FLOWSERVE

USER INSTRUCTIONS

Installation
Operation
Maintenance

Valtek FlowTop

General Service Control Valve
Type V750 and V752

02/2025

This document is the 'Original Instructions'



Experience In Motion

General Service Control Valve - Valtek FlowTop

The Valtek FlowTop (hereinafter referred to as FlowTop) product line is low cost, compact and light-weight. Yet, it is rugged and can be used safely and confidently in a wide range of general service applications plant-wide. Its modular design provides trim and material options to suit most service situations. Simplicity of design reduces maintenance and parts inventory costs. It is ideally suited for flow and pressure control of liquid and gas media in oil and gas, power, chemical and petrochemical processing and related industries. The Valtek FlowTop control valve package provides flow rates, control accuracy and reliability at levels comparable to special engineered service control valves, but at a significantly lower cost. The Valtek FlowTop is manufactured to ISO 9001 standards.

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on Flowserve Valtek FlowTop control valves. This instruction manual does not include specific product design data. Such data can be found on the valve's serial plate or specification documents; additionally, dimensional information can be found in the Valtek FlowTop technical bulletin. Procure needed documents as necessary before you begin any work on the valve.

User Instructions cannot deal with all possible situations and installation options. It is required that only trained and qualified technicians are authorized to adjust, repair or work on control valves, actuators, positioners and other accessories. Review this bulletin prior to installing, operating or performing any maintenance on the valve. Additional Installation, Operation, and Maintenance Instructions (IOMs) cover other features (actuators, handwheels, packing and positioners).

To avoid possible injury to personnel or damage to valve parts, WARNING and NOTICE indicators must be strictly followed. Modifying this product, substituting non-factory parts or using maintenance procedures other than outlined could drastically affect performance and be hazardous to personnel and equipment and may void existing warranties. This manual should be used in conjunction with applicable local and national laws. Failure to comply with User Instructions will render the manufacturer's guarantee and liability null and void. Unless otherwise agreed, the manufacturer's general terms and conditions of sale shall apply.

Read the user instructions carefully before use.
Keep for future reference.

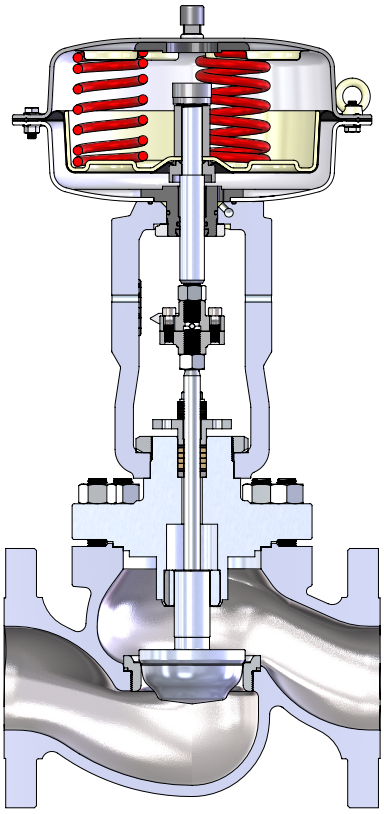


Figure 1: FlowTop V750 with screwed seat

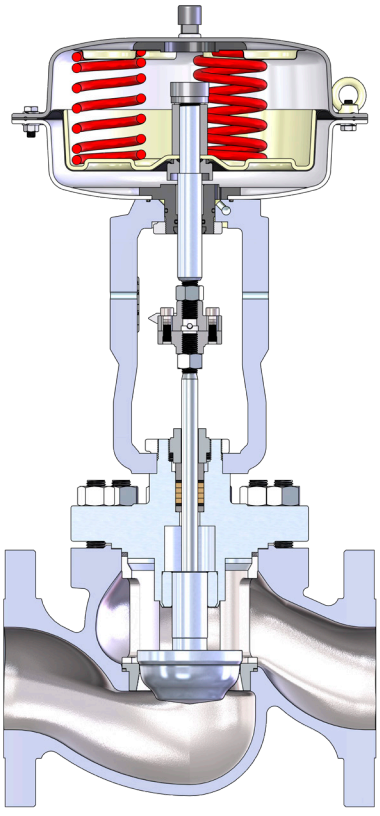


Figure 2: FlowTop V752 with clamped seat

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1 Scope of Manual

The following user information covers the FlowTop general service control valve:

