.
- ❑ Place the back seal (63) in the ball seat (7); see Fig. 25. Place the seat in the body cap (2). Lock the seat with a special tool. See Section 4.9.4 for instructions.

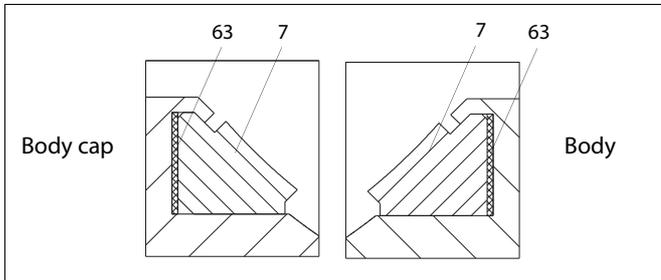


Fig. 25 K seat (2'')

**H seats:**

- ❑ Place the back seal (63) into the body counterbore. Then place the seat (7) into the body counterbore, see Fig. 26.
- ❑ Lock the seat into the body using a special tool. See Section 4.9.4 for instructions.
- ❑ Place the back seal (75), back-up ring (76), spring (62) and the seat (25) into body cap, Fig. 26.

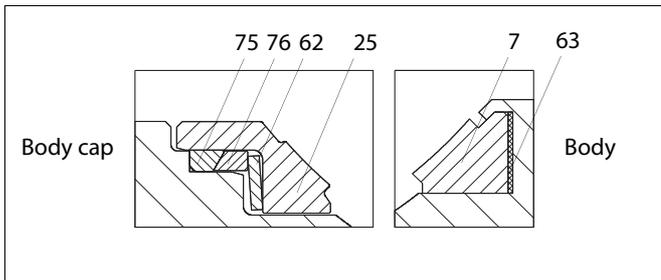


Fig. 26 H seat (2'')

**G seats:**

- ❑ Place the back seal (63) into the body counterbore. Then place the seat (7) into the body counterbore, see Fig. 27.
- ❑ Lock the seat into the body using a special tool. See Section 4.9.4 for instructions.
- ❑ Place the back seal (75), back-up ring (76), spring (62) and the seat (25) with back seal (64) into body cap, see Fig. 27.

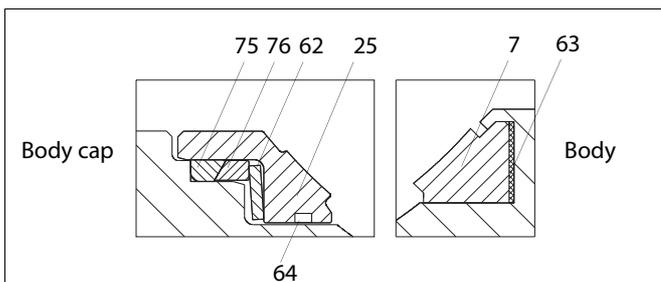


Fig. 27 G seat (2'')

**J seats:**

See 4.9.1 details.

**All versions:**

- ❑ Place the shaft partly inside the body from above and place the thrust bearings (70) on the shaft from inside the body. Place the spline driver (4) on the shaft spline and lock it with a pin (50).
- ❑ Put the ball (3) in its position so that the spline driver is in the ball slot. Pull the shaft to make sure that the pin locks the spline driver properly to the shaft.
- ❑ Place the packing (69), the studs (14) and the gland (9) in their position. Place the nuts (18) on the studs (14) and screw down them gently.
- ❑ Place the body gasket (65) in the body groove.

**S seats:**

- ❑ Place the seat on the ball.

**All versions:**

- ❑ Carefully place the body cap (2) on the body. Make sure that the marks made during dismantling are aligned.
  - Do not drop the H seat from the body cap!**
- ❑ Fasten the body nuts (16). Tighten the nuts gradually, always switching to other side of the valve after every nut. The recommended torques are given in Table 5. The flange faces must be in even contact with each other.
- ❑ Mount the key (10).
- ❑ To make sure that the ball lies properly between the seats, turn the shaft slowly in both directions two or three times.
- ❑ Assemble, deform and adjust the packing as shown in Section 4.2.
- ❑ Check the gland packing for leakage when the valve is pressurized.
- ❑ Install the valve in the pipeline, as carefully and accurately as when removed it. Note the instructions in Section 3.

**4.9.3 Size 3"-4"**

- ❑ Place the valve body on its pipe flange. Use a surface that does not damage the pipe flanges.

**H seats:**

See 4.9.1 for details.

**G seats:**

See 4.9.1 for details.

**J seats:**

See 4.9.1 for details.

**All versions:**

- ❑ Place the thrust bearings (70, 71) onto the shaft and insert into the pocket of the valve. (**NOTE:** the thrust bearings may not fit through the bottom of the valve in all sizes and therefore have to be inserted through the side of the valve and onto the shaft).
- ❑ Pull the shaft through the stuffing box until the thrust washer fits into the mating recess in the body.

- ❑ If required, replace the bottom flange (78) using a new gasket (79). Coat the screws (13) with anti-galling compound, replace and torque them to the proper value as shown in Table 6.

Table 6 Tightening torques for bottom flange screws

Valve size	Thread	Torque (Nm)
03"	1/2 UNC	100
04"	5/8 UNC	210

- ❑ Turn the shaft so that the blade is in line with the bore of the valve, then insert the ball into the body by rotating the slot in the ball onto the blade.
- ❑ If removed prior, coat body studs (12) with anti-galling compound and screw them into the body until they bottom out in the holes.
- ❑ Verify that the body gasket groove is free of contaminate, then place a new body gasket (65) in the groove.
- ❑ Place the body cap (2) over the body studs being careful not to damage the seat or pinch the body gasket.
- ❑ Coat the bearing surfaces of the body stud nuts with anti-galling compound and screw them on the body studs using a criss-cross tightening sequence. Torque the nuts to the value shown in Table 5.
- ❑ Install new packing (69) in the stuffing box.
- ❑ If removed prior, coat the gland studs (14) with anti-galling compound and screw them into the body until they bottom out in the holes.
- ❑ To make sure that the ball lies properly between the seats, turn the shaft slowly in both directions two or three times.
- ❑ Assemble, deform and adjust the packing as shown in Section 4.2.
- ❑ Check the gland packing for leakage when the valve is pressurized.
- ❑ Install the valve in the pipeline, as carefully and accurately as when removed it. Note the instructions in Section 3.

