

Installation, operation and maintenance instructions for Flowrox Slurry Knife Gate valves SKW DN50 -600 (Wafer) and SKF DN80 -600 (Flanged)



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

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TABLE OF CONTENTS

1	DIRECTIVE CONFORMANCE DECLARATIONS	4
1.1	General safety instructions	5
2	INTRODUCTION	6
2.1	Applications and purpose of use	6
2.1.1	Restrictions on use for SKW and SKF valves	6
2.1.2	Using the valve in explosive conditions	6
2.2	General description	7
2.2.1	Principle of operation	7
2.2.2	Mechanical structure	8
2.3	Technical data	11
2.3.1	Product identification	11
2.3.2	Actuators	12
3	TRANSPORTATION, STORAGE AND LIFTING	13
4	INSTALLATION	14
4.1	General	14
4.2	Flow direction, support, and valve position	15
4.3	Valve installation	16
4.4	Flushing installation guidelines	17
5	VALVE OPERATION	20
5.1	Commissioning and decommissioning	20
5.2	Flushing	20
6	SERVICING AND MAINTENANCE	21
6.1	General maintenance and checks	21
6.1.1	Scheduled maintenance	22
6.1.2	Spare parts	22
6.1.3	Lubrication	23
6.2	Changing the secondary seal	24
6.3	Changing the ring sleeves	25
6.4	Valve dismantling	26
6.4.1	Removing the actuator, gate, and tower	26
6.4.2	Dismantling the valve body	27
6.5	Valve assembly	28
6.5.1	Valve body, secondary seal, and gate assembly	28
6.5.2	Tower and actuator assembly	29
6.5.3	Testing and adjusting the valve stroke	30
6.5.4	Final assembly and testing	30
6.6	Troubleshooting	31
	Appendix A: Main measurements of SKW and SKF valves	32

1 DIRECTIVE CONFORMANCE DECLARATIONS

FLOWROX OY
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hereby declares that the **Flowrox Slurry
Knife Gate valve, Wafer (SKW) and Slurry Knife Gate valve, Flanged (SKF)**
comply with the following applicable regulations:

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

Valves according to article 3, clause 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, 1 September 2015






Jukka Koskela
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 Slurry Knife Gate valves (SKW) and (SKF) are intended for industry medium and slurry applications. They are bi-directional and are installed between flat flanges to shut-off or open flow within instructed temperature and pressure limits.

2.1.1 Restrictions on use for SKW and SKF valves

The valve must not be used to throttle the flow in any way, nor should the gate be left in partially opened or closed position as this will lead to premature failure.

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 SKW and SKF valves.

Ring sleeve material	NR	NBR	EPDM
Max valve operating temperature (°C)	-40 to +75	-30 to +100	-40 to +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 of use in explosive conditions.

2.2 General description

2.2.1 Principle of operation

Flowrox SKW and SKF valves are built with a cast or welded body and feature a heavy-duty stainless steel gate as a standard structure. Removable ring sleeves on both sides of the gate provide a bi-directional bubble tight seal.

In the open position the two ring sleeves seal against each other in the centre of the valve, providing a full bore through which the medium can travel. Main components are shown in Figure 1. Closing the valve forces the gate progressively down between the two mating ring sleeves, until it reaches the fully closed position. When the valve is fully closed, the ring sleeves push against both sides of the gate, effectively sealing and completely containing the line pressure. Any medium discharged between the ring sleeves during open/close strokes is collected to the valve body cavity and drained or flushed through the flushing ports.

The secondary seal is built in the upper part of the body. On every valve stroke, it wipes the gate and lubricates it with silicone grease. Easier actuation and minimum wear are achieved. There is no need to remove the valve from the line when replacing the secondary seal, but in tight or unsafe conditions it is unavoidable.

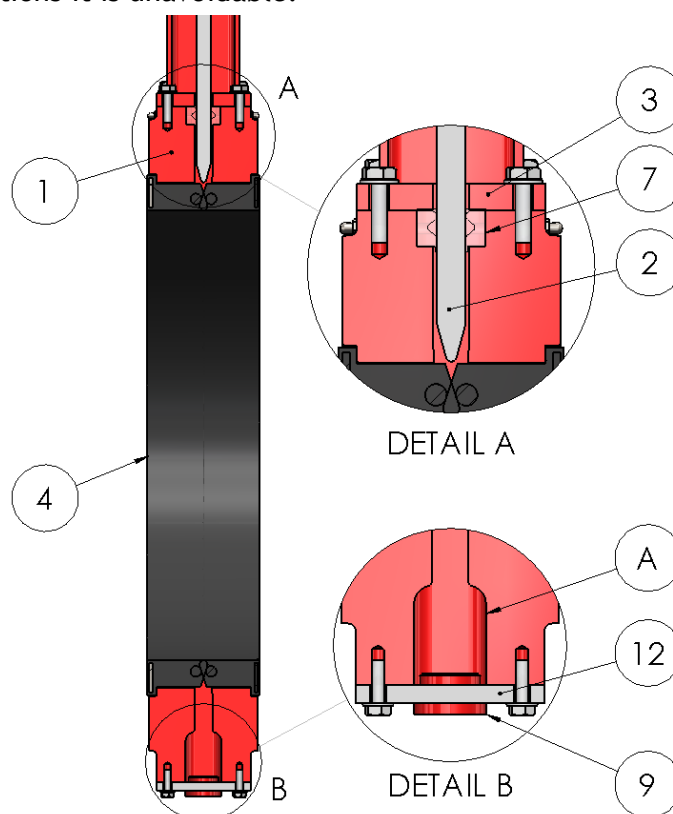




Figure 1. Valve main components.

No.	Description	No.	Description
1	Valve body	7	Secondary seal
2	Gate	9	Protective plug (on flushing port)
3	Tower	12	Bottom cover plate
4	Ring sleeve	A	Valve body cavity

	<p>The valve must not be used to throttle in any way, nor should the gate be left in partially opened or closed position as this will lead to premature failure.</p>
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This valve is intended for on-off operation only. Ring sleeves are easily replaced, and are available in a number of molded elastomer options to suit different conditions.

	<p>The gate speed may not exceed 25mm/s.</p>
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2.2.2 Mechanical structure

SKW and SKF valves can be delivered with the actuator options shown in Figure 2. Alternative actuators. Manual actuator type depends on the valve size.

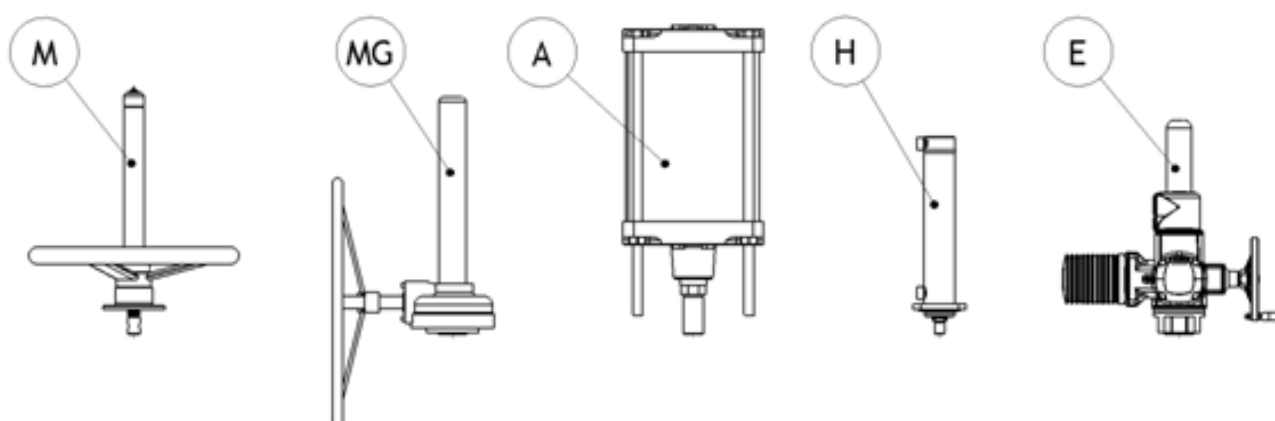


Figure 2. Alternative actuators

Type	Description
M	Manual actuator
MG	Manual actuator with gearbox
A	Pneumatic actuator
H	Hydraulic actuator
E	Electric actuator

SKW valve part list is shown in Table 3 and the exploded view in Figure 3. Part quantities are not displayed if they are valve size or actuator type dependent.