- Screwed seat - Type V750, clamped seat - Type V752
- English ASME Units - Class 150 & 300, NPS ½ - 12
- Assembled with a pneumatic actuator
- Comes with or without ancillary equipment

2 Intended Use

WARNING **Control valves are pressure vessels designed and rated for specific application conditions. Before installation, check the serial number and / or the tag number to ensure that the valve and actuator being installed are correct for the intended application. Do not use the valve outside of its rated design limits. Exceeding the design limits may cause hazardous conditions including leakage of the process media or rupture of the pressure boundary resulting in possible process loss, equipment or environmental damage, or serious personal injury or death.**

The specific product design data can be found on the valve's serial plate, data sheet and the calculation sheet (in acc. to the IEC 60534-7:2010).

The noise level emitted by control valves is always determined by the operating data and the installation situation and is different for each application. There is no general typical value for this. In any case, technical measures are used to try to keep this below 80 dB(A). The individually expected pre-calculation noise level can be found in the calculation data sheets.

The Valtek FlowTop handles a wide variety of general service applications, while offering high flow capacity. All sizes come standard with unbalanced trim; for high pressure drop applications optional pressure balanced trim is available for NPS size 3 to 12.

The Valtek FlowTop consists of the body, bonnet, trim, and actuator. The valve is designed with a high level of interchangeability allowing the user to assemble the greatest possible number of variations from a minimum number of components to match each application. There are five bonnet designs: standard bonnet or extended bonnet (either as unbalanced or pressure balanced), and bellows seal bonnets.

The Valtek FlowTop is designed in compliance with **EN 1349:2009 -** Industrial Process Control Valves (DIN EN 1349 and VDE 0409-1349) and **ASME B16.34:2009 -** Valves - Flanged, Threaded, and Welding End.

The Valtek FlowTop is designed for use in **MODERATE** and **WORLDWIDE** environmental conditions. However, the intended use of the pneumatic actuators and the accessories is limited by their permissible ambient temperature applicationlimits. When operated in the moderate range, a service life of 7 to 10 years can be expected before servicing. Leaks can occur at low temperatures (-60°C to -25°C), at high temperatures permanent damage to the elastomers (+60°C to +80°C, expected service life then < 1 year). Humidity up to 93% non-condensing, air pollution up to 300 µg/m^3 unless restricted by accessories.

The product offering may include optional ancillary equipment, such as positioners, air-filter regulators, solenoid valves, limit switches or boosters. Digital, I/P, or pneumatic positioners can be mounted directly, with a mounting bracket or according to NAMUR standards. Refer to the relevant manufacturer's user instructions for information regarding other ancillary equipment.

3 Product Identification

Each Valtek FlowTop (V750 and V752) control valve comes with an attached serial plate which includes key information specifically for each control valve:

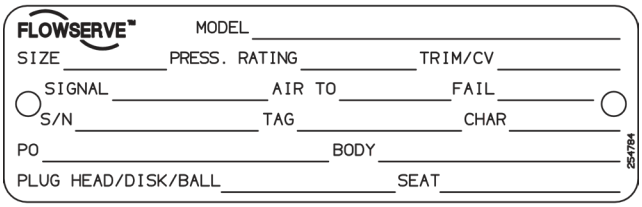


*Figure 3: Serial Plate (WW-design, **W**orld**W**ide)*

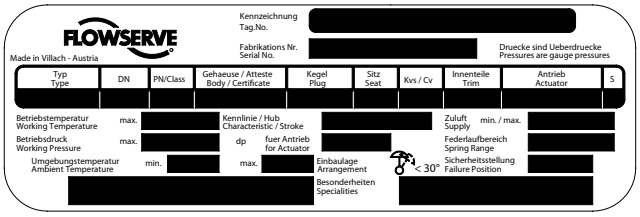


*Figure 4: Serial Plate (EU-design, **E**uropean **U**nion)*

The same serial number shown on the plate will appear on all Valtek FlowTop data sheets, dimensional drawings, bills of material, and spare parts lists. Other information located on the serial plate is self-explanatory for the Valtek FlowTop control valve.

You can download .pdf versions of the Valtek FlowTop documentation including a technical bulletin and user instructions at *www.flowserve.com*. It is the user's responsibility to keep this and related documentation on file and accessible for the Valtek FlowTop product.

4 Valtek FlowTop Modification

Valtek FlowTop control valves are generally delivered as tested and assembled units, with factory-mounted actuators.

Unauthorized modification of the Valtek FlowTop control valve voids the product test certification and product warranties, could drastically affect product performance, and could be hazardous to personnel and equipment.

