

SKF 700-1200-2016-02-ENG Original document language: English

# Installation, operation and maintenance instructions for Flowrox Slurry Knife Gate valves SKF DN700 -1200 (Flanged)





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 Marssitie 1 P.O. Box 338 FI-53101 Lappeenranta Finland Tel. +358 201 113 311

#### hereby declares that the Flowrox Slurry Knife Gate valve, Knife Gate valve, Flanged (SKF) comply with the following applicable regulations:

Pressure Equipment Directive PED 2014 / 68 / EV: 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, 19 July 2013

Heikki Hyttinen President and CEO



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### 1.1 General safety instructions

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

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

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 (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 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 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 SKF values 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 trough the flushing ports.

The gland packing 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 gland seal package, but in tight or unsafe conditions it is unavoidable.



Figure 1. Valve main components.

No.	Description	No.	Description
1	Valve body	7	Gland packing seals
2	Gate	8	Gland retainer
3	Tower	9	Grease spacer
4	Ring sleeve		

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Image: WarningThe value 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.
--

This value 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.

WARNING	The gate speed may not exceed 25 mm/s.	
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### 2.2.2 Mechanical structure

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

Туре	Description
MG	Manual actuator with gearbox
Н	Hydraulic actuator
E	Electric actuator

Because of the big operating forces required, pneumatic cylinders shoud be avoided. On these big valve sizes also manual actuation (MG) should be avoided because of the very high number of handwheel revolutions needed. It is not a practical solution.



SKF 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. Exploled view of SKF valve



© 2014 Flowrox Oy. All rights reserved. Contents are subject to change without notice. SKW/ SKF-2014-10-ENG Table 3.SKF valve part list.

Part	Qty	Description	Part	Qty	Description
1	1	Valve body	12	1	Valve body washer
2	1	Gate	13	1	Clevis
3	1	Tower	14	1	Clevis locking screw
		Ring sleeve set (recommended spare			
4	2	part)	15	1	Clevis pin
5		Tower mounting bolt	16	2	Retaining ring
6		Tower mounting washer	17	4	Grease nipples
7		Gland packing seals	18	6	Protective plugs
8	1	Gland retainer	19		Gland retainer nut
9	1	Grease spacer	20		Gland retainer washer
10	1	Valve body bolt	21		Stud bolts
11	1	Valve body nut	22	1	Body sealing

### 2.3 Technical data

### 2.3.1 Product identification

Flowrox valve type plate is shown in Figure 4.



Figure 4. Valve type plate example.

#### Table 4. Valve model key table.

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

Туре	Size (DN)	Actuator	Pressure class (PN)	-	Flange drilling	Body material	Gate material	-	Ring sleeve material	-	Auxiliaries
SKF = Flowrox Slurry Knife Gate valve, Flanged	700-1200	MG = manual with gearbox H = hydraulic E = electric	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
- I	0		ACA ND A								

Examples: SKF700MG10-60S0-NR-G

X = feature that is explained on the order acknowledgement.

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

### 2.3.2 Actuators

Standard actuators:

- Hydraulic (H)
  - Electric (E)
  - Manual with gear (MG), not recommended

Manual actuator operation revolutions are shown in Table 5. Valves are closed by turning clockwise.

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.



Table 5. Manually actuated valve operating revolutions.

Valve nominal size	DN	DN	DN	DN	DN	DN
	700	750	800	900	1000	1200
Bevel gear revs. to stroke valve	756	800	844	933	1067	1650

## 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 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.



Lift the valves securely from the lifting lugs installed at the top of the tower. 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.

When you disassemble the valve use the threaded flange bolt holes to fasten a suitable lifting eye or hook to the lifted part.



Figure 5. Valve lifting example.



## 4 INSTALLATION

DANGER	Do not put your hands or fingers into the tower or port areas when the valve cycles.
	1
DANGER	Do not use higher pressure than rated for the valve. Higher pressures can cause serious damage to the valve or harm to operating personnel.
DANGER	Do not energize the actuator before the valve is properly attached to the pipeline.
	Never use the valve with all flushing ports plugged. If the medium is harmful in any way, the flushing

If the medium is harmful in any way, the flushin port must be piped to a safe location.

### 4.1 General

WARNING

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.



WARNING	Do not install valves in other that vertical position or maximum 15 ° angle sideways without support. This is to prevent possible distortion of the actuator and valve tower.
DANGER	Do not step on a valve installed in horizontal or angled 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 of the pipe. The valve must never be used to support the pipes.

