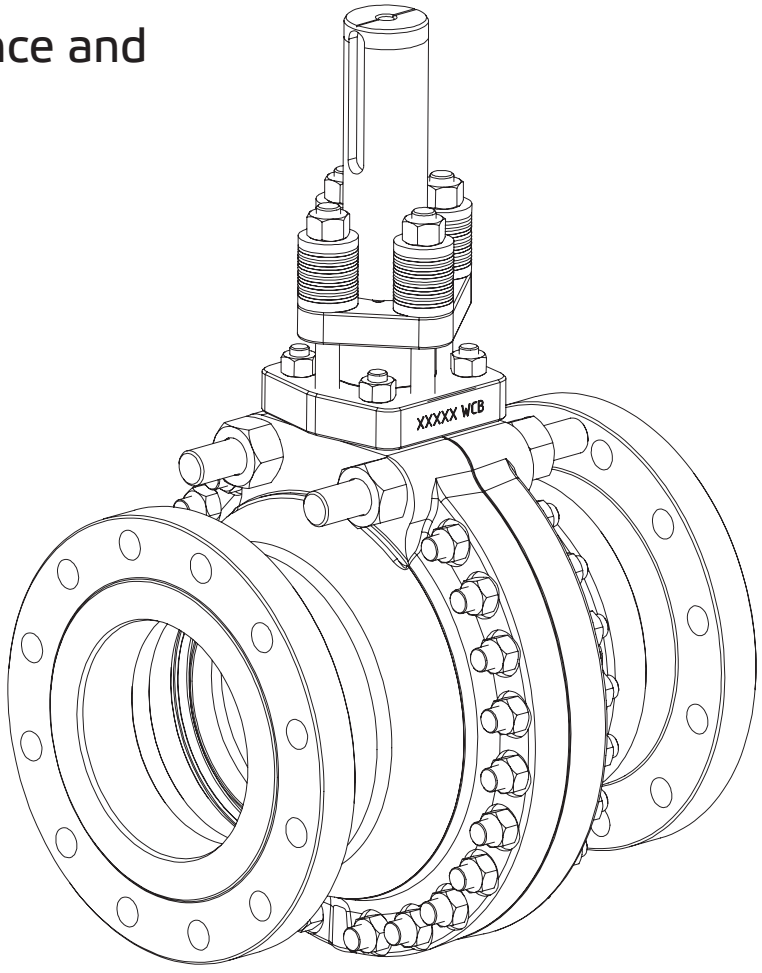
Neles™ ball valve
Series D

Installation, maintenance and operating instructions



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This product meets the requirements set by the Customs Union of the Republic of Belarus, the Republic of Kazakhstan and the Russian Federation.

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.

SAVE THESE INSTRUCTIONS!

Addresses and phone numbers are printed on the back cover.

1. GENERAL

1.1 Scope of the manual

This manual provides the essential information about the use of series D ball valves. For more information on actuators and other equipment, which are covered only briefly, please refer to the separate manuals on their installation, use and maintenance.

NOTE:
Selection and use of the valve in a specific application requires close consideration of detailed aspects. E.g. Q2G-trim is for relatively clean gas applications, note possibility of clogging. 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 Valmet for more information.

For valves in oxygen service, please see also the separate installation, maintenance and operating instructions for oxygen service (see Neles document id:10O270EN.pdf).

1.2 Valve description

Series D valves are flanged ball valves. The body consists of two symmetrical parts which are attached to each other with screws. The ball and stem are of one piece. Large low-friction bearings ensure reliability and long maintenance intervals. The valves have spring-loaded seats which are either soft or made of metal.

The valves can be used for shut-off and control applications.

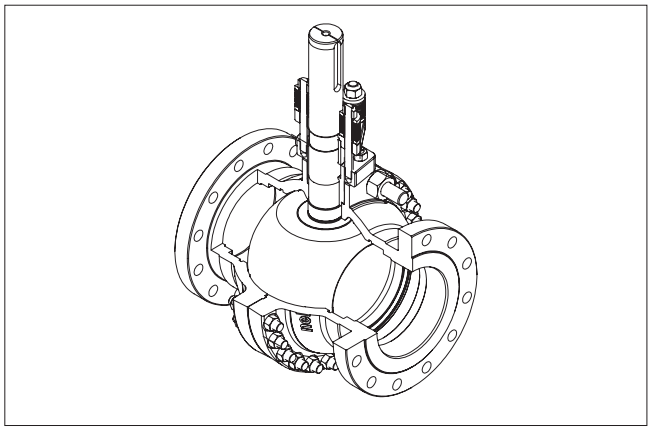


Fig. 1 Construction of the D series valve

1.3 Valve markings

The body markings are cast or stamped on the body side. The identification plate (Figure 2) is attached to the valve flange.

Identification plate marking:

1. Size
2. Pressure class
3. Type code
4. Body material
5. Seat material
6. Model number
7. Date
8. Trim material
9. Shaft material
10. Maximum shut-off pressure
11. Maximum temperature
12. Certification and approvals, eg. CE, Atex etc.

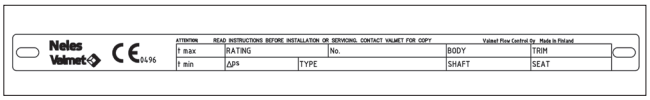


Fig. 2 Identification plate

1.4 Technical specifications

Product type

Full or reduced bore, trunnion mounted ball valve.

Ball and stem are integrally cast.

Split body design.

Flanged.

Pressure ratings

ASME Class 150, 300 and 600.

Size range, full bore

DN 300 … 900 / 12” - 36” in ASME Class 150.

DN 100 … 900 / 4” - 36” in ASME Class 300.

DN 50 … 600 / 2” - 28” in ASME Class 600.

Size range, reduced bore

DN 250 ... 600 / 10” - 24” in ASME Class 150.

DN 200 ... 600 / 8” - 24” in ASME Class 300.

DN 80 ... 600 / 3” - 24” in ASME Class 600.

Larger sizes on request.

Temperature range

-200 … +450 °C (+600 °C)

-330 … +840 °F (+1100 °F).

Design standards

Valve body	ASME B16.34.
Valve body joint	ASME VIII. DIV. 1 APPX 2.
Valve flanges	ASME B16.5.
Face-to-face	ASME B16.10.

Standard materials

Body	ASTM A351 gr. CF8M.
	ASTM A216 gr. WCB.
Ball	ASTM A351 gr. CF8M + Hard chrome or other special coating with metal seats.
Bearings	SS 316 + PTFE net or Cobalt based alloy
Seats	AISI 316 + Cobalt based alloy.
	AISI 316 + PTFE insert.
Seals/gaskets	PTFE, Graphite.

Standard bearing construction

Large, low friction bearings.

SS 316 + PTFE net or Cobalt based alloy.

Emissions

ISO 15848-1 type approved and certified

Bolting

B8M/8M with stainless steel body.

L7M/2H or 2MH with carbon steel body.

Standard options

Cryogenic design.

Bonnet extension.

Oxygen construction for gaseous oxygen service.

High temperature design.

Carbide hard facing or NiBo ball coating.

Noise/cavitation reduction ball insert; Q-trim design.

Fire safety API 607 (on selected seat designs).

NACE MR-01-03 or MR-01-75.

Material and test certification

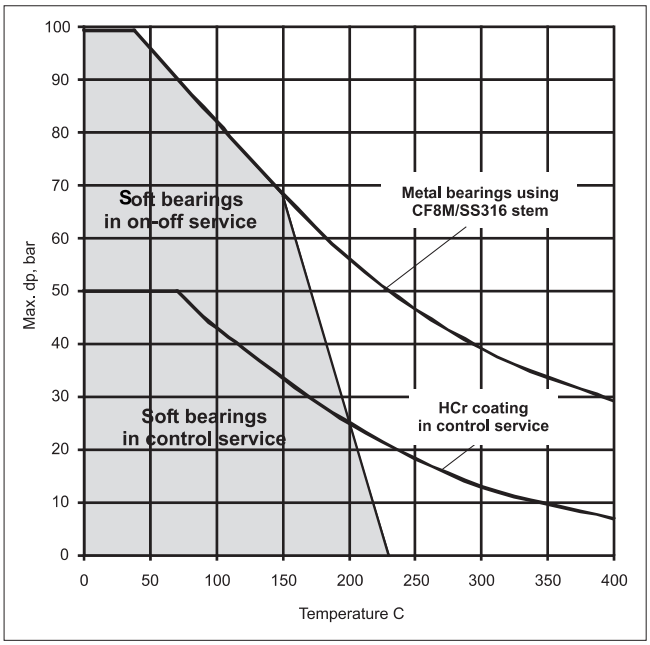
EN 10204-3.1 material certificates for body, ball and bonnet.

Valve tightness

ANSI/FCI 70-2 class V	for metal seats.
ANSI/FCI 70-2 class VI	for soft seats, for selected metal seats
ISO 5208 rate C or D	for metal seats.
ISO 5208 rate B	for soft seats.

Other tigthness rates upon request.

Maximum allowable differential pressure curves



NOTE:
Final valve materials may vary due to application and customer requirements. The final selected materials are shown in the bill of materials of delivered valve.

1.5 CE and ATEX 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.

When applicable, the valve meets the requirements of the European Directive 2014/34/EU relating to equipment and protective systems intended for use in potentially explosive atmospheres, and has been marked according to the Directive.

1.6 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.

1.7 Safety precautions

CAUTION:
Do not exceed the performance limitations!
Exceeding the performance limitations marked on the valve may result in valve damage or even in uncontrolled pressure release. Damage or personal injury may result.

CAUTION:
Do not remove or dismantle a pressurized valve!
Removing or dismantling a pressurized valve will cause an uncontrolled pressure release. Always shut off the pipeline, release the pressure and remove the medium before removing or dismantling the valve. Identify the medium, protect yourself and the environment against any harmful or poisonous substances. Prevent the medium from entering the pipes during maintenance.
Failure to do this may result in damage or personal injury.

CAUTION:
Beware of the ball 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:
Protect yourself from noise!
The valve may produce noise in the pipeline. The noise level depends on the application. It can be measured or calculated using the Neles Nelprof software. Observe the relevant work environment regulations on noise emission.

CAUTION:
Beware of extreme temperatures!
The valve body may be very hot or very cold. Protect people against frostbites and burns.

CAUTION:
When handling the valve or the valve package, remember 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. Please consult separate document: Instructions for lifting Neles products. (See Neles document id: 10LIFT70en.pdf). Damage or personal injury may result from falling parts.
Valve weights are listed in Section 11.

