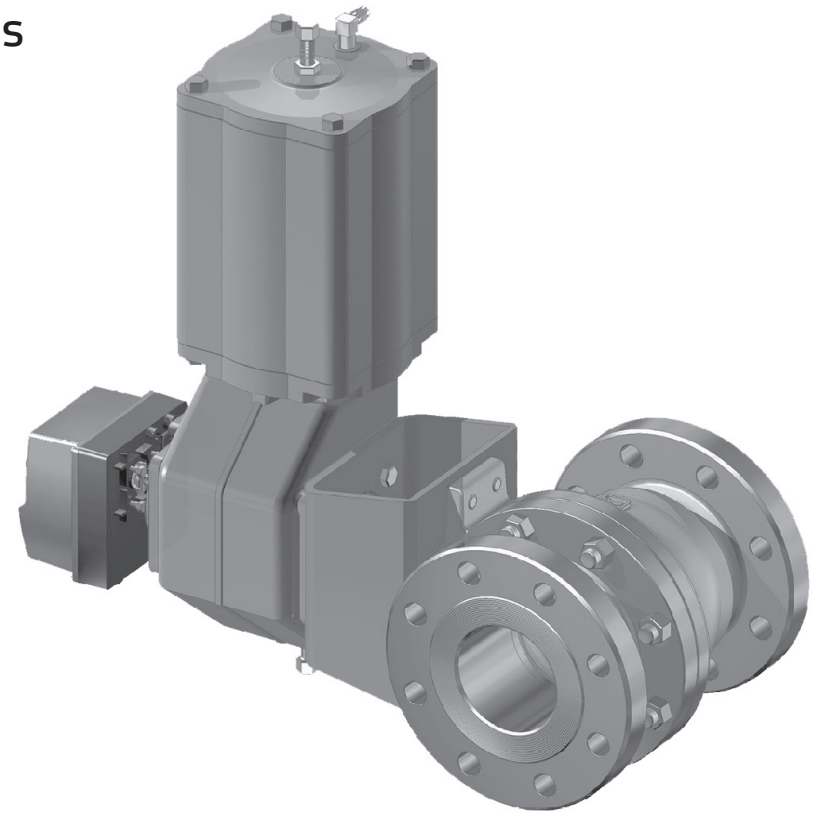
Trunnion mounted full bore Neles™ ball valve

Series XG, XM

Installation, maintenance and operating instructions



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EAC 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 installation, operation and maintenance manual provides essential information on trunnion mounted XG/XM series ball valves. The actuators and instrumentation to be used with these 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. 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

Trunnion mounted XG/XM 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 bonnet and a shoulder machined on the shaft.

The valve is either soft or metal seated. Shaft torque is transmitted to the ball through a splined bore in the ball.

The valve is 1-way or 2-way tight depending on the seat construction. Tightness direction is shown with an arrow on 1-way valves.

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.

Trunnion mounted XG/XM series ball valves are specially designed for demanding throttling and shut-off service with high pressure differentials.

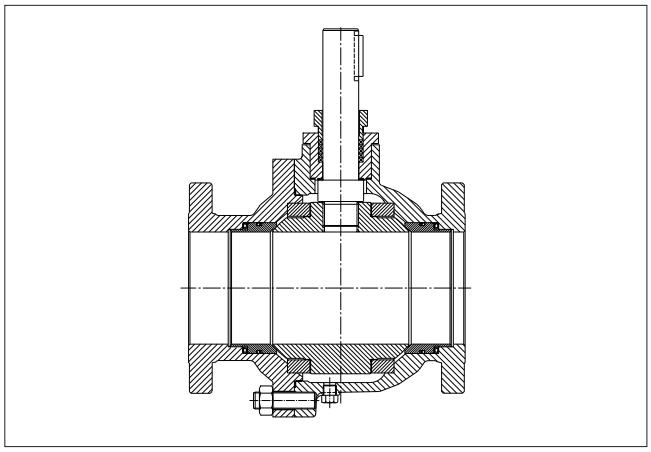


Fig. 1 Construction of a trunnion mounted XG/XM series ball valve

1.3 Markings

Body markings are cast or stamped on the body (see Fig. 2).

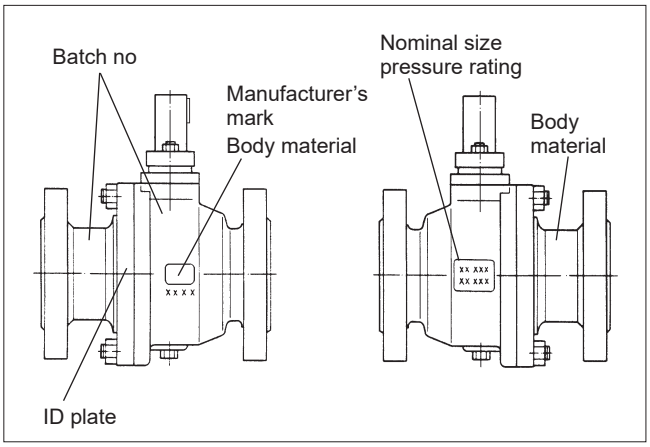


Fig. 2 Valve markings

The identification plate (Fig. 3) 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

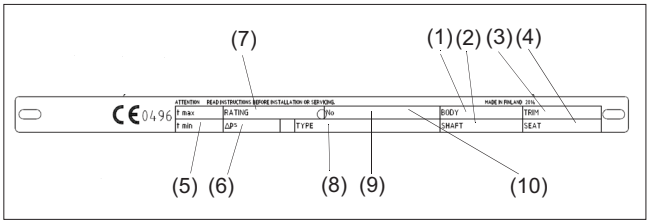


Fig. 3 Example of identification plate

1.4 Specifications

Face-to-face length:	ASME B.16.10 long pattern
Body rating:	ASME Class 150, 300 EN PN 10-40
Max. pressure differential:	see Figs. 4 and 5
Temperature range:	-50°…+600 °C -58°…+1110 °F
Tightness:	Bi-directional or uni-directional depending on seat construction
metal seated	ISO 5208 Rate C
soft seated	ISO 5208 Rate B
Dimensions:	see tables on pages 13–15
Weights:	see tables on pages 13–15

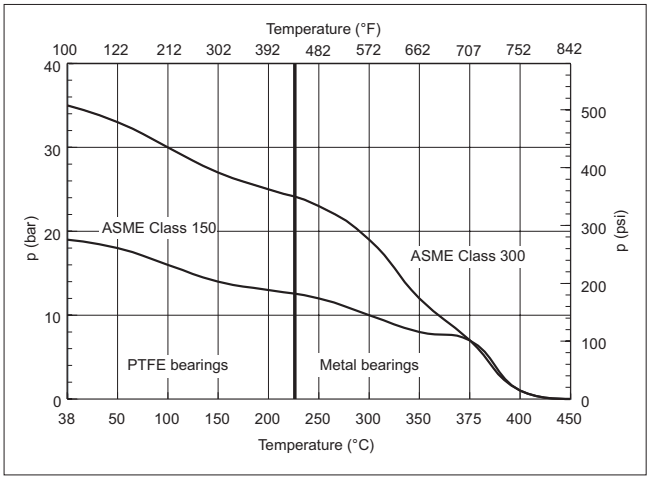


Fig. 4 Maximum allowable Δp in control service

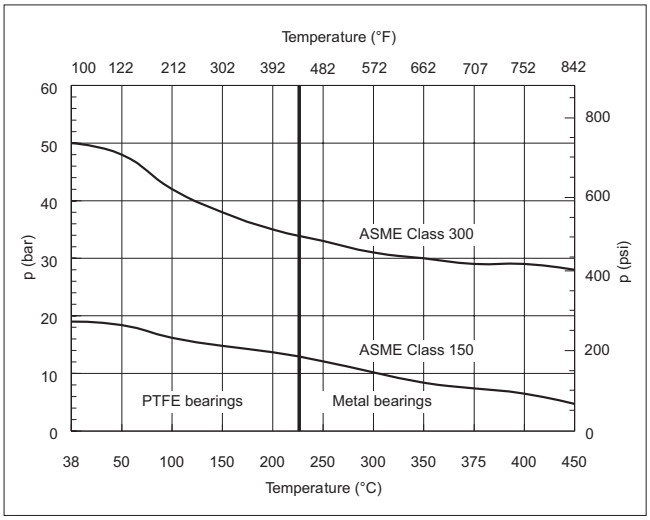


Fig. 5 Maximum allowable Δp in on-off service

1.5 Valve approvals

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

Fire safety characteristics are designed according to API 607 and BS 6755.