#### 4.9.4 Locking of the seat

A seat locking tool (can be ordered from the manufacturer) and a hydraulic press with suitable capacity are needed for locking.

- ❑ Mount the seat with the back seal as described in the earlier sections.
- ❑ Mount the locking tool carefully over the seat, see Fig. 28.
- ❑ Place the valve body/body cap on the bed of the press. The bed surface must be level and non-scratching.
- ❑ Use forces from the Table 7.

Table 7 Pressing forces for seat locking

Valve size	Force (N)
02"	70 000
03"	140 000
04"	200 000

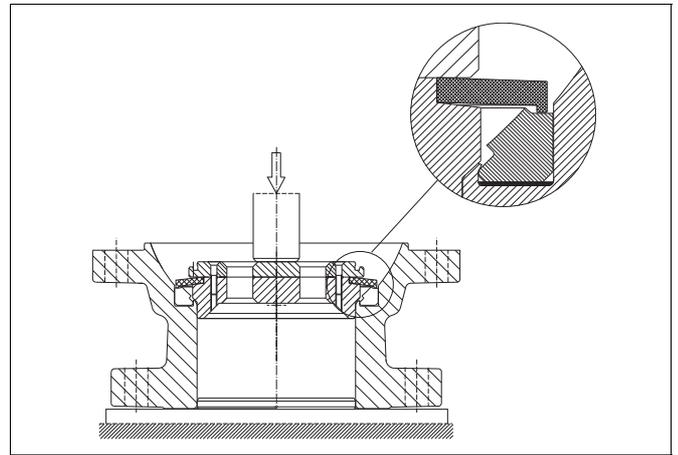


Fig. 28 Locking of the seat

## 5 INSTALLING THE ACTUATOR

### 5.1 General

Different Metso actuators can be mounted using suitable brackets and couplings. The valve can be actuated by an M-series handwheel operator or B1-series actuators.

### 5.2 Installing the M-series handwheel operator

- ❑ The mark at the end of the shaft indicates the direction of the ball flow bore. Turn the valve to the closed position.
- ❑ Lubricate the operator shaft bore and the shaft. Place the bracket on the valve and turn the lubricated screws a few times.

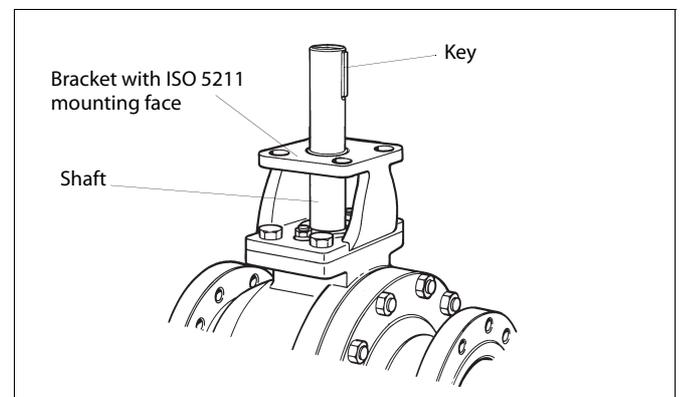


Fig. 29 Bracket mounted on valve

- ❑ Turn the actuator to the closed position and push it carefully onto the valve shaft. Please note the marks on the handwheel and the shaft.
- ❑ Lubricate the operator screws. Tighten all screws.
- ❑ Adjust the circular movement of the ball with the hexagon screws located at the side of the housing (see Fig. 30). The stop-screw for the open position is nearest to the handwheel on the side of the housing and the screw for the closed position is at the opposite end. The turning directions for the handwheel are marked on the wheel.
- ❑ Check the handwheel by turning the valve to the extreme positions. The yellow arrow should indicate the direction of the ball flow bore.

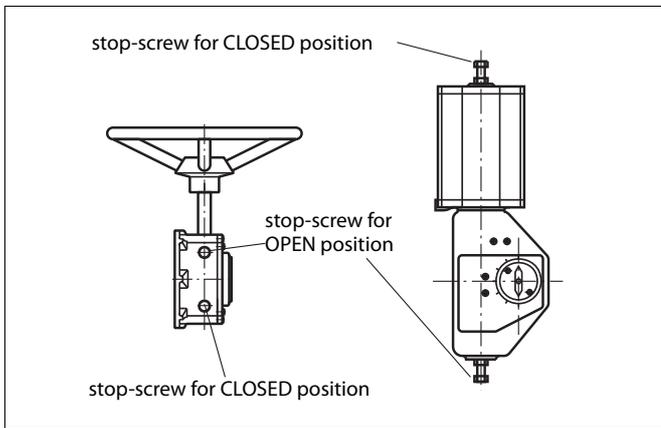


Fig. 30 Open and closed positions of the actuator

### 5.3 Installing the B1C-series actuator

#### CAUTION:

#### Beware of ball cutting movement!

- ❑ Turn the valve to the closed position and drive actuator piston to the extreme outward position.
- ❑ File off any burrs and clean the shaft bore.
- ❑ Note the correct position. The line at the end of the shaft indicates the direction of the ball flow bore.
- ❑ Lubricate the valve shaft and shaft bore. Fasten the bracket loosely to the valve.
- ❑ Slip the actuator carefully onto the shaft. Avoid forcing it since this may damage the ball and seats. We recommend mounting the actuator so that the cylinder is pointing upwards.
- ❑ Position the actuator parallel or vertical to the pipeline as accurately as possible. Lubricate the actuator mounting screws and then fasten all screws.
- ❑ Adjust the ball open and closed positions by means of the actuator stop screws located at both ends (see Fig. 30).