CAUTION:
Lifting threads in pipe flanges are not to be used for lifting the entire valve.

CAUTION:
Follow the proper procedures when handling and servicing oxygen valves.

ATEX/Ex Safety

CAUTION!
Potential electrostatic hazard, ensure the protection (grounding, etc.) in the process.

CAUTION!
The actual surface temperature of valve is depended on the process temperature. The protection from high or low temperature must be considered by the end user before valve is put into service.

CAUTION!
Ensure the general process and worker protection from static electricity in the facilities.
Note! Within series there is possibility to Category 2, Category 3 and non-ATEX valve.

1.8 Welding notes

WARNING:
Welding and/or grinding stainless steel and other alloys containing chromium metal may cause the release of hexavalent chromium. Hexavalent chromium(VI) or Cr(VI), is known to cause cancer. Be sure to use all appropriate personal protective equipment (PPE) when welding metals containing chromium.

NOTE:
A qualified welder must do the installation welding. The welder and welding procedure should be qualified in accordance with the ASME Boiler and Pressure Vessel Code Section IX or other applicable regulation.

CAUTION:
To prevent damage to the seat and seals, do not allow the temperature of the seat and body seal area to exceed 94 °C (200 °F). It is recommended that thermal chalks be used to check the temperature in these areas during welding.

CAUTION:
Ensure that any weld splatter does not fall onto the valve closing members eg. ball or seats. This may damage critical seating surfaces and cause leaks.

2. TRANSPORT, 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.

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.

3. MOUNTING AND COMMISSIONING

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-actuator assembly as a whole, bear in mind the weight of the valve or the entire package!

Clean the pipes by flushing or blowing before mounting the valve. Keep the valve in fully open position during flushing. Any impurities such as sand or pieces of welding electrode may damage the seats and tightening surfaces of the ball.

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 functioning of the valve, actuator or the positioner is not affected by the flow direction or the valve position. Do not, however, install the valve with the stem pointing downwards. This may allow impurities at the bottom of the pipeline to enter the space between the stem and the body and damage the gland packing.

Sufficient support for the pipeline reduces stress due to pipeline vibration. Low vibration also ensures reliable positioner operation.

An unsupported valve is easier to maintain. Nevertheless you can support the valve by its body with standard pipe clamps and supports. Do not fasten the supports to the flange bolts or the actuator.

Assembly of welding end valve

The valves are mounted in the pipeline by using standard welding methods.

When welding or annealing the joints, assure that the temperature of body in PTFE or the rubber sealings is not higher than that allowed for this type of sealing material, e.g. 120 °C. The increase of temperature can be prevented by winding wet protection cloth around the body during the welding. Figure 3.

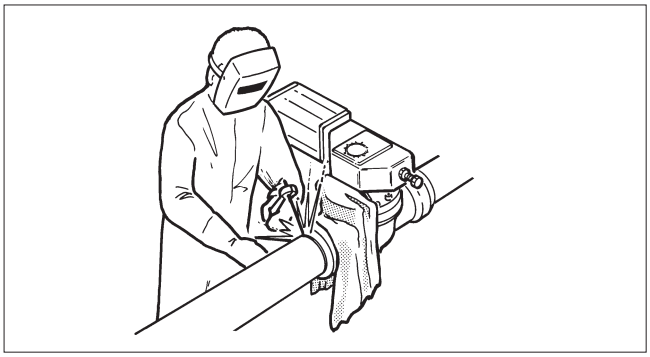


Fig. 3 Valve body covered with wet protection cloth during welding

Valves with welding ends are, if necessary, supported by flaky, arched supports on the machined part or preferably (Figure 4) on the part of pipeline next to the valve.

After welding, the piping should be carefully cleaned and flushed before operating the valve.

After trial operation, the valve should be left in the ‘Open’ position until the process is started up.

If the valve is found to jam during test operation, open it and flush again with a powerful flow.

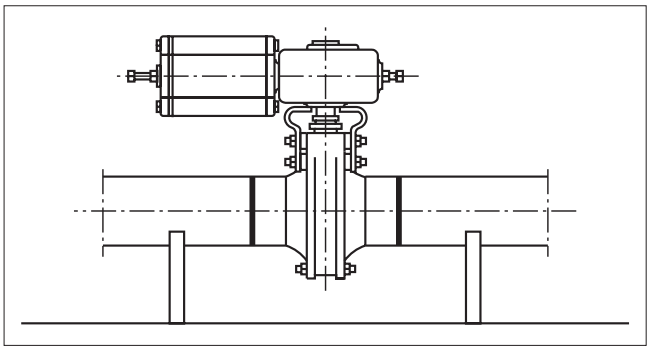


Fig. 4 Supporting the welding end valve

Valve insulation

If necessary, the valve may be insulated. Insulation must not continue above the upper level of the valve body, see Figure 5.

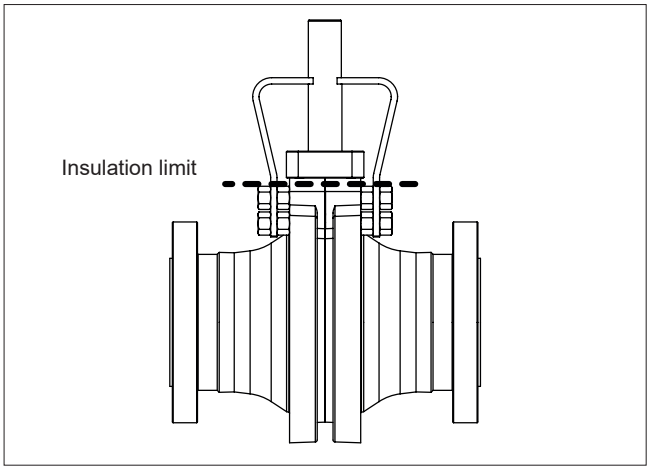


Fig. 5 Insulation of the valve

3.3 Actuator

NOTE:
When installing the actuator on the valve, make sure that the valve-actuator assembly 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 stem (parallel to the flow opening).

If you are not sure about the indicator, check the flow direction by the groove.

If possible, mount the valve so that it can remain in place even if the actuator is removed.

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 stems, or where severe vibration is present. Please contact Valmet 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 1.7 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 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.

Valmet 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 Valmet 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 Valmet 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 Maintenance of a mounted valve

Gland packing

Replace the gland packing (69) if the tightening of the nuts does not stop leakage.

Ensure that the valve is unpressurized and remove the actuator. Then remove the existing gland packing using a tool that does not damage the tightening surfaces.

Install the new gland packing as instructed in Section 4.7.

Body and bonnet joint

Should the body joint leak tighten the nuts as indicated by the torques in Table 1 in Section 4.7.

Turning the ball

If the ball's primary sealing surface is so badly damaged that the valve leaks in closed position, turn the ball 180 degrees. Note the effect of the measure on the orientation of the actuator. Should the leaking continue, send the ball to the manufacturer for repairs.

Do not turn a ball with a Q attenuator. For further instructions, contact the manufacturer.

4.3 Removing the actuator from the valve

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

CAUTION:
Do not detach a spring-return actuator unless a stop-screw is carrying the spring force!

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 usually easiest to remove the actuator and its support equipment before removing the valve from the pipeline. If the package is small or not easily accessible, it is better to remove the entire package at one go.

- Close and detach the actuator pressure supply and remove the control cables and pipes from their couplers.
- Loosen the bracket screws.
- Remove the actuator from the valve with an extractor, that can be ordered from the manufacturer (See Section 8). See Figure 6.
- Remove the bracket and any coupling.

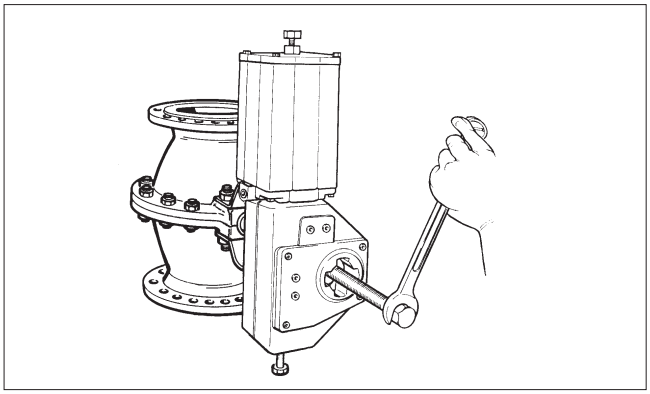


Fig. 6 Removing the actuator with the extractor

4.4 Removing the valve from the pipeline

CAUTION:
Do not dismantle the valve or remove pipeline while the valve is pressurized!

- Make sure that the pipeline is empty and unpressurized and that there is no medium flowing into the pipeline while the valve is not in its normal position.
- Support the valve carefully with a hoist. Place ropes carefully and unscrew the pipe flange bolts. Place the lifting sling around body, avoid any contact with the instrumentation. Lift valve down. Please consult separate document: Instructions for lifting Neles products.

4.5 Dismantling the valve

- Place the valve on its flange on a clean, level surface made of wood, hardboard or plastic. If necessary, support the actuator so that it cannot overturn as the mounting bolts are being removed.
- Remove the actuator if it is still attached to the valve.
- Remove the mounting brackets of the valve.
- Tap loose the key at the end of the ball stem.
- Remove any burrs from the keyway edges.
- Loosen the gland packing nuts and the bonnet's fastening bolts and pull the bonnet away from the ball stem.
- Remove the bolts keeping the body halves together and lift the upper body half on its flange.

4.6 Removing and inspecting the valve parts

Ball

To make carrying and inspection easier, the balls >DN300 (12") have a threaded hole at the end of the stem for an eyebolt.

- Lift the ball from the body on a soft surface and clean it.
- Check the sealing and bearing surfaces of the ball stem.
- Remove any minor scratches and impurities using an emery cloth.
- File off any burrs from the stem keyway.
- If the ball has deep scratches on its sealing and bearing surfaces or if it is not fully spherical, it should be sent to the manufacturer for repairs.

Bearings

- Check the bearings. In PTFE bearings, the stainless steel net should not be visible.

Seats

- Turn the body upside down and detach the seat by tapping at it through the flow opening with a rubber or plastic mallet.
- Clean and check the tightening surfaces.

Body and bonnet

- Always replace the body and bonnet gaskets during maintenance.
- Remove existing gaskets from all sealing surfaces and clean the surfaces carefully.
- Do not round the sharp edges at the convergence point of the body joint and bonnet sealing surfaces, as this could cause leaks. See Figure 7.
- Remove the gasket from the bonnet, for example with a screwdriver.