The best installation position is with the actuator vertically upright. If this is not possible, the actuator can be mounted in a maximum  $\pm 15^{\circ}$  angle sideways. See the following Figure 6.



Figure 6. Installation alternatives for SKF valves.





Figure 7. Support for horizontally installed valves.

In vertical pipes, the valve can be installed horizontally with a support under the top plate of the tower. See Figure 7.

### 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 6.
- 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 8. Recommended tightening torque is shown in Table 6.
- 5. Other than mentioned flange drillings are also available.
- 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 6. Valve connection maximum tightening torque and bolt nominal diameter for steel flanges.

Valve size (DN)	Tapped hole depth in body (mm)	DIN PN10 Bolt nominal diameter	DIN Bolt torques [Nm]	ANSI150 Bolt nominal diameter	ANSI Bolt torques [lb/f]
700	55	M27	830	1 ¼″ -7 UNC	835
750	55	N/A	N/A	1 ¼″ -7 UNC	835
800	65	M30	1130	1 ¼″ -7 UNC	835
900	65	M30	1130	1 ½″ -6 UNC	1470
1000	65	M33	1600	1 ½″ -6 UNC	1470
1200	65	M36	1990	1 ½″-6	1470



Figure 8. 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 threaded plugs and/or protective 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.

If the valve is used with all flushing connections plugged the pressure inside the liquid filled body can be higher than the pressure rating when the valve is being closed. Larger diameter valves can have additional flushing connection to ensure proper flushing. Flushing connections are 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. 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.



18. Protective plugs (6 pcs)

Figure 9. Flushing example 1.





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.

In flushing example 2 (Figure 10), 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 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 SKF valve.



Figure 10. Flushing example 2.

In flushing example 2 (Figure 11), the water is supplied to upper corner of the valve and drained from the opposite lower corner of the valve.





Figure 11. Flushing example 3

- A. Flush water supply
- B. Drain line



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## 5 VALVE OPERATION

### 5.1 Commissioning and decommissioning

Before the value 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
- 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 Flowrox gate values 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 value 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 15 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

DANGER	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.
DANGER	Crush hazard. Keep your hands and feet clear of moving parts. Lock the gate before any maintenance work.
DANGER	De-energize actuators before maintenance.



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 7. Schedules will vary with applications.

Table 7. Maintenance schedule.

Maintenance task	Frequency & advice
Do a leakage inspection	Regularly. Refer to Troubleshooting.
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: SKF700MG10-60S0-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 8 available at your factory warehouse. Part numbers refer to *Mechanical structure*.

Table 8. Spare part list.

Part	Part number	Quantity/valve
Ring sleeve	4	2
Gland packing seals	7	6



### 6.1.3 Lubrication



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 9. 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.

- 1. Valve body
- 2. Gate
- 3. Tower
- 5. Tower mounting bolt
- 6. Tower mounting washer
- 7. Gland packing seals
- 12. Grease nipple

#### Table 9. Volume of grease required per unit.

Valve nominal size	DN 700	DN 750	DN 800	DN 900	DN 1000	DN 1200
Lubricant when adding online (cm <sup>3</sup> )	100	110	120	130	260	320
Lubricant when overhauling (cm <sup>3</sup> )	195	225	235	260	525	650



### 6.2 Changing the gland packing

Follow these instructions if you are to change the gland packing seals 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.



- 1. Open the valve.
- 2. Make sure there is no pressure inside the valve.
- 3. Wash the valve thoroughly from the outside.
- 4. Disconnect the power supply to the actuator (hydraulic / electric).
- 5. Lubricate the visible part of the stud bolts (21)
- 6. Unscrew the gland retainer nuts (19).
- 7. Remove the washers (20).
- 8. Wiggle the gland retainer loose by lifting it alternately at the ends, a small crow-bar or similar tool might be needed.
- 9. Lift the gland retainer high up along the gate, and secure it so it stays up
- 10. Remove the old gland packing with a hook or other suitable tool. Be careful when lifting up the grease spacer (9).
- 11. Clean the packing space thoroughly.
- 12. Insert the first two layers of gland packing.
- 13. Make sure the packing joints are always on opposite side than the previous one.
- 14. Lower down the grease spacer.
- 15. Add the top layers of the gland packing.
- 16. Lower down the gland retainer.
- 17. Lubricate the stud bolts (21).



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

- 18. Assemble the washers (20) and the nuts (19).
- 19. Screw down the nuts so they are hand tight, then tighten them evenly about  $\frac{1}{2}$  turn.
- 20. Insert the correct type of silicon based grease through the grease nipples. The quantity is given in table 9.
- 21. Tighten the nuts (19) evenly on both sides of the gland retainer, starting from the centre, proceeding towards the ends, making sure the gland retainer stays horizontal.
- 22. Connect the power to the actuator (hydraulic, electric)
- 23. Stroke the value  $2^*$ -3 times to see if moves smoothly.
- 24. Apply recommended silicon lubricant on the chamfered edge of the gate (2).
- 25. Lower the actuator, tower and gate package on the body and fasten with bolts (5).
- 26. Lubricate valve grease nipples (17) as instructed in Lubrication.
- 27. Reconnect automatic actuator to power supply.
- 28. Run a few test strokes before the pipeline is pressurized.



### 6.3 Changing the ring sleeves

If gland packing replacement is needed, follow instructions in chapter 6.2.

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*.



- 1. Open the valve.
- 2. Make sure there is no pressure inside the valve.
- 3. Wash the valve thoroughly from the outside.
- 4. Disconnect the power supply to the actuator (hydraulic / electric).
- 5. On hydraulic actuators, fit a manual oil pump if available.
- 6. Fit proper lifting equipment.
- 7. Unscrew all the flange bolts connecting the valve to the piping flanges.
- 8. Lift up the valve carefully.
- 9. Lower the valve down so that the weight is on the ground (on a proper surface), so that the valve stays vertical. Always follow the local safety instructions).
- 10. Take out the old ring sleeves.
- 11. Wash the inside of the body thoroughly, make sure all sediment and dirt is removed.
- 12. Lubricate the body inside and the new ring sleeve on the outside with correct silicon grease. Also lubricate the sealing tips of the ring sleeve.



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.

- 13. Insert the new ring sleeves so that the markings point sideways (not straight up or down).
- 14. Lift the valve back into the pipeline.
- 15. First attach all flange bolts before tightening any of them.
- 16. Tighten the flange bolts evenly.
- 17. Disconnect the hydraulic hand pump (if used).
- 18. Connect the power source.
- 19. Stroke the valve 2-3 times.

### 6.4 Valve dismantling

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

When you lift parts of valve use the threaded flange bolt holes to fasten a suitable lifting eye or hook.

- 6.4.1 Removing the actuator, gate, and tower
  - 1. Remove the valve from the pipeline as instructed in the earlier chapter 6.3.
  - Remove the tower mounting bolts (5) bolts and lift the actuator, gate (2) and tower (3) off.
  - 3. To detach the gate (2) from the actuator stem, remove retaining ring (17) and the clevis pin (15) from the clevis (13).



Figure 13. Removing the clevis pin.

- 4. 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 gland packing seals (7) and ring sleeves (4).
- 5. Use a marker to mark the height of the clevis (13) on the cylinder shaft. The position is needed in valve assembly.
- 6. Remove the clevis locking screw (14) and the clevis (13) by rotating it.
- 7. Remove the bolts from between the actuator and tower (or adapter plate if equipped). Lift the actuator off the tower.
- 8. 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 gland retainer (8), gland packing seals (7) and grease box (9).
- 4. Remove the body bolts (10), body nuts (11) and body washers (12) connecting the two valve body halves together.



Figure 14. Dismantled valve bodies

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



### 6.5 Valve assembly

Follow the general tightening torques in Table 10, 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	10 Comonal	<b>+</b> : +	+	la altalana	0 0	1	M-C)
rable	10.General	tigntening	torques	(DOIT CLASS	8.8,	IUDFICATION	$IVIOS_2$ ).

Size	M6	M8	M10	M12	M16	M20	M24	M30	M33	M36
Tightening torques Nm (ft-lbs)	7 (5)	17 (13)	33 (24)	57 (42)	140 (103)	282 (208)	499 (368)	1000 (737)	1300 (958)	1750 (1266)

6.5.1 Valve body, gland packing, and gate assembly

- 1. Attach the body bolts (10), body nuts (11) and washers (12) to connect the two valve body halves.
- 2. Install 2 pcs of gland packing seals (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 gland packing seals.
- 3. Install the grease box and 4 pcs of gland packing seals.
- 4. Install grease nipples (17) and protective plugs (18).



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

- 5. 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.
- 6. 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.
- 7. 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 (13) to the actuator stem if it was dismounted.
- 5. Stroke the actuator stem down or lift the gate to fit the clevis pin (15) through the aligning holes of the gate (2) and clevis (13). Secure the clevis pin with the retaining rings (16).
- 6. Continue to test the stroke in the next chapter.



Figure 16. Tightening the tower mounting bolts.



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 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. Measure how much the gate (2) must be adjusted.
- 4. Disconnect automatic actuator from power supply to prevent injuries.
- 5. Remove retaining ring (16) from the clevis pin (15) and remove the clevis pin.
- 6. Push the gate (2) down to get space for the clevis (13) to turn.
- 7. Loosen the clevis locking screw (14).
- 8. Rotate the clevis (13) on the stem to adjust it up or down according the dimension measured above.
- 9. Re-install the clevis. Repeat adjustment if pin does not fit in place. Continue to the next chapter if valve is adjusted correctly.
- 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 (17) 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 11. Troubleshooting.

Problem	Possible reason	Action
	Flange connection is loose	Tighten the flange connection bolts to correct torque
Leakage from flange	Flange connection bolts are too long	Measure the bolts and change as needed
connection	Pipeline flanges and valve are misaligned	Check that the flanges are parallel and concentric to valve
	Gland retainer connection is loose	Tighten the gland retainer nuts to correct torque
Leakage from the	Tower mounting bolts loose	Tighten tower mounting bolts
giana paolang ooalo	Gland packing seals worn out	Replace gland packing seals
Valve does not	Fault in actuator, limit switch or control system	Check and fix actuator operation
open/close or valve	Clogged up with solids	Clean gate and body cavity. Check or install flushing.
lo not tigitt	Damaged gate, ring sleeve or secondary seal	Classifier Action   a Tighten the flange connection bolts to correct torque   re too long Measure the bolts and change as needed   a are misaligned Check that the flanges are parallel and concentric to valve   n is loose Tighten the gland retainer nuts to correct torque   se Tighten the gland retainer nuts to correct torque   se Tighten tower mounting bolts   n out Replace gland packing seals   vitch or control Check and fix actuator operation   Clean gate and body cavity. Check or install flushing.   e or secondary seal Check and change damaged parts   Lubricate valve and increase scheduled lubrication.   Lubricate the actuator.   Lubricate valve and increase scheduled lubrication.   Lubricate the actuator.   g bolts too tight Check and change damaged parts   e or secondary seal Check and change damaged parts   check flushing flow and pressure or install flushing   Increase scheduled lubrication   Lubricate flow and pressure or install flushing   Increase scheduled lubrication   Check flushing flow and pressure or install flushing   Increase scheduled lubrication   Check gate for s
Valve does not open/close smoothly	Insufficient lubrication	Lubricate valve and increase scheduled lubrication. Lubricate the actuator.
On a miner /alassina	Insufficient lubrication	Lubricate valve and increase scheduled lubrication. Lubricate the actuator.
force too high*	Flange or tower mounting bolts too tight	Check and loosen bolts
	Damaged gate, ring sleeve or secondary seal	Check and change damaged parts
	Insufficient flushing	Check flushing flow and pressure or install flushing
Valve does not open/close or valve is not tight Valve does not open/close smoothly Opening/closing force too high*	Insufficient lubrication	Increase scheduled lubrication
is short	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.



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## Appendix A: Main measurements of SKF valves



#### Figure 17. SKF valve dimensions.

Valve	А	В	С	D	E	F	G	Н	I	Weigl	ht (kg)		Т	B* = I
(DN)	MG	MG	MG	E	E	E	Н	Н	Н	MG	E	Н		MG =
700	3452	1320	600	3598,5	1320	794,5	3510,5	1320	378	1820	2262	2260	G1 1/2″	E = e
750	3642	1370	600	3726	1370	919	3661	1370	390	2462	2475	2500	G1 1/2″	H = h
800	3757	1420	600	3791	1420	919	3826	1420	412	2256	2835	2755	G1 1/2″	T = fl
900	4131	1520	800	4155	1520	919	4145,5	1520	469	3712	3746	3780	G1 1/2″	
1000	4741	1620	800	4761	1620	1177	4805,5	1620	512	5086	5132	5420	G1 1/2″	Dime
1200	5626	1870	800	5651	1870	1177	5695,5	1870	512	6155	6200	6320	G1 1/2″	are a millin

- ring sleeve uncompressed
- manual with gearbox
- lectric
- vdraulic
- lushing connection

nsions and weight are for guidance only - detailed drawings vailable on request. All other dimensions are in neters, but flushing connections are in inches.





Proven Performance

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