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 Neles 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. 7). Damage or personal injury may result from falling parts.

The weights are shown on pages 13–15.

CAUTION:

Follow the proper procedures when handling and servicing oxygen valves.

CAUTION:

Potential electrostatic charging hazard. Ensure the protection in the process.

1.9 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. 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.

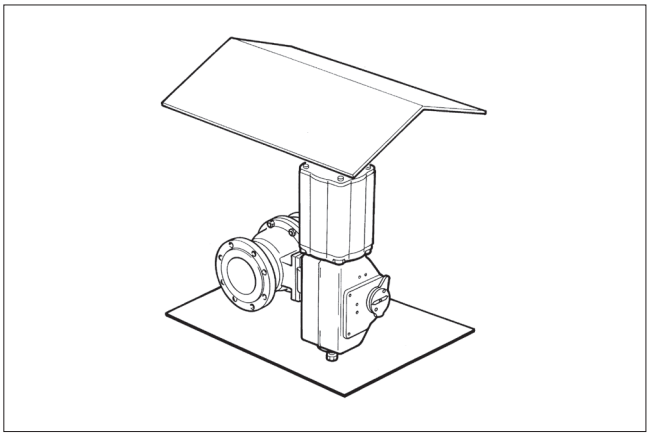


Fig. 6 Storing the valve

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.

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.

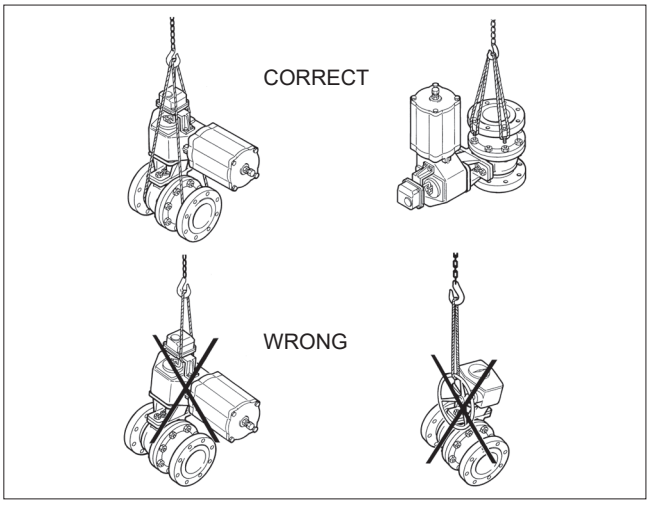


Fig. 7 Lifting the valve

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 fasteningsused 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 1-way or 2-way tightness, see Sections 1.2 and 1.4. 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. 8.

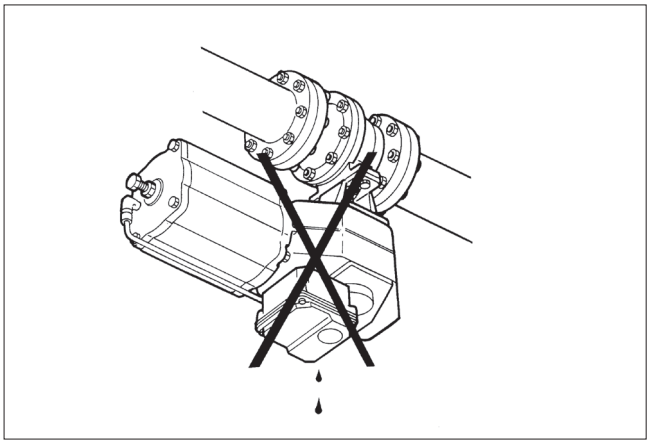


Fig. 8 Avoid this mounting position

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. 9.

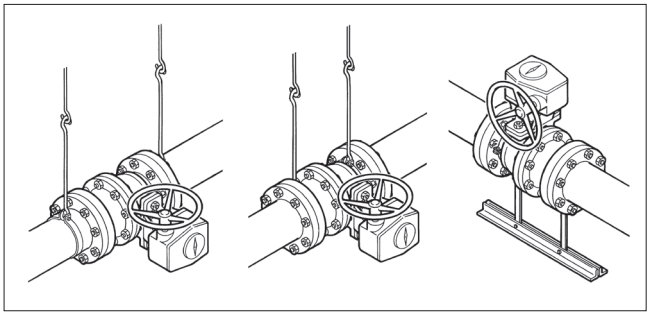


Fig. 9 Supporting the valve

Valve insulation

If necessary, the valve may be insulated. Insulation must not continue above the upper level of the valve body, see Figure 10.

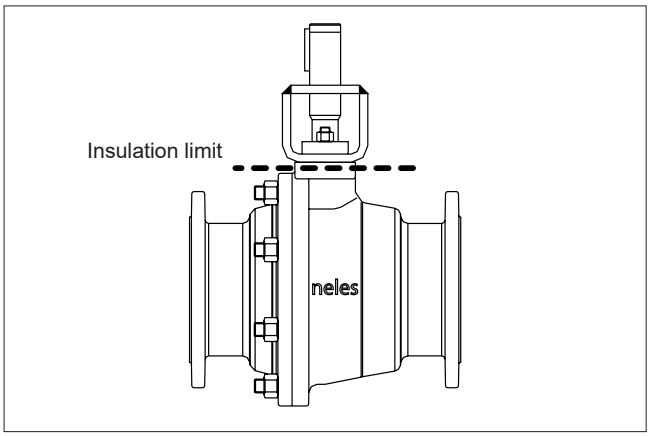


Fig. 10 Insulation of the valve

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 Valmet 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 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 Changing 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!

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 follower 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 nuts (18), the disc spring sets (150) and the gland (9).
- Remove old packing rings (69). Do not damage the surfaces of the packing ring counterbore and shaft.
- Clean the packing ring counterbore.
- Place the new packing rings (69) over the shaft (5). The gland follower may be used for pushing the rings into the counterbore. Do not damage packing rings in the shaft keyway. See Fig. 11 for proper orientation.
- 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 H2. See Fig. 11 and the value from Table 1.
- 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 Table 1.
- If the leakage still occurs when the valve is pressurized, re-tighten the nuts but don't exceed the value in the Table 1 by 50 % or do not fully compress the disc springs.

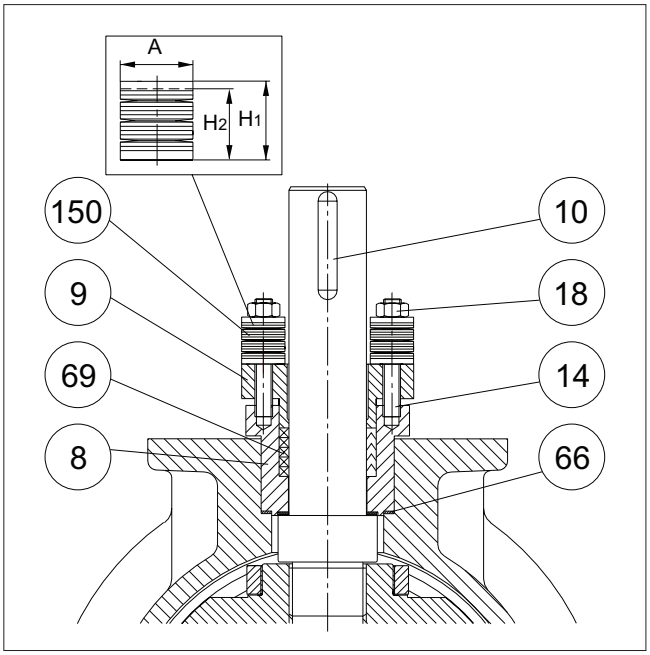


Fig. 11 Gland packing

Table 1 Tightening of gland packing

Valve size		Shaft dia	Spring dimensions (free)		PTFE V-ring		Graphite		Graphite (Braided)	
					Disc spring	Nut	Disc spring	Nut	Disc spring	Nut
DN	NPS	mm	A, mm	H1, mm	H2, mm	Tt, Nm	H2, mm	Tt, Nm	H2, mm	Tt, Nm
50	02	20	20	22	21.0	3	20.2	6	-	-
80	03	20	20	22	21.0	3	20.2	6	-	-
100	04	30	25	30.5	29.3	8	28.4	14	-	-
150	06	40	25	30.5	28.9	10	28.2	15	-	-
200	08	40	25	30.5	28.9	10	28.2	15	-	-
250	10	55	35.5	41	38.8	23	37.4	38	-	-
300	12	55	35.5	41	38.8	23	37.4	38	-	-
350	14	75	50	59	57.3	43	55.3	91	-	-
400	16	85	50	59	57.1	48	54.9	102	-	-
450	18	85	50	59	57.5	54	56	108	54.5	162
500	20	85	50	59	57.5	54	56	108	54.5	162
500	20	95	71	73	70.8	126	68.6	252	66.4	378
600	24	95	71	73	70.8	126	68.6	252	66.4	378
600	24	120	71	73	70.8	156	66	311	63.6	467

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!

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 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.

- 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 8 “Tools”).
- Remove the bracket.

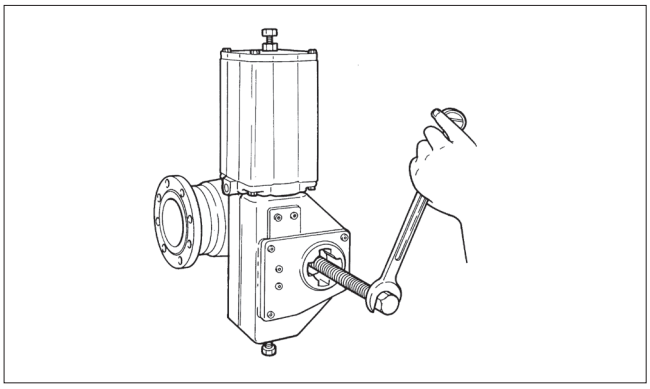


Fig. 12 Removing the actuator with an extractor

4.5 Removing the valve from the pipeline

CAUTION:

Do not dismantle the valve or remove 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. 7. Lift valve down.

4.6 Dismantling the valve

- 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 the body halves for correct orientation during re-assembly.
- Turn the ball to the closed position.
- Remove the key (10).
- Unscrew the gland nuts (18). Remove the disc spring sets (150) and the gland (9).

- 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.
- Remove the seat (7) from body cap (2) if it is still in place.
- Unscrew the bonnet stud nuts (17). Remove the shaft (5) and bonnet (8). Knock the bonnet off with a piece of wood and a hammer, if needed.
- Lift the ball (3) along with the trunnion plates (89) out of the body (1). Handle the ball carefully and place it on a soft surface.
- Remove the seat (7) from the body (1).
- Remove the trunnion plates (89) from the hubs of the ball.
- Remove the trunnion bearings (99) and the bearing spacers (91) from each trunnion.
- Push the shaft out of the bonnet.
- Remove thrust bearings (70, 71) from the shaft and packing rings (69) from the bonnet (8).
- Remove the body gasket (65) and the bonnet gasket (66).

4.7 Inspection of removed parts

- Clean removed parts.
- See if the shaft (5) or bearings (70, 71, 99) 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 sealing surfaces 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 Re-assembly of the valve

- Place the valve body (1) and the body cap (2) on the pipe flange end. Use a level surface that will not scratch the flanges.

Pre assembly of the seats

S and T seats:

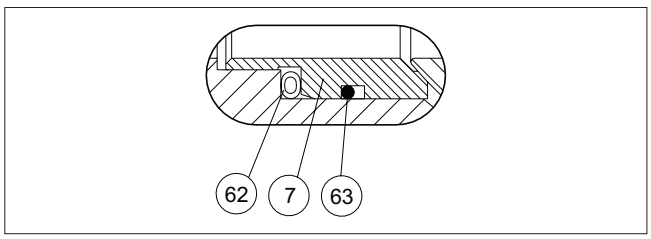


Fig. 13 S seat

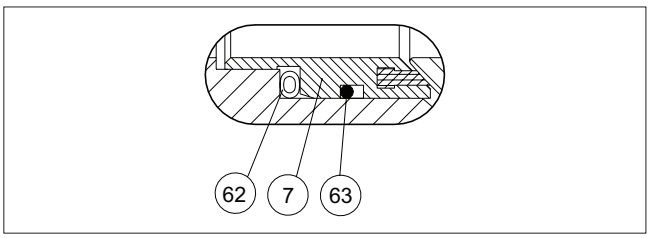


Fig. 14 T seat

Check the sealing surfaces.

- Place the back seal (O-ring) (63) into the groove in the seat. See Figures 13 and 14.
- For easier assembly, lubricate the O-ring surfaces facing the seats with silicone grease or another suitable substance. Please ensure the compatibility with the flow medium.
- Place the spring (62) into the groove in the seat (7). Connect the ends of the spring.
- Place the seats into the body and body cap by hand or if necessary, using a plastic mallet. The seat is in correct position when the spring touches the body shoulder.

D and B seats:

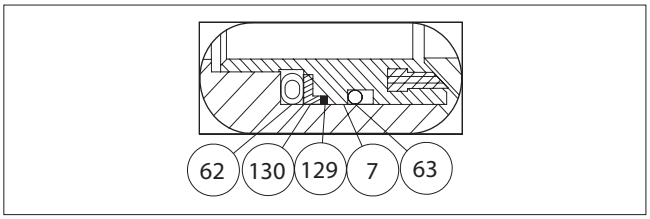


Fig. 15 D seat

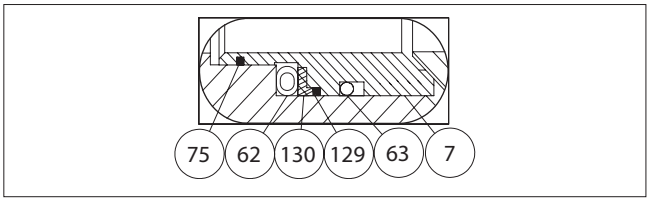


Fig. 16 B seat

K and G seats:

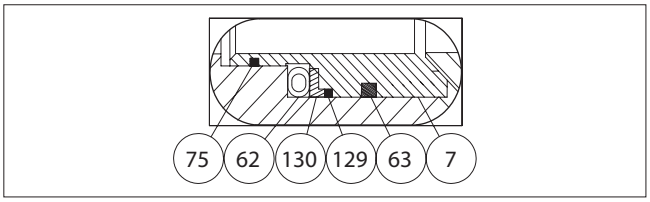


Fig. 17 G and K seat

H seats:

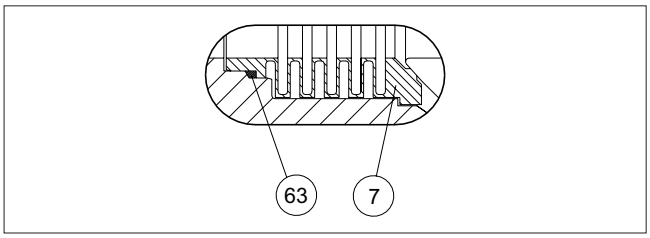


Fig. 18 H seat

- Check the sealing surfaces.
- Place the back seal (63) into the seat (7). See Figure 18.
- Place the seat into the body counterbore.

L seats:

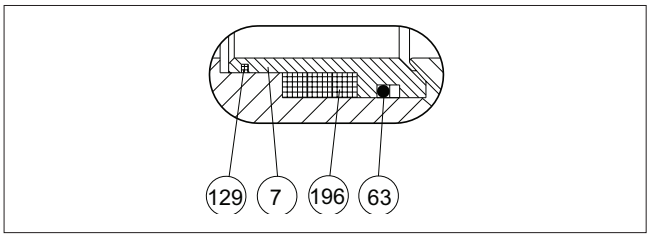


Fig. 19 L seat

L seats:

- Measure the 0-torque of the valve. It should be acc. to Table 2.

0-torque shall be adjusted with graphite sheet rings (available thicknesses are 0.2 and 0.4 mm).

Table 2 0-torques

DN / NPS	0-torque (Nm / lbf ft)	
	1-seat	2-seat
80 / 3	50-100 / 37-74	150-200 / 110-148
100 / 4	100-150 / 74-110	200-250 / 148-184
150 / 6	150-200 / 110-148	250-300 / 184-221
200 / 8	200-250 / 148-184	300-350 / 221-258
250 / 10	250-300 / 184-221	350-400 / 258-295
300 / 12	300-350 / 221-258	400-450 / 295-332
350 / 14	350-400 / 258-295	450-550 / 332-405
400 / 16	400-500 / 295-368	550-650 / 405-479

Roughness of the surfaces in contact with graphite back seals shall be Ra 0.4 or better. Sharp edges shall be rounded off. Apply a thin and even layer of molybdenum grease spray on cleaned ball and seat surfaces before assembly.

- Place the O-ring (63) into the groove of the ball seat (7) and lubricate the O-ring (63) with silicone grease.
- Place the graphite back seals (196) onto the seat.
- Place seal ring (braided graphite) (129) into the groove of the ball seat.
- Place the ball seats into the body and the body cap using plastic or wooden mallet or if necessary, using a hydraulic press.

All versions:

- Place a trunnion bearing (99) into each trunnion plate (89) counterbore.
- Place a bearing spacer (91) over each ball trunnion.
- Fit a trunnion plate over each ball trunnion until the plate rests against the bearing spacer (91). This operation must be performed with care and without excessive force or the bearing will be damaged. It may be necessary to tap the plate on with a plastic mallet.
- Align the trunnion plates (89) relative to the ball port in the closed position.

NOTE:

The shaft will fit into the ball in one position only. There's a larger cog in the splined shaft or added cog in square end shaft and a matching groove in the ball shaft bore. It is essential to note the groove's position during the next assembly step.

- With the ball (3) in the "closed" position, lower the ball/trunnion plate subassembly into the body (1). **NOTE:** This procedure is critical and careful attention is a must. The outside diameter of the trunnion plates must pilot in the body counterbore. Carefully lower the subassembly until a trunnion plate enters the counterbore (Usually one trunnion plate will enter the counterbore and the other will be out of position.) Use a plastic mallet or a block of wood to rotate the second trunnion into position. Once trunnion plates are aligned, lower the subassembly until the trunnion plates are seated in the bottom of the counterbore.
- Slide the thrust bearings (70=thinner, 71=thicker) over the shaft (5). See the exploded view for proper orientation.
- Insert shaft subassembly through the bonnet (8) and install packing (69). Refer to Fig. 11 for proper orientation of packing.
- Install the gland (9) over shaft (5) and gland studs. Install the disc springs sets (150) and the gland stud nuts (18) on studs and tighten "finger tight."
- Install the bonnet gasket (66) and the bonnet subassembly over the bonnet studs (10). Note the correct shaft position! Lubricate the threads of studs (13) and tighten the nuts (17) according to values in Table 2.
- Install the body gasket (65) in the body groove.
- Place the body cap (2) carefully over the body studs (12) and the body (1). See that the flange holes are aligned acc. to the mark made during the dismatling. Take care not to damage the body gasket and the seat (7) in 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 2. The flange faces must in even contact with each other.
- Mount the key (10).
- Cycle the valve slowly a couple of times to insure correct position of the ball between the two seats.

Tightening torques of the body joint bolting

Material	ASTM A320 gr. L7M	ASTM A193 gr. B8M cl. 1	ASTM A193 gr. B8M cl. 2
Bolt Size	Tightening Torque (Nm)	Tightening Torque (Nm)	Tightening Torque (Nm)
M8	25	11	31
M10	50	22	60
M12	85	38	100
M14	140	61	170
M16	210	95	260
M18	290	130	350
M20	420	190	420
M22	560	250	560
M24	720	320	720
M27	1100	480	870
M30	1400	650	1200
M33	2000	880	1200
M36	2500	1100	1600
M39	3300	1500	2100

NOTE: Threads must be well lubricated
NOTE: ASTM A193 B8M cl.1 utilized in sizes 2”-16”, ASTM A193 cl.2 utilized in sizes 18”-24”

- Tighten the gland nuts (18) acc. to Section 4.2 . Pull on the shaft (5) while tightening to assure that shaft and thrust bearings are always in contact with the body. Check for leakage once the valve is pressurized..
- Install the valve in the pipeline as carefully and accurately as when removing it. Follow the instructions given in Section 3.

5. TESTING THE VALVE

CAUTION:

Pressure testing should be carried out using equipent 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 an half-open position during the test.

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

6. INSTALLING THE ACTUATOR

6.1 General

CAUTION:

Beware of ball cutting movement!

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.

6.2 Installing the M-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 grooves of the actuator and the couplings. Place the coupling on the shaft and lock it. Place the bracket on the valve and turn the lubricated screws a few times.
- Turn the actuator to the closed position and push it carefully onto the valve shaft on which the coupling has been mounted. Please note the marks on the handwheel and the coupling.
- Lubricate the actuator screws. Tighten all screws.
- Adjust the ball open and closed positions with the hexagon screws located at the side of the housing (see Figure 20). 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.

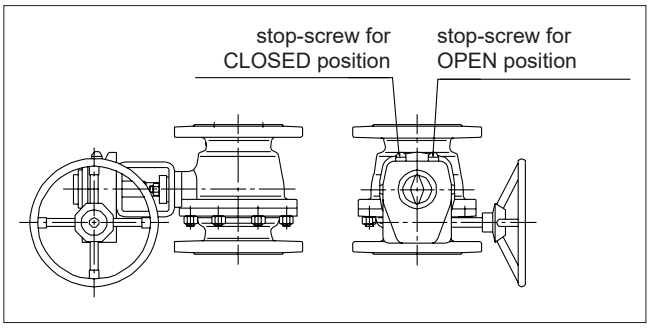


Fig. 20 Open and closed positions of the M actuator

6.3 Installing the B1C-series actuator

- 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.
- The line at the end of the shaft indicates the direction of the ball flow bore.
- Lubricate the actuator shaft bore. Fasten the bracket loosely to the valve.
- Slip the actuator carefully onto the valve 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.

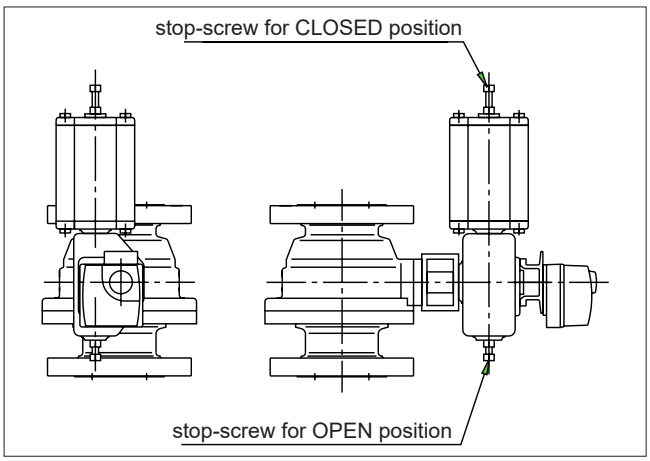


Fig. 21 Open and closed positions of the B1C/B1J actuator

- Adjust the ball open and closed positions by means of the actuator stop screws located at both ends (see Fig 21). 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.

6.4 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.

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 makes of actuators

NOTE:

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

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

7. TROUBLE SHOOTING TABLE

The following Table 3 lists malfunctions that might occur after prolonged use.

Table 3 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

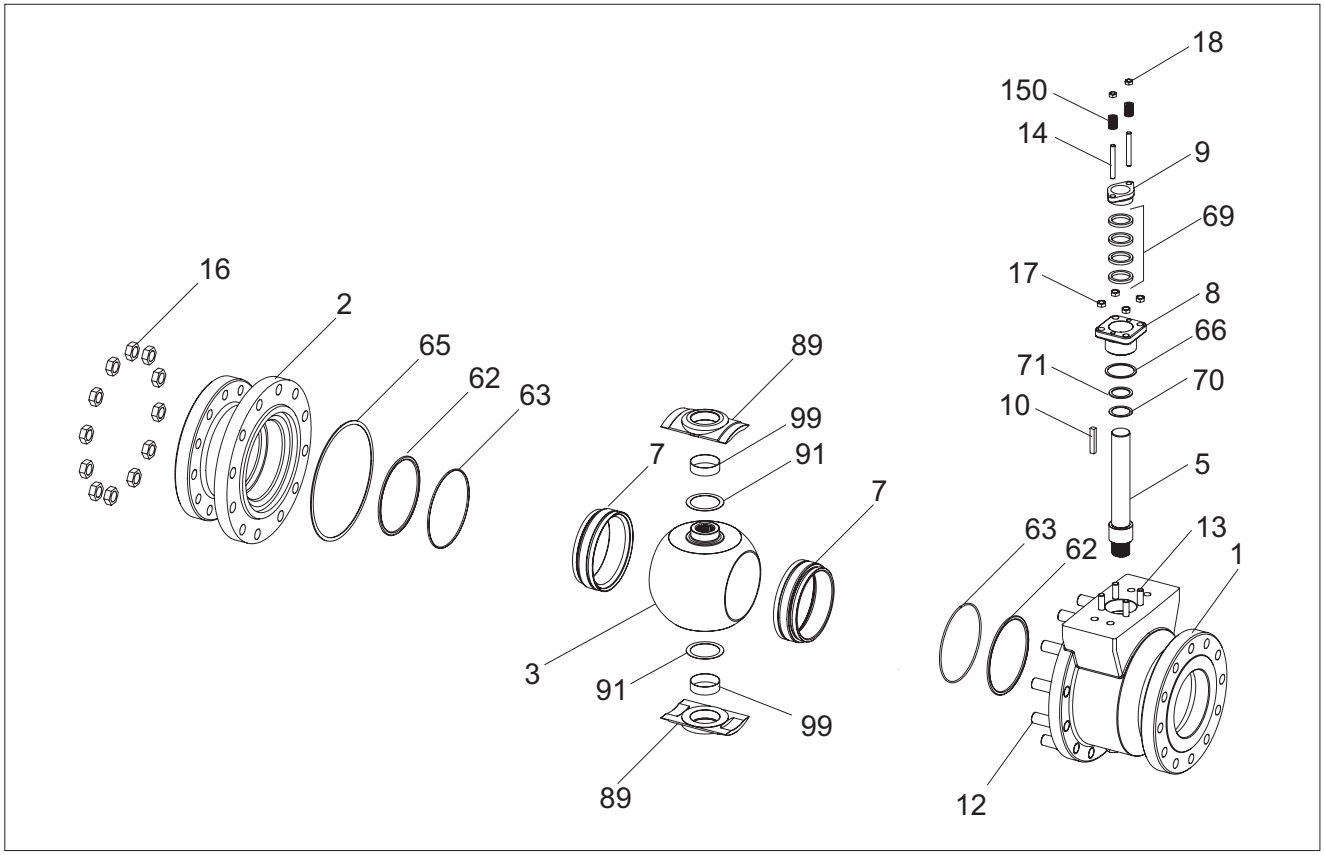
When ordering spare parts, always include the following information:

- type code, sales order number, serial number
- 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 VIEW AND PARTS LIST

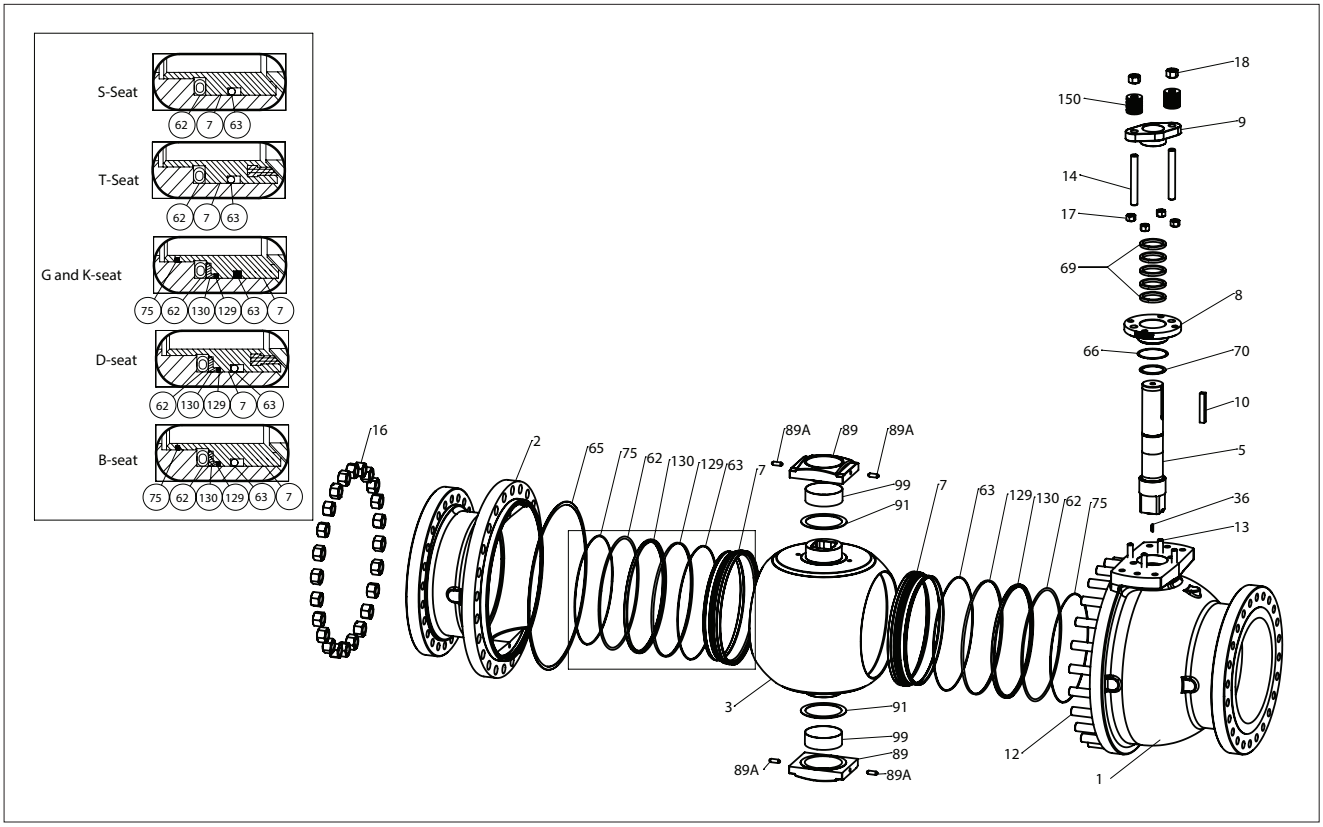
Sizes 2”-16”.



Item	Qty	Description	Spare part category
1	1	Body	
2	1	Body cap	
3	1	Ball	3
5	1	Shaft	3
7	1 or 2	Seat (S, T)	2
	1 or 2	Seat (H)	
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	
62	1	Spring	
63	2	O-ring (S, T)	1
	1	Back seal (H)	1
65	1	Body gasket	1
66	1	Bonnet gasket	1
69	1	Packing / V-ring set	1
70	2	Thrust bearing (S,T)	3
	1	Thrust bearing (H)	3
71	1	Thrust bearing	
89	2	Trunnion plate	
91	2	Bearing spacer	3
99	2	Trunnion bearing	3
150	2	Disc spring set	

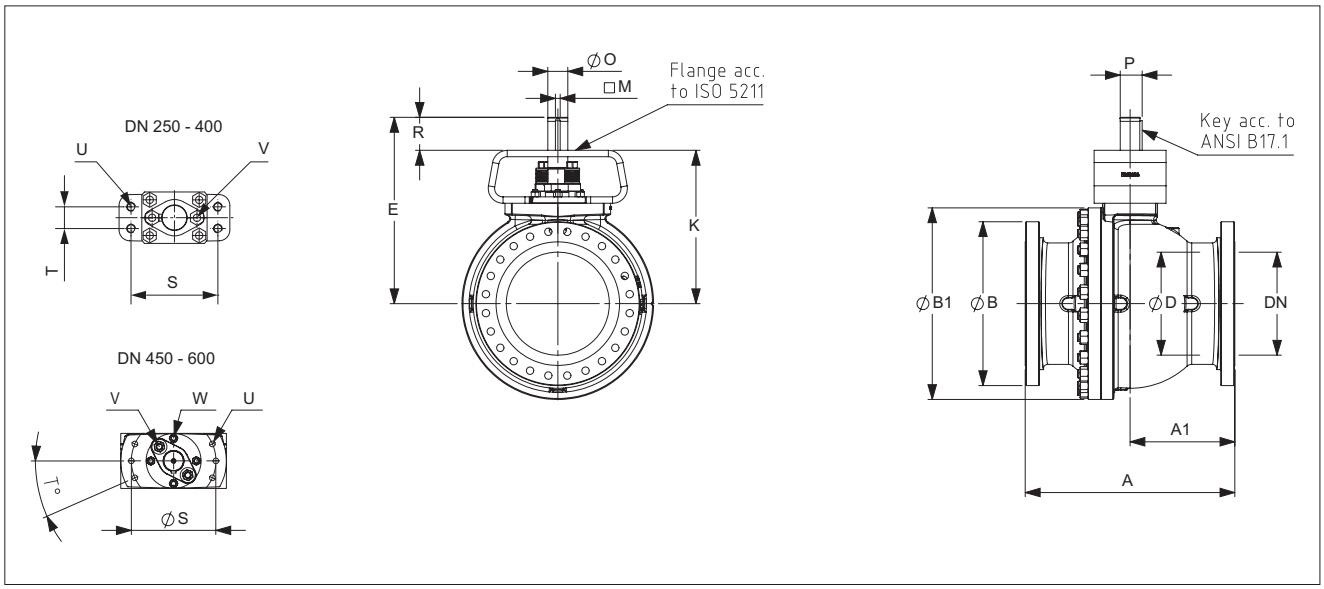
Spare part (Spare Part Set): Recommended soft parts, always needed for the repair. Delivered as a set.
Spare part category 2: Parts for replacing of the seat. Available also as a set.
Spare part category 3: Parts for replacing of the closing element.
Spares for the full overhaul: All parts from the categories 1, 2 and 3.

Sizes 18”-24”.



Item	Qty	Description	Spare part category
1	1	BODY	
2	1	BODY CAP	
3	1	BALL	3
5	1	SHAFT	3
7	1 or 2	SEAT (G, K, D)	2
	1 or 2	SEAT (S, T)	
	1 or 2	SEAT (B)	
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	
19	1	IDENTIFICATION PLATE	
36	1	ANTI-STATIC SPRING	3
62	1 or 2	SPRING	2
63	1 or 2	O-RING (S, T, B)	1
	1 or 2	BRAIDED SEAL SQUARE (G, K)	1
65	1	BODY SEAL SPIRAL WOUND	1
66	1	SHEET RING	1
69	1	PACKING RING/V-RING SET	1
70	1	THRUST BEARING	1
75	1 or 2	BRAIDED SEAL SQUARE (S, G, B, K)	1
89	2	TRUNNION PLATE	
89A	4	PIN	1
91	2	THRUST BEARING	1
99	2	TRUNNION BEARING	1
129	1 or 2	BACK SEAL (G, B, K, D)	1
130	1 or 2	SUPPORT RING (G, B, K, D)	2
150	2	DISC SPRING SET	

11. DIMENSIONS



ASME 150

DN	ISO FLANGE	DIMENSIONS, mm										WEIGHT kg
		A	A1	ØB	ØB1	ØD	E	K	□M	ØO	P	
50	F07, F10	178	79	150	146	50.8	203	168	4.76	20	22.16	10
80	F07, F10, F12, F14	203	96.5	190	190	76.2	225	190	4.76	20	22.16	22
100	F10, F12, F14	229	112	230	241	101.6	296	250	6.35	25	27.75	32
150	F14, F16	394	197	280	338	152.4	373	305	9.53	40	44.23	75
200	F14, F16, F25	457	229	343	426	203.2	453	385	9.53	40	44.23	190
250	F14, F16, F25,F30	533	267	407	514	254	562	472	12.7	55	60.6	325
300	F14, F16, F25, F30	610	305	483	592	304.8	605	515	12.7	55	60.6	480
350	F16, F25, F30, F35	686	343	533	665	340	741	607	19.05	75	83.15	635
400	F16, F25, F30, F35	762	381	597	750	390	779	633	22.23	85	94.63	840
450	F30, F35	864	457	635	800	436	793.9	645.7	22.23	85	95.68	1001
500	F30, F35	914	495.5	700	885	487	811	665	22.23	85	95.68	1304
600	F25, F30, F35, F40	1067	571.5	815	1041	589	987	831	22.23	95	105.87	2087

Face-to-face dimension acc. to ANSI B16.10, Table 1, long pattern

ASME 300

DN	ISO FLANGE	DIMENSIONS, mm										WEIGHT kg
		A	A1	ØB	ØB1	ØD	E	K	□M	ØO	P	
50	F07, F10	216	89	165	146	50.8	203	168	4.76	20	22.16	15
80	F07, F10, F12, F14	282	141	210	200	76.2	225	190	4.76	20	22.16	32
100	F10, F12, F14	305	152	255	254	101.6	296	250	6.35	25	27.75	58
150	F14, F16	403	201	320	353	152.4	373	305	9.53	40	44.23	125
200	F14, F16, F25	502	249	380	462	203.2	453	385	9.53	40	44.23	225
250	F14, F16, F25, F30	568	284	445	580	254.0	562	472	12.70	55	60.60	330
300	F14, F16, F25, F30	648	324	520	652	304.8	605	515	12.70	55	60.60	610
350	F16, F25, F30, F35	762	381	585	700	340.0	741	607	19.05	75	83.15	800
400	F16, F25, F30, F35	838	419	650	799	390.0	779	633	22.23	85	94.63	1015
450	F30, F35	914	389.5	710	825	436	793.9	645.7	22.23	85	95.68	1235
500	F25, F30, F35, F40	991	457	775	906	487	881	725	22.23	95	105.87	1692
600	F35, F40	1143	533.5	915	1060	589	1090	885	31.75	120	136.54	2636

Face-to-face dimension acc. to ANSI B16.10, Table 1, long pattern

ASME 150

Size	ISO FLANGE	DIMENSIONS, inch										WEIGHT lbs
		A	A1	ØB	ØB1	ØD	E	K	□M	ØO	P	
2	F07, F10	7.01	3.11	5.91	5.75	2.00	7.99	6.61	0.19	0.79	0.87	22
3	F07, F10, F12, F14	7.99	3.80	7.48	7.48	3.00	8.86	7.48	0.19	0.79	0.87	48.4
4	F10, F12, F14	9.02	4.41	9.06	9.49	4.00	11.65	9.84	0.25	0.98	1.09	70.4
6	F14, F16	15.51	7.76	11.02	13.31	6.00	14.69	12.01	0.38	1.57	1.74	165
8	F14, F16, F25	17.99	9.02	13.50	16.77	8.00	17.83	15.16	0.38	1.57	1.74	418
10	F14, F16, F25, F30	20.98	10.51	16.02	20.24	10.00	22.13	18.58	0.50	2.17	2.39	715
12	F14, F16, F25, F30	24.02	12.01	19.02	23.31	12.00	23.82	20.28	0.50	2.17	2.39	1056
14	F16, F25, F30, F35	27.01	13.50	20.98	26.18	13.39	29.17	23.90	0.75	2.95	3.27	1397
16	F16, F25, F30, F35	30.00	15.00	23.50	29.53	15.35	30.67	24.92	0.88	3.35	3.73	1848
18	F30, F35	34.02	17.99	25.00	31.50	17.17	31.26	25.42	0.88	3.35	3.77	2224
20	F30, F35	35.98	19.51	27.56	34.84	19.17	31.93	26.18	0.88	3.35	3.77	2898
24	F25, F30, F35, F40	42.01	22.50	32.09	40.98	23.19	38.86	32.72	0.88	3.74	4.17	4638

Face-to-face dimension acc. to ANSI B16.10, Table 2, long pattern

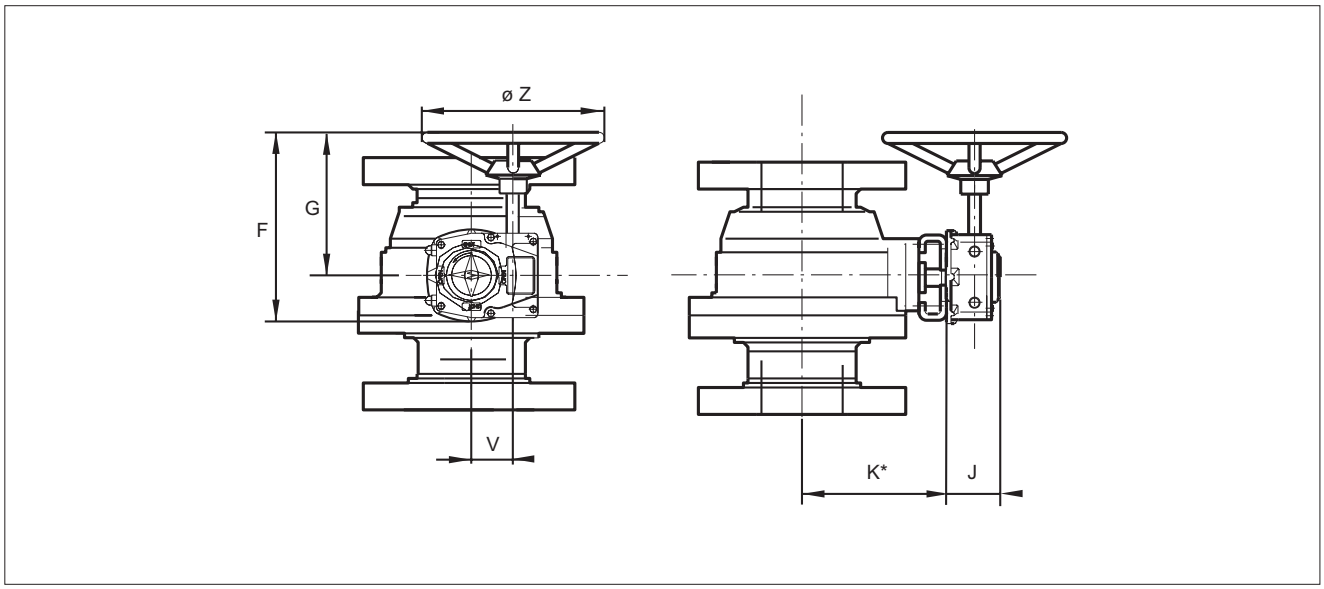
ASME 300

Size	ISO FLANGE	DIMENSIONS, inch										WEIGHT lbs
		A	A1	ØB	ØB1	ØD	E	K	□M	ØO	P	
2	F07, F10	8.50	3.50	6.50	5.75	2.0	7.99	6.61	0.19	0.79	0.87	33
3	F07, F10, F12, F14	11.12	5.55	8.25	7.87	3.0	8.86	7.48	0.19	0.79	0.87	70
4	F10, F12, F14	12.00	6.00	10.00	10.00	4.0	11.65	9.84	0.25	0.98	1.09	128
6	F14, F16	15.88	7.93	12.50	13.90	6.0	14.69	12.01	0.38	1.57	1.74	276
8	F14, F16, F25	19.75	9.80	15.00	18.19	8.0	17.83	15.16	0.38	1.57	1.74	496
10	F14, F16, F25, F30	22.38	11.18	17.50	22.83	10.0	22.13	18.58	0.50	2.17	2.39	727
12	F14, F16, F25, F30	25.50	12.76	20.50	25.67	12.0	23.82	20.28	0.50	2.17	2.39	1345
14	F16, F25, F30, F35	30.00	15.00	23.00	27.56	13.4	29.17	23.90	0.75	2.95	3.27	1764
16	F16, F25, F30, F35	33.00	16.50	25.50	31.46	15.4	30.67	24.92	0.88	3.35	3.73	2237
18	F30, F35	35.98	15.33	27.95	32.48	17.17	31.26	25.42	0.88	3.35	3.77	2744
20	F25, F30, F35, F40	39.02	17.99	30.51	35.67	19.17	34.69	28.54	0.88	3.74	4.17	3760
24	F35, F40	45.00	21.00	36.02	41.73	23.19	42.91	34.84	1.25	4.72	5.38	5858

EN PN 10 - 40

Type	DN	DIMENSIONS, mm																	WEIGHT kg
		ØD	A	A1	ØB	ØB1	E	K	M	N	ØO	P	S	T	U	V	W	C	
PN10	450	436	864	432	615	800	794	648	22.23	146	85	94.63	330	21.3	M30	M20	M20	M27	981
	500	487	914	457	670	885	811.5	665.5	22.23	146	85	94.63	330	21.3	M30	M20	M20	M27	1288
	600	589	1067	533.5	780	1041	987	831	22.23	156	95	105.87	400	23.6	M30	M30	M24	M30	2037
PN16	450	436	864	432	640	800	794	648	22.23	146	85	94.63	330	21.3	M30	M20	M20	M27	1011
	500	487	914	457	715	885	811.5	665.5	22.23	146	85	94.63	330	21.3	M30	M20	M20	M27	1328
	600	589	1067	533.5	840	1041	987	831	22.23	156	95	105.87	400	23.6	M30	M30	M24	M30	2141
PN25	450	436	914	457	710	785	794	648	22.23	146	85	94.63	330	21.3	M30	M20	M20	M36	1249
	500	487	991	495.5	775	880	881	725	22.23	156	95	105.87	400	23.6	M30	M30	M24	M39	1692
	600	589	1143	571.5	915	1050	1090	885	31.75	205	120	136.54	460	23.6	M30	M30	M24	M39	2636
PN40	450	436	914	457	710	825	794	648	22.23	146	85	94.63	330	21.3	M30	M20	M20	M36	1249
	500	487	991	495.5	775	906	881	725	22.23	156	95	105.87	400	23.6	M30	M30	M24	M39	1692
	600	589	1143	571.5	915	1060	1090	885	31.75	205	120	136.54	460	23.6	M30	M30	M24	M39	2636

11.1 Valve with manual gear operator series M

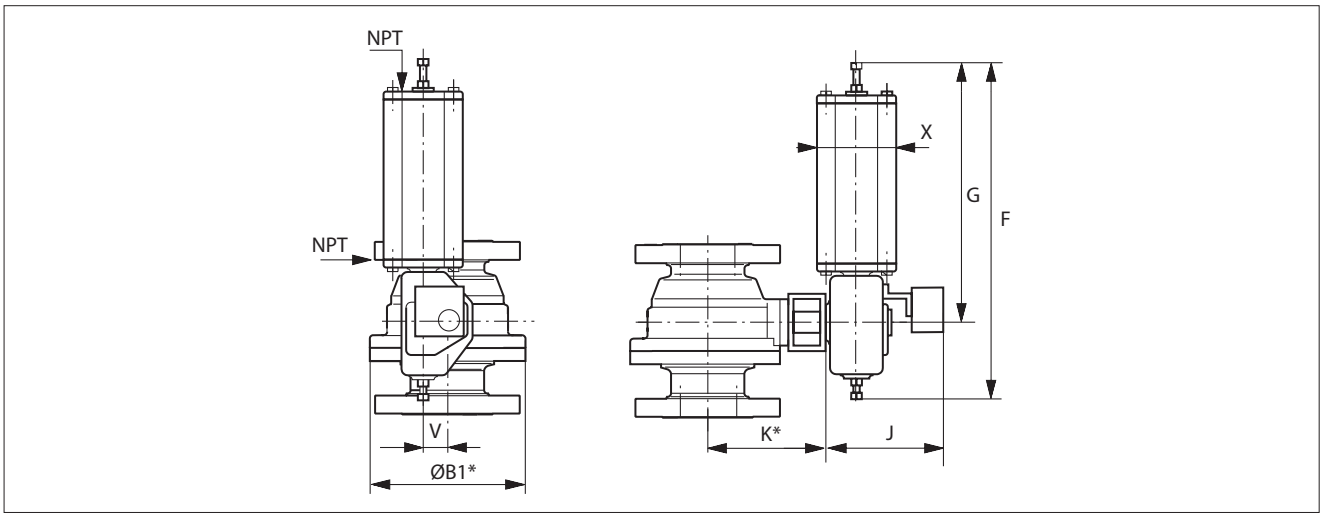


*) See K dimensions from tables on page 13

Type	Dimensions, mm					kg
	F	G	J	V	øZ	
M07	196	152	58	38	125	3
M10	297	239	67	52	200	5
M12	357	282	81	66	250	10
M14	435	345	93	89	457	18
M15	532	406	105	123	457	31
M16	642	466	126	154	610	45

Type	Dimensions, in					lb
	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

11.2 Valve with pneumatic cylinder actuator series B1C/B1J



*) See K and ØB1 dimension from tables on page 13.

B1C actuator

Actuator	Dimensions, mm					NPT	kg
	F	G	J	V	X		
B1C6	400	260	283	36	90	1/4	4.2
B1C9	455	315	279	43	110	1/4	9.6
B1C11	540	375	290	51	135	3/8	16
B1C13	635	445	316	65	175	3/8	31
B1C17	770	545	351	78	215	1/2	54
B1C20	840	575	385	97	215	1/2	73
B1C25	1040	710	448	121	265	1/2	131
B1C32	1330	910	525	153	395	3/4	256
B1C40	1660	1150	595	194	505	3/4	446
B1C50	1970	1350	690	242	610	1	830

Actuator	Dimensions, in					NPT	lb
	F	G	J	V	X		
B1C6	15.75	10.24	11.14	1.42	3.54	1/4	9
B1C9	17.91	12.40	10.98	1.69	4.33	1/4	21
B1C11	21.26	14.76	11.42	2.01	5.31	3/8	35
B1C13	25.00	17.52	12.44	2.56	6.89	3/8	68
B1C17	30.31	21.46	13.82	3.07	8.46	1/2	119
B1C20	33.07	22.64	15.16	3.82	8.46	1/2	161
B1C25	40.94	27.95	17.64	4.76	10.43	1/2	289
B1C32	52.36	35.83	20.67	6.02	15.55	3/4	564
B1C40	65.35	45.28	23.43	7.64	19.88	3/4	983
B1C50	77.56	53.15	27.17	9.53	24.02	1	1829

B1J actuator

Actuator	Dimensions, mm					NPT	kg
	F	G	J	V	X		
B1J/B1JA8	560	420	279	43	135	3/8	17
B1J/B1JA10	650	490	290	51	175	3/8	30
B1J/B1JA12	800	620	316	65	215	1/2	57
B1J/B1JA16	990	760	351	78	265	1/2	100
B1J/B1JA20	1200	935	358	97	395	3/4	175
B1J/B1JA25	1530	1200	448	121	505	3/4	350
B1J/B1JA32	1830	1410	525	153	540	1	671

Actuator	Dimensions, in					NPT	lb
	F	G	J	V	X		
B1J/B1JA8	22.05	16.54	10.98	1.69	5.31	3/8	37
B1J/B1JA10	25.59	19.29	11.42	2.01	6.89	3/8	66
B1J/B1JA12	31.50	24.41	12.44	2.56	8.46	1/2	126
B1J/B1JA16	38.98	29.92	13.82	3.07	10.43	1/2	220
B1J/B1JA20	47.24	36.81	14.09	3.82	15.55	3/4	386
B1J/B1JA25	60.24	47.24	17.64	4.76	19.88	3/4	771
B1J/B1JA32	72.05	55.51	20.67	6.02	21.26	1	1479

12. TYPE CODE

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
XG	06	D	W	TA	J2	PJ	S	A	B	T

1.	VALVE SERIES & STYLE & FACE-TO-FACE
XG	Full bore, trunnions, f-to-f ASME B 16.10, Table 2, long pattern, ASME 300
XM	Full bore, trunnions, f-to-f ASME B 16.10, Table 1, long pattern, ASME 150

2.	SIZE		
ASME valves with metric threads		EN valves with metric threads	
	NPS		DN / mm
02	2"	050	50
03	3"	080	80
04	4"	100	100
06	6"	150	150
08	8"	200	200
10	10"	250	250
12	12"	300	300
14	14"	350	350
16	16"	400	400
18	18"	450	450
20	20"	500	500
24	24"	600	600

3.	PRESSURE CLASS
C	ASME Class 150 (Use XM, size NPS 2"...24").
D	ASME Class 300 (Use XG, size NPS 2"...24").
J	PN 10 (Use XM, sizes DN200 ... DN600).
K	PN 16 (Use XM, sizes DN100 ... DN600).
L	PN 25 (Use XG, size DN200 ... DN600).
M	PN 40 (Use XG, size DN50 ... DN600).

4.	END CONNECTION STYLE
W	raised face, ASME B 16.5 (Ra 3.2-6.3), **standard** with ASME rated flanges.
C	EN 1092-1 Type B1, (Ra 3.2 – 12.5), standard with EN rated flanges.

5.	CONSTRUCTION & APPLICATION
TA	**Standard** construction. Double seated. Live loaded packing.
TE	Single seated. Otherwise standard.
TQ	Q-Trim construction. Otherwise standard.
EQ	Single seated, Q-Trim construction.
2G	Q2G-trim for gas application, single seated, otherwise standard.
2H	Q2G-trim for gas application, HIGH CAPACITY version.
TZ	BAM tested non-metallic materials, for oxygen service. Double seated. Metal bearings. Live loaded graphite packing. Temperature range -50...+200C. Max pressure based on body rating. Oxygen cleaning acc. to Neles internal procedure FC-QC-0001included.

6.	BODY MATERIAL
J2	ASTM A216 gr WCB (Carbon Steel)
S6	ASTM A351 gr CF8M (Stainless Steel)
J5	ASTM A217 gr C5 (Low Alloy Steel)

7.	BALL / COATING & STEM MATERIAL
PJ	316SS / Hard Chrome & 17-4PH
PP	316SS & 17-4PH (soft seats, ball without coating)
PV	316SS/Tungsten carbide, TC2
PL	316SS / NiBo & 17-4PH
PX	316SS / Chrome carbide & 17-4PH
SJ	316SS / Hard Chrome & XM-19 (Nitronic 50)
SP	316SS & XM-19 (Nitronic 50) (soft seats, ball without coating)
RX	316SS / CrC (Chrome carbide) & XM-19 (Nitronic 50), only with metal bearings.
RR	316SS / WC-Co (Tungsten carbide) & XM-19 (Nitronic 50)
SL	316SS / NiBo & XM-19 (Nitronic 50)
SW	410SS / Chrome carbide & XM-19 (Nitronic 50)

17-4PH stem material required to comply API 608 stem strength,
limitations may apply in XG size 8" & 12", see instructions after sign 11.
Balls with coating are used in metal seated valves.
Max temperatures for coatings:
- Hard Chrome (HCr): 450 °C
- Tungsten carbide (WC-Co): 450 °C
- Chrome carbide (CrC/CrC-LF): 600 °C

If seat coating is Chrome Carbide, CrC-LF, then use Chrome Carbide, CrC as ball coating.

8.	SEAT AND BACK SEAL TYPES / SPRING MATERIALS			
	Seat type	Back seal	Spring	Back-up ring
S	metal, general service	O-ring	Inconel 625	-
B	metal, solid proof, firesafe	Graphite + O-ring	Inconel 625	-
K	metal, solid proof, high temp, firesafe	Graphite + Graphite	Inconel 625	-
G	metal, solid proof, high temp, firesafe	Graphite + Graphite	Inconel 625	-
L	metal, polymer proof	Graphite + O-ring	-	-
H	metal, bellows	Graphite	-	-
T	soft, general service	O-ring	Inconel 625	-
D	soft, firesafe service	Graphite + O-ring	Inconel 625	-

9.	SEAT MATERIAL	
	Metal seats	
	Seat material	Coating
A	Type 316 stainless steel (S, B, K, G, L seats), AVESTA 248SV (H seats)	Cobalt based hard facing
B	Type 316 stainless steel (S, B, K, G, L seats), AVESTA 248SV (H seat)	Chrome Carbide, CrC-LF
V	Type 316 stainless steel with S, B, K and L type seats AVESTA 248SV with H type seat.	Tungsten Carbide, TC2
R	Type 316 stainless steel (S, B, K, G, L seats), AVESTA 248SV (H seats)	Tungsten Carbide, WC-CO
Z	Type 410 stainless steel (S, B, K, G, L seats)	Tungsten Carbide, WC-Co
W	Type 410 stainless steel (S, B, K, G, Lseats)	Chrome Carbide, CrC-LF
F	F6NM (H seat for high temp. NACE service)	Chrome Carbide, CrC-LF
D	Inconel 718 with H type seat	Tungsten Carbide, WC-Co
	Soft seats	
	Seat material	Insert
T	Type 316 stainless steel	PTFE
M	Type 316 stainless steel	Filled PTFE
P	Type 316 stainless steel	PEEK
N	Type 316 stainless steel	Polyamid
L	Monel	Filled PTFE

10.	BEARING AND SEAL MATERIALS				
	Trunnion bearing	Packings	Body gaskets	O-ring	Thrust bearing
A	Reinforced PTFE	V-rings PTFE	PTFE	Viton GF	Metal
B	Reinforced PTFE	Graphite	Graphite	Viton GF	Metal
C	Stellite	V-rings PTFE	PTFE	Viton GF	Metal
D	Stellite	Graphite	Graphite	Viton GF	Metal
H	Reinforced PTFE	V-rings PTFE	PTFE	EPDM	Metal
S	Reinforced PTFE	Graphite	Graphite	EPDM	Metal
U	SS + WC-CO	Graphite	Graphite	Viton GF	Metal
V	SS + WC-CO	Graphite gr.GTA	Graphite	Viton GF	Metal
T	SS + WC-CO	Braided PTFE	Graphite	Viton GF	Metal

*) Cobalt based alloy is NACE compatible

11. sign	Bolting material with metric thread				
	Pressure retaining		Packing gland bolting		
Standard	Studs	Nuts	Studs	Nuts	Temp range
E*	B8M	8M	gr. 660	gr. 660	-200 ... +538 °C
T**	L7M	2HM	B7	2H	-40 ... +538°C
S**	L7M	2HM	gr. 660	gr. 660	-46 ... +538°C
D *	B8M	B8	B8M	8M	-200 ... +800°C
F **	L7M	2HM	L7M	2HM	-46 ... +538°C
Non Standard	Studs	Studs	Studs	Nuts	Temp range
A **	B7	2H	B7	2H	-40 ... +538°C
B *	B8	8	B8	8	-200 ... +800°C
G **	B7M	2HM	B7M	2HM	-200 ... +260°C

EN/ISO bolting materials are obsoleted. ASME bolting materials can be used in EN rated valves.
* Bolting materials for stainless steel body
** Bolting materials for carbon and low alloy steel body

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