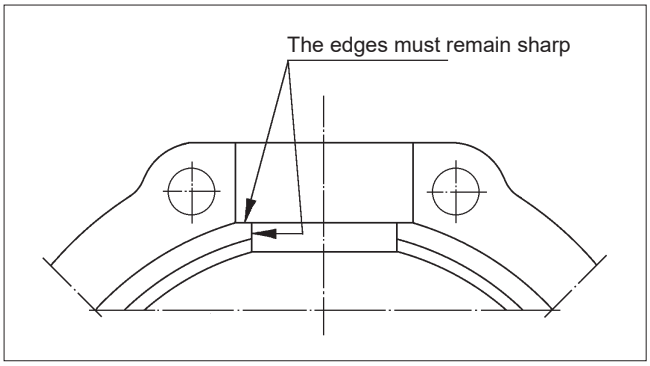


Fig. 7 Sealing surfaces

Other parts

- Clean all parts carefully, including the studs and nuts.
- After cleaning and checking all parts, keep them in a protected place until reassembly. Handle the ball, its seats and the body joint surfaces with particular care.
- If necessary, send the valve to the manufacturer for repairs.

4.7 Reassembling the valve

- Reassemble the valve by placing the female body half on a level surface in an upright position with the body joint pointing upwards.
- Then put the parts in their place in the following order:
  1. Seats
  2. Ball with its bearings
  3. Body joint between body halves and bonnet
  4. Gland packing

Fitting the seats

T and S seats

- Check and clean all components before starting the seat assembly
- Place the back seals (63) into their position to the body grooves. See Figure 8.
- Place the back-up rings (64) made of PTFE strips at the side of the O-ring. To ensure that the seam becomes flexible, the strip must have slanted ends.
- For easier assembly, lubricate the O-ring and back-up ring surfaces facing the seats with silicone grease or another suitable substance.
- Place the spring (62) into the groove in the seat (7). Connect the ends of the spring.
- Place the seats into the body by hand or if necessary, using a plastic mallet. The seat is in correct position when the spring touches the body shoulder.

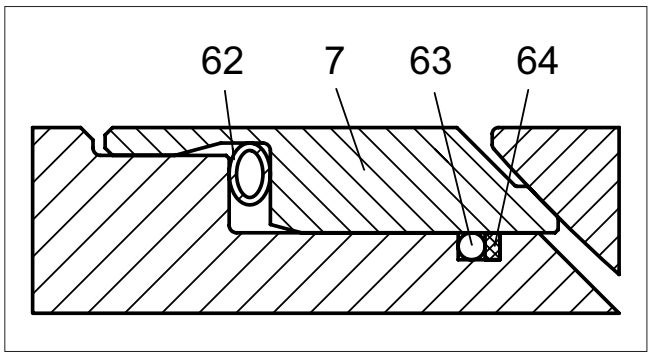


Fig. 8 T and S seats

D and R seats

- Check and clean all components before starting the seat assembly.
- Place the spring (62) into the body cavity and connect the ends of the spring.
- Place the set ring (130) against the spring (62).
- Place the graphite backseal (129) carefully against set ring (130).
- Make sure the back seal (129) is installed in correct direction.
- Place the O-ring (63) into the body groove.
- Place the back-up rings (64) made of PTFE strips at the side of the O-ring. Ensure that the seam becomes flexible, the strip must have slanted ends.
- For easier assembly, lubricate the O-ring (63) and back-up ring (64) with silicone grease or another suitable substance.
- Place the seat (7) into the body cavity by hand or if necessary, using a plastic mallet. The seat (7) is in correct position when the backseal (129) touches the seat shoulder (7).

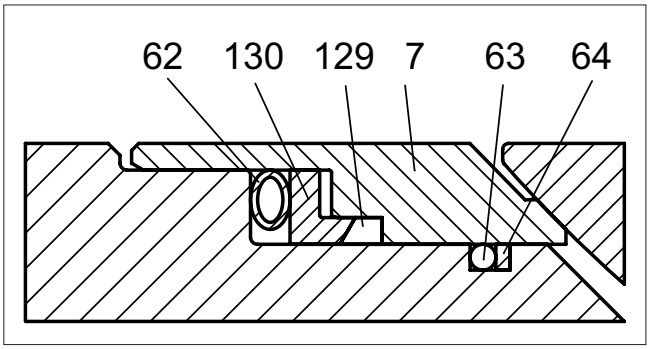


Fig. 9 D and R seats

E seats

- Check and clean all components before starting the seat assembly.
- Place the back seals (63, 75) into their place in the body grooves. See Figure 10.
- Place the back-up rings (64, 76) made of PTFE strips on both sides of the back seal (63) and beside the back seal (75). To ensure that the seam becomes flexible, the strips must have slanted ends.
- For easier assembly, lubricate the O-ring and back-up ring surfaces facing the seats with silicone grease or another suitable substance.
- Place the spring (62) into the groove in the seat (7). Connect the ends of the spring.
- Place the seats into the body by hand and make sure that the pin (78) in the body, which prevents the seat from rotating, goes into the hole in the seat. Note that the bore through the seat is an ejector hole. If necessary, use a plastic mallet.
- The seat is in the correct position when the spring touches the body shoulder.

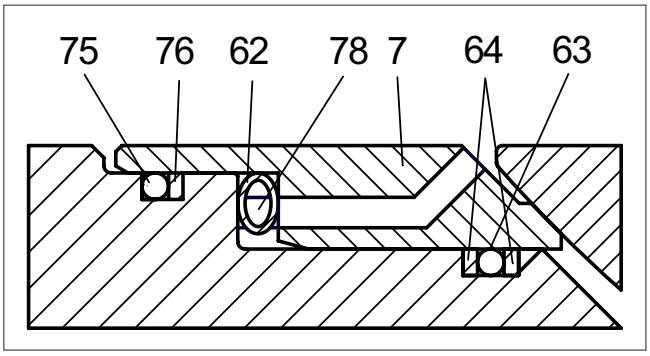


Fig. 10 E seat

H seats

- Check and clean all components before starting the seat assembly.
- Lap the opposing surfaces of the seat and bellows and of the bellows and body with diamond paste before you fit the seat.
- Clean the parts carefully using a suitable solvent and emery paper (500 or finer).
- Place the seat into the body.

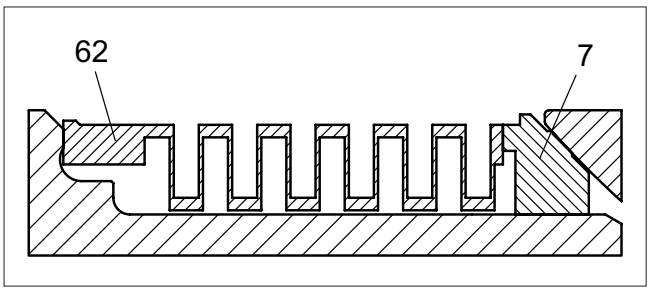


Fig. 11 H seat

C seats

- Check and clean all components before starting the seat assembly.
- Place graphite backseal (129) carefully into the seat. Make sure the backseal is installed in correct direction.
- Make sure there are not any sharp edges in the seat cavity of valve body to damage the backseal.
- Place the seat into the body.

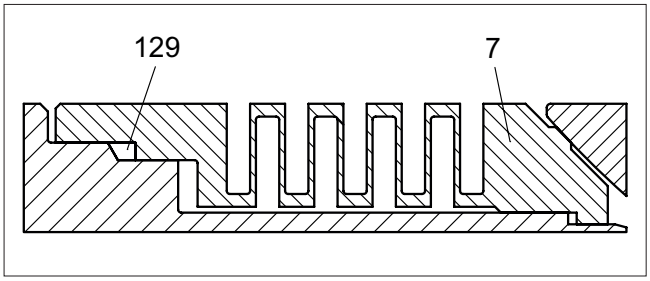


Fig. 12 C seats

Bearings and ball

PTFE bearings

- Place the bearings (60, 61) onto the thrust and trunnion bearings so that the PTFE surface touches the stem. See Figure 13.
- Push the bearing (60) into the thrust bearing (4).
- Turn the bearing (61) so that it fits inside the trunnion bearing (5). Push the bearing until the lip is flush with the flange groove. Then release the bearing and push the lip into the groove.
- When you install the thrust bearing (89), make sure that the PTFE surface is against the ball shoulder.
- Push the bearings onto the stem and the trunnion.

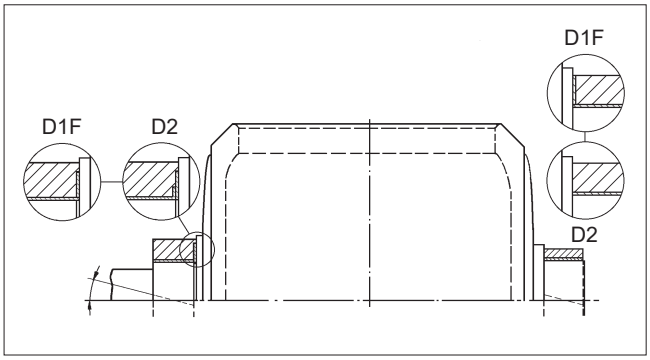


Fig. 13 PTFE bearings

Heat-resisting bearings

High-tolerance cobolt alloy bushings are used as bearings.

- Place the bearing (4) onto the stem so that the shoulder faces the ball.
- Place the trunnion bearing (5) in its place.

Ball

- Lower the ball (3) carefully to the female body half (2). The bearings will ensure that the ball goes into the correct position inside the body half.

Body Joint

Depending on the valve application, the body joint gasket (65) is of either PTFE or graphite.

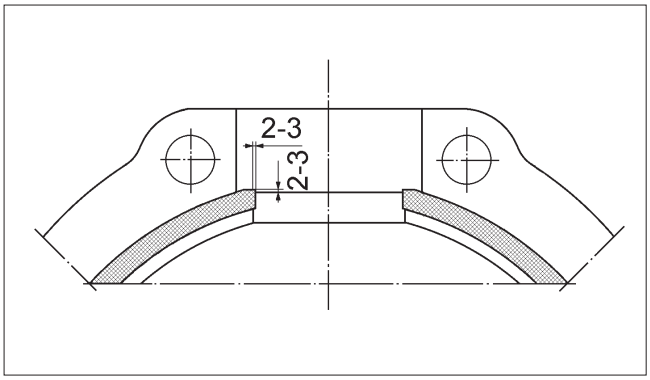


Fig. 14 Fitting and cutting the graphite gasket

- Place the PTFE gasket into the outer circumference of the groove of the female body half. See Figure 15.