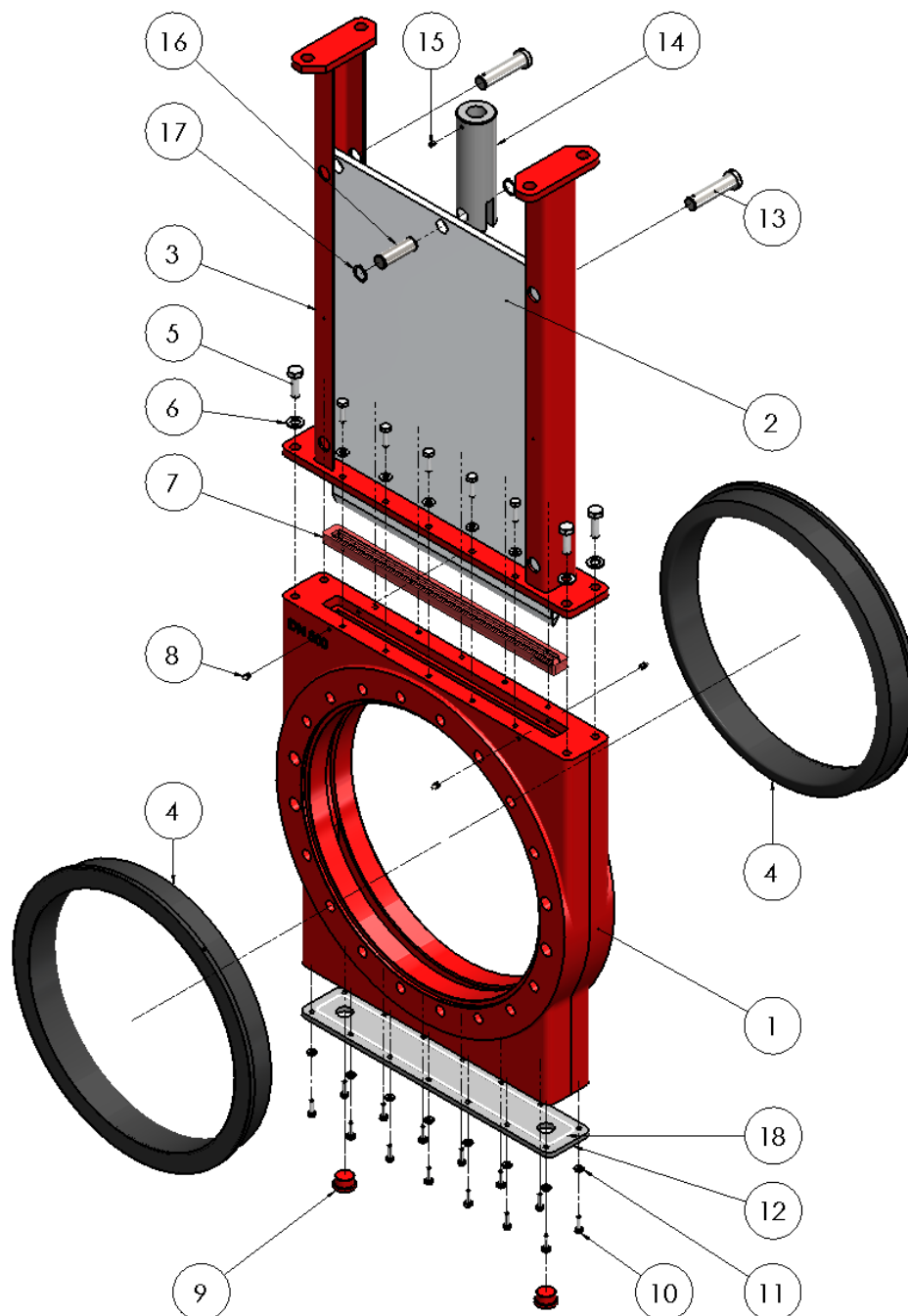


Figure 3. Exploded view of SKW valve

Table 3. SKW valve part list

Part	Qty	Description	Part	Qty	Description
1	1	Valve body	10		Bottom cover bolt
2	1	Gate	11		Bottom cover washer
3	1	Tower	12	1	Bottom cover plate
4	2	Ring sleeve (recommended spare part)	13	2	Locking pin
5		Tower mounting bolt	14	1	Clevis
6		Tower mounting washer	15	1	Clevis locking screw
7	1	Secondary seal (recommended spare part)	16	1	Clevis pin
8	4	Grease nipple	17	2	Retaining ring
9	2	Protective plug	18		PTFE sealing strip

SKF valve part list is shown in Table 4 and the exploded view in Figure 4. Part quantities are not displayed if they are valve size or actuator type dependent.

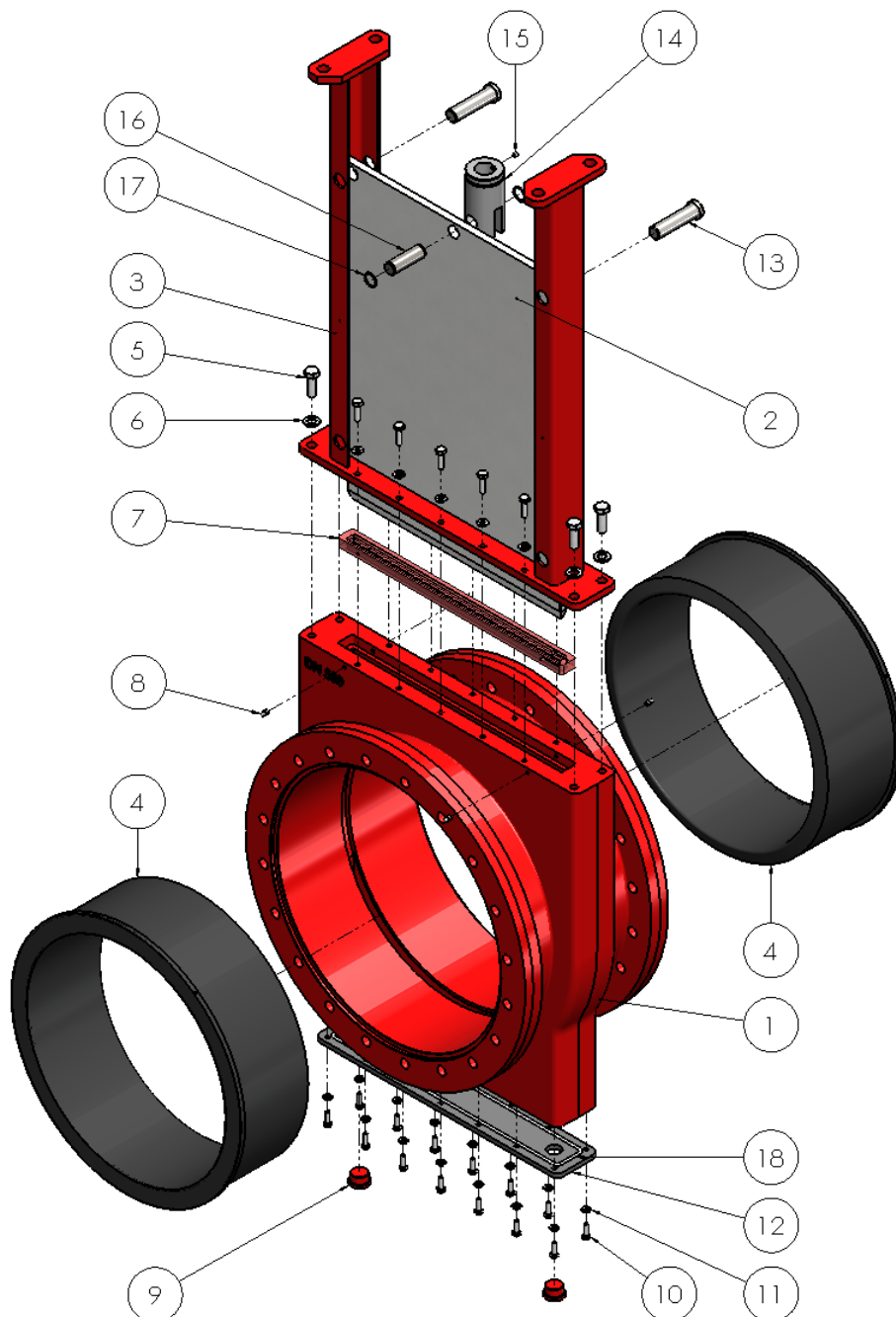


Figure 4. Exploded view of SKF valve

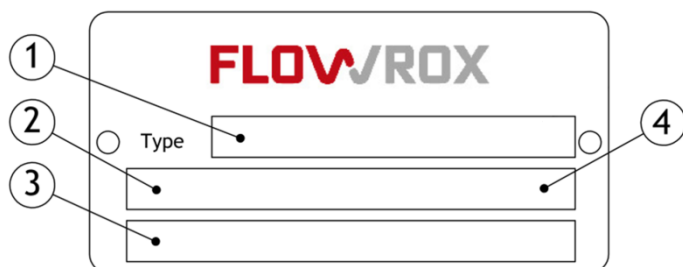
Table 4. SKF valve part list.

Part	Qty	Description	Part	Qty	Description
1	1	Valve body	10		Bottom cover bolt
2	1	Gate	11		Bottom cover washer
3	1	Tower	12	1	Bottom cover plate
4	2	Ring sleeve (recommended spare part)	13	2	Locking pin
5		Tower mounting bolt	14	1	Clevis
6		Tower mounting washer	15	1	Clevis locking screw
7	1	Secondary seal (recommended spare part)	16	1	Clevis pin
8	4	Grease nipple	17	2	Retaining ring
9	2	Protective plug	18		PTFE sealing strip

2.3 Technical data

2.3.1 Product identification

Flowrox valve type plate is shown in Figure 5.



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 5. Valve type plate example.

Table 5. Valve model key table.

Type	Size (DN)	Actuator	Pressure class (PN)	-	Flange drilling	Body material	Gate material	-	Ring sleeve material	-	Auxiliaries
SKW = Flowrox Slurry Knife Gate valve, Wafer	50-600	M = handwheel MG = manual with gearbox A = pneumatic	10 = 10 bar		2 = DIN PN10 3 = DIN PN16 4 = DIN PN25 5 = DIN PN40 6 = ANSI150 7 = ANSI300 9 = other	0 = Cast iron / Welded steel 2 = AISI 316 4 = other	S = AISI 316 Other on request COATING: 0 = nothing		NR = natural rubber NBR = nitrile EPDM = ethylene propylene diene monomer		R = readiness for inductive limits R1 = AC/DC R2 = DC, PNP R3 = DC, NPN Z1 = solenoid valve, 24V DC Z2 = solenoid valve, 220V, 50/60 Hz Z3 = solenoid valve, 110V, 50/60 Hz G = Gate guard
SKF = Flowrox Slurry Knife Gate valve, Flanged		AU = pneumatic with pneumatic spring H = hydraulic E = electric									

Examples: SKW100M10-60S0-NR-G
SKF100M10-60S0-NR-G

X = feature that is explained in the valve type plate.

The main dimensions and weight are given in *Appendix A* of this manual.

2.3.2 Actuators

Standard actuators:

- Handwheel / handwheel with gearbox
- Pneumatic
- Hydraulic
- Electric

Manual actuator operation revolutions are shown in Table 6. Valves are closed by turning clockwise.

Pneumatic actuators are with a fixed stroke and do not require external controls to position the gate. The minimum supply pressure for pneumatically operated valves is 6 bars. Air must be clean, waterless, lubricated and comply with ISO 8573-1:2001 Class 3.

Use correct sized pneumatic hoses to ensure sufficient air flow. Pneumatic actuator noise level may exceed 85 dB and it is recommended to use ear protectors when working near the valve.

Hydraulic actuators have a minimum supply pressure of 150 bars.

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.


	<p>The gate speed may not exceed 25mm/s.</p>
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Table 6. Manually actuated valve operating revolutions.


Valve nominal size	DN 50	DN 80	DN 100	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 450	DN 500	DN 600
Handwheel revs. to stroke valve	18	25	28	40	50	60	-	-	-	-	-	-
Bevel gear revs. to stroke valve	-	-	-	-	-	-	120	137	313	350	380	340

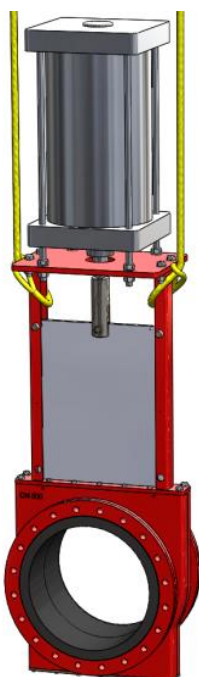
3 TRANSPORTATION, STORAGE AND LIFTING

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

1. Prior to storage, thoroughly drain valves of any liquid.
2. Indoor storage is required. For unfavorable 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 with the gate locked in open position.
5. Ensure pneumatic and hydraulic cylinder actuators have appropriate plugs installed in the respective supply ports to prevent contamination of the cylinders.
6. Protect valve ring sleeves from heat, light and exposure to ozone.
7. Cover the flange openings.
8. Do not store any objects on the rubber ring sleeves.
9. Follow actuator instructions for storage.
10. Before start-up, clean the gate and lubricate the valve.

When storing used valves, wash the valve and also the body cavities 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.

	<p>Lifting equipment must be used for valves weighing over 25kg.</p>
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Lift the valves securely from the tower (part 3 in *Mechanical structure*). Bigger valves may have pre-installed lifting eyes which should be used when available. When pre-installed lifting eyes are not available, use soft straps to lift valve as shown in Figure 6.

Do not attach lifting equipment to the valve bore, handwheel, actuator, locking pin holes or gate guards, as they can be damaged.

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

Figure 6. Valve lifting example.

4 INSTALLATION

	<p>Do not put your hands or fingers into the tower or port areas 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>
	<p>Never use the valve with all flushing ports plugged. If the medium is harmful in any way, the flushing port must be piped to a safe location.</p>

4.1 General


Flowrox gate valves are normally delivered fully assembled and ready for use. 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 gate valves have connections with DIN or ANSI bolt drillings as standard design, but other drillings are also available, such as BS, AS, JIS.

Reserve enough space for safe installation and maintenance. See *Appendix A* for valve dimensions. Notice that during opening and closing cycles, a small amount of medium is discharged in the valve body cavity; therefore do not install gate valves above walkways or critical components. Flushing and drainage connection must be installed if medium is harmful or corrosive.

If the valve has been stored in the warehouse, lubricate the valve as instructed in the *Lubrication* chapter.

4.2 Flow direction, support, and valve position

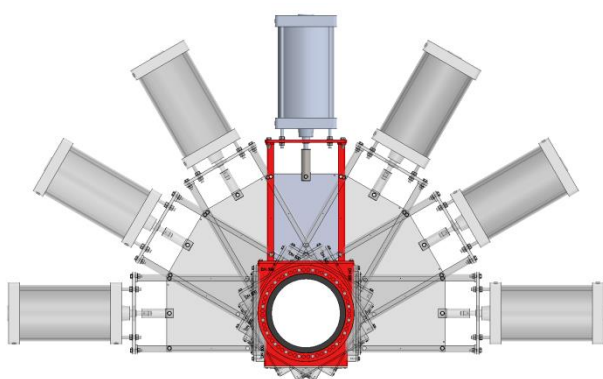
	<p>Do not install DN250 or larger pneumatically actuated valves in other than vertical position without support. This is to prevent possible distortion of the actuator and valve tower.</p>
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	<p>Do not step on a valve installed in horizontal or angled position.</p>
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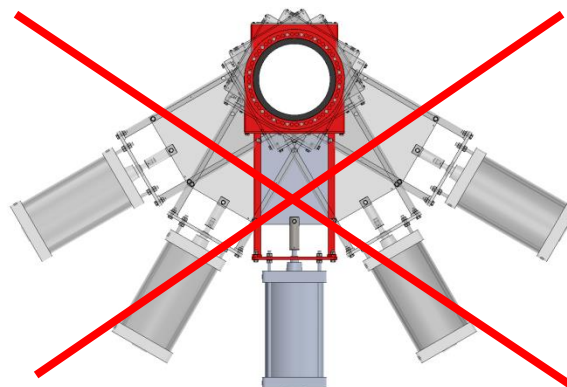
The valve does not have an intended flow direction; therefore it can be installed either way in the pipeline.

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

The valve can be installed in any position other than below horizontal. Flushing will not work in installations below horizontal level and it will lead to leaking and nonfunctional valve. See the following Figure 7.



Recommended installation positions



Forbidden installation positions

Figure 7. Installation alternatives for SKW and SKF valves.