NOTICE *Before Valtek FlowTop re-use, all necessary tests must be repeated and recorded in compliance with all test routines, guidelines and engineering standards.*

5 Safety

Safety terms - WARNING and *NOTICE* - are used to highlight specific dangers and / or provide additional information that may not be readily apparent in the User Instructions. WARNING directions must be strictly followed.

⚠ WARNING or **⚠ WARNING indicates that severe personal injury, death and substantial property damage can occur if proper precautions are not taken.**

NOTICE *NOTICE indicates practices or provides additional technical information.*

Green fields indicate safety-related informations.

6 Packaging and Transport

Pay close attention to shipping marks and transport pictograms.

Careful packing, loading and transport arrangements are required to prevent products from being damaged during transport. Standard packaging includes a cardboard box, with or without a wooden pallet base as needed. Special packaging may include a wooden box. Packaging may use cardboard, plastic wrap, foam, or paper as packing material. Filling material may be a carton type or paper.

Shipping marks display product and package dimensions and weight (for further information see Packaging and Sending Instructions, Form L 002). Packing guidelines for export follow HPE standards. (Nonreturnable packaging may contain up to 90% recyclable materials.)

7 Storage

Maximum storage time for control valves is 6 months.

NOTICE *The packing box begins to break down after 6 months. Leakage may develop.*

Upon arrival on site, store the Valtek FlowTop on a solid base in a cool, dry closed room. Until its installation, the valve must be protected from the weather, dirt and other potentially harmful influences.

Do not remove the protective covers from the body flanges of the control valve or from the instrument ports of the actuator and accessories until the valve is ready for installation at the site.

8 Unpacking - Lifting

Hoisting and lifting are inherently dangerous activities and require safe rigging and proper training to mitigate hazards. Use standard industry safety practices, personal protection, and warranted lifting devises.

⚠ WARNING **Crushing hazard ! Arrange rigging to prevent tipping of the control valve. Do not allow the valve assembly to rotate during removal. Do not stand under suspended loads. Failure to do so can cause serious personal injury and damage the valve or nearby equipment.**

NOTICE *Be aware that the center of gravity may be above the lifting point. Do not allow the sling to touch the stem, travel indicator or peripheral equipment. Observe the maximum permitted working load limit.*

Flowserve is not a transport and lifting company. It is the responsibility of the persons commissioned on site to carry out these tasks in accordance with good and relevant rigging and lifting practices and in compliance with the currently applicable rules. The proposals presented are tried and tested methods from the manufacture of control valves. We are in no way responsible for the local practices that result from the

suggestions made here. The situation, the possibilities and the requirements on the plant site are simply too individual and must be included in the planning and realization of this task. The aim is to ensure safe and trouble-free operation because of rigging and lifting.

WARNING **Due to the design, sharp edges cannot be completely avoided - always wear cut-resistant gloves and safety shoes.**

The stem of the valve and actuator are burnished, sealing surfaces are carefully machined, any damage inevitably leads to premature wear and leakage during subsequent operation. Control valves are supplied with accessories, piped, adjusted, and tested in the factory. Damage to the supply piping, to the lever mechanism of the positioner or to the limit switch or in general to the built-on accessories leads to malfunctions, which must be repaired before commissioning and for which the manufacturer is not liable.

1. Check the packing list against materials received to ensure all components and accessories are present.

   NOTICE *Typically, tubing connection materials and spare parts are not included with the valve unless ordered separately.*

2. Control valves are usually packaged lying down and arrive at their place of installation. There they must be properly erected to be transported to their final location.
3. Small valves under 23 kg are usually moved by hand, see Figure 5 for suggestions for handling heavier valves.

   WARNING **Ring nuts and Ring bolts according to DIN 580 and DIN 582 may only be loaded in the longitudinal direction of the ring plane, considering their load capacity. Inclined loads or transverse loads are not permitted!**

4. Upon removing the control valve from the packaging, we recommend that you:
   - Promptly touch up any damage to the corrosion protection.
   - Contact your shipper immediately to report any damage.
   - Call your Flowserve representative if you experience any problems.
   - Do not remove the protective covers from the body flanges of the control valve or from the instrument ports of the actuator and accessories until the valve is ready for installation at the site.