An accurate open position can be seen in the body flow bore. Check that the yellow arrow on the actuator indicates the ball flow opening position. **Keep fingers out of the flow bore!**

There is no need for stop screw adjustment if the actuator is re-installed in the same valve. Drive actuator piston to the housing end (open position). Turn the actuator by hand until the valve is in the open position. Fasten the actuator in this position as explained above.

- ❑ Check the stop screw thread tightness. An O-ring is used for sealing.
- ❑ Check that the actuator is functioning correctly. Drive the actuator piston to both cylinder ends and check the ball position and its movement with respect to the actuator (close: clockwise; open: counterclockwise). The valve should be closed when the piston is in the extreme outward position.
- ❑ If necessary, change the position of the actuator pointing cover to correctly indicate the valve open/closed position.

### 5.4 Installing the B1J-series actuator

Spring-return actuators are used in applications where valve opening or closing movement is needed in case the air supply is interrupted.

The B1J type is used for spring-to-close operation; the spring pushes the piston towards the cylinder end, the extreme outward position. In turn, the B1JA type is used for spring-to-open operation; the spring pushes the piston towards the housing.

Spring-return actuators are installed in a manner similar to B1C-series actuators, taking into account the following.

#### 5.4.1 B1J-type

- ❑ Install the actuator so that the piston is in the extreme outward position. The cylinder must not be pressurized and air supply connections must be open. The valve must be in the **closed** position.

#### 5.4.2 B1JA-type

- ❑ Install the actuator so that the piston is in the cylinder end position at housing side. The cylinder must not be pressurized and air supply connections must be open. The valve must be in the **open** position.

The rest of the installation procedure is the same as in Section 5.3.

### 5.5 Installing other makes of actuators

#### NOTE:

Metso accepts no responsibility for compatibility of actuators not installed by Metso.

Other actuators can be installed only if they have an ISO 5211 actuator connection.

## 6 MALFUNCTIONS

The following Table 8 lists malfunctions that might occur after prolonged use.

## 7 TOOLS

In addition to standard tools, the following special tools might be needed.

- For removal of the actuator:

Extractor tools (Actuator Series B1C/B1J)	
Product:	ID:
B1C/B1J 6	303821
B1C 8-11 / B1J 8-10	8546-1
B1C 12-17 / B1J 12-16	8546-2
B1C/B1J 20	8546-3
B1C/B1J 25	8546-4

- For removal of the locked seats:

Seat removal tools	
Product:	ID:
DN 25 (1")	270073
DN 40 (1½")	270075
DN 50 (2")	270076
DN 80 (3")	270078
DN 100 (4")	270079

- For locking of the seats:

Seat locking tools / Insertion tools	
Size:	ID:
(1")	H018890
(1½")	H018889
(2")	H018886
(3")	H018885
(4")	H018881

These tools can be ordered from the manufacturer. Always give the valve type designation when ordering.

## 8 ORDERING SPARE PARTS

When ordering spare parts, always include the following information:

- type code, sales order number, serial number (stamped on a valve body)
- number of the parts list, part number, name of the part and quantity required

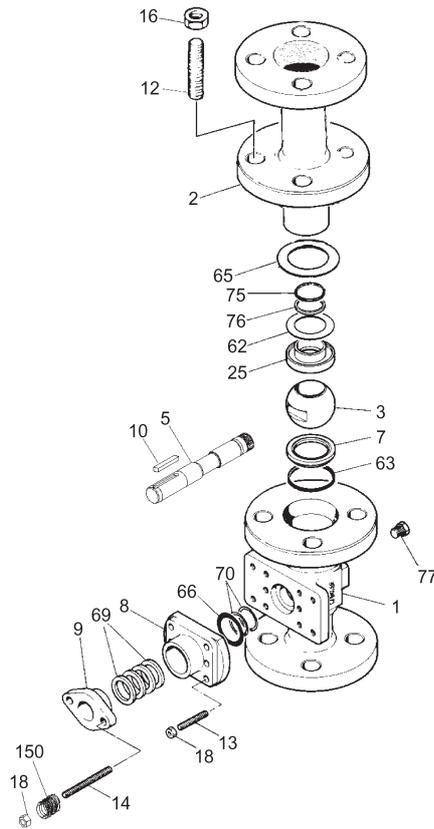
This information can be found from the identification plate or documents.

Table 8 Possible malfunctions

Symptom	Possible fault	Actions
Leakage through a closed valve	Wrong stop screw adjustment of the actuator	Adjust the stop screw for closed position
	Damaged ball surface	Turn the ball by 180°
	Damaged seat(s)	Replace seat(s)
	Ball cannot move freely	Clean the inside of the valve
Irregular valve movement	Impurities between the ball and seats	Flush the valve from the inside
		Clean the sealing surfaces and seats mechanically
Leakage through gland packing	Loose packing	Tighten the nuts
	Worn-out or damaged packing	Replace the gland packing

## 9 EXPLODED VIEWS AND PARTS LISTS

### 9.1 Sizes 1" - 1 1/2"



Item	Qty	Description	Spare part category
1	1	Body	
2	1	Body cap	
3	1	Ball	3
5	1	Shaft	3
7	1	Seat	2
		Seat (H)	2
8	1	Bonnet	
9	1	Gland	
10	1	Key	3
12		Stud	
13		Stud	
14		Stud	
16		Hexagon nut	
17		Hexagon nut	
18		Hexagon nut	
25	1	Seat	2
62	1	Seat spring	2
63	1	Back seal (H, G)	1
	2	Back seal (J)	1
65	1	Body gasket	
66	1	Gasket	1
69	1	Packing	1
70	2	Thrust bearing	3
75	1	Back seal	
76	1	Back-up ring	2
77	1	Plug	
150	2	Disc spring set	

Spare part (Spare Part Set): Recommended soft parts, always needed for the repair. Delivered as a set.