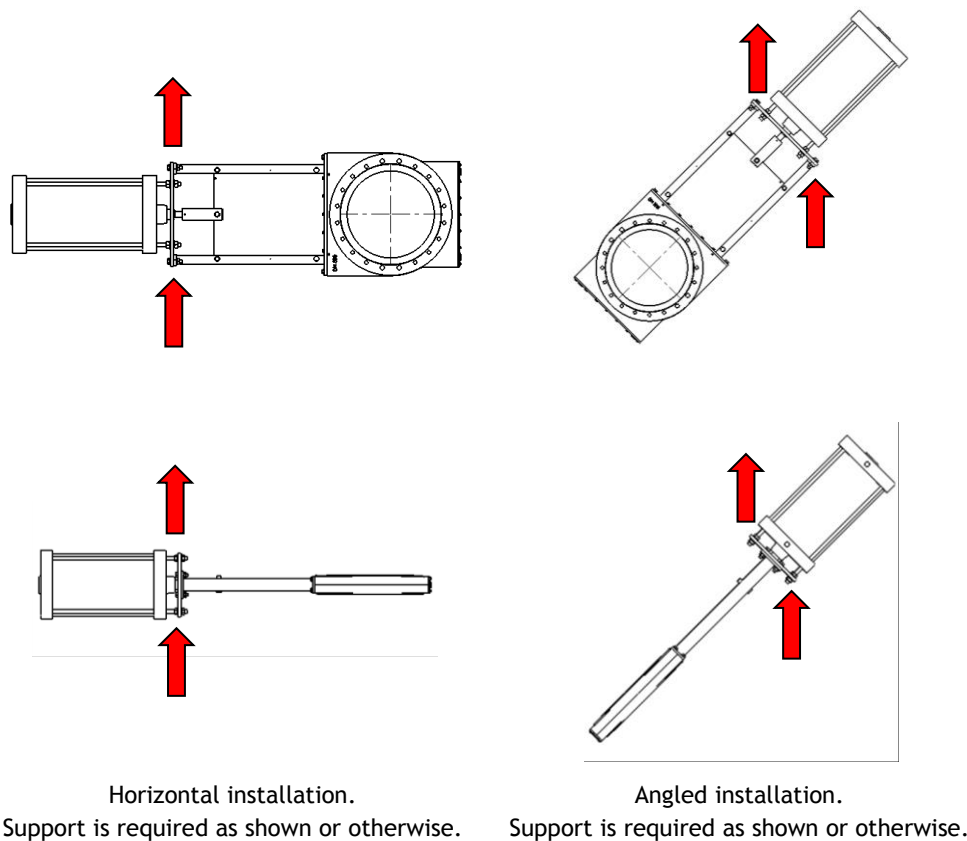


Figure 8. Support for pneumatically actuated valves.

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. See Table 7.
- The valve is in OPEN position.

Follow these Installation steps:

1. Disconnect automatic actuator from power supply if connected.
2. Install the safety guards and required accessories to the valve
3. Lift the valve on place with appropriate lifting equipment.
4. Tighten the flange connection bolts evenly in a crosswise sequence shown in Figure 9. Recommended tightening torque is shown in Table 7.
5. Other than mentioned flange drillings are also available.

Always support DN250 and larger pneumatically actuated valves (Figure 8).

6. Connect automatic actuator to power supply.
7. Connect flushing connection (if applicable).
8. Check that all connections have been fastened and the actuator is installed correctly.
9. Run a few open/close cycles without pressure in the pipeline. Refer to *Troubleshooting* if the valve does not operate smoothly or without extra force.

Table 7. Valve connection maximum tightening torque and bolt nominal diameter for steel flanges.

Valve size (DN)	Recommended tightening torque for flange bolt Nm (ft-lbs)	Tapped hole depth in body (mm)	DIN Bolt nominal diameter	ANSI150 Bolt nominal diameter
50	43 (32)	12	M16	5/8"-11 UNC
80	43 (32)	14	M16	5/8"-11 UNC
100	43 (32)	14	M16	5/8"-11 UNC
150	75 (55)	16	M20	3/4"-10 UNC
200	75 (55)	23	M20	3/4"-10 UNC
250	120 (90)	23	M20	7/8"-9 UNC
300	120 (90)	24	M20	7/8"-9 UNC
350	185 (135)	24	M20	1"-8 UNC
400	185 (135)	30	M24	1"-8 UNC
450	260 (190)	28	M24	1-1/8"-7 UNC
500	260 (190)	42	M24	1-1/8"-7 UNC
600	260 (190)	42	M27	1-1/4"-7 UNC

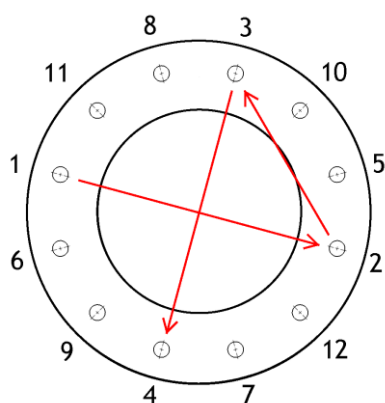


Figure 9. Flange bolt tightening example.

4.4 Flushing installation guidelines



Never use the valve with all flushing ports plugged. If the medium is harmful in any way, the flushing port must be piped to a safe location.

When valve flushing is required, customers need to provide the plumbing. The valves are shipped with plugs installed in the flushing holes. Contact Flowrox office for process specific instructions.

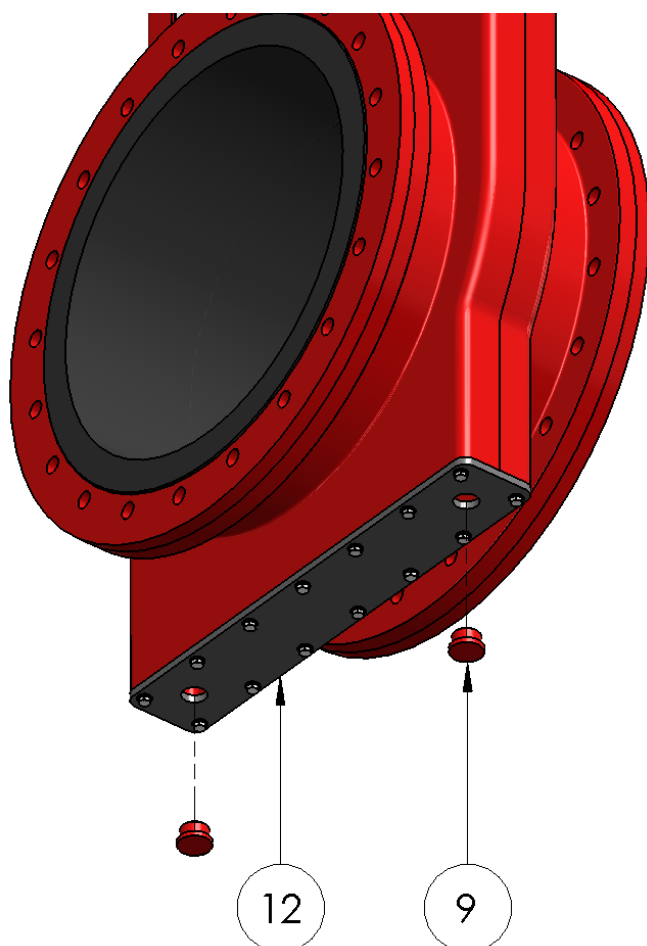
The concept of flushing is to ensure the valve does not jam due to accumulation of medium solids in the valve body. Flushing line or drain line is also required if the medium is harmful to people, environment or other components nearby. In other cases, the flushing connections can be opened to prevent valve body from clogging up.

Reclaim service water is usually clean enough to accomplish the water flush, if clean water is not readily available.

Larger diameter valves can have additional flushing connection to ensure proper flushing. Flushing connections are on the sides, bottom or on the face of the valve. Hole sizes are shown in *Appendix A*. One or more flushing connections are used, depending on the process.

A flow indicator can be installed to the flushing line for easier function check-out.

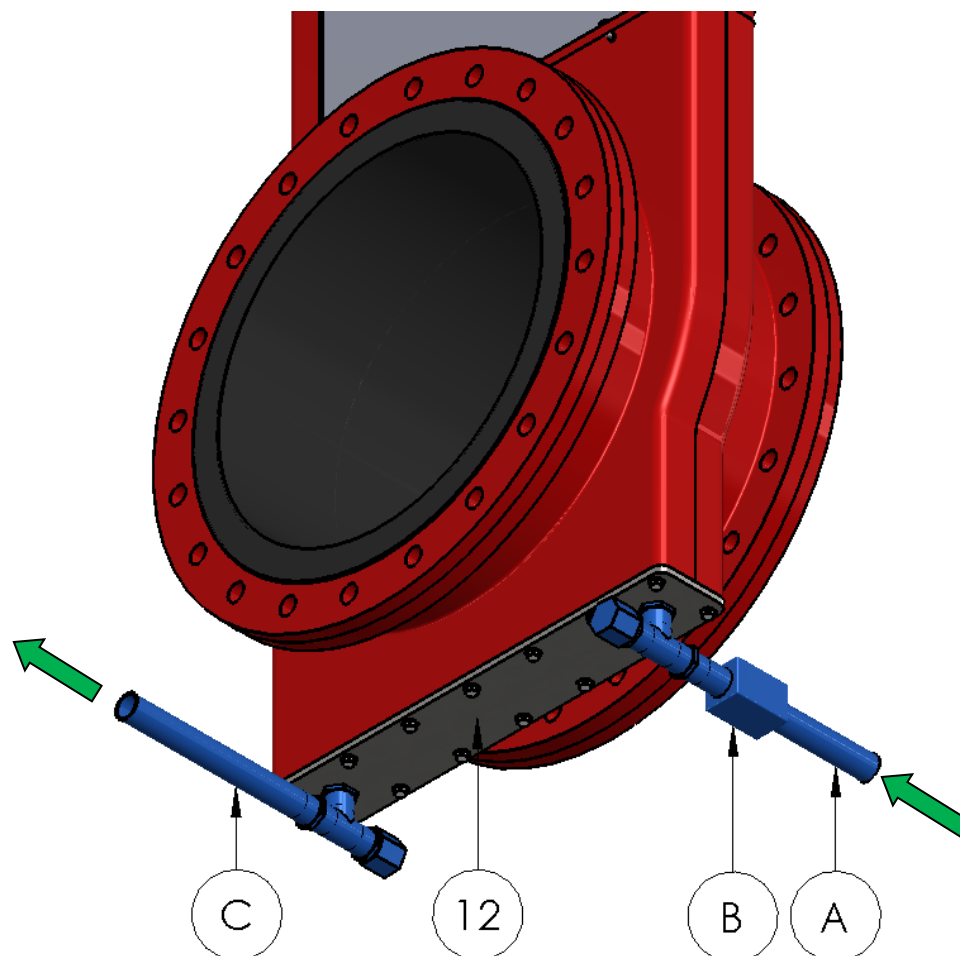
In **flushing example 1** the valve protective plugs (9) are removed or bottom cover plate (12) is removed. The process medium slipping between the gate and ring sleeves during valve operation flows freely out of the valve. If the medium is harmful in any way, the flushing port must be piped to a safe location.



- 9. Protective plug
- 12. Bottom cover plate

Figure 10. Flushing example 1.

In flushing example 2 (Figure 11), the water is supplied to one side and drained from the other side of the valve. It is necessary to have a shut-off valve (B) on the upstream or supply side of the flush water line to prevent water running constantly. This can be located anywhere, but is usually near to the valve.



- 12. Bottom cover plate
- A. Flush water supply
- B. Shut-off valve
- C. Drain line

Figure 11. Flushing example 2.

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 gate guards and other accessories are installed
- Possible explosive conditions have been taken into account

When a valve is decommissioned, dispose the valve parts and electric/pneumatic/hydraulic 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.

5.2 Flushing






Follow these operation instructions, when valve flushing is installed.

Flush Fowrox gate valves at least after every 20 cycles to keep the body clear of solids, depending on application and process. If slurry solids are present in the process, the flushing sequence needs to be initiated each time the valve is operated.

It is important to open the water supply valve a moment before the valve is operated. The flushing water is then left on for the entire cycle and for a minimum of 10 seconds after the cycle. To improve flushing, the water should be left on until clean flushing water is exhausting through the drain line.

6 SERVICING AND MAINTENANCE

6.1 General maintenance and checks

	<p>Depressurize, 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>
	<p>Crush hazard. Keep your hands and feet clear of moving parts. Lock the gate before any maintenance work.</p>
	<p>De-energize actuators before maintenance. Especially pneumatic actuators equipped with a mechanical spring can cause injury to people and equipment if cylinder actuates unintentionally.</p>
	<p>Lifting equipment must be used for valves weighing over 25kg.</p>
	<p>Do not step on a valve installed in horizontal or angled position.</p>

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, lubricating is the only mandatory maintenance task. Periodic inspections should be done as valves may 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 8. Schedules will vary with applications.

Table 8. Maintenance schedule.

Maintenance task	Frequency & advice
Do a leakage inspection	Regularly. Refer to <i>Troubleshooting</i> .
Lubricate valve	After every 50 cycles. More often if valve is operated rarely. Refer to chapter 6.1.3.
Lubricate the actuator stem	Every six months. Read the manufacturer's instructions.
Run an open/close cycle	Suggested once a month for smooth and reliable operation.
Examine the flushing and drainage	Every two months
Clean the gate	Every two months. Reduces the ring sleeve and gland packing wear.
Examine the gate for erosion	Every two months.
Examine the valve for erosion and wear	Every six months.

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: SKW100M10-60S0-NR-G)
- Spare part name and quantity (example: Ring sleeve, 2 pieces)

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 the spare parts of Table 9 available at your factory warehouse. Part numbers refer to *Mechanical structure*.

Table 9. Spare part list.

Part	Part number	Quantity/valve
Ring sleeve	4	2
Secondary seal	7	1
Sealing kit for hydraulic or pneumatic actuator	-	1

6.1.3 Lubrication



Do not use hydrocarbon based grease. Use silicone based lubricants such as DOW# 111, DOW 4, DOW 44, GENERAL ELECTRIC COMPOUND G661, AND RHONE - POULENE RHODORSIL III

Flowrox gate valves have grease nipples on both sides of the valve body (Figure 12). Valves are lubricated when assembled - therefore first lubrication should not be required unless the valves have been in stock for a longer time. For dry material handling, lubrication might be limited or forbidden.

Hydrocarbon based greases cannot be used to lubricate these valves as the elastomer ring sleeves will swell and disintegrate.

Lubricate both sides of the valve approximately every 50 cycles, or after long periods of infrequent cycling. Grease volume requirement is shown in Table 10. Please notice that even when the lubricant is inert it may disturb a sensitive process. Acceptable lubricants include: DOW# 111, DOW 4, DOW 44, GENERAL ELECTRIC COMPOUND G661 AND RHONE - POULENE RHODORSIL III.

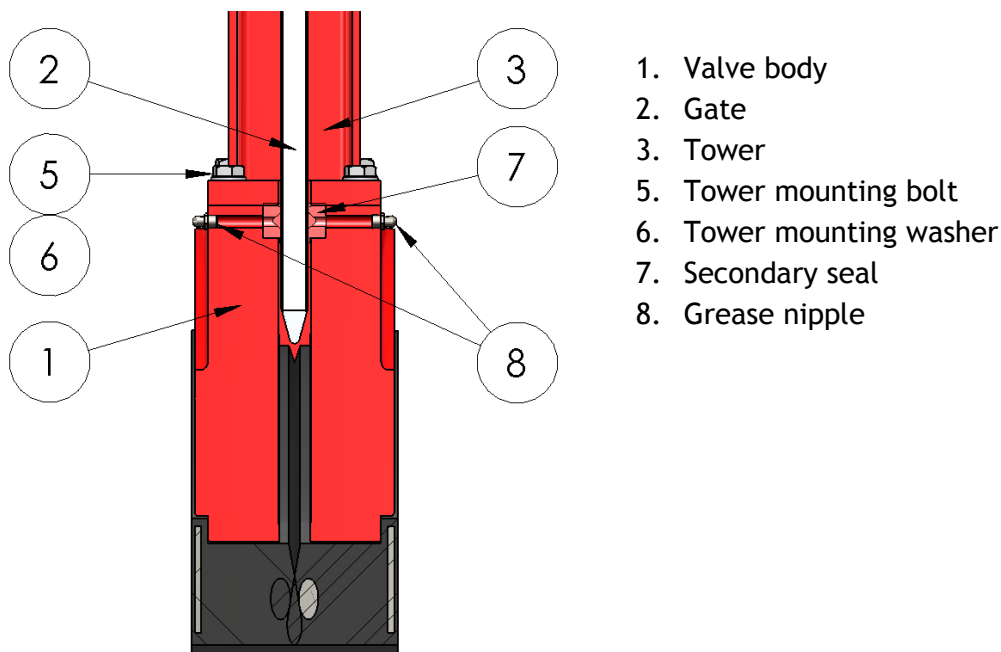


Figure 12. Grease nipples on valve body.


Table 10. Volume of grease required per unit.

Valve nominal size	DN 50	DN 80	DN 100	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 450	DN 500	DN 600
Lubricant per valve (cm ³)	35	40	60	65	105	240	480	490	550	620	1090	1470


6.2 Changing the secondary seal

Follow these instructions if you are to change the secondary seal while the valve is installed to a pipeline. The actuator, tower, and gate are removed as one package to get more work space. Refer to *Changing the ring sleeves* or *Valve dismantling* if further service is required as well.

Part numbers refer to *Mechanical structure*.

	<p>Crush hazard. Keep your hands and feet clear of moving parts.</p>
---	--


1. Depressurize and drain the pipeline.
2. Stroke the valve to fully OPEN position and put the locking pins (13) on place.
3. Disconnect automatic (electric, pneumatic or hydraulic) actuator from power supply to prevent injuries.
4. Remove the bolts (5) that attach the tower (3) to the body (1). Lift the actuator, tower (3) and gate (2) off as one package. The secondary seal (7) might come up with the gate (2).
5. Remove the secondary seal (7).
6. Clean the space for the secondary seal (7).
7. Apply recommended silicon lubricant to any inner contours and outside of the new secondary seal (7) and push it in the sealing slot. If the secondary seal has a sealing lip, place it towards valve bore.

	<p>Do not use hydrocarbon based grease. Use silicone based lubricants such as DOW# 111, DOW 4, DOW 44, GENERAL ELECTRIC COMPOUND G661, AND RHONE - POULENE RHODORSIL III</p>
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8. Apply recommended silicon lubricant on the chamfered edge of the gate (2).
9. Lower the actuator, tower and gate package on the body and fasten with bolts (5).
10. Lubricate valve grease nipples (8) as instructed in *Lubrication*.
11. Reconnect automatic actuator to power supply and remove locking pins (13).
12. Run a few test strokes before the pipeline is pressurized.

6.3 Changing the ring sleeves


To change the ring sleeves, 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*.

	<p>Do not disconnect a pressurized valve from the pipeline in any case!</p>
---	---

1. Depressurize and drain the pipeline.
2. Stroke the valve to fully OPEN position and put the locking pins (13) on place.
3. Disconnect automatic (electric, pneumatic or hydraulic) actuator from power supply to prevent injuries.
4. Disconnect flushing pipelines from the valve if flushing is installed.

	<p>Lifting equipment must be used for valves weighing over 25kg.</p>
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5. Remove the flange connection bolts and lift the valve to a suitable working surface.
6. Lift the ring sleeves (4) out from the valve body and inspect for visible damage such as cuts, slits or erosion grooves. Depressions and evident flat spots are also to be taken as signs of damage.
7. Check if the gate (2) is damaged and needs to be replaced.
8. Clean the valve body (1).

	<p>Do not use hydrocarbon based grease. Use silicone based lubricants such as DOW# 111, DOW 4, DOW 44, GENERAL ELECTRIC COMPOUND G661, AND RHONE - POULENE RHODORSIL III.</p>
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9. Apply a thin layer of recommended silicone based lubricant to the sealing lip and to the outer face of the new ring sleeves. Insert the sleeves into the valve body - centering the ring sleeve within the bore.
10. Leave the valve to OPEN position until it is installed and follow the *storage* instructions if the valve is placed in stock.

6.4 Valve dismantling

Follow these instructions if you are to do full overhaul on the valve. Part numbers refer to *Mechanical structure*.

6.4.1 Removing the actuator, gate, and tower

1. Remove the valve from the pipeline as instructed in the earlier chapter 6.3.
2. Install locking pins (13) between the gate (2) and tower (3).
3. Remove the tower mounting bolts (5) bolts and lift the actuator, gate (2) and tower (3) off.
4. To detach the gate (2) from the actuator stem, remove retaining ring (17) and the clevis pin (16) from the clevis (14).

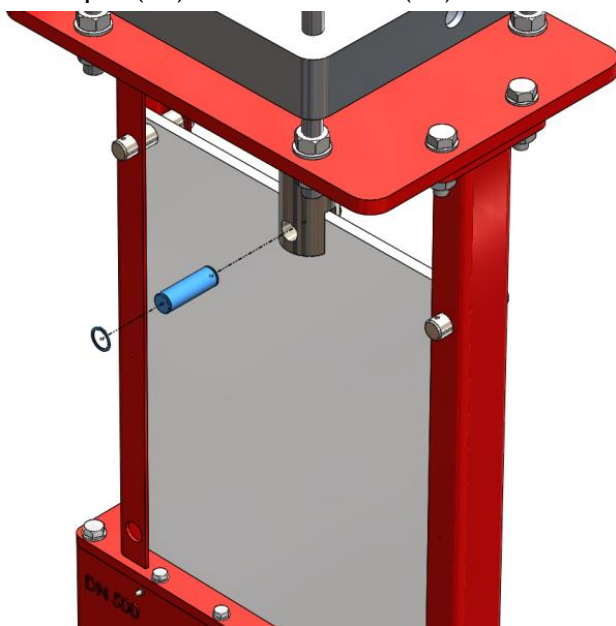


Figure 13. Removing the clevis pin.

5. Clean the gate (2) and inspect it for deep scars and transformations. Replace the gate if it's damaged to prevent accumulation of damage to the secondary seal (7) and ring sleeves (4).
6. Use a marker to mark the height of the clevis (14) on the cylinder shaft. The position is needed in valve assembly.
7. Remove the clevis locking screw (15) and the clevis (14).
8. Remove the bolts from between the actuator and tower (or adapter plate if equipped). Lift the actuator off the tower.
9. Refer to actuator manufactures' instructions for actuator sealing replacement or other maintenance work.

6.4.2 Dismantling the valve body

1. Disassemble the valve with the instruction above to the point where the actuator, gate (2) and tower (3) have been removed from the valve body (1).
2. Remove the ring sleeves (4) from the valve body and inspect for visible damage such as cuts, slits or erosion grooves. Depressions and evident flat spots are also to be taken as signs of damage. Change ring sleeves if damaged.
3. Remove the secondary seal (7).
4. Remove bottom cover plate (12).
5. Remove grease nipples (8).

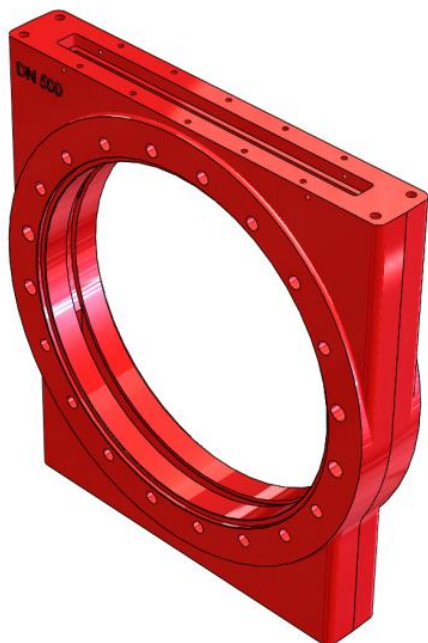


Figure 14. Dismantled valve body.

6. Clean the body (1) from the inside and ensure that the bores are flawless.
7. When all valve parts have been cleaned and inspected, continue to *Valve assembly*.

6.5 Valve assembly

Follow the general tightening torques in Table 11, when specific tightening instructions are not given in this document or in other supplied documentation. Part numbers in assembly instructions refer to *Mechanical structure*.

Table 11. 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)

6.5.1 Valve body, secondary seal, and gate assembly

1. Install the secondary seal (7) in the sealing slot with the possible sealing lip facing towards valve bore. Apply recommended silicon lubricant to any inner contours and outside of the new secondary seal.
2. Install grease nipples (8).



Do not use hydrocarbon based grease. Use silicone based lubricants such as DOW# 111, DOW 4, DOW 44, GENERAL ELECTRIC COMPOUND G661, AND RHONE - POULENE RHODORSIL III

3. Insert a piece of timber in the bore as shown in Figure 15. It is to prevent excessive gate drop before clevis pin is installed.
4. Apply recommended silicon lubricant on the chamfered edge and sides of the gate (2) and slide it through the opening at the top of the valve body until it stands safely on the piece of timber.
5. Continue to the tower and actuator assembly in the next chapter.

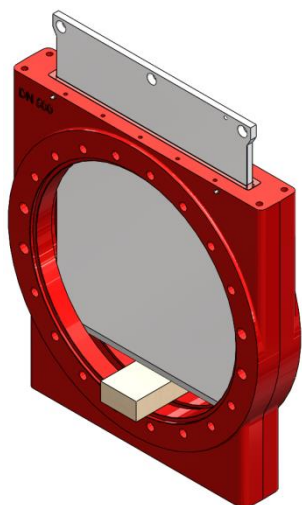


Figure 15. Detail of timber insert.

6.5.2 Tower and actuator assembly

1. After the valve body and gate have been assembled, lift and fit the tower (3) on the valve body. Install the tower mounting bolts hand tight (5).
2. Tighten the mounting bolts by starting from the middle as shown in the Figure 16.
3. Fit the actuator (and possible adapter plate) on the top of the tower (3) using the correct bolts and nuts.
4. Assemble the clevis (14) to the actuator stem if it was dismantled.
5. Stroke the actuator stem down or lift the gate to fit the clevis pin (16) through the aligning holes of the gate (2) and clevis (14). Secure the clevis pin with the retaining rings (17).
6. Install the bottom cover plate (12) and tighten the bottom cover bolts (10).
7. Continue to test the stroke in the next chapter.

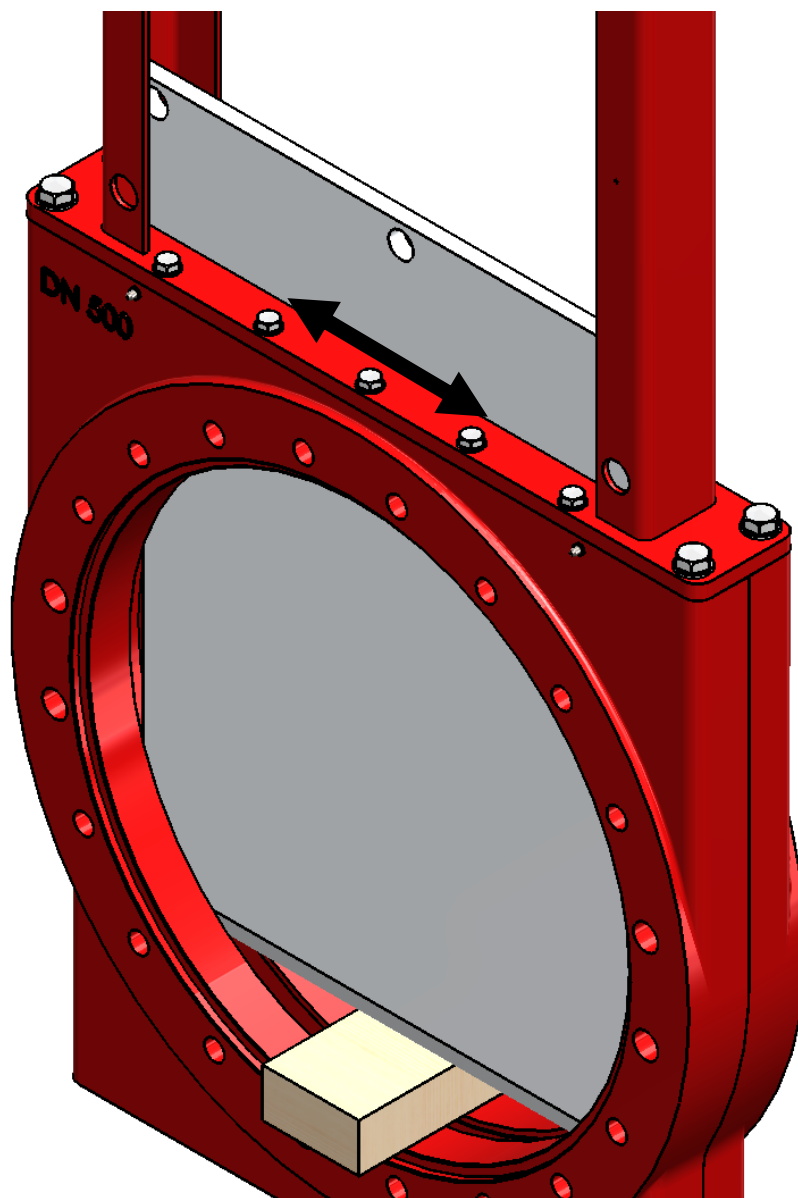
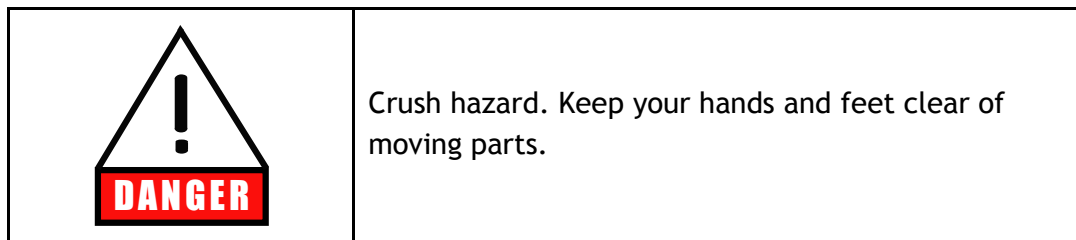


Figure 16. Tightening the tower mounting bolts.

6.5.3 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 or hydraulic actuator. This is not needed with manual actuators. Refer to the electric actuator documentation for specific stroke adjustment instructions.



1. Assemble the valve according to the instructions above.
2. Connect the actuator to power source and stroke the valve to fully OPEN position.
3. Stroke is adjusted correctly if gate (2) can now be locked with the locking pins (13). Otherwise continue to the next step for stroke adjustment. See Figure 17.
4. Measure how much the gate (2) must be adjusted.
5. Disconnect automatic actuator from power supply to prevent injuries.
6. Remove retaining ring (17) from the clevis pin (16) and remove the clevis pin.
7. Push the gate (2) down to get space for the clevis (14) to turn.
8. Loosen the clevis locking screw (15)
9. Rotate the clevis (14) on the stem to adjust it up or down according the dimension measured above.
10. Re-install the clevis and test if the locking pins (13) fit in now. Repeat adjustment if pin does not fit in place. Continue to the next chapter if valve is adjusted correctly.

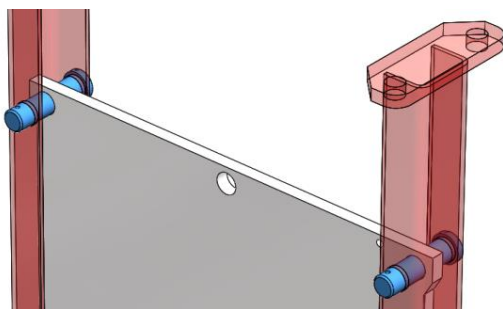


Figure 17. Stroke correctly adjusted.

6.5.4 Final assembly and testing

1. Stroke the valve with the actuator to fully OPEN and fully CLOSED position to ensure smooth operation and the correct positioning of the gate.
2. Install the ring sleeves (4).
3. Lubricate valve grease nipples (8) as instructed in *Lubrication*.
4. Install all removed safety guards and other accessories according to the manufacturer's instructions.
5. Run a few open/close cycles and leave the valve open. If the valve operates smoothly, it is ready to be installed on the pipeline. Follow the *Installation* instructions.

6.6 Troubleshooting

Table 12. Troubleshooting.

Problem	Possible reason	Action
Leakage from bottom cover plate	Loose flushing pipeline connections or bottom cover plate	Check the flushing connection and bottom cover plate tightness
	Damaged ring sleeve and/or gate	Check ring sleeves and gate and change as needed
Leakage from flange connection	Flange connection is loose	Tighten the flange connection bolts to correct torque
	Flange connection bolts are too long	Measure the bolts and change as needed
	Pipeline flanges and valve are misaligned	Check that the flanges are parallel and concentric to valve
Leakage from the secondary seal	Tower mounting bolts loose	Tighten tower mounting bolts
	Secondary seal worn out	Replace secondary seal
Valve does not open/close or valve is not tight	Fault in actuator, limit switch or control system	Check and fix actuator operation
	Clogged up with solids	Clean gate and body cavity. Check or install flushing.
	Damaged gate, ring sleeve or secondary seal	Check and change damaged parts
Valve does not open/close smoothly	Insufficient lubrication	Lubricate valve and increase scheduled lubrication. Lubricate the actuator.
Opening/closing force too high*	Insufficient lubrication	Lubricate valve and increase scheduled lubrication. Lubricate the actuator.
	Flange or tower mounting bolts too tight	Check and loosen bolts
	Damaged gate, ring sleeve or secondary seal	Check and change damaged parts
Ring sleeve lifetime is short	Insufficient flushing	Check flushing flow and pressure or install flushing
	Insufficient lubrication	Increase scheduled lubrication
	Unsuitable ring sleeve material for process	Check with Flowrox
	Damaged gate	Check gate for scrapes and bending and change if damaged

* Manually operated valves are actuated with normal hand force.

Appendix A: Main measurements of SKW and SKF valves

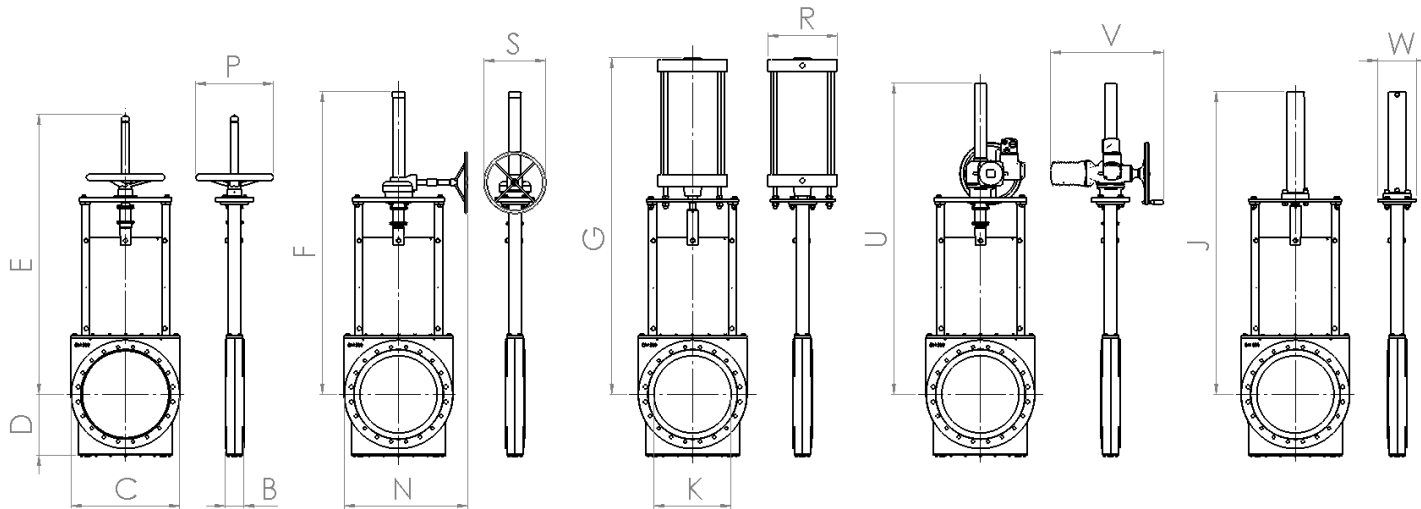


Figure 18. SKW valve dimensions.

Valve size (DN)	B	B*	C	D	E	F	G	J	U	K	N	P	R	S	V	W	Weight (kg)					T
					M	MG	A	H	E		MG	M	A	MG	E	H	M	MG	A	E	H	
50	54	58	165	102	566	-	586	-	-	-	-	350	110	-	-	-	20	-	17	-	-	G1/2"
80	57	61	200	112	628	-	683	-	739	80	-	350	110	-	513	-	24	-	22	48	-	G1/2"
100	57	61	230	132	648	-	725	-	751	100	-	350	120	-	513	-	30	-	28	51	-	G1/2"
150	64	68	285	157	921	-	972	-	879	150	-	350	176	-	513	-	42	-	49	64	-	G1/2"
200	76	80	346	188	1006	1148	1115	988	972	200	466	350	220	400	513	150	61	87	75	83	59	G1/2"
250	76	80	410	223	1133	-	1316	-	1150	250	-	350	250	-	537	-	82	-	113	104	-	G1/2"
300	83	87	483	262	-	1380	1512	-	1363	300	535	-	340	400	537	-	-	134	190	150	-	G 1"
350	83	87	533	285	-	1455	1661	1521	1481	350	560	-	340	400	724	200	-	145	215	184	146	G 1"
400	95	99	600	322	-	1574	1799	1700	1600	400	698	-	340	400	724	200	-	186	260	222	187	G 1"
450	95	99	645	352	-	1875	2049	1831	1834	450	771	-	450	400	724	250	-	229	318	262	243	G 1"
500	121	125	705	403	-	1962	2180	1962	2015	500	801	-	450	400	731	250	-	316	400	370	320	G 1"
600	121	125	825	447	-	2250	2323	2291	2234	600	861	-	630	400	795	250	-	461	592	532	484	G 1"

B* = ring sleeve uncompressed

M = handwheel

MG = manual with gearbox

A = pneumatic

E = electric

H = hydraulic

T = flushing connection

Dimensions and weight are for guidance only - detailed drawings are available on request. All other dimensions are in millimeters, but flushing connections are in inches.

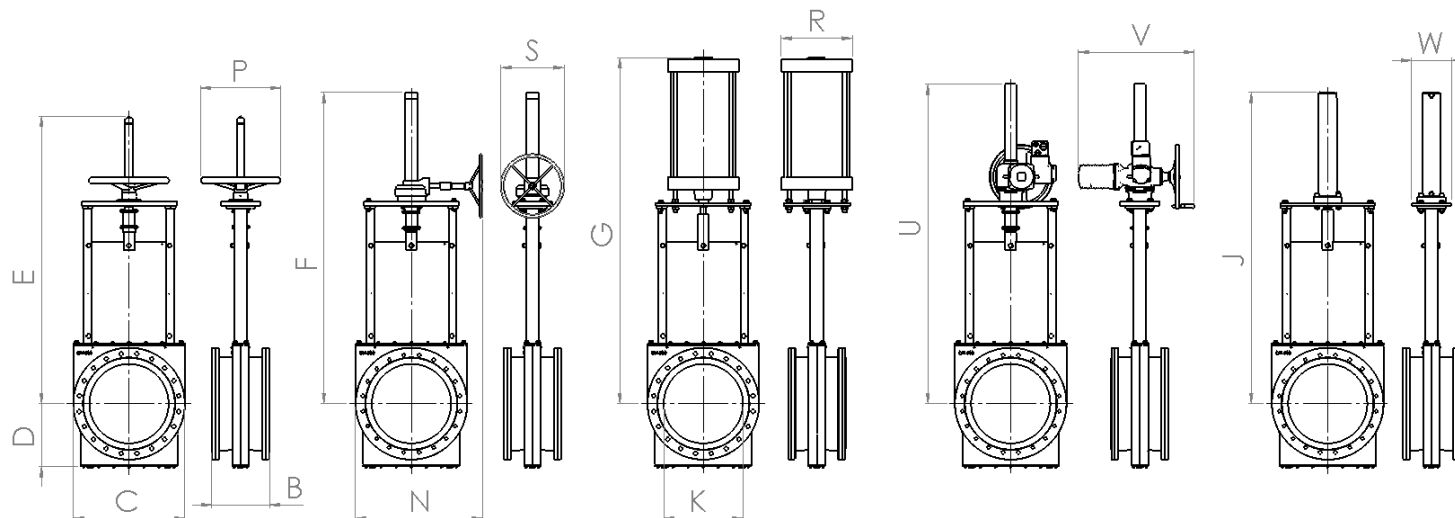


Figure 19. SKF valve dimensions.

Valve size (DN)	B	B*	C	D	E	F	G	J	U	K	N	P	R	S	V	W	Weight (kg)					T
						M	MG	A	H	E	MG	M	A	MG	E	H	M	MG	A	E	H	
80	175	179	200	112	628	-	683	-	739	80	-	350	110	-	513	-	32	-	31	57	-	G 1/2"
100	175	179	230	132	640	-	725	-	751	100	-	350	120	-	513	-	39	-	41	64	-	G 1/2"
150	178	182	285	157	913	-	972	-	879	150	-	350	176	-	513	-	41	-	66	80	-	G 1/2"
200	184	188	346	188	1006	-	1115	-	972	200	-	350	220	-	513	-	85	-	100	108	-	G 1/2"
250	226	230	410	223	-	-	1316	-	1150	250	-	-	270	-	537	-	-	-	143	142	-	G 1/2"
300	257	261	483	262	-	1380	1512	-	1363	300	535	-	340	400	537	-	-	187	253	203	-	G 1"
350	257	261	533	285	-	1455	1661	1521	1481	350	560	-	340	400	724	200	-	215	282	252	216	G 1"
400	279	283	600	322	-	1574	1799	1700	1600	400	698	-	340	400	724	200	-	284	349	320	285	G 1"
450	311	315	645	352	-	1875	2049	1831	1834	450	771	-	450	400	724	250	-	335	420	368	344	G 1"
500	359	363	705	402	-	1961	2180	1962	2015	500	801	-	450	400	731	250	-	447	527	501	451	G 1"
600	372	376	825	447	-	2250	-	2291	2234	600	861	-	-	400	795	250	-	629	-	700	652	G 1"

B* = ring sleeve uncompressed

M = handwheel

MG = manual with gearbox

A = pneumatic

E = electric

H = hydraulic

T = flushing connection

Dimensions and weight are for guidance only - detailed drawings are available on request. All other dimensions are in millimeters, but flushing connections are in inches.

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