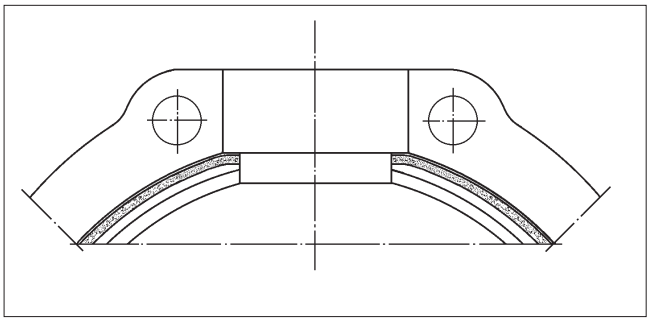


Fig. 15 Fitting the PTFE gasket strip

Tightening the body joint bolts

- After fitting the ball and the body gasket, lift the male body half (1) and the seat (7) onto the ball. See Section 4.7.
- Check the correct alignment of the bonnet bore with the body joint. Push the bonnet (8) onto the stem.
- Lubricate the flange, neck and bonnet bolts and screw them into position. If hexagon bolts are used as flange bolts, it is easier to tighten them if they are inserted from below so that the nuts can be tightened from above the body joint flange.
- Put the bonnet (8) into its place. After tightening the flange bolts loosen the bonnet bolts and remove the bonnet.
- Tighten the flange bolts as indicated in Figure 16. Start from opposite the stem and first tighten the bolts to torques that are 10 % of the values in Table 1. Then tighten them to their final torques in the same sequence.

- In valves up to DN 100 (4”), insert the neck bolts before mounting the body halves. Center them so that the distance from the nut’s outer side to the bolt’s shoulder is equal at both ends. Tighten the neck bolts after tightening the flange bolts.

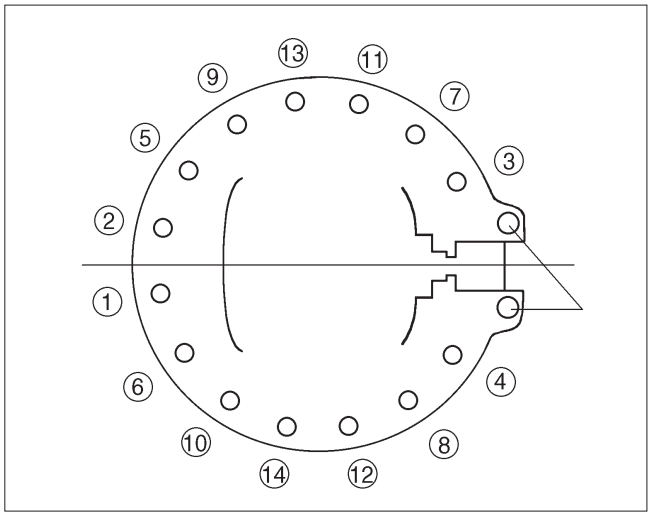


Fig. 16 Tightening the body joint bolts

Tightening the bonnet bolts

- Remove any excessive body gasket from the gland surface.
- Place the ring-shaped bonnet gasket (66) into the bonnet shoulder. You can attach the gasket to the bonnet for the duration of the installation with small amounts of silicon grease.
- Place the bonnet onto the stem.
- Tighten the bonnet bolts as indicated by the torques in Table 1.

Table 1 Recommended tightening torques of body joint and bonnet bolting

Thread	ASTM A320 gr. L7M	ASTM A193 gr. B8M cl. 1
	Tightening torque (Nm)	Tightening torque (Nm)
5/16 UNC	23	10
3/8 UNC	41	18
1/2 UNC	99	44
7/8 UNC	560	250
1 UNC	840	380
1 1/4 8UN	1800	790
1 1/2 8UN	3200	1400
1 3/4 8UN	5200	2300
2 8UN	7900	3500
2 1/4 8UN	11000	5100
2 1/2 8UN	16000	7100
2 3/4 8UN	21000	9500
3 8 UN	28000	12000

NOTE: Check the correct bolt material from valve bill of materials. If material is not shown above table, please consult the manufacturer.
NOTE: Threads must be well lubricated.

Gland packing, D2, D1F

- Make sure the valve is not pressurized.
- Unfasten the nuts (18) and remove the disc spring set (150), the gland (9a), the retainer ring (42) and the compression ring (9b).
- Remove old packing rings (20). Do not damage the surfaces of the packing ring counterbore and shaft.
- Install the new gaskets one by one by using the gland. PTFE rings should be mounted so that the breaks are at a 45 angle with respect to the flow opening and at a 90 angle with respect to each other. Graphite rings should be put into place from the end of the stem. Make sure that there is no burrs in the keyway, as it could damage the gland packing.
- Put the gland into place.
- Turn the hexagon nuts on the studs and tighten the gland packings while the valve is still unpressurized.
- Re-tighten the nuts as needed.

Gland packing, D1F_G, D2_G

- Make sure the valve is not pressurized.
- Unfasten the nuts (18) and remove the disc spring set (150), the gland (9a), the retainer ring (42) and the compression ring (9b).
- Remove old packing rings (20). Do not damage the surfaces of the packing ring counterbore and shaft.
- Clean the gland and packing ring counterbore. Install new set of packings. Slip the rings onto the shaft. Ensure that there are no burrs in the keyway groove which could damage the packing. Position the cut ends of the graphite rings at a 90° angle to each other.
- Mount the compression ring.
- Slip the retainer ring (42) on the shaft and push it against the compression ring, see Figure 17. See also the caution.
- Install the gland.

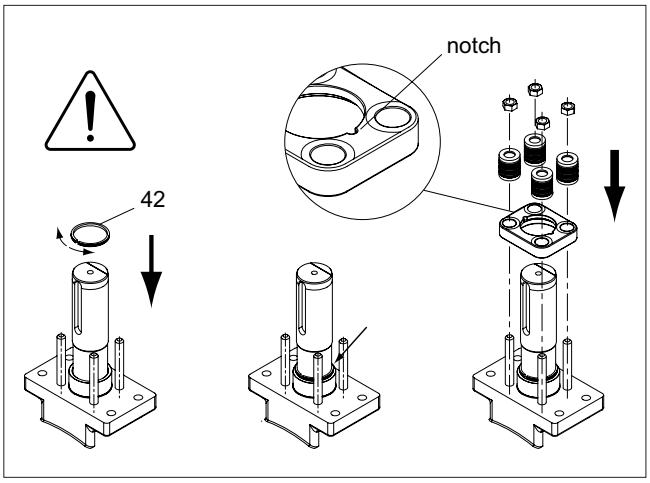


Fig. 17 Mounting the retainer ring

- Pre-compress the packing rings first either by tightening the gland nuts (with or without disc springs) to the torque Tt or by tightening the gland with disc springs to the height H_2. See Fig. 18 and the value from Tables 2 and 3.
- Carry out 3…5 operation cycles with the valve. Suitable range of movement is about 80 %.
  It is not necessary to fully close or open the valve during the operation.
- Loosen the gland nuts. Place the disc spring sets (150) on the gland studs as applicable. Retighten the nuts (18) to the torque T_t or so that the disc springs are compressed to the height H_2, see Tables 2 and 3.
- Check leakage when the valve is pressurized.

CAUTION:
Before pressurizing the valve, check through a notch in the gland that the retainer ring (42) is installed in place.

- If the leakage still occurs when the valve is pressurized, re-tighten the nuts but don't exceed the value in the Table 2 and 3 by 50 % or do not fully compress the disc springs.

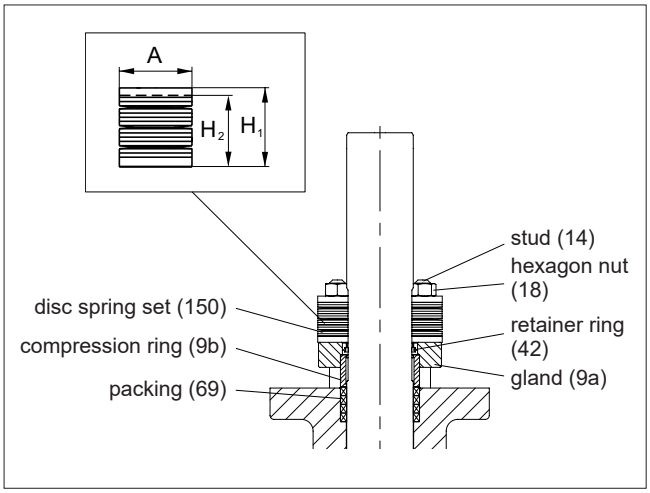


Fig. 18 Gland packing, D1F_G, D2_G

Table 2 Tightening of the gland packing with stainless steel disc spring sets (*).

Valve size (in)			Shaft dia (mm)	Spring dimensions		PTFE V-ring		Graphite		ID code of disc spring set
D2C_G	D2D_G	D1F_G		A (mm)	H1 (mm)	H2 (mm)	Tt (Nm)	H2 (mm)	Tt (Nm)	
		02	25	25	33.4	32.9	4	31.9	12	H148584
		03	35	31.5	35.2	34.3	7	32.5	20	H148588
	04	04	40	35.5	43.5	43.0	7	42.0	22	H148585
	06	06	55	40	48.5	47.5	16	45.6	48	H161163
	08	08	70	50	59	57.9	23	55.7	69	H148587
10	10	10	85	50	59	57.7	27	55.1	82	H148587
12-18	12, 18	12	95	71	73	71.3	62	67.8	187	H148589
20	14, 20	14	105	56	60	57.2	62	54.1	186	H148591
24	16, 24	16	120	71	73	70.9	83	66.6	250	H148589
28	28	18	135	71	73	70.6	93	66.0	278	H148589
30	30, 32	20	150	80	90.3	87.7	184	82.6	551	H148592
36	36	24	165	80	90.3	88.4	134	84.7	401	H148592
		28	190	80	90.3	88.3	142	84.3	425	H148592

(*) Disc spring set material change has been done in mid 2019.

Table 3 Tightening of the gland packing with carbon steel+ENP coated disc spring sets.

Valve size (in)			Shaft dia (mm)	Spring dimensions		PTFE V-ring		Graphite		ID code of disc spring set
D2C_G	D2C_G	D1F_G		A (mm)	H1 (mm)	H2 (mm)	Tt (Nm)	H2 (mm)	Tt (Nm)	
		02	25	25	30.5	29.8	4	28.5	12	979560
		03	35	31.5	35.2	34.4	7	32.7	20	989920
	04	04	40	35.5	41	40.2	7	38.6	22	979580
	06	06	55	40	45.5	44.5	13	42.4	40	979600
	08	08	70	50	59	58.0	23	56.0	69	979620
10	10	10	85	50	59	57.7	30	55.0	91	979620
12-18	12, 18	12	95	71	73	71.4	62	68.2	187	1116060
20	14, 20	14	105	56	60	57.2	62	54.1	186	1072560
24	16, 24	16	120	71	73	71	83	67.0	250	1116060
28	28	18	135	71	73	70.8	93	66.3	278	1116060
30	30, 32	20	150	80	90.3	87.9	184	83.2	551	H066733
36	36	24	165	80	90.3	88.6	200	85.1	401	H066733
		28	190	80	90.3	88.5	142	84.8	425	H066733

5. TESTING THE VALVE

CAUTION:
Pressure testing should be carried out using equipment conforming to the correct pressure class!

We recommend that the valve body be pressure tested after the valve has been assembled.

The pressure test should be carried out in accordance with an applicable standard using the pressure rating required by the pressure class or flange drilling of the valve. The valve must be in a half-open position during the test.

If you also want to test the tightness of the closure member, contact the manufacturer.

6. MOUNTING THE ACTUATOR

6.1 General

CAUTION:
Beware of ball cutting movement!

CAUTION:
Do not detach a spring-return actuator unless a stop-screw is carrying the spring force!

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

Please use tightening torques given in Table 1 when bolting the bracket on to valve.

6.2 M actuator

- File off any burrs and clean the stem bore.
- Place the coupling over the stem. Note the correct position. The line at the end of the stem and coupling indicates the direction of the ball flow bore.
- Lubricate the coupling and the stem bore. Fasten the bracket loosely to the valve.
- Slip the actuator carefully onto the coupling. Avoid forcing it, since this may damage the ball and seats.
- Lubricate actuator mounting screws and then fasten all screws.
- Adjust the ball open and closed positions by means of the stop screws located at the side of the housing (see Figure 19). The closed position screw is nearest to the handwheel on the side of the housing, and the open position screw is on the opposite end. The turning directions are marked on the wheel.
- Ensure correct functioning of the actuator. Turn it to both open and closed positions. The yellow arrow should indicate the direction of the ball flow bore.

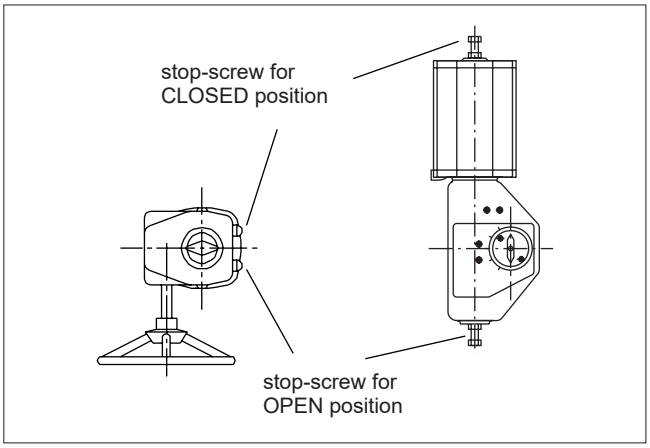


Fig. 19 Open and closed positions of the valve

6.3 B1C actuator

- Drive the actuator piston to the extreme end of the cylinder and turn the valve to closed position.
- Clean the actuator stem bore and remove any burrs.
- Insert the coupling into the stem bore, if necessary. Note the correct position of the actuator stem. A line at the end of the shaft and the coupling indicate the direction of the ball flow bore.
- Lubricate the coupling and the stem bore and place the brackets on the valve.
- Carefully push the actuator onto the shaft. Excessive force may damage the ball and the seat. If possible, mount the actuator is mounted with the cylinder pointing upwards.
- Place the actuator as straight as possible relative to the valve. Lubricate the fastening bolts, install the washers and tighten them and all screws.
- Adjust the open and closed positions of the ball with the adjustment screws in the actuator. See Figure 19. The exact open position is indicated by the flow bore. The yellow arrow should indicate the direction of the flow bore. **Do not put your fingers into the flow bore!**

No adjustments are needed if the actuator has been mounted on the same valve previously. You only need to move the actuator to the open position,turn it so that the valve is also fully open and install the actuator.

- Check the tightness of the adjustment screw at the cylinder end. An O-ring is used for sealing.
- Check the proper functioning of the actuator. Check the direction of the ball flow bore and the direction of the actuator with respect to the valve (clockwise closed, counter-clockwise open) after you have mounted the actuator. When the piston is at the extreme end of the cylinder, the valve should be in the closed position.
- Check that the yellow arrow indicates the direction of the flow bore. Correct the arrow direction if necessary.

6.4 B1J actuator

Spring return actuators are used when the valve should either open or close when the air supply is running out. The B1J is used for the function 'spring closes', in which the spring is on the side of the piston stem and pushes the piston towards the outer end of the cylinder. B1JA is used for the function 'spring opens', in which the spring is between the piston and the cylinder end on the other side than the piston rod.

Install spring return actuators in the same way as B1C actuators. However the following should be taken into account.

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.

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 6.3.

6.5 Installing other manufacturer's actuators

NOTE:
Valmet only accepts responsibility for the actuators of other manufacturers which it has installed.

Actuators of other manufacturers can only be installed if they have an ISO 5211 actuator connection.

7. TROUBLE SHOOTING TABLE

The following Table 4 lists malfunctions that might occur after prolonged use.

Table 4 Trouble shooting

Symptom	Possible fault	Recommended action
Leakage through a closed valve	Wrong stop screw adjustment of the actuator	Adjust the stop screw for closed position
	Faulty zero setting of the positioner	Adjust the positioner
	Damaged seat	Replace seat
	Damaged closing member	Replace the closing member
	Closing member in a wrong position relative to the actuator	Select the correct keyway in the actuator
Leakage through body joint	Damaged gasket	Replace the gasket
	Loose body joint	Tighten the nuts or screws
Irregular valve movements	Actuator or positioner malfunction	Check the operation of the actuator and positioner
	Process medium accumulated on the sealing surface	Clean the sealing surfaces
	Closing member or seat damaged	Replace the closing member or seat
	Crystallizing medium has entered the bearing spaces	Flush the bearing spaces
Gland packing leaking	Gland packing worn or damaged	Replace the gland packing
	Loose packing	Tighten the packing nuts

8. TOOLS

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

- For removal of the actuator:
  - extractor (ID-code table in actuator's IMO).

This tool can be ordered from the manufacturer. Always give the valve type designation when ordering.

9. ORDERING SPARE PARTS

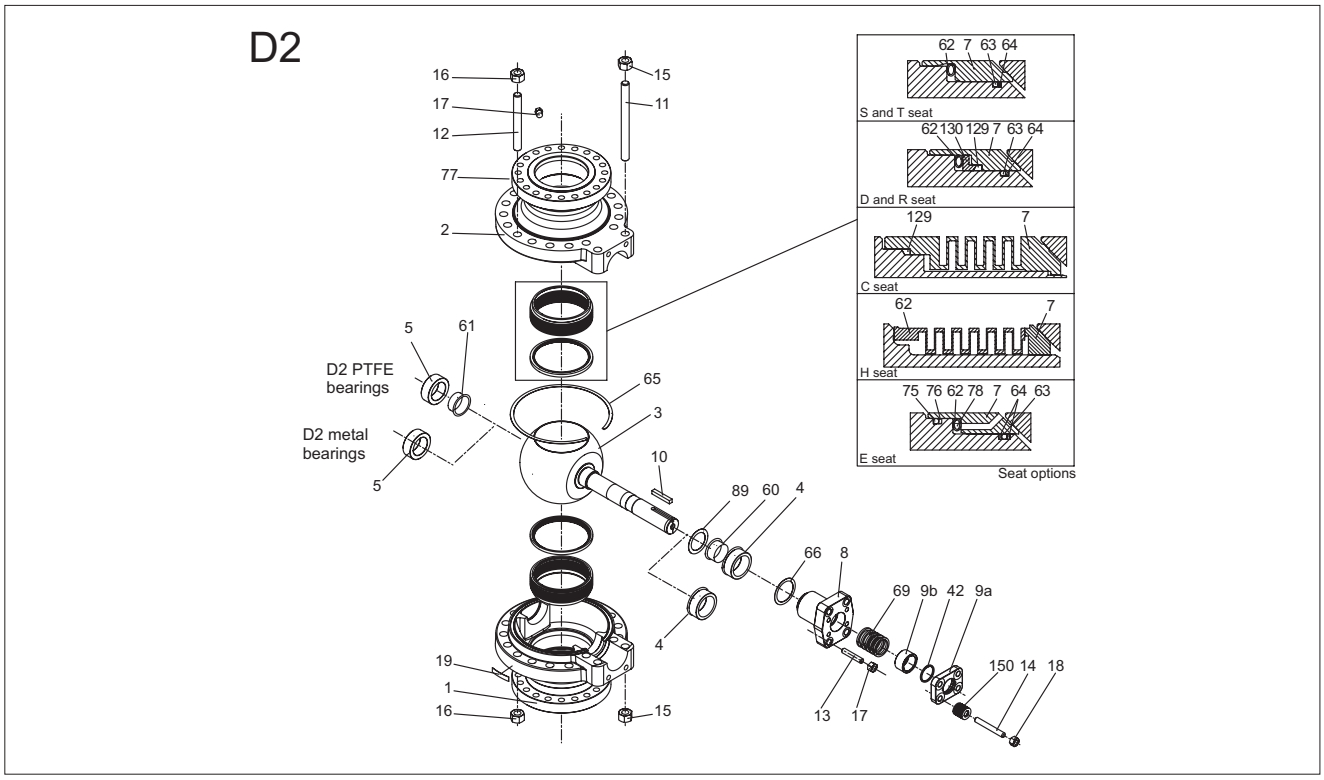
When ordering spare parts, always include the following information:

- 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.

10. EXPLODED VIEWS AND LISTS OF PARTS

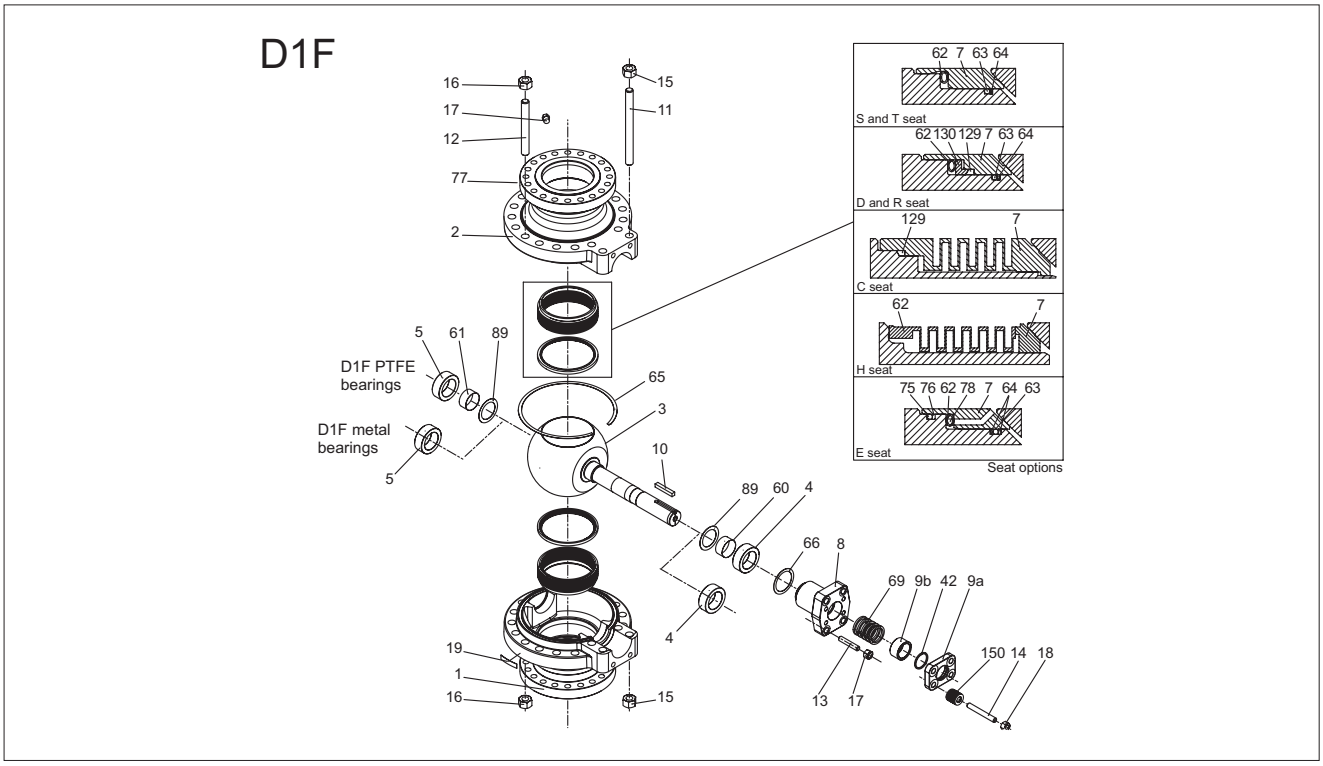
10.1 D2 valves



Part	Qty	Description	Spare part category
1	1	Body half, female	
2	1	Body half, male	
3	1	Ball	3
4	1	Trunnion bearing	3
5	1	Trunnion bearing	3
7	2	Ball seat	2
8	1	Bonnet	
9a	1	Gland	
9b	1	Compression sleeve	
10	1	Key	3
11		Stud	
12		Stud	
13		Stud	
14		Stud	
15		Hexagon nut	
16		Hexagon nut	
17		Hexagon nut	
18		Hexagon nut	
19	1	Identification plate	
42	1	Retainer ring	
60 *	1	Bearing strip	1
61 *	1	Bearing strip	1
62	2	Spring	1
63	2	O-ring	1
64	2	Back-up ring	1
65	2	Seal strip	1
66	1	Sheet ring	1
69		Packing ring	1
75	1	O-ring	
76	1	Back-up ring	
77	1	Hexagon plug	
78	1	Spring pin	
89 *	1	Thrust bearing	1
129	1	Back seal	1
130	1	Set ring	
150	4	Disc spring set	

Spare part (spare part set) category 1: 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.
Note: * Only in PTFE bearing construction.

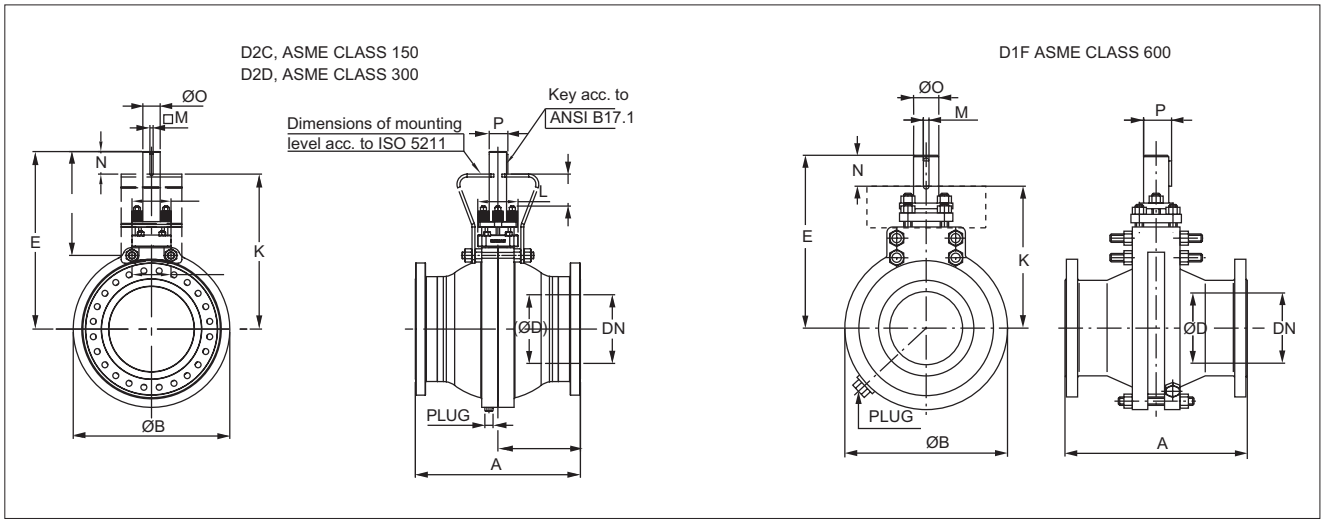
10.2 D1F valves



Part	Qty	Description	Spare part category
1	1	Body half, female	
2	1	Body half, male	
3	1	Ball	3
4	1	Trunnion bearing	3
5	1	Trunnion bearing	3
7	2	Ball seat	2
8	1	Bonnet	
9a	1	Gland	
9b	1	Compression sleeve	
10	1	Key	3
11		Stud	
12		Stud	
13		Stud	
14		Stud	
15		Hexagon nut	
16		Hexagon nut	
17		Hexagon nut	
18		Hexagon nut	
19	1	Identification plate	
42	1	Retainer ring	
60 *	1	Bearing strip	1
61 *	1	Bearing strip	1
62	2	Spring	1
63	2	O-ring	1
64	2	Back-up ring	1
65	2	Seal strip	1
66	1	Sheet ring	1
69		Packing ring	1
75	1	O-ring	
76	1	Back-up ring	
77	1	Hexagon plug	
78	1	Spring pin	
89 *	2	Thrust bearing	1
129	1	Back seal	1
130	1	Set ring	
150	4	Disc spring set	

Spare part (spare part set) category 1: 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.
Note: * Only in PTFE bearing construction.

11. DIMENSIONS AND WEIGHTS



D2C, ASME CLASS 150

Type	Dimensions, mm										Mounting face	Plug NPTF	kg
	DN	A	ØB	ØD	E	K	M	N	ØO	P			
D2C 12	300	610	596	304	756	600	22.22	156	95	104.8	F16, F25, F30	1	420
D2C 14	350	686	668	337	818	662	22.22	156	95/105	104.8	F16, F25, F30	1	550
D2C 16	400	762	744	387	840	684	22.22	156	95/120	104.8	F16, F25, F30	1	720
D2C 18	450	864	814	440	890	734	22.22	156	95/120	104.8	F16, F25, F30	1	1300
D2C 20	500	914	904	490	969	789	25.40	180	95/105	116.1	F16, F25, F30, F35	1	1500
D2C 24	600	1067	1084	590	1128	923	31.75	205	95/120	133.8	F25, F30, F35, F40	1	2300
D2C 28	700	1244	1245	692	1263	1038	31.75	225	105/135	149	F30, F35, F40	1	3800
D2C 30	750	1295	1318	740	1485	1235	38.10	250	150	166.6	F30, F35, F40	1	4400
D2C 36	900	1524	1560	880	1661	1381	38.10	280	165	181.8	F40, F48	1	6500

Type	Dimensions, inch										Mounting face	Plug NPTF	lb
	Size	A	ØB	ØD	E	K	M	N	ØO	P			
D2C 12	12	24.02	23.46	11.97	29.76	23.62	0.87	6.14	3.74	4.13	F16, F25, F30	1	924
D2C 14	14	27.01	26.30	13.27	32.20	26.06	0.87	6.14	3.74/4.13	4.13	F16, F25, F30	1	1210
D2C 16	16	30.00	29.29	15.24	33.07	26.93	0.87	6.14	3.74/4.72	4.13	F16, F25, F30	1	1584
D2C 18	18	34.02	32.05	17.32	35.04	28.90	0.87	6.14	3.74/4.72	4.13	F16, F25, F30	1	2860
D2C 20	20	35.98	35.59	19.29	38.15	31.06	1.00	7.09	3.74/4.13	4.57	F16, F25, F30, F35	1	3300
D2C 24	24	42.01	42.68	23.23	44.41	36.34	1.25	8.07	3.74/4.72	5.27	F25, F30, F35, F40	1	5060
D2C 28	28	48.98	49.02	27.24	49.72	40.87	1.25	8.86	4.13/5.31	5.87	F30, F35, F40	1	8360
D2C 30	30	50.98	51.89	29.13	58.46	48.62	1.50	9.84	5.91	6.56	F30, F35, F40	1	9680
D2C 36	36	60.00	61.42	34.65	65.39	54.37	1.50	11.02	6.50	7.16	F40, F48	1	14300

D2D, ASME CLASS 300

Type	Dimensions, mm										Mounting face	Plug NPTF	kg
	DN	A	ØB	ØD	E	K	M	N	ØO	P			
D2D 04	100	305	262	100	373	305	9.52	68	40	44.2	F10, F12, F14	1/2	60
D2D 06	150	403	368	152	480	390	12.70	90	55	60.6	F12, F14, F16	3/4	140
D2D 08	200	502	454	202	575	456	19.05	119	70	78.2	F14, F16, F25	3/4	240
D2D 10	250	568	558	254	684.5	538.5	22.22	146	85	94.6	F16, F25, F30	1	380
D2D 12	300	648	630	304	756	600	22.22	156	95	104.8	F16, F25, F30, F35	1	590
D2D 14	350	762	706	337	818	638	25.40	180	105	116.2	F25, F30, F35	1	770
D2D 16	400	838	792	387	910.5	705.5	31.75	205	120	133.8	F25, F30, F35	1	1050
D2D 18	450	914	884	440	1005	849	22.22	156	95	104.8	F25, F30, F35	1	1250
D2D 20	500	991	966	490	1085	905	25.40	180	105	116.2	F25, F30, F35, F40	1	1950
D2D 24	600	1143	1130	590	1229	1024	31.75	205	120	133.8	F30, F35, F40	1	3100
D2D 28	700	1346	1340	690	1323	1098	31.75	225	135	149	F35, F40	1	5250
D2D 30	750	1397	1414	740	1485	1235	38.10	250	150	166.6	F35, F40, F48	1	5500
D2D 32	800	1524	1490	785	1521	1271	38.10	250	150	166.6	F35, F40	1	6700
D2D 36	900	1727	1684	880	1720	1440	38.10	280	165	181.8	F40, F48	1	8700

Type	Dimensions, inch										Mounting face	Plug NPTF	lb
	Size	A	ØB	ØD	E	K	M	N	ØO	P			
D2D 4	4	12.01	10.31	3.94	14.69	12.01	0.37	2.68	1.57	1.74	F10, F12, F14	1/2	132
D2D 6	6	15.87	14.49	5.98	18.90	15.35	0.50	3.54	2.17	2.39	F12, F14, F16	3/4	308
D2D 8	8	19.76	17.87	7.95	22.64	17.95	0.75	4.69	2.76	3.08	F14, F16, F25	3/4	528
D2D 10	10	22.36	21.97	10.00	26.95	21.20	0.87	5.75	3.35	3.72	F16, F25, F30	1	836
D2D 12	12	25.51	24.80	11.97	29.76	23.62	0.87	6.14	3.74	4.13	F16, F25, F30, F35	1	1298
D2D 14	14	30.00	27.80	13.27	32.20	25.12	1.00	7.09	4.13	4.57	F25, F30, F35	1	1694
D2D 16	16	32.99	31.18	15.24	35.85	27.78	1.25	8.07	4.72	5.27	F25, F30, F35	1	2310
D2D 18	18	35.98	34.80	17.32	39.57	33.43	0.87	6.14	3.74	4.13	F25, F30, F35	1	2750
D2D 20	20	39.02	38.03	19.29	42.72	35.63	1.00	7.09	4.13	4.57	F25, F30, F35, F40	1	4290
D2D 24	24	45.00	44.49	23.23	48.39	40.31	1.25	8.07	4.72	5.27	F30, F35,F40	1	6820
D2D 28	28	52.99	52.76	27.17	52.09	43.23	1.25	8.86	5.31	5.87	F35,F40	1	11550
D2D 30	30	55.00	55.67	29.13	58.46	48.62	1.50	9.84	5.91	6.56	F35, F40, F48	1	12100
D2D 32	32	60.00	58.66	30.90	59.88	50.04	1.50	9.84	5.91	6.56	F35, F40	1	14740
D2D 36	36	68.00	66.30	34.65	67.72	56.69	1.50	11.02	6.50	7.16	F40, F48	1	19140

D1F, ASME CLASS 600

Type	Dimensions, mm										Plug NPTF	kg
	DN	A	ØB	ØD	E	K	M	N	ØO	P		
D1F 02	50	292	206	50	305	300	6.35	46	25	27.8	1/2	35
D1F 03	80	356	262	77	375	340	9.52	58	35	39.1	1/2	60
D1F 04	100	432	314	100	427	387	9.52	68	40	44.2	1/2	120
D1F 06	150	559	404	152	540	485	12.70	90	55	60.6	3/4	280
D1F 08	200	660	507	202	645	575	19.05	119	70	78.2	3/4	380
D1F 10	250	787	610	254	765	680	22.22	146	85	94.6	1	690
D1F 12	300	838	748	302	890	795	22.22	156	95	104.8	1	1134
D1F 14	350	889	824	340	970	865	25.40	180	105	116.1	1	1500
D1F 16	400	991	954	390	1068	948	31.75	205	120	133.8	1	2500
D1F 18	450	1092	1090	440	1200	1065	31.75	225	135	149.0	1	3300
D1F 20	500	1194	1176	490	1355	1205	38.10	250	150	166.6	1	3880
D1F 24	600	1397	1224	591	1440	1275	38.10	280	165	181.8	1	6500

Type	Dimensions, inch										Plug NPTF	lb
	Size	A	ØB	ØD	E	K	M	N	ØO	P		
D1F 2	2	11.50	8.11	1.97	12.01	11.81	0.25	1.81	0.98	1.09	1/2	77
D1F 3	3	14.02	10.31	3.03	14.76	13.39	0.37	2.28	1.38	1.54	1/2	132
D1F 4	4	17.01	12.36	3.94	16.81	15.24	0.37	2.68	1.57	1.74	1/2	264
D1F 6	6	22.01	15.91	5.98	21.26	19.09	0.50	3.54	2.17	2.39	3/4	616
D1F 8	8	25.98	19.96	7.95	25.39	22.64	0.75	4.69	2.76	3.08	3/4	836
D1F 10	10	30.98	24.02	10.00	30.12	26.77	0.87	5.75	3.35	3.72	1	1518
D1F 12	12	32.99	29.45	11.89	35.04	31.30	0.87	6.14	3.74	4.13	1	2495
D1F 14	14	35.00	32.44	13.39	38.19	34.06	1.00	7.09	4.13	4.57	1	3300
D1F 16	16	39.02	37.56	15.35	42.05	37.32	1.25	8.07	4.72	5.27	1	5500
D1F 18	18	42.99	42.91	17.32	47.24	41.93	1.25	8.86	5.31	5.87	1	7260
D1F 20	20	47.01	46.30	19.29	53.35	47.44	1.50	9.84	5.91	6.56	1	8536
D1F 24	24	55.00	48.19	23.27	56.69	50.20	1.50	11.02	6.50	7.16	1	14300

12. TYPE CODE

Neles™ ball valve, series D											
1.	2.	3.	4.	5.	6.	7.	8.	9.	/	10.	11.
D2	D	E	06	D	A	E	02	G		-	-

Q-CODE	PRODUCT OPTIONS
Q	Standard low noise trim for gas and liquid application, single seated (const. E or B) with open down stream side ball surface
Q2G	Q2-trim for gas application (single seated const.E or B)

1.	SERIES
D	Center split body, trunnion mounted, bonnet
STANDARD	
D2, D1(F)	Full bore, flanged
NON-STANDARD	
D3	Full bore, weld ends
D4	Reduced bore, weld ends
D5	Reduced bore, flanged

2.	PRESSURE RATING
C	ASME class 150
D	ASME class 300
F	ASME class 600

3.	CONSTRUCTION
STANDARD	
A	General construction, PTFE bearings, 2 seats, temperature range: -50 °C to +230 °C.
B	Single seated, one-way tight, metal bearings, temperature range: -50 °C to +450/600 °C
E	Single seated, one-way tight, PTFE bearings, temperature range: -50 °C to +230 °C
H	High-temperature construction, metal bearings, 2 seats, temperature range: -50 °C to +450/600 °C
NON-STANDARD	
C	Cryogenic construction, PTFE bearings, temperature range: -200 °C to +230 °C
S	Subsea construction
Z	OXYGEN CONSTRUCTION BAM tested non-metallic materials temperature range: -50 °C to +200 °C. See IMO '10O270EN.pdf'.
Y	Special construction

4.	SIZE (in)
D1F	02, 03, 04, 06, 08, 10, 12, 14, 16, 18, 20, 24, 28
D2D	04, 06, 08, 10, 12, 14, 16, 18, 20, 24, 26*, 28*, 30*, 32*, 36*
D2C	10, 12, 14, 16, 18, 20, 24, 28*, 30*, 36*
D5F	03, 04, 06, 08, 10, 12, 14, 16, 18, 20, 24
D5D	06, 08, 10, 12, 14, 16, 18, 20, 24, 28*, 30*, 32*, 36*
D5C	12, 14, 16, 18, 20, 24, 28*, 30*, 36*

*) Flanges acc. to ASME B16.47 series A in sizes 26" or larger.
Flanges in sizes up to NPS 24" are acc. to ASME B 16.5.

5.	BODY	BOLTING
STANDARD MATERIALS		
A	CF8M	B8M / 8M
D	WCB	L7M / 2HM
Y	Special	

**) When soft seat, then ball without chrome.

6.	BALL
A	CF8M / AISI 316 + Chrome**
D	CF8M / AISI 316 + NiBo, only size ≤ 24"
Y	Special

7.	SEAT TYPE
T	Soft seat
D	Soft seat, fire safe
S	Metal seat
E	Metal seat
H	Bellows seat
C	Bellows seat
K	Solids Proof metal seat
R	Fire safe metal seat
F6	Special metal seat.

8.	STANDARD MATERIALS				
	Seat seal	Body gasket	Gland packing	Wound spring or bellows spring	
02	Viton GF	Graphite	Graphite	W	X-750
03		Graphite Graphite	Graphite Graphite	B W	W.no.1.4418 X-750
	NON-STANDARD MATERIALS				
63	Viton GF, graphite	Graphite	Graphite	W	X-750
64	Lip seal, grafoil	Graphite	Graphite	W	X-750

9.	PACKING CONSTRUCTION CODE
G	Standard packing, live loaded graphite packing, ISO 15848-1 certified
-	Non-live loaded packing. Obsolete.

10.	FLANGE FACING
-	ASME B16.5 raised face Ra 3.2-6.3 or EN 1092-1 Type B1 (Ra 3.2-12.5) (without sign)
05	Ring Joint

11.	FLANGE DRILLING
-	Acc. to valve pressure rating, without sign (standard)
C	ASME class 150***
D	ASME class 300***
F	ASME class 600***
J	EN PN 10
K	EN PN 16
L	EN PN 25
M	EN PN 40
N	EN PN 64
P	EN PN 100
R	JIS 10K
S	JIS 16K
T	JIS 20K
U	JIS 30K
W	JIS 40K
Y	Special

***) Flange drilling acc. to ASME B16.47 series A in sizes 26" or larger.
Flange drilling in sizes up to NPS 24" are acc. to ASME B 16.5

13. GENERAL SAFETY WARNINGS AND DISCLAIMERS

General safety warnings

Lifting

1. Always use a lifting plan created by a qualified person to lift this equipment. Lifting guidance is provided in this IMO (Installation, Maintenance and Operation manual) to assist in lifting plan development. Think about the center of gravity (CG) of the equipment being lifted. Make sure the CG is always under the central lifting point.
2. Valves may be equipped with lifting threads on the body or on the flanges. These are intended to be used with the lifting plan.
3. Use only correct and approved lifting devices. Ensure that lifting devices and straps are securely attached to the equipment prior to lifting.
4. Check, that lifting devices are not damaged and in good condition with a valid check stamp prior to use.
5. Workers must be trained for lifting and handling valves.
6. Never lift an assembly by the instrumentation (solenoid, positioner, limit switch, etc.) or by the instrumentation piping. Straps and lifting devices should be fitted to prevent damage to instrumentation and instrumentation piping. Failure to follow the lifting guidance provided may result in damage and personal injury from falling objects.

Work activities on the valve

1. Wear your personal safety equipment. Personal safety equipment includes but is not limited to protective shoes, protective clothing, safety glasses, helmet, hearing protection and working gloves.
2. Always follow the local safety instructions in addition to the Valmet instructions. If Valmet instructions conflict with local safety instructions, stop work and contact Valmet for more information.
3. Before beginning service on the equipment, make sure that the actuator is disconnected from any kind of power source (pneumatic, hydraulic, and/or electric), and no stored energy is applied on the actuator (compressed spring, compressed air volumes, etc.). Do not attempt to remove a spring return actuator unless the stop screw is carrying the spring force.
4. Make sure that there is a LOTOTO (Lock Out / Tag Out / Try Out) procedure in place for the system in which the valve is installed and strictly follow it.
5. Always make sure that the pipeline is depressurized and in ambient temperature condition before maintenance work is started.
6. Keep hands and other body parts out of the flow port when the valve is being serviced and the actuator is connected to the valve. There is a high risk of serious injury to hands and/or fingers due to malfunction if the valve suddenly starts to operate.
7. Beware of Trim (Disc, Ball or Plug) movement even when the valve is disassembled. Trim may move simply due to the weight of the part or change in position of the valve. Keep hands or other body parts away from locations where they may be injured by movement of the trim. Do not leave objects near or in the valve port which may fall in and need to be retrieved.

General disclaimers

Receiving, handling and unpacking.

1. Respect the safety warnings above!
2. Valves are critical components for pipelines to control high pressure fluids and must therefore be handled with care.
3. Store valves and equipment in a dry and protected area until the equipment is installed.
4. Do not exceed the maximum storage temperatures given in the IMO (installation, maintenance, and operating instructions).
5. Keep the original packaging on the valve as long as possible to avoid environmental contamination by dust, water, dirt, etc.
6. Remove the valve endcaps just before mounting into the pipeline.
7. FOR YOUR SAFETY IT IS IMPORTANT TO FOLLOW THESE PRECAUTIONS BEFORE REMOVAL OF THE VALVE FROM THE PIPELINE OR ANY DISASSEMBLY:
   - Be sure you know what flow medium is in the pipeline. If there is any doubt, confirm with the proper supervisor.
   - Wear any personal protective equipment (PPE) required for working with the flow medium involved in addition to any other PPE normally required.
   - Depressurize the pipeline, bring to ambient temperature, and drain the pipeline flow medium.
   - Cycle the valve to relieve any residual pressure in the body cavity.
   - After removal but before disassembly, cycle the valve again until no evidence of trapped pressure remains.
   - The valves with offset shaft (Butterfly, eccentric rotary plug) have greater trim area on one side of the shaft. This will cause the valve to open when pressurized from the preferred direction without a locking handle or an actuator installed.
   - **WARNING:** DO NOT PRESSURIZE THE ECCENTRIC VALVE WITHOUT A HANDLE OR AN ACTUATOR MOUNTED ON IT!
   - **WARNING:** DO NOT REMOVE A HANDLE OR AN ACTUATOR FROM AN ECCENTRIC VALVE WHILE PRESSURIZED!
   - Before installing the eccentric valve in or remove it from the pipeline, cycle the valve closed. Eccentric valves must be in the closed position to bring the trim within the face to face of the valve. Failure to follow these instructions will cause damage to the valve and may result in personal injury.

Operating

8. The identification plate (ID-plate, type plate, nameplate, or engraved markings) on the valve gives the information of max. process conditions to the valve.
9. (For soft seats) The practical and safe use of this product is determined by both the temperature and pressure ratings of the seat and body. Read the identification plate and check both ratings. This product is available with a variety of seat materials. Some seat materials have pressure ratings that are lower than the body ratings. All body and seat ratings are dependent on the valve type, size and material of the body and seat. Never exceed the marked rating.
10. Temperatures and pressures must never exceed values marked on the valve. Exceeding these values may cause uncontrolled release of pressure and process medium. Damage or personal injury may result.
11. The operating torque of the valve may rise over time due to wear, particles or other damage of the seat. Never exceed the actuator torque preset values (air supply, position). Application of excessive torque may cause damage to the valve.
12. Valmet valves typically are designed to be used in atmospheric conditions. Do not use valves under external pressurized conditions unless specifically designed and explicitly marked for this service.

13. Avoid Pressure shocks or water hammer. Systems with high pressure valves should be equipped with a bypass to reduce the differential pressure before opening the valve to avoid pressure shock.
14. Avoid thermal shock. High temperature, Low temperature and cryogenic valves should be operated in a way that limits the rate of increase or decrease in temperature. The valve should be thermally stabilized before being pressurized.
15. Materials of the valve are carefully selected for the process conditions. Changes to the process media can have a major impact on function and safety of the valve. Always confirm the materials are suitable for the service prior to installation.
16. As the use of the valve is application specific, several factors should be considered when selecting a valve for a given application. Therefore, some situations in which the valves are used are outside the scope of this manual.
17. It is the end user's responsibility to confirm compatibility of the valve materials with the intended service, however if you have questions concerning the use, application, or compatibility of the valve for the intended service, contact Valmet for more information.
18. Never use a valve with enriched or pure oxygen if the valve is not explicitly designed and cleaned for oxygen. Selected materials and design have a major impact on the safety to operate the valve with oxygen.
19. Valves intended for use in or with explosive atmospheres must be equipped with a grounding device and marked according ATEX (or equivalent international standards).
20. Manual handles are available for specific butterfly valve sizes and maximum line pressures. Do not operate a valve with a handle or wrench outside the size and pressure limits stated in the IMO. High line pressure may create a large enough force to pull the handle from the operator's hands. Damage or personal injury may result.

Maintenance

21. Respect the safety warnings above!
22. Plan service and maintenance actions, that spare parts, lifting devices and service personnel is available.
23. Maintain the valve within the recommended minimum maintenance intervals or within the recommended maximum operating cycles.
24. Always make sure that the valve and the pipeline is depressurized before starting any kind of maintenance work at a valve.
25. Always check the position of the valve before starting maintenance work. Follow the Lock out /tag out (LOTO) rules at the site before starting any maintenance activity.
    - See IMO for the correct stem position.
    - Consider that the positioner may give the wrong signals.
26. Sealing materials (soft sealing parts) should be changed when the valve in maintenance. Always use original equipment manufacturers (OEM) spare parts to ensure proper performance of the repaired valve.
27. All pressure containing parts must be inspected visually for damage or corrosion. Damaged parts must be replaced.
28. Valve pressure retaining parts and all internals must be inspected for corrosion or erosion which may result in reduced wall thickness on pressure retaining parts. Damaged pressure retaining parts must be replaced with original equipment manufacturer's (OEM) replacement parts or repaired to factory specifications by an authorized Valmet service partner in order to maintain the warranty.
29. Do not use sharp tools, grinding machines, or files to work on functional surfaces such as sealing, seating or bearing surfaces as this can damage these surfaces.
30. Check the condition of sealing surfaces on the seats, trim (disc, ball, plug, etc.), body and body cap. Replace parts if there are significant wear, scratches, or damage.
31. Check the wear of bearings and bearing contact surfaces on the shaft and replace damaged parts if necessary.
32. Do not weld on pressure retaining parts without an ASME and PED qualified procedure and personnel.
33. Pressure retaining parts of valves in high temperature applications must be carefully examined for the effects of material creep and fatigue.
34. Make sure that the valve is positioned in the correct flow direction into the pipeline.
35. If the valves are marked to be suitable for explosive atmospheres, the correct function of the discharging device must be tested before returning to service.
36. Always work in a clean environment. Avoid getting particles inside the valve due to machining, grinding, or welding nearby.
37. Never store a valve in maintenance without flow port protection.
38. When pressure testing valve seats, never exceed the maximum operating pressure of the system or the maximum shut-off pressure marked on the valve identification plate.
39. Actuator mounting and unmounting:
    - Before installing the actuator on to the valve, be sure the actuator is properly indicating the valve position. Failure to assemble these to indicate correct valve position may result in damage or personal injury.
    - When installing or removing a linkage kit, best practice is to remove the entire linkage assembly, including couplings which may fall off the valve during lifting or when position changes.
    - Mounting sets have been designed to support the weight of the Valmet actuator and recommended accessories either as is or with additional actuator support. Use of the linkage to support additional equipment or additional weight such as people, ladders, etc. may result in equipment damage or personal injury.
40. The valve should be installed between flanges using appropriate gaskets and fasteners that are compatible with the application, and in compliance with applicable piping codes and standards. Center the gaskets carefully when fitting the valve between the flanges. Do not attempt to correct pipeline misalignment by means of the flange bolting.
41. Repairs on valves for special service like Oxygen, Chlorine, and Peroxide, have special requirements.
    - Parts must be cleaned appropriate to the service and protected from contamination prior to assembly.
    - Assembly areas and tools must be clean and dry to prevent contamination of the parts during assembly.
    - Test equipment must be clean and dry to prevent contamination during testing. This includes the test equipment internals that may allow particles or other contamination into the test medium during the test.
    - Lubrication shall be used only if specifically required in the instructions. Where lubrication is required, the lubricant must be approved for the service by the end user.

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