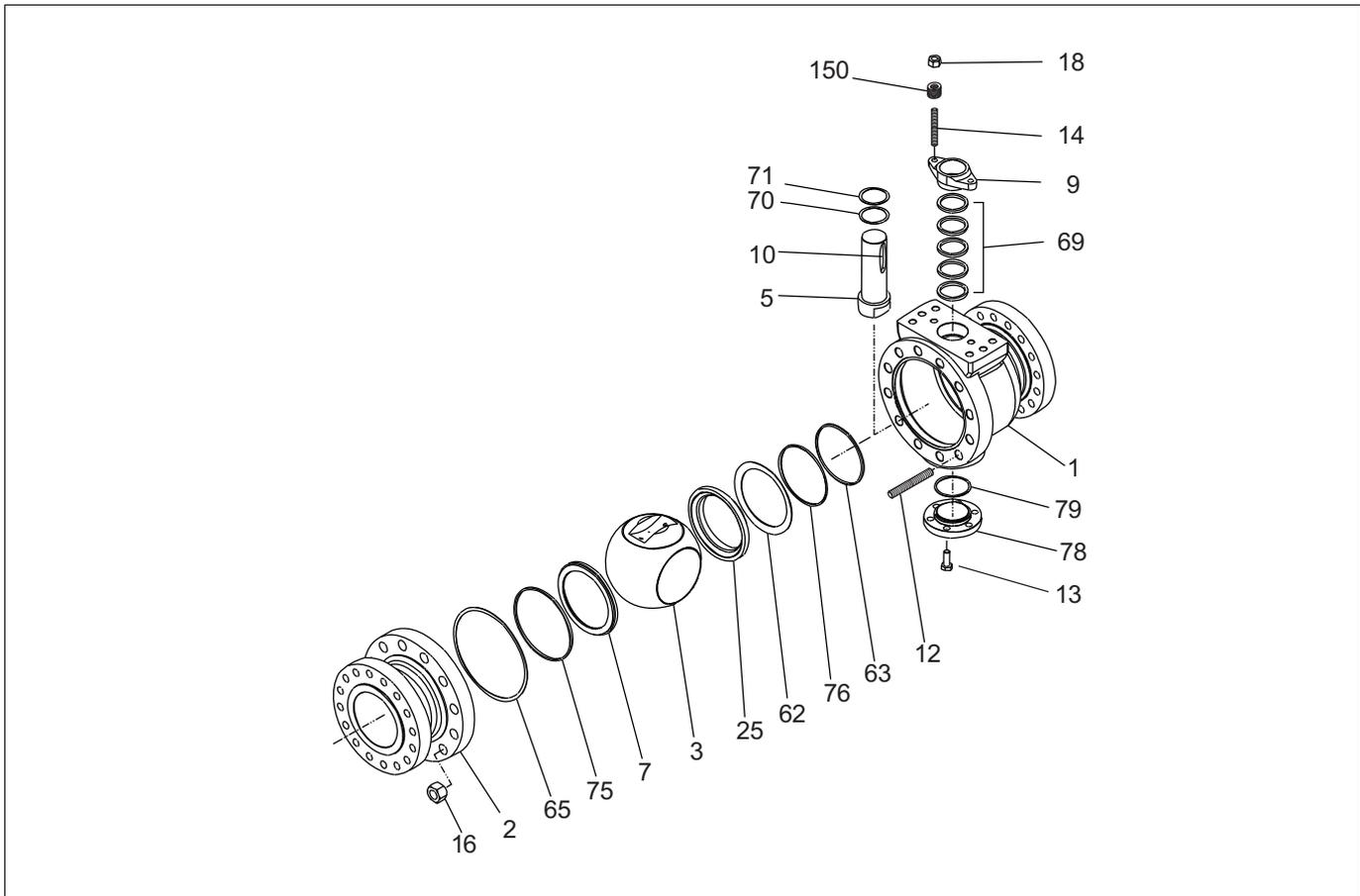
Spare part category 2: Parts for replacing of the seat. Available also as a set.

Spare part category 3: Parts for replacing of the closing element.

Spares for the full overhaul: All parts from the categories 1, 2 and 3.



### 9.3 Sizes 3" and 4"



Item	Qty	Description	Spare part category
1	1	Body	3
2	1	Body cap	
3	1	Ball	
5	1	Shaft	3
7	1	Seat	2
9	1	Gland	
10	1	Key	3
12		Stud	
13		Screw	
14		Stud	
16		Hexagon nut	
18		Hexagon nut	
25	1	Seat	2
62		Spring	2
63	1	Back seal	1
65	1	Body gasket	1
69	5	Packing ring	1
70	1	Thrust bearing	3
71	1	Thrust bearing	3
75	1	Back seal (H, G)	1
76	1	Back-up ring (H, G)	2
78	1	Bottom flange	
79	1	Gasket	
150	2	Disc spring set	

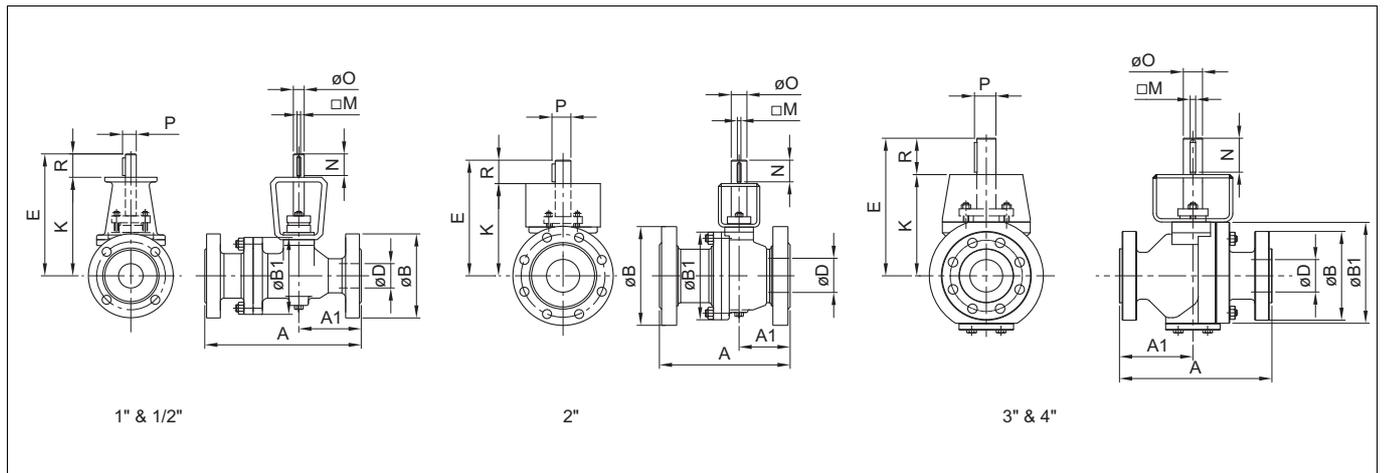
Spare part (Spare Part Set): Recommended soft parts, always needed for the repair. Delivered as a set.