Suggested rigging method / maximum load capacity:

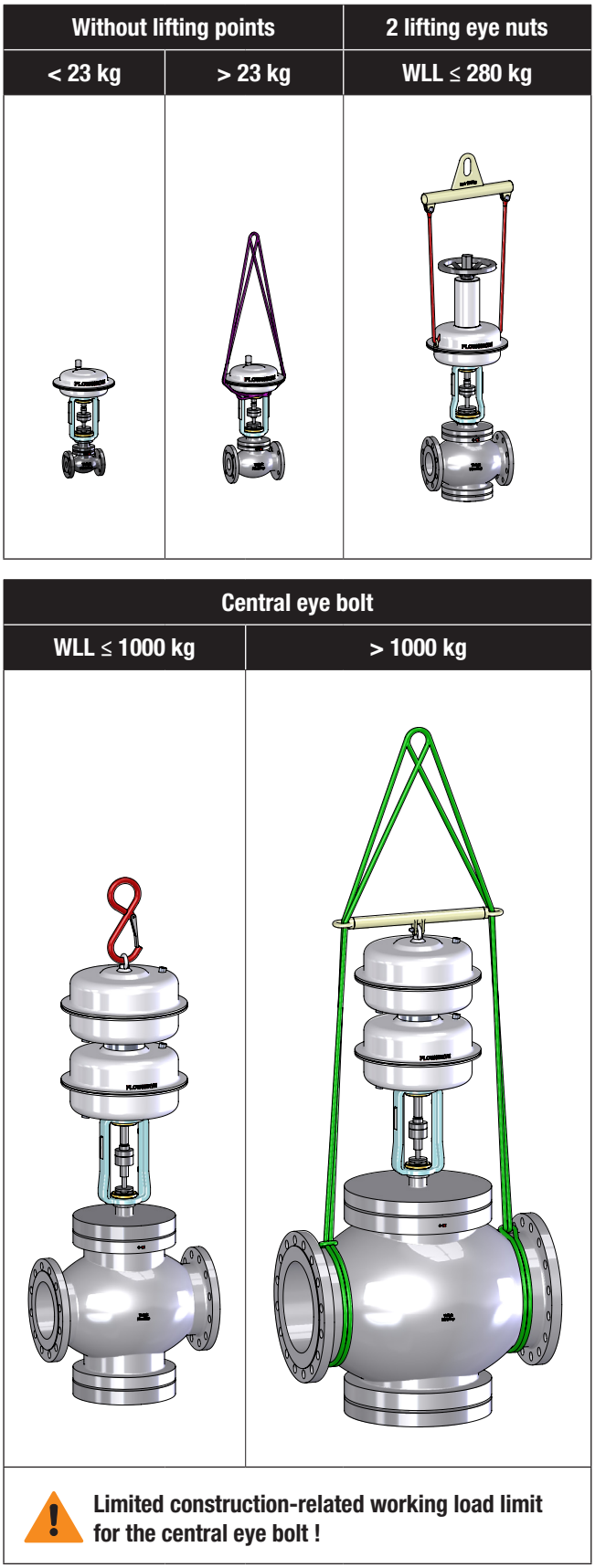


Figure 5: Valtek FlowTop rigging method

9 Installation

The control valve must be installed and commissioned by qualified staff - personnel who are familiar with the installation, commissioning and operation of this product and possess the relevant qualifications in their field of activity.

NOTICE *The successful sizing and selection of control valves depends on the knowledge of the actual process conditions in the system in which the valve will be installed. This clear information about the operating conditions is not always available. However, the more assumptions made about the flow conditions, the less accurate the sizing of the control valve. Basically, control valves are designed according to the operating data specified by the customer. The following standards can be used to calculate control valves: Kv value calculation - EN 60543-2-1, ANSI / ISA 75.01.01 and noise calculation - EN 60534-8-3, EN 60534-8-4, VDMA 24 422/1979/1989 (withdrawn). If these calculations attest a critical valve operating condition, the selection of suitable trims divides these into several uncritical throttle points. Since all these calculations consider only the punctual installation location of the valve, these are only valid under the condition of an "undisturbed pipe flow profile". This pipe flow can only be achieved by professional piping - according to the recognized rules of technology - with sufficient distance to sources of interference such as pumps, bends, T-pieces, pipe extensions, pipe reducers or other valves. Yes, even improperly executed welds near the control valve can affect design accuracy and adversely affect the predicted valve behavior.* ***The minimum SPR (straight piping run) should be 0.5 meters or 6 x DN upstream and downstream of the valve.*** *In case of problematic operating conditions (cavitation, evaporation, two-phase flow, noise, excessive medium speeds, etc.) double the downstream section. As a preventive measure, vibration situations and pressure pulsations in the pipeline can be identified by pulsation studies (VDI 3842) by the plant planner or operator and avoided by suitable planning measures. Experience has shown that control valves are operated continuously with a workload of 10 - 90%. In particular, continuous operation < 10 % can damage the control valve. Subsequent changes using a modified interior trim are only possible to a limited extent and do not always lead to success. In the worst case, such a problem can be resolved only by a subsequent expensive pipe change. Flowserve Control Valves GmbH is a manufacturer of valves, not a piping contractor. Our expertise is in the design and manufacture of control valves. This does not include piping design and layouts. It is in the responsibility of the plant planner / operator to install the valve to good piping practices. We kindly provide this information based on our wealth of experience and expressly emphasize that we cannot in any way accept responsibility for the actual performance of a pipeline installation resulting from the recommendations given here. As a rule, it should be assumed that the shorter the straight pipe run before a valve, the higher the probability of turbulent flow into the valve.*

Prior to installation of the valve, we require, that you check the following conditions to reduce the risk of malfunction and safety related incidents.

No.	Check	Possible malfunction or safety related incident
1	Confirm that the nominal / operational data on the serial plate matches the operational data of the facility.	*An operational mismatch can cause considerable damage to the valve or may lead to a failure at the facility.*
2	Confirm that the pipeline is clear of dirt, welding slag, chips, scale or other foreign material.	*The risk of control valve damage due to foreign particles will be reduced if a suitable strainer is installed upstream of the valve. (Suggested mesh size of 0.004 inch (0,1 mm)*
3	Confirm the piping flanges are coaxial, parallel, and correspond with the face-to-face dimension of the valve.	*Incompatible sizing may result in excessive tension, valve malfunction or flange connection leakage.*
4	Confirm the piping is routed correctly and the valve is free of additional piping forces.	*Incorrect routing may result in leakage and / or potential valve failure.*
5	Confirm that the control valve can be installed in an upright position whenever possible.	*Non-upright positioning may increase wear in the packing, resulting in leakage and premature wear.*

<table>
<tr><th>No.</th><th>Check</th><th>Possible malfunction or safety related incident</th></tr>
<tr><td>6</td><td>Confirm the actuator has enough overhead clearance to disassemble the plug from the valve body.

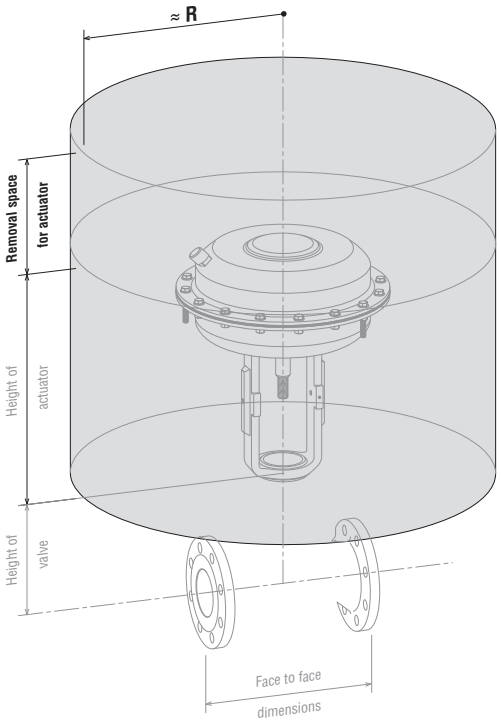
<table>
<tr><th rowspan="2">Actuator Code</th><th colspan="2">Removal Space</th><th colspan="2">≈ R</th></tr>
<tr><th>mm</th><th>inch</th><th>mm</th><th>inch</th></tr>
<tr><td>253</td><td rowspan="5">180</td><td rowspan="5">7.1</td><td>260</td><td>10.2</td></tr>
<tr><td>503</td><td>290</td><td>11.4</td></tr>
<tr><td>701</td><td>330</td><td>13.0</td></tr>
<tr><td>1500</td><td rowspan="2">415</td><td rowspan="2">16.3</td></tr>
<tr><td>3000</td></tr>
</table>
Table 2: Overhead clearance dimensions</td><td>

Figure 6: Overhead clearance drawing</td></tr>
<tr><td>7</td><td>Confirm there are suitable straight piping run upstream and downstream of the valve installation site in order to minimize a sudden pressure surge in the flow.</td><td>Absence of suitable piping lengths can create critical operating conditions and cause unacceptable levels of noise and vibration.</td></tr>
<tr><td>8</td><td>Confirm removal of all hazards and ensure appropriate protective measures are in place.</td><td>none</td></tr>
<tr><td>9</td><td>Confirm flow direction to ensure the correct valve installation. Flow direction is indicated by the arrow on the valve body.</td><td>Improper flow direction causes critical changes to operating conditions that may damage the control valve.</td></tr>
<tr><td>10</td><td>Confirm that the air supply and instrument signal lines are dry and clear of dirt and oil.</td><td>At a minimum, the instrument air must conform to ISA- 7.0.01-1996 (ISO 8573-1 Compressed Air - Class 2) requirement or those of the accessory manufacturer.</td></tr>
<tr><td>11</td><td>Confirm the valve is grounded in order to prevent an electrical discharge.</td><td>Noncompliance may result in electrical discharges.</td></tr>
<tr><td>12</td><td>Confirm that the bonnet bolting of valves used in NACE MR 0175 / MR 0103 or ISO 15 156 applications are ventilated.</td><td>Do not cover or insulate over bonnet flange bolting !</td></tr>
<tr><td>13</td><td>Throttling control valves are typically equipped with a pneumatic actuator and valve positioner. Refer to the appropriate positioner manual for connections and maximum air supplies.</td><td>The air supply must be limited to less than 87 psig (6 bar) per the actuator serial plate. An air filter regulator should be installed to ensure that the supply pressure to the pneumatic actuator does not exceed the air supply pressure indicated on the WW or EU serial plate.</td></tr>
</table>

Table 1: Basic safety massages for installing the valve

After these requirements are confirmed the valve can be installed and connected in the piping.

1. Remove the protective flange covers and coating from the control valve; clean the flange gasket surface.

NOTICE *Unsuitable cleaning agents can damage and cause leakage in PTFE and graphite gaskets. Consult a current chemical resistance list before applying.*

2. Install the control valve in an upright position whenever possible. Vertical installation permits easier valve maintenance.

3. Install and connect the control valve to the pipeline.
4. Locate gaskets in the center of the body flanges and secure nuts and bolts.

5. Connect the power supply and instrument signal lines.

10 Valve Quick-Check

Apply appropriate personal protective equipment when working on the control valve to prevent hazards arising from the operation. Protect yourself against freezing, burns and cuts by wearing appropriate protective clothing, gloves and eye protection.

Do not over-tighten packing.

Sudden exposure of the control valve to full working pressure and temperature may cause stress cracks.

Prior to valve operation, we require, that you check the following conditions to reduce the risk of malfunction and safety related incidents.

No.	Important information	Possible malfunction or safety related incident
1	Avoid critical operating conditions where excessive noise or vibration levels might occur.	*Impermissible continuous operation of a control valves under critical conditions can damage the valve.*
2	Avoid frequent system start-ups and shutdowns.	*Critical operating conditions, which can damage the control valve, may be encountered during system start-up or shut down.*
3	Keep the operating medium free of foreign particles.	*Installing a suitable strainer upstream of the control valve can prevent foreign particles from damaging the valve.*
4	Instrument air must conform to ISA 7.0.01-1996 (with a dew point at least 18°F (10°C) below ambient temperature, particle size below 1 µm and oil content not to exceed 1 ppm)	*Contaminated instrument air can damage the accessories and control valve or cause them to fail.*
5	**Do not touch the body and bonnet ! The temperature of the operating medium is transferred to the surface of the linear actuator.**	**Excessive hot surface temperatures can put you at risk for burns.** **Frigid surface temperatures can put you at risk for freezing.**
6	**Critical operating conditions can cause excessive or hazardous levels of vibration or noise.**	**Impermissible levels of vibration can cause hearing loss, vascular and nerve damage and damage to joints and bones. Use hearing protection when noise levels exceed 80 dB(A).**
7	**Incorrect maintenance can result in the emission of hot, cryogenic, and / or toxic operating media.**	**Incorrect maintenance can put you at risk for heat related burns, freezing, acid burns or poisoning.**

Table 3: Basic safety massages for operating the valve

⚠ WARNING Due to risk of crushing hazard, do not work between the yoke legs while the valve is in operation.

Prior to start-up, we strongly recommend that you:

1. Stroke the valve and compare the plug position indicator on the stem clamp to the stroke indicator plate. The plug should change position in a smooth, linear fashion.

   NOTICE *If over tightened, excessive friction may impair smooