

Installation, operation, and maintenance instructions for Flowrox PVG valves DN50 - 250



These instructions must be read carefully and understood prior to the installation, use, and servicing of this product.

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1 DIRECTIVE CONFORMANCE DECLARATIONS

FLOWROX OY
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P.O. Box 338
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hereby declares that the **Flowrox PVG pinch valve** delivered
complies with the following applicable regulations:

Pressure Equipment Directive 97/23/EC (PED):

Valve size DN 250 (PN 10) and smaller according to article 3, paragraph 3 (SEP), no CE marking for conformity with PED.

European Union Machinery Directive 2006/42/EC and

Finnish Government Decree on Machine Safety, 400/2008, Machine Decree (koneasetus):

Annex IIB “partly complete machine”. No conformity with directive when valve is actuated manually.

Atex Directive 94/9/EC:

Conformity to directive declared only if Ex and CE are marked on valve nameplate. In that case a separate Atex declaration is supplied.

Do not operate valve before conformity to machine directive 2006/42/EC has been declared for the complete machine (pipeline) to what the valve is installed as a partly complete machine. Follow the valve installation instructions in this manual. Conformance declarations for accessories (solenoid valve, limit switches etc.) and actuators are supplied separately in component documentation. Risk analysis responsible employee at Flowrox Oy is Jarmo Partanen.

On behalf of Flowrox Oy
In Lappeenranta, 19 July 2013






Heikki Hyttinen
President and CEO

1.1 General safety instructions

The symbols in Table 1 are used in this manual to highlight the parts requiring particular attention.

Table 1. Warning and safety signs.

Symbol	Description
	<p>Risk to personal safety: Neglecting the safety measures can cause serious injury or death.</p>
	<p>Machinery or environmental risk: Incorrect maintenance or operation of the product can harm the environment or the product.</p>
	<p>Read the operation and maintenance instructions: Read and understand the operation and maintenance instructions before using the product.</p>

Prevent accidents and ensure the valve's appropriate operation by complying with the installation, safety, and maintenance instructions in this manual. Installation and maintenance of the valve must be carried out by persons with appropriate training. Electrical installation work of the actuator must be performed by a qualified electrician.

Access to the IOM-manual must be guaranteed at all times at the place of operation of the valve. It is required to observe the IOM-manual in all work tasks for the valve.

Use personal protective equipment when performing any checks or maintenance operation for the valve (goggles, helmet, clothing and gloves). Always follow the factory safety regulations.

In case of any discrepancies between translations, the English version shall prevail.

2 INTRODUCTION

2.1 Applications and purpose of use

Flowrox PVG is made for processes involving pressure resistance, abrasion, corrosion and aggressive slurries. In open position, the PVG valve is at full bore with no flow restrictions.

The core of the PVG valve is an elastic sleeve, which is the only part in contact with the process medium. Designed to withstand wear, corrosion and chemicals, Flowrox sleeves guarantee non-clogging, trouble free operation and extended lifetime. The sleeves are bubble tight and easily replaceable if necessary.

2.1.1 Restrictions on use for PVG valves

The valve temperature and pressure range must not be exceeded. The temperature ranges are given in Table 2 for standard sleeve materials. Check the pressure class from the valve type plate. Do not use higher pipeline pressure than rated for the valve.

Table 2. Temperature ranges for PVG valves.

Sleeve material	SBRT	EPDM
Min valve operating temperature (°C)	-40	-40
Max valve operating temperature (°C)	+110	+120

2.1.2 Using the valve in explosive conditions

This valve type is not designed for Ex-areas.

For use in explosive conditions the valve must have the required Ex-classification and the grounding cables must be connected to earth. Check actuator, solenoid valve, and limit switch documentation for more information about operation in explosive conditions.

2.2 General description

2.2.1 Principle of operation

Flowrox PVG valve is built with a cast body and a rubber sleeve as a standard structure. Removable sleeve means no metal parts are in contact with the process medium.

In the open position the valve provides full bore through which the medium can travel. There are some structural differences between valve sizes, but the main components are shown in Figure 1.

Closing the valve forces the actuator side of the sleeve progressively towards the other side until it reaches the fully closed position. When the valve is fully closed, the sleeve is squeezed between the pusher on actuator and valve body, effectively sealing and completely containing the line pressure.

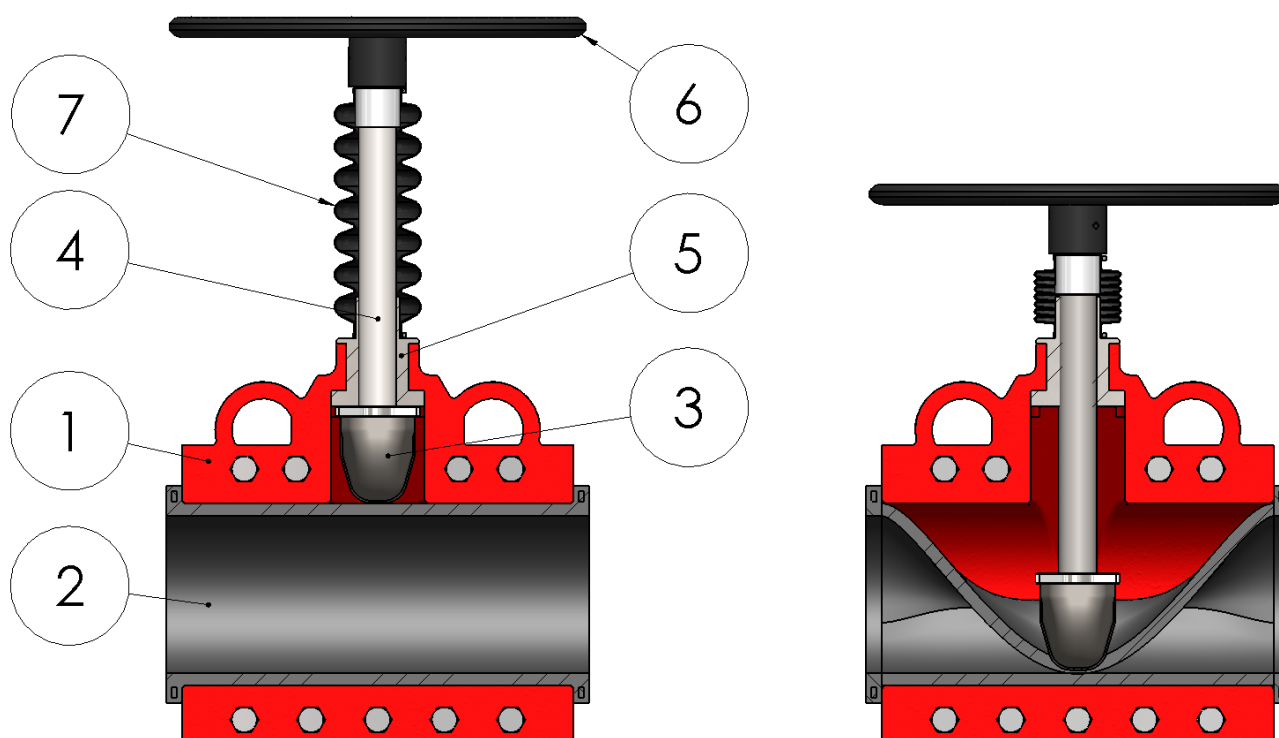


Figure 1. Main components of PVG valve with manual actuator.

Part	Description	Part	Description
1	Body	5	Threaded bushing
2	Sleeve	6	Hand Wheel
3	Pusher	7	Bellows
4	Stem		



The valve must not be used to throttle the flow as this will lead to premature failure of the sleeve.

This valve is intended for on-off operation only.

2.2.2 Mechanical structure

The alternative actuators are displayed in Figure 2.

An exploded view of PVG valve with manual actuator is shown in Figure 3 and valve part list in Table 4.

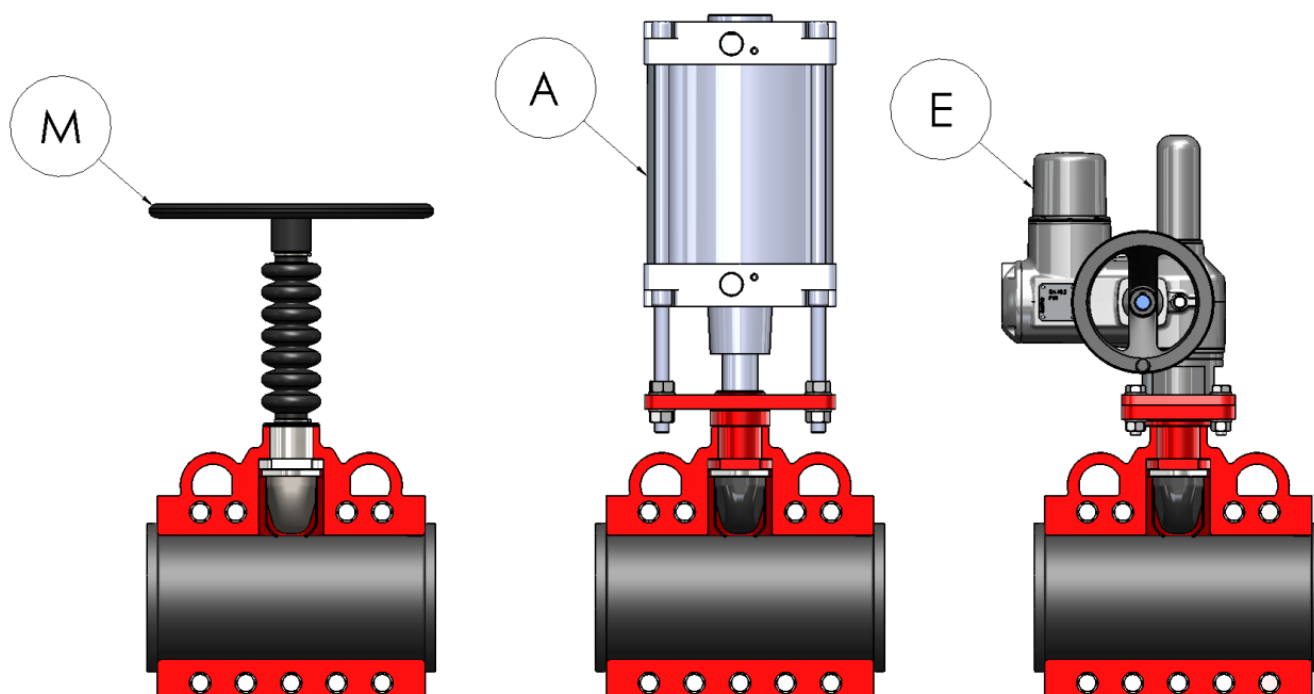


Figure 2. Alternative actuators.

Table 3. PVG valve actuator options.

Part	Description
M	Manual actuator
A	Pneumatic actuator
E	Electric actuator

Table 4. Part list of PVG valve with manual actuator.

Part	Description	Part	Description
1	Valve body	9	Cable tie
2	Sleeve	10	Bellows
3	Pusher	11	Washer
4	Stem	12	Hex screw
5	Pusher plate	13	Nut
6	Hex socket screw	14	Hand wheel
7	Thread bushing	15	Keen pin
8	Bellows bushing		

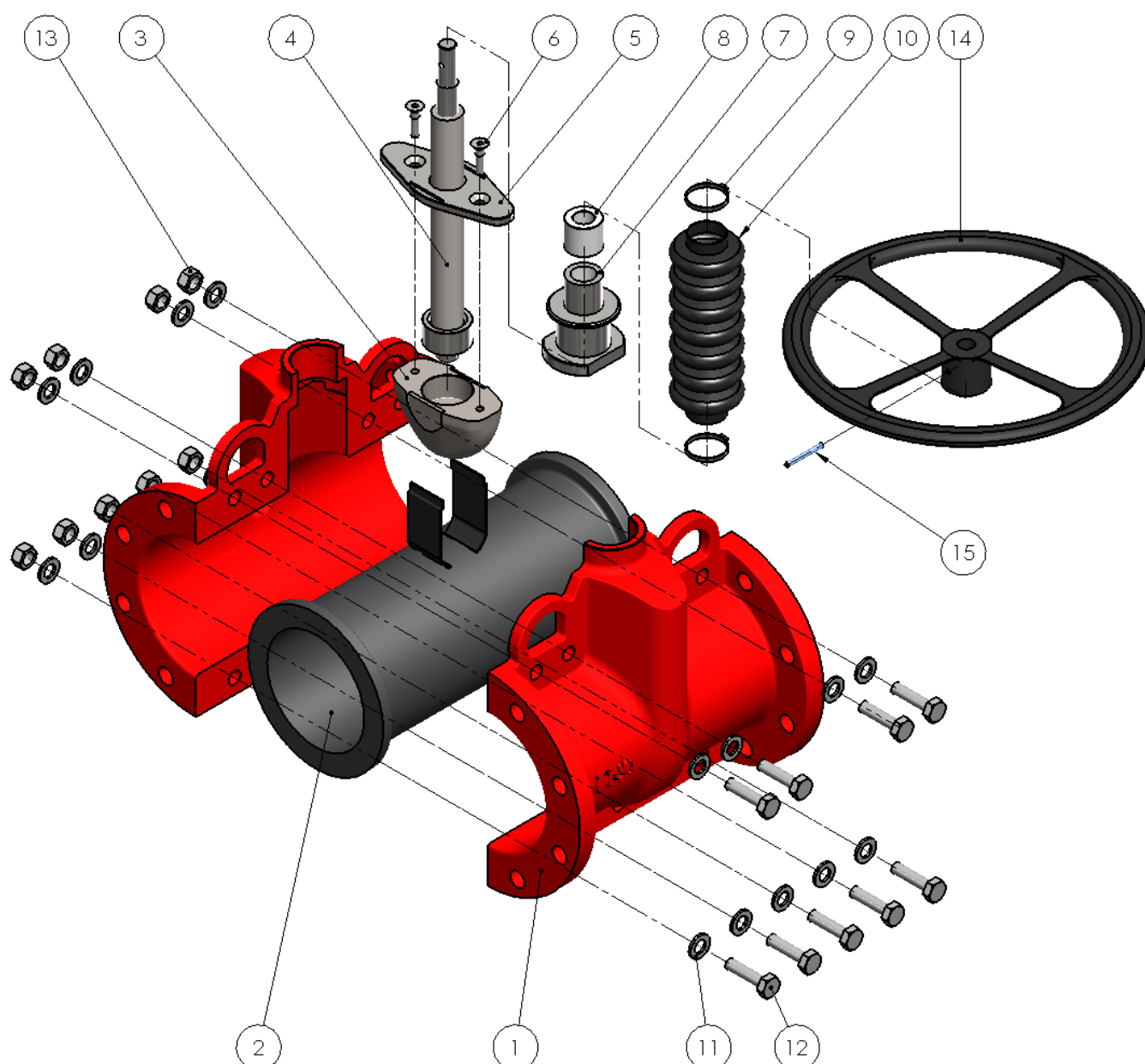


Figure 3. Exploded view of PVG valve with manual actuator.

2.3 Technical data

2.3.1 Product identification

Flowrox valve type plate is shown in Figure 4.



1. Valve type (see Table 5)
2. Serial number (year, order number, series size, individual valve number)
3. Customer tag number etc.
4. Nominal diameter, pressure class

Figure 4. Example of valve type plate.

Table 5. PVG valve model key table.

Type	Size (DN)	Actuator	Pressure class (PN)	-	Flange drilling	Body material	-	Sleeve material	-	Auxiliaries
PVG = Flowrox Pinch valve	50-250	M = manual A = pneumatic E = electric	4 = 4 bar 6 = 6 bar 10 = 10 bar		2 = DIN PN10 6 = ANSI150 9 = other	0 = Cast iron		SBRT = Styrene Butadiene rubber EPDM = ethylene propylene diene monomer		Z1 = solenoid valve, 24V DC Z2 = solenoid valve, 220V, 50/60 Hz Z3 = solenoid valve, 110V, 50/60 Hz

Example: PVG150M10-20-SBRT

The main dimensions and weight are given in Appendix A: Main dimensions of valves.

2.3.2 Actuators

Standard actuators:

- Manual
- Pneumatic
- Electric

Manual valves are closed by turning the hand wheel clockwise.

Pneumatic actuators are with a fixed stroke and do not require external controls. The minimum supply pressure for pneumatically operated valves is 6 bars. Use correct sized pneumatic hoses to ensure sufficient air flow.

Air must be clean and dry and comply with ISO 8573-1:2001 Class 3.

Pneumatic actuator noise level may exceed 85 dB and it is recommended to use ear protectors when working near the valve.

Electric actuators have open/close limit switches preset at the factory. A separate instruction from the actuator manufacturer is always included in the shipment.


Please consult the manufacturer's instructions on actuator requirements or/and limitations. If actuator is changed or valve needs adjustment, follow the *Maintenance* instructions.

3 TRANSPORTATION, STORAGE AND LIFTING

Check and document any damages in the valve packages or valves. Contact the transportation company in case of damage. When new or unused valves are sitting idle for long periods, the following procedures should be complied with:

1. Prior to storage, thoroughly drain valves of any and all water.
2. Indoor storage is required. For unfavourable environment, cover the equipment with protective tarpaulin that will allow proper air circulation.
3. Protect the equipment from temperature and humidity extremes and exposure to excessive dust, moisture, vibration and sunlight.
4. It is preferred to store valves in the open position.
5. Avoid dirt and/or moisture contamination of the stem (threaded rod).
6. Ensure pneumatic cylinder actuators have appropriate pipe plugs installed in the respective supply ports to prevent contamination of the cylinders.
7. Protect valve sleeves from heat, sunlight and exposure to ozone.
8. Cover the flange openings.
9. Do not store any objects on top of the rubber sleeves.
10. Follow the actuator instructions for storage.
11. Before start-up clean the valve.

When storing used valves, wash the valve with fresh water and follow the steps above. For storage periods greater than 36 months, please contact Flowrox as the rubber parts need to be changed before use.

	Lifting equipment must be used for valves weighing over 25kg.
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Lift the valves securely from the body (part 1 in *Mechanical structure*) and use existing lifting eyes when available. When lifting eyes are not available use soft straps to lift valve as shown in Figure 5. Valve lifting examples.

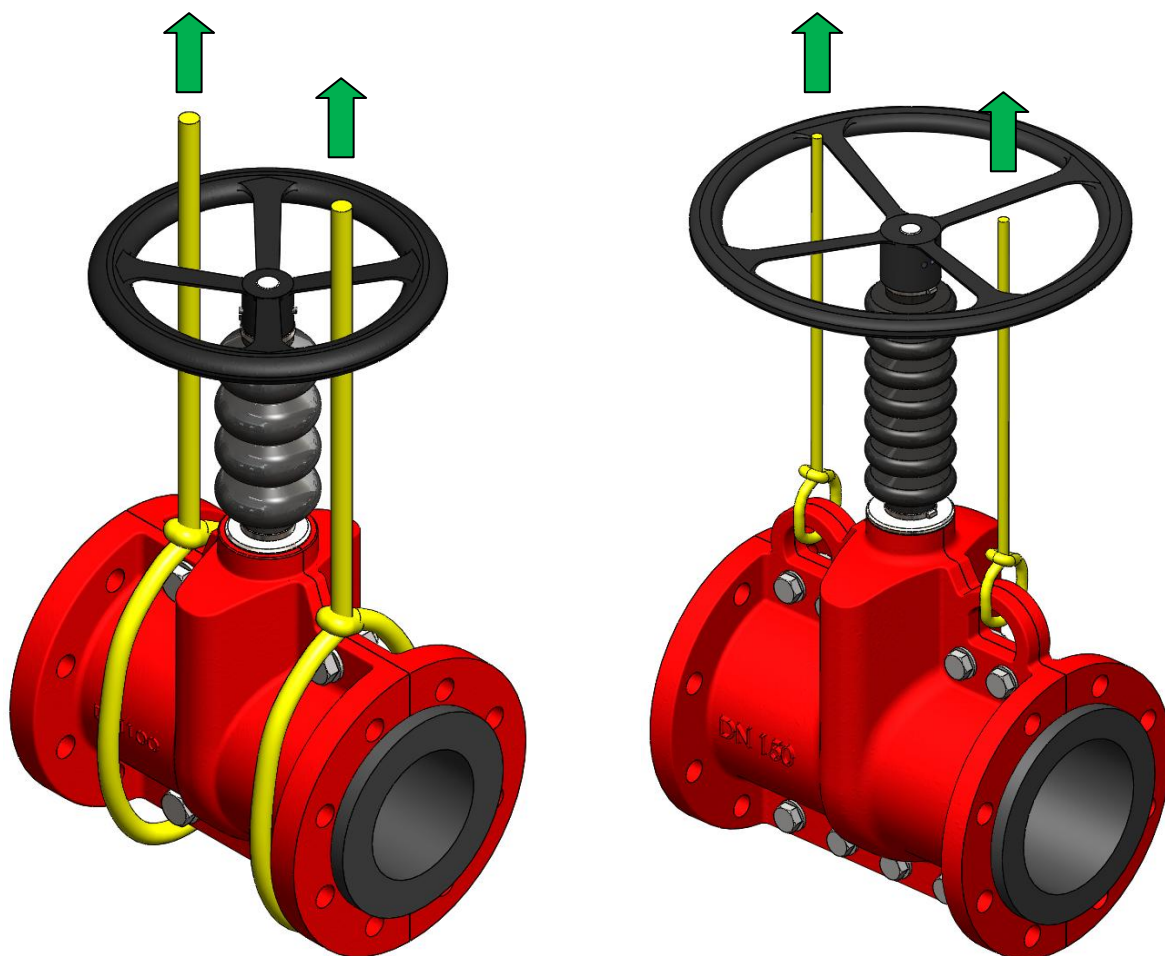





Figure 5. Valve lifting examples.

Do not attach lifting equipment to the valve bore or actuator as they can be damaged.

For valve dimensions and weight, refer to *Appendix A*.

4 INSTALLATION

	<p>Do not put your hands or fingers inside the sleeve when the valve cycles.</p>
	<p>Do not use higher pressure than rated for the valve. Higher pressures can cause serious damage to the valve or harm to operating personnel.</p>
	<p>Do not energize the actuator before the valve is properly attached to the pipeline.</p>

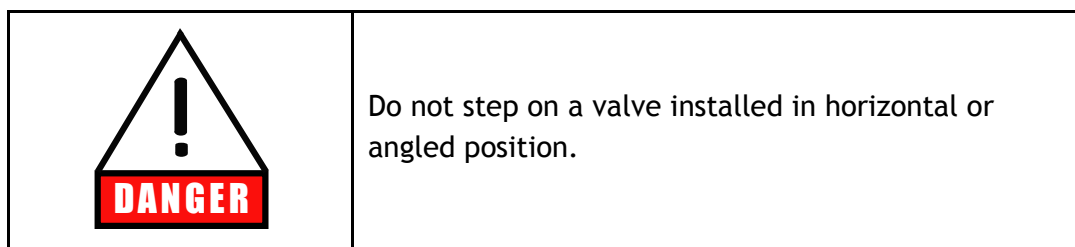
4.1 General

Flowrox valves are normally delivered fully assembled and ready for use. The valve can be installed either way in terms of flow direction. Only personnel with appropriate training are allowed to install the valves. If the valve is delivered without an actuator or accessories, they must be installed in accordance with the manufacturer's instructions.

Flowrox valves have connections with DIN or ANSI bolt drillings as standard design, but some other drillings are also available on request.

Reserve enough space for safe installation and maintenance. See *Appendix A* for valve dimensions.

4.2 Flow direction, support, and valve position



The valve does not have an intended flow direction; therefore it can be installed either way in the pipeline.

Proper pipe support must be placed on either side of the valve to support the weight. The valve must never be used to support the pipes.

The valve can be installed in any position.

4.3 Valve installation

At least the following must be ensured before valve installation:

- The pipeline is isolated from the process and there is no pressure in it.
 - The pipeline is empty, clean, and cooled down.
 - The pipeline flanges are parallel, concentric and with correct distance.
 - The flange connection bolts size is correct. Shown in Table 6. PN10 flange bolt nominal diameter and compression values for rubber sleeve flanges.
 - The valve is in OPEN position.
1. Disconnect automatic actuator from power supply if connected.
 2. Lift the valve on place with appropriate lifting equipment.
 3. Tighten the flange bolts evenly in a crosswise sequence as shown in Figure 7. Flange bolt tightening example.
Recommended compression for the rubber sleeve flange is shown in Table 6. PN10 flange bolt nominal diameter and compression values for rubber sleeve flanges.
 4. Connect automatic actuator to power supply.
 5. Check that all connections have been fastened and the actuator is connected correctly.
 6. Run a few open/close cycles without pressure in pipeline. Refer to *Troubleshooting* if the valve does not operate smoothly or without extra force.

Table 6. PN10 flange bolt nominal diameter and compression values for rubber sleeve flanges.

Valve size (DN)	Recommended compression for rubber sleeve flange (mm)	DIN Bolt nominal diameter	ANSI150 Bolt nominal diameter
50	2-3	M16	5/8"-11 UNC
80	2-3	M16	5/8"-11 UNC
100	3-4	M16	5/8"-11 UNC
150	3-4	M20	3/4"-10 UNC
200	4-5	M20	3/4"-10 UNC
250	4-5	M20	7/8"-9 UNC

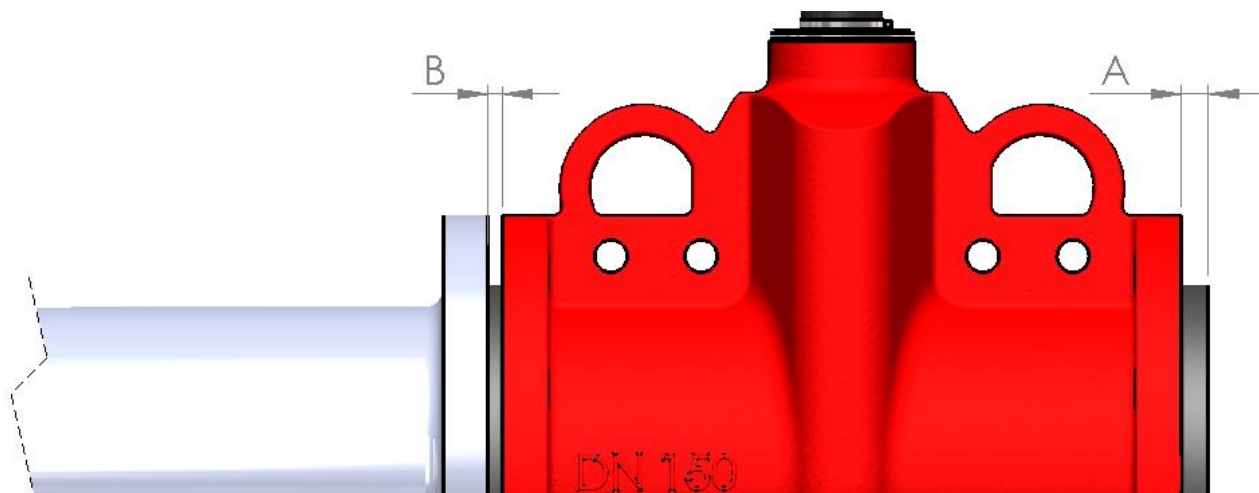


Figure 6. Compression of the sleeve rubber flange.

A = Uncompressed rubber sleeve flange [mm]

B = compressed rubber sleeve flange [mm]

→ (A - B) = Recommended compression [mm], shown in Table 6. PN10 flange bolt nominal diameter and compression values for rubber sleeve flanges.

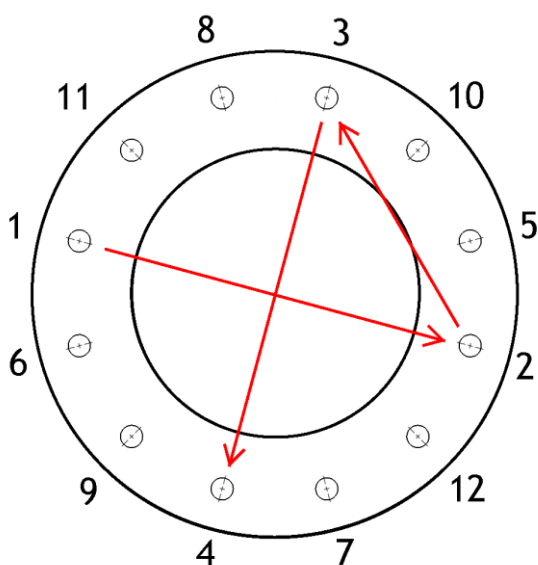


Figure 7. Flange bolt tightening example.

5 VALVE OPERATION

5.1 Commissioning and decommissioning

Before the valve is operated within the pipeline, ensure that it has been installed in accordance with this manual and applicable safety regulations.

The following must also be ensured:


- Parameters on the type plate are suitable for the process and environment
- The valve is used for the purpose specified at the time of sales
- Required accessories are installed if applicable
- Possible explosive conditions have been taken into account


When a valve is decommissioned, dispose the valve parts and electric/pneumatic devices (actuators) according to the local regulations and the instructions given by the part or device manufacturer.


Collect and dispose dangerous process media, so that people and environment are not endangered. Follow the local regulations.

6 SERVICING AND MAINTENANCE

6.1 General maintenance and checks

	<p>Depressurise, empty and cool down the valve before any maintenance work. Valve surface can be hot. Isolate the valve completely from the process and follow the factory safety regulations.</p>
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	<p>Crush hazard. De-energize actuators before maintenance.</p>
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	<p>Do not step on a valve installed in horizontal or angled position.</p>
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Only personnel with appropriate training are allowed to service the valves. For actuator service instructions consult the manufacturer's documentation supplied with the valve.

Check the condition of the valve regularly. When the valve is tight and it actuates flawlessly, periodic inspection is the only mandatory maintenance task. Do not neglect it as sleeves wear over time depending on conditions and process.

6.1.1 Scheduled maintenance

Include the valves in your factory maintenance program. Maintenance tasks and service intervals are offered as a guideline in Table 7. Schedules will vary with applications.

Table 7. Maintenance schedule.

Maintenance task	Frequency & advice
Do a leakage inspection	Regularly. Refer to <i>Troubleshooting</i> .
Run an open/close cycle	Suggested once a month for smooth and reliable operation.
Examine the valve for erosion and wear	Every six months.

For electric actuator maintenance schedule refer to manufacturer's instructions.

6.1.2 Spare parts

To ensure correct and quick delivery of spare parts, the order must contain at least the following information:

- Valve type number as in type plate (example: PVG150M10-20-SBRT)
- Spare part name and quantity (example: Sleeve, 1 piece)

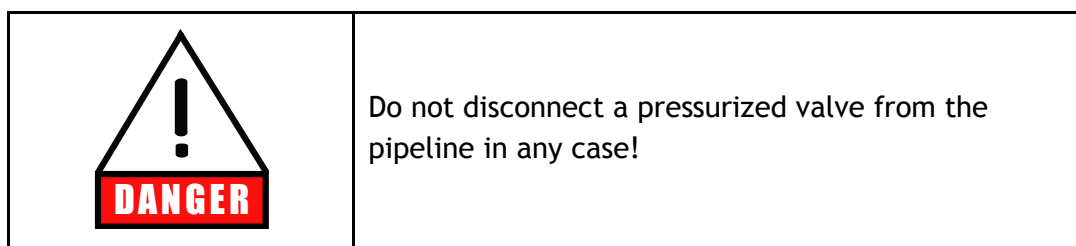
You can order the spare parts from Flowrox offices, distributors or agents. Contact information is available at <http://www.flowrox.com>

It is recommended to keep one sleeve as a spare part at your factory warehouse. For part numbers refer to *Mechanical structure*.

Information regarding wearing components that are not supplied as Flowrox spare parts are also in *Mechanical structure*.

6.2 Changing the sleeve

To change the sleeve, the valve needs to be removed from the pipeline. Refer to *Valve dismantling* if further service is required as well. Part numbers refer to *Mechanical structure*.



6.2.1 Removing the sleeve

1. Operate the valve to fully OPEN position.
2. Depressurise and drain the pipeline according to mill specific orders.
3. Disconnect automatic (electric or pneumatic) actuator from power supply to prevent injuries.
4. Remove the flange connection bolts and lift the valve to a suitable working surface. Use lifting equipment on valves weighing over 25kg.
5. Remove the valve body fasteners (parts 11-13) and lift both body halves (part 1) away.



Figure 8. Removing the valve body parts.

6. Loosen the pusher screws (part 6) to be able to release the opening tags on the sleeve.

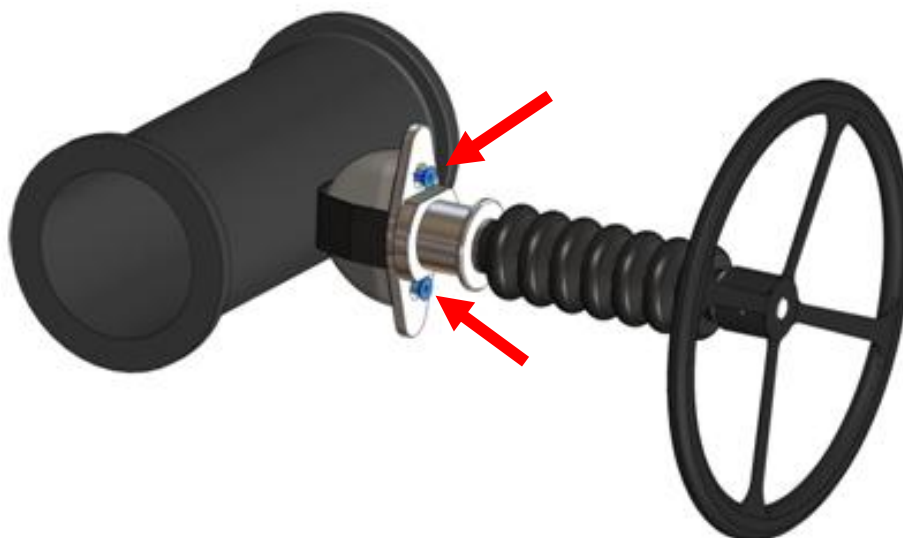


Figure 9. Releasing the opening tags.

7. Detach the sleeve (part 2) from the pusher (part 3).

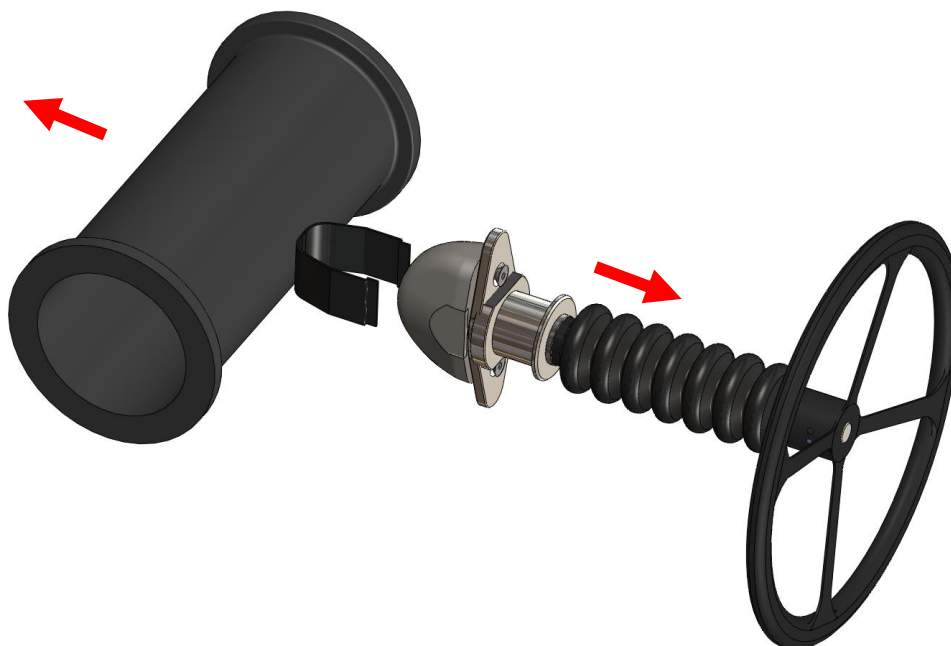


Figure 10. Removing the sleeve.

8. Inspect the body halves for visible damage.
9. Check if the pusher (part 3) is damaged and needs to be replaced.
10. Clean the valve body halves.

6.2.2 Installing the sleeve

Follow the general tightening torques in Table 8. General tightening torques (bolt class 8.8, lubrication MoS₂), when specific tightening instructions are not given in this document or in other supplied documentation. Part numbers in these assembly instructions refer to *Mechanical structure*.

Table 8. General tightening torques (bolt class 8.8, lubrication MoS₂).

Size	M6	M8	M10	M12	M16	M20	M24
Tightening torques Nm (ft-lbs)	7 (5)	17 (13)	33 (24)	57 (42)	140 (103)	282 (208)	499 (368)

1. Put some grease on the pusher (part 3) where the stem (part 4) will be attached. This is for valves with manual actuator only.

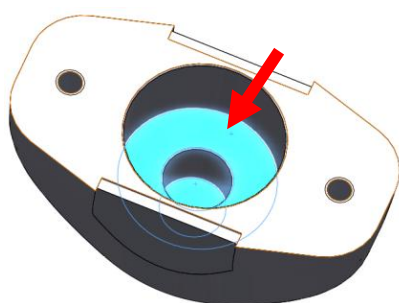


Figure 11. Lubricating the pusher.

2. Lubricate the thread on the stem (part 4) lightly in valves with manual or electrical actuator.
3. Start the reassembly by putting the pusher (part 3) tip against the sleeve (part 2), between the opening tags.

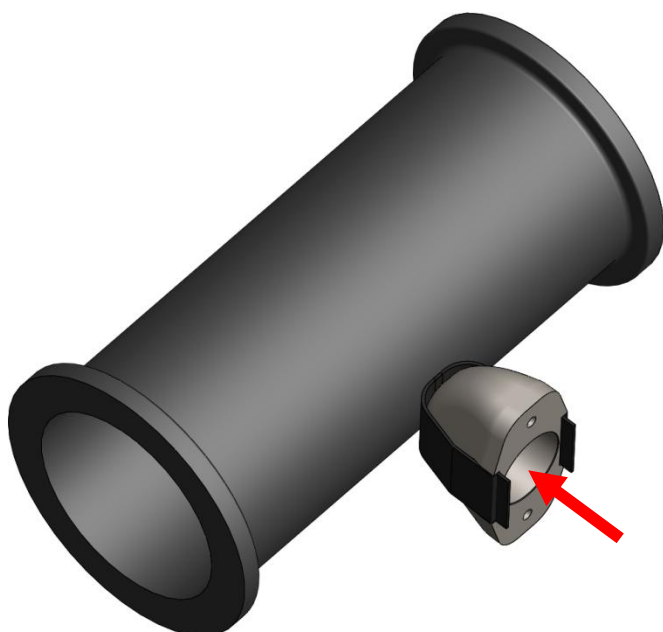


Figure 12. Installing the sleeve to the pusher.

4. Install the opening tags through the slots in the pusher plate (part 5).



Figure 13. Installing the opening tags to pusher plate.

5. Pull the opening tags finger tight and fasten the pusher plate with hex screws (part 6).
6. Check that the tags follow the shape of the pusher (part 3).
7. Cut away the extra length of the tags.



Figure 14. Fastening the pusher plate screws.

8. Lift the body halves (1) back and install the fasteners (parts 11-13).

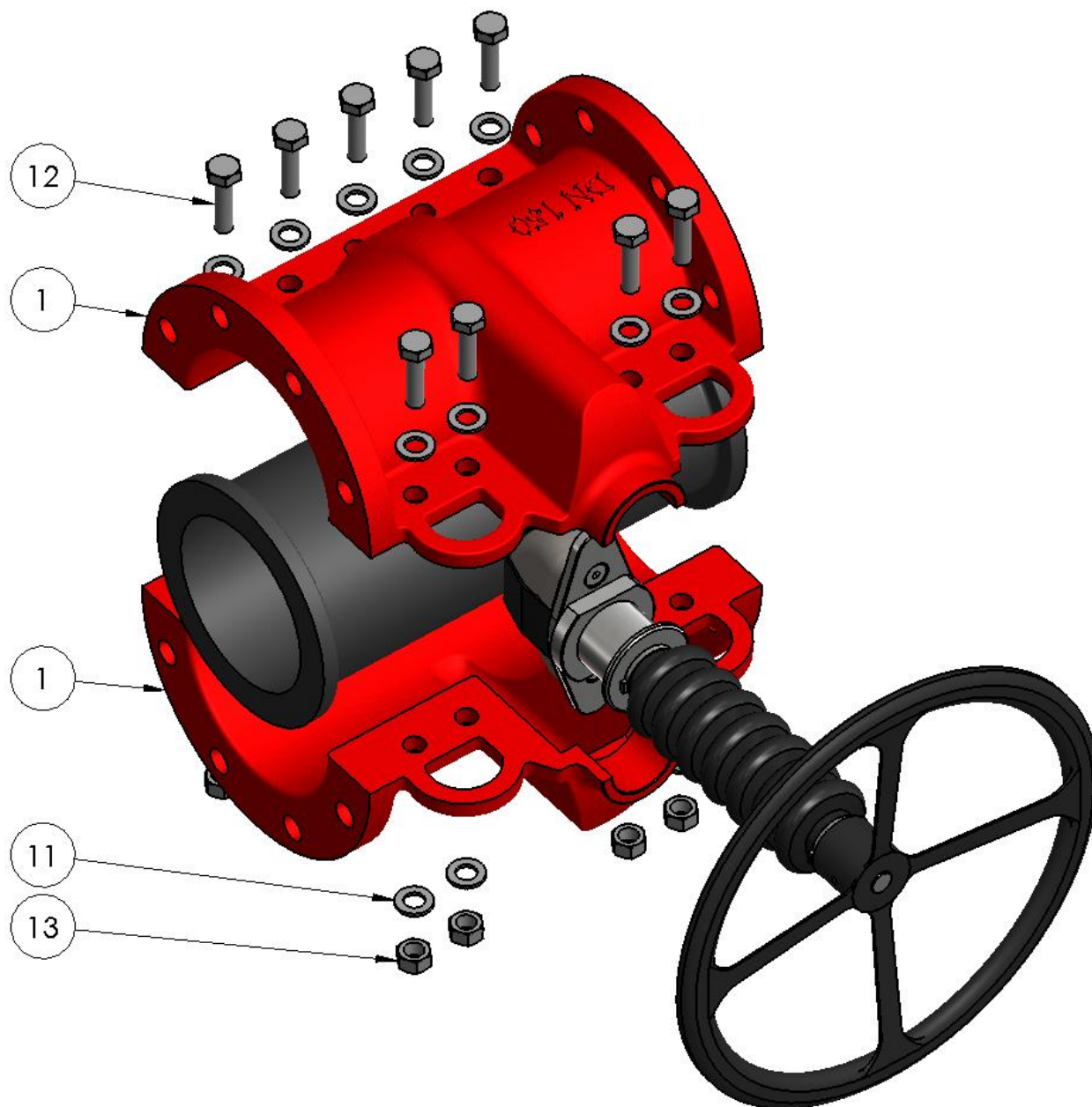
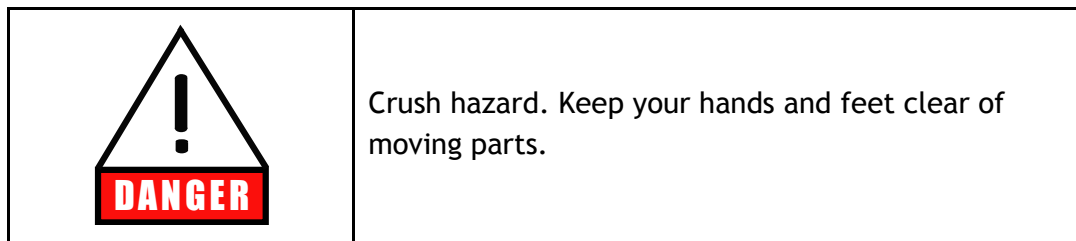


Figure 15. Fastening the body halves to the valve.

9. Leave the valve to OPEN position until it is installed and follow the *storage* instructions if the valve is placed in stock.

6.3 Testing and adjusting the valve stroke

Only personnel with appropriate training are allowed to energize the valves. Check and adjust the valve stroke if you dismantle the valve or assemble a pneumatic actuator. This is not needed with manual actuators. Refer to the electrical actuator documentation for specific stroke adjustment instructions.



6.3.1 Adjusting the pneumatic actuator stroke

1. Assemble the valve according to the assembly instructions.
2. Loosen the actuator lower and upper fastener nuts.

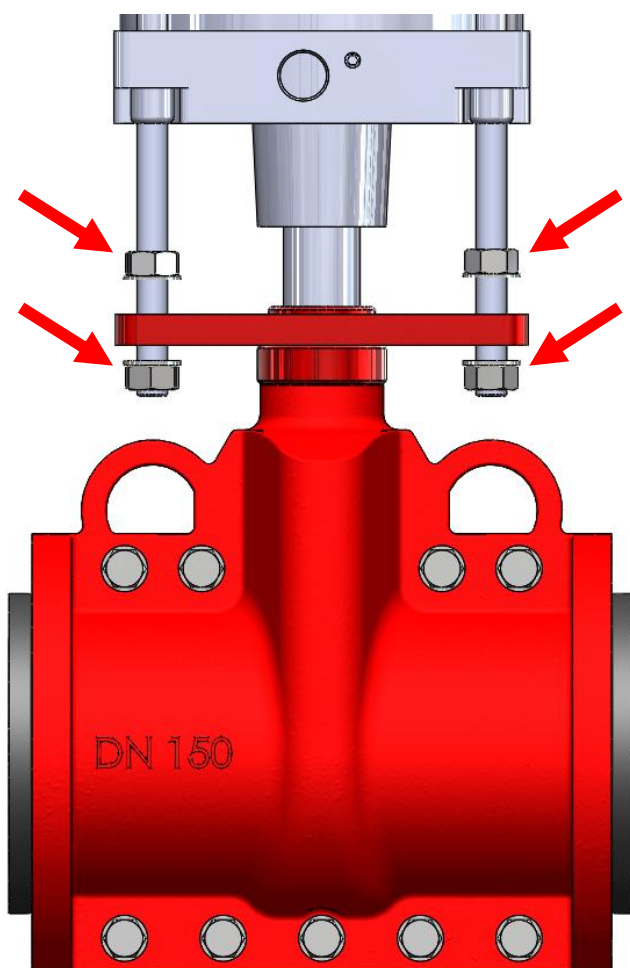


Figure 16. Pneumatic actuator lower and upper fastener nuts.

3. Connect the actuator to power source and stroke the valve to fully CLOSED position.

4. Tighten the lower actuator nuts (1) until strip of light disappears. If needed loosen the upper actuator nuts (2) to achieve this.

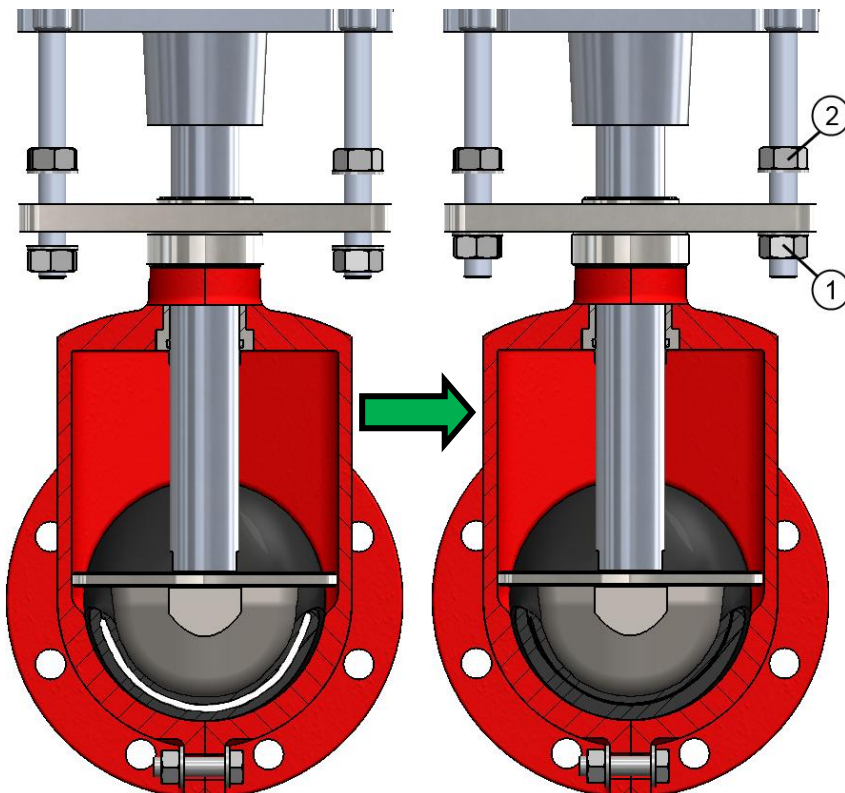


Figure 17. Stroke adjustment.

1 Lower nut

2 Upper nut

5. Measure the dimension Z from every corner to make sure the actuator is aligned straight.

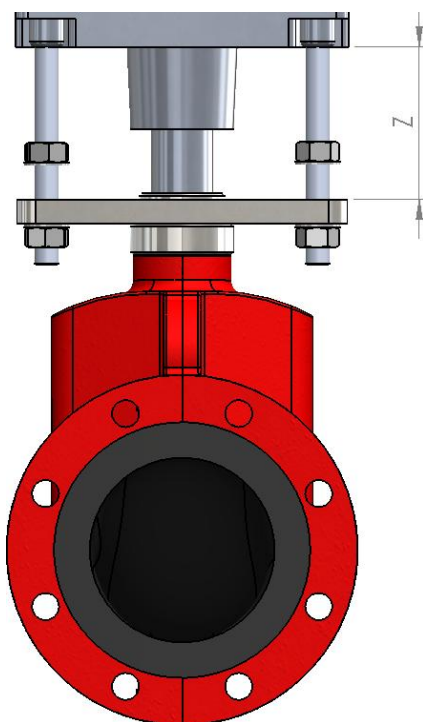


Figure 18. Checking actuator alignment.

6. Adjust the actuator upper nuts (2) to achieve the needed squeeze for the sleeve. Check the correct value for dimension A from the Table 9. Needed squeeze for the valve sleeves (dimension A on the Figure 19. Measuring the compression value.)

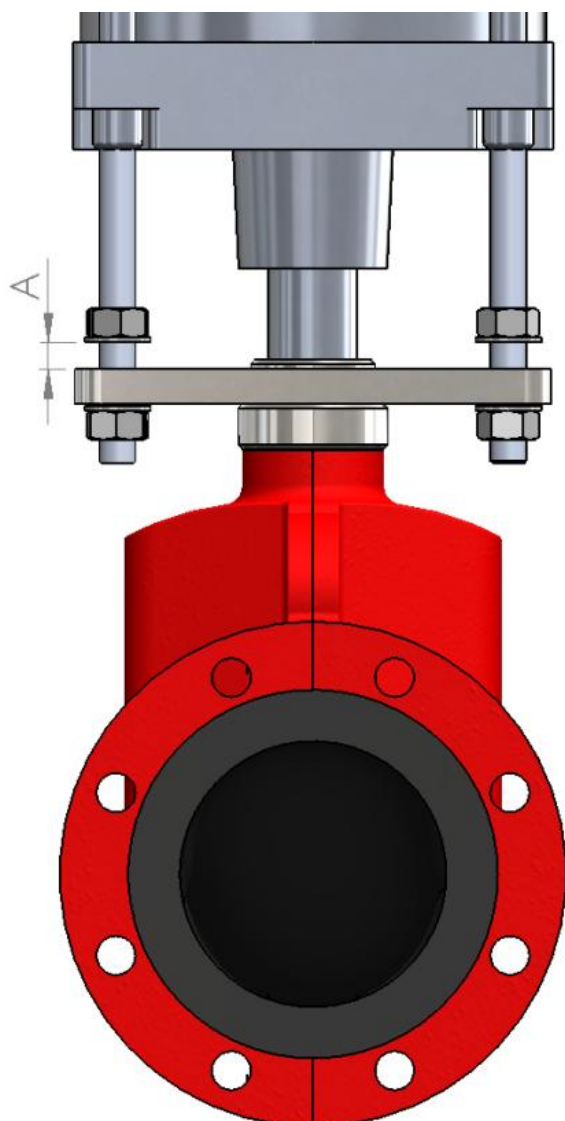


Figure 19. Measuring the compression value.

Table 9. Needed squeeze for the valve sleeves (dimension A on the Figure 19. Measuring the compression value.)

Valve size (DN)	50	80	100	150	200	250
Squeeze (mm)	3	3	4	4	5	5

7. Tighten the lower actuator nuts (1) until there's no gap between them and the attachment frame. Follow the torque given in Table 8. General tightening torques (bolt class 8.8, lubrication MoS₂).

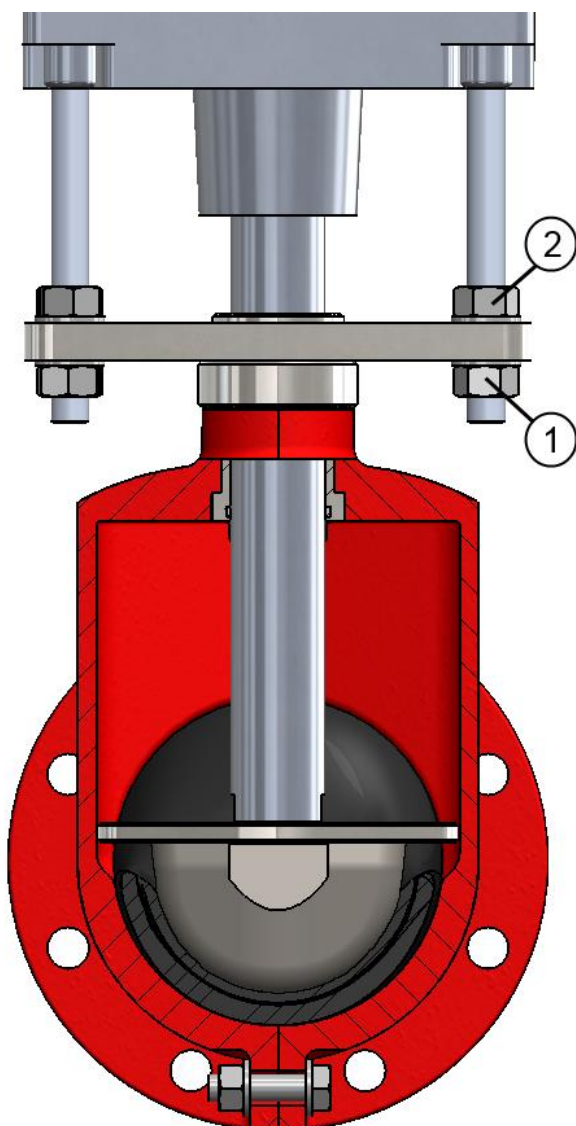


Figure 20. PVG valve with adjusted pneumatic actuator.

8. Test the adjustments by cycling the valve few times between OPEN and CLOSED position.
9. Leave the valve to OPEN position until it is installed and follow the storage instructions if the valve is placed in stock.

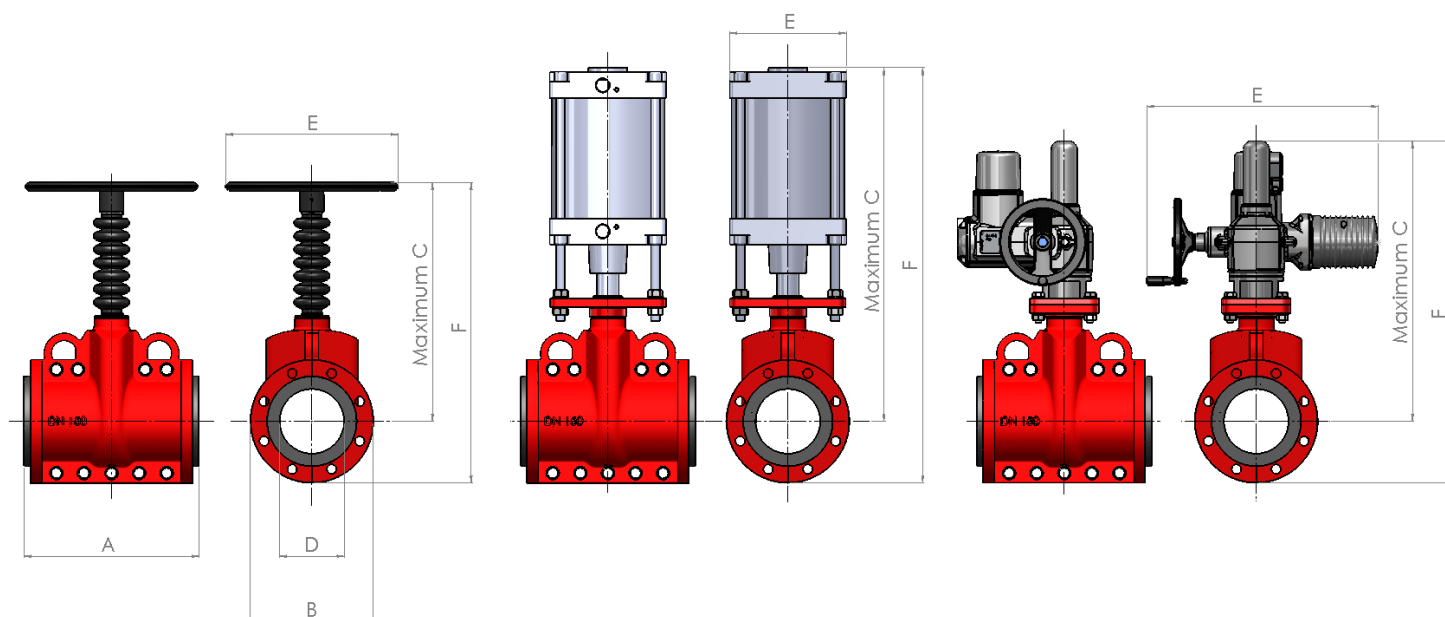
6.4 Troubleshooting

Table 10. Troubleshooting.

Problem	Possible reason	Action
Leakage from flange connection	Flange connection is loose	Tighten the flange connection bolts to correct torque
	Pipeline flanges and valve are misaligned	Check that the flanges are parallel and concentric with the valve
Sleeve lifetime is short	Damaged valve body	Check valve body for scrapes and sharp edges and change if damaged
	Unsuitable sleeve material for process	Check with Flowrox
	Damaged pusher	Check pusher for scrapes and sharp edges and change if damaged
Valve does not open/close or valve is not tight	Fault in actuator or control system	Check and fix actuator operation
	Too low pneumatic supply pressure	Fix air supply
	Damaged sleeve or pusher	Check and change damaged parts
Valve does not open/close smoothly	Insufficient lubrication	Lubricate the actuator.

* Manually operated valves are actuated with normal hand force

Appendix A: Main dimensions of valves



Valve size (DN)	A		C			D	E			F			Weight (kg)			Max Pressure (Bar)		
	M	A	M	A	E	M	A	E	M	A	E	M	A	E	M	A	E	
50	190	165	280	398	474	50	150	110	515	363	481	556	14	18	45	10	6	10
80	254	200	344	482	505	80	200	135	515	444	582	605	21	30	53	10	6	10
100	305	228	394	568	526	100	250	176	515	508	682	640	30	43	60	10	6	10
150	406	285	553	774	650	150	400	270	536	696	917	792	49	60	98	10	6	10
200	521	343	645	871	697	200	600	270	536	817	1043	868	96	141	144	6	4	6
250	635	406	785	1412	749	250	600	270	536	988	1615	952	140	215	188	6	4	6

M = manual, A = pneumatic, E = electric

Dimensions and weight are for guidance only - detailed drawings are available on request.
All dimensions are in millimetres.

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