Spare part category 2: Parts for replacing of the seat. Available also as a set.

Spare part category 3: Parts for replacing of the closing element.

Spares for the full overhaul: All parts from the categories 1, 2 and 3.

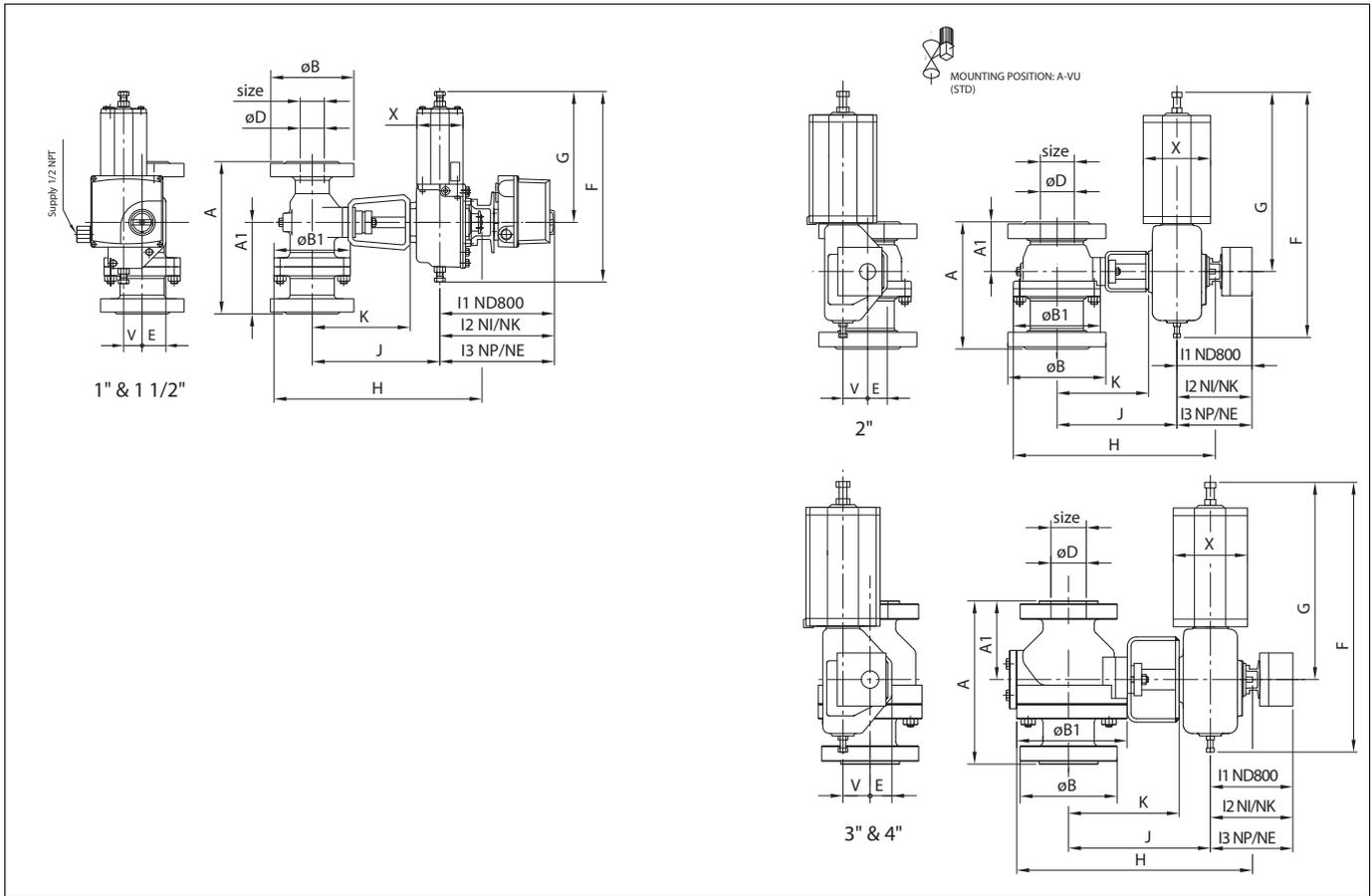
## 10 DIMENSIONS AND WEIGHTS



TYPE	SIZE	ISO FLANGE	Dimensions in mm												NPTF U1	kg
			A	A1	ØB	ØB1	ØD	E	K	M	N	ØO	P	R		
XU_F	1	F07	216	79	125	119	25.4	170	145	4.76	25	15	17	25	1/4	17
	1 1/2	F07, F10	241	86	155	148	38.1	202	172	4.76	35	20	22.2	30	1/4	26
	2	F07, F10, F12, F14	292	98	165	153	50.8	215	168	6.35	46	25	27.8	47	1/2	35
	3	F14, F16	356	172	210	239	76.2	327	246	12.70	80	45	50.4	81	-	64
	4	F14, F16, F25	432	213	275	294	101.6	383	292	12.70	90	55	60.6	91	-	141

TYPE	SIZE	ISO FLANGE	Dimensions in inch												NPTF U1	lbs
			A	A1	ØB	ØB1	ØD	E	K	M	N	ØO	P	R		
XU_F	1	F07	8.50	3.11	4.88	4.69	1	6.69	5.71	0.19	0.98	0.59	0.67	0.98	1/4	37
	1 1/2	F07, F10	9.49	3.39	6.12	5.83	1.5	7.95	6.77	0.19	1.38	0.79	0.87	1.18	1/4	57
	2	F07, F10, F12, F14	11.50	3.86	6.50	6.02	2	8.46	6.61	0.25	1.81	0.98	1.09	1.85	1/2	77
	3	F14, F16	14.02	6.77	8.25	9.41	3	12.87	9.69	0.5	3.15	1.77	1.98	3.19	-	141
	4	F14, F16, F25	17.01	8.39	10.75	11.57	4	15.08	11.50	0.5	3.54	2.16	2.39	3.58	-	311

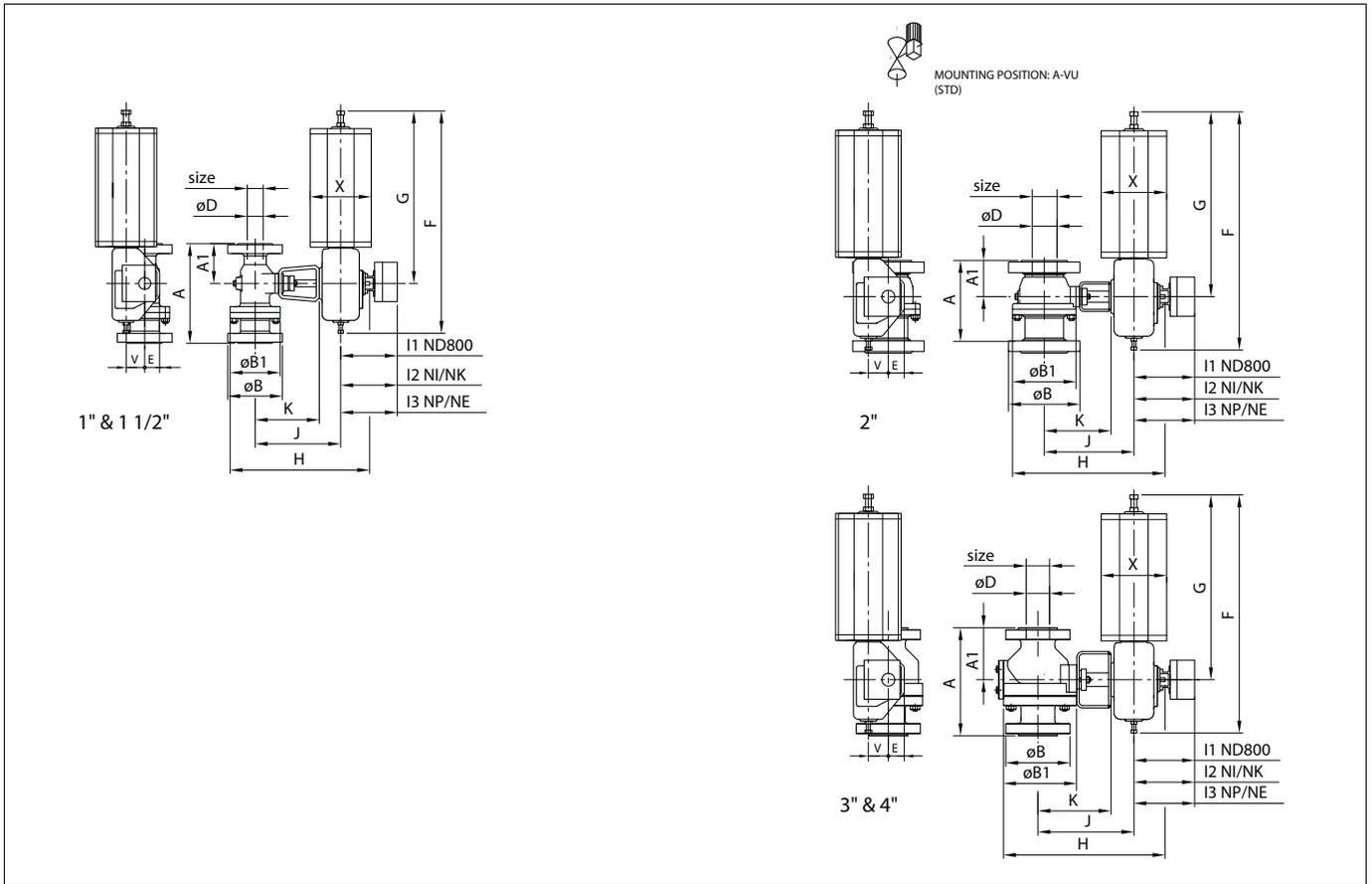
Valve and B1C actuator



Valve	DN	Actuator	Dimensions in mm															NPTF	NPT	kg	
			A	A1	ØB	ØB1	ØD	E	F	G	H	I1	I2	I3	J	K	V				X
XU01F	25	B1CU6	216	79	125	119	25.4	46	395	270	343	225	210	215	203	145	36	90	1/4	1/4	23
XU1HF	40	B1CU9	241	86	155	148	38.1	50	450	315	386	225	210	215	231	172	43	110	1/4	1/4	38
		B1CU11	241	86	155	148	38.1	50	535	375	410	230	215	225	237	172	51	135	1/4	3/8	44
XU02F	50	B1CU11	292	98	165	153	50.8	50	535	375	409	230	215	225	233	168	51	135	1/2	3/8	53
		B1CU13	292	98	165	153	50.8	65	640	445	435	250	235	245	249	168	65	175	1/2	3/8	68
XU03F	80	B1CU13	356	172	210	239	76.2	65	640	445	556	250	235	245	327	246	65	175	-	3/8	97
		B1CU17	356	172	210	239	76.2	70	785	555	588	270	255	260	342	246	78	215	-	1/2	120
XU04F	100	B1CU20	432	213	275	294	101.6	80	880	590	701	290	275	280	407	292	97	215	-	1/2	216
		B1CU25	432	213	275	294	101.6	110	1075	725	743	310	295	300	430	292	121	265	-	1/2	274

Valve	DN	Actuator	Dimensions in inch															NPTF	NPT	LBS	
			A	A1	ØB	ØB1	ØD	E	F	G	H	I1	I2	I3	J	K	V				X
XU01F	1	B1CU6	8.50	3.11	4.88	4.69	1.00	1.81	15.55	10.63	13.50	8.86	8.27	8.46	7.99	5.71	1.42	3.54	1/4	1/4	51
XU1HF	1 1/2	B1CU9	9.49	3.39	6.10	5.83	1.50	1.97	17.72	12.40	15.20	8.86	8.27	8.46	9.09	6.77	1.69	4.33	1/4	1/4	83
		B1CU11	9.49	3.39	6.10	5.83	1.50	1.97	21.06	14.76	16.14	9.06	8.46	8.86	9.33	6.77	2.01	5.31	1/4	3/8	97
XU02F	2	B1CU11	11.50	3.86	6.50	6.02	2.00	1.97	21.06	14.76	16.10	9.06	8.46	8.86	9.17	6.61	2.01	5.31	1/2	3/8	117
		B1CU13	11.50	3.86	6.50	6.02	2.00	2.56	25.20	17.52	17.13	9.84	9.25	9.65	9.80	6.61	2.56	6.89	1/2	3/8	150
XU03F	3	B1CU13	14.02	6.77	8.25	9.41	3.00	2.56	25.20	17.52	21.89	9.84	9.25	9.65	12.87	9.69	2.56	6.89	-	3/8	214
		B1CU17	14.02	6.77	8.25	9.41	3.00	2.76	30.91	21.85	23.15	10.63	10.04	10.24	13.46	9.69	3.07	8.46	-	1/2	265
XU04F	4	B1CU20	17.01	8.39	10.75	11.57	4.00	3.15	34.65	23.23	27.60	11.42	10.83	11.02	16.02	11.50	3.82	8.46	-	1/2	476
		B1CU25	17.01	8.39	10.75	11.57	4.00	4.33	42.32	28.54	29.25	12.20	11.61	11.81	16.93	11.50	4.76	10.43	-	1/2	604

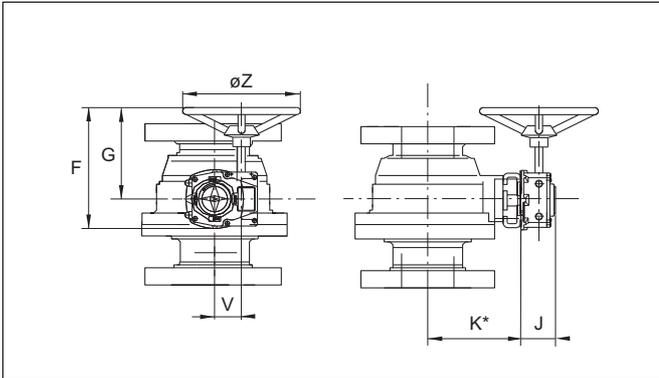
**Valve and B1J/JA actuator**



Valve	DN	Actuator	Dimensions in mm															NPTF	NPT	kg	
			A	A1	øB	øB1	øD	E	F	G	H	I1	I2	I3	J	K	V				X
XU01F	25	B1JU/B1JAU8	216	79	125	119	25.4	50	555	420	336	225	210	215	204	145	43	135	1/4	3/8	36
XU1HF	40	B1JU/B1JAU10	241	86	155	148	38.1	50	640	480	391	230	215	225	237	172	51	175	1/4	3/8	58
XU02F	50	B1JU/B1JAU12	292	98	165	153	50.8	65	815	620	420	250	235	245	249	168	65	215	1/2	1/2	94
XU03F	80	B1JU/B1JAU16	356	172	210	239	76.2	70	990	760	573	270	255	260	342	246	78	265	-	166	
		B1JU/B1JAU20	356	172	210	239	76.2	80	1230	940	606	290	275	280	361	246	97	395	-	3/4	241
XU04F	100	B1JU/B1JAU20	432	213	275	294	101.6	80	1230	940	679	290	275	280	407	292	97	395	-	3/4	318
		B1JU/B1JAU25	432	213	275	294	101.6	110	1490	1140	739	310	295	300	430	292	121	505	-	3/4	493

Valve	DN	Actuator	Dimensions in inch															NPTF	NPT	lbs	
			A	A1	øB	øB1	øD	E	F	G	H	I1	I2	I3	J	K	V				X
XU01F	1	B1JU/B1JAU8	8.50	3.11	4.88	4.69	1.00	1.97	21.85	16.54	13.23	8.86	8.27	8.46	8.03	5.71	1.69	5.31	1/4	3/8	80
XU1HF	1 1/2	B1JU/B1JAU10	9.49	3.39	6.10	5.83	1.50	1.97	25.20	18.90	15.39	9.06	8.46	8.86	9.33	6.77	2.01	6.89	1/4	3/8	128
XU02F	2	B1JU/B1JAU12	11.50	3.86	6.50	6.02	2.00	2.56	32.09	24.41	16.54	9.84	9.25	9.65	9.80	6.61	2.56	8.46	1/2	1/2	207
XU03F	3	B1JU/B1JAU16	14.02	6.77	8.25	9.41	3.00	2.76	38.98	29.92	22.56	10.63	10.04	10.24	13.46	9.69	3.07	10.43	-	366	
		B1JU/B1JAU20	14.02	6.77	8.25	9.41	3.00	3.15	48.43	37.01	23.86	11.42	10.83	11.02	14.21	9.69	3.82	15.55	-	3/4	532
XU04F	4	B1JU/B1JAU20	17.01	8.39	10.75	11.57	4.00	3.15	48.43	37.01	26.73	11.42	10.83	11.02	16.02	11.50	3.82	15.55	-	3/4	701
		B1JU/B1JAU25	17.01	8.39	10.75	11.57	4.00	4.33	58.66	44.88	29.09	12.20	11.61	11.81	16.93	11.50	4.76	19.88	-	3/4	1087

## Valve and M-series gear operator



\*) See K dimension from tables on page 19

Type	Dimensions, mm					kg
	F	G	J	V	ØZ	
M07	196	152	58	38.5	125	3
M10	297	239	67	52.0	200	5
M12	357	282	81	67	250	10
M14	435	345	94	90	457	18
M15	532	406	106	123	457	31
M16	642	466	127	154	610	45

Type	Dimensions, inch					lbs
	F	G	J	V	ØZ	
M07	7.72	5.98	2.28	1.52	4.92	6
M10	11.69	9.41	2.64	2.05	7.87	11
M12	14.06	11.10	3.19	2.63	9.84	21
M14	17.13	13.58	3.68	3.52	17.99	40
M15	20.94	15.98	4.15	4.84	17.99	68
M16	25.28	18.35	4.98	6.06	24.02	99

## 11 TYPE CODE

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
<b>XU</b>	<b>02</b>	<b>F</b>	<b>W</b>	<b>TA</b>	<b>S6</b>	<b>SJ</b>	<b>S</b>	<b>A</b>	<b>A</b>	<b>D</b>

<b>1.</b>	<b>Valve series &amp; style, face-to-face length</b>		
<b>XU</b>	Full bore, seat supported, face-to-face length according to ASME B16.10, Table 4, long pattern, ASME 600.		
<b>2.</b>	<b>Size</b>		<b>2.</b>
	<b>DIN</b>	<b>ASME</b>	
<b>025</b>	25 mm	1"	<b>01</b>
<b>040</b>	40 mm	1 1/2"	<b>1H</b>
<b>050</b>	50 mm	2"	<b>02</b>
<b>080</b>	80 mm	3"	<b>03</b>
<b>100</b>	100 mm	4"	<b>04</b>
<b>3.</b>	<b>Pressure rating, flanges, flange drilling</b>		
<b>F</b>	ASME Class 600		
<b>N</b>	PN 64		
<b>P</b>	PN 100		
<b>4.</b>	<b>End connection style</b>		
<b>W</b>	raised face, ASME B 16.5, "smooth finish" (Ra 3.2-6.3), standard		
<b>C</b>	PN 63 and PN 100 rated valves ; EN 1092-1 Type B2 (Ra 0,8 - 3.2)		
<b>5.</b>	<b>Application and/or construction</b>		
<b>TA</b>	Standard construction. Live loaded packing		
<b>TU</b>	Special solids proof seat design, pressure area 0 - <10 bar (ambient)		
<b>T1</b>	Special solids proof seat design, pressure area 10 - <20 bar (ambient)		
<b>T2</b>	Special solids proof seat design, pressure area 20 - 30 bar (ambient)		
<b>TZ</b>	BAM tested non-metallic parts, for oxygen service. Double seated. Metal bearings. Live loaded graphite packing. Temperature range -50 ... +200 °C. Oxygen cleaning acc. to Metso internal procedure T-2115 included.		
<b>XU</b>	series does not comply to API 608 currently and is not covered with ISO 15848-1 certifications.		

<b>6.</b>	<b>Body material and body related parts material</b>		
	<b>Body and body cap</b>	<b>Bonnet</b>	<b>Gland</b>
<b>S6</b>	CF8M	CF8M	CF8M
<b>J2</b>	WCB	WCB	CF8M
<b>J5</b>	C5	C5	CF8M

NOTE! Bonnet is used only in sizes 1" and 1 1/2"

<b>7.</b>	<b>Ball / coating and shaft material</b>
	<b>Standard</b>
<b>SJ</b>	316SS / Hard Chrome & XM-19
<b>RX</b>	316SS / Chrome carbide & XM-19
<b>RR</b>	316SS / WC-CO & XM-19
<b>SL</b>	316SS / NiBo & XM-19

<b>8.</b>	<b>Seat type, back seal and spring material</b>		
	<b>Seat type</b>	<b>Back seal</b>	<b>Spring</b>
<b>S</b>	Metal, S	PTFE	-
<b>K</b>	Metal, K (locked)	PTFE	-
<b>H</b>	Metal, H	Graphite	Incoloy 825
<b>G</b>	Metal, H	Graphite	Incoloy 825
<b>J</b>	Metal	Graphite	-

<b>9.</b>	<b>Seat and coating material</b>	
	<b>Seat material</b>	<b>Coating</b>
<b>A</b>	316 Stainless steel	Cobalt based hard facing
<b>B</b>	316 Stainless steel	CrC + LF
<b>R</b>	316 Stainless steel	Tungsten carbide, WC-CO

<b>10.</b>	<b>Gasket and packing material</b>		
	<b>Body gasket</b>	<b>Packing</b>	<b>Thrust bearing</b>
<b>A</b>	PTFE	PTFE V-rings	Filled PTFE
<b>B</b>	Graphite	Graphite	Filled PTFE
<b>C</b>	PTFE	PTFE V-rings	Cobalt based alloy and stainless steel
<b>D</b>	Graphite	Graphite	Cobalt based alloy and stainless steel

<b>11.</b>	<b>Bolting materials</b>				
	<b>Pressure retaining</b>		<b>Packing gland bolting</b>		
	<b>Studs</b>	<b>Nuts</b>	<b>Studs</b>	<b>Nuts</b>	<b>Temp range</b>
<b>E*</b>	B8M	8M	gr. 660	gr. 660	-200°C...+538°C
<b>T**</b>	L7M	2HM	B7	2H	-40°C...+538°C
<b>S**</b>	L7M	2HM	gr. 660	gr. 660	-46°C...+538°C
<b>U</b>	UNS S31803	UNS S31803	UNS S31803	UNS S31803	-46°C...+315°C

\*) with stainless steel body

\*\*) with carbon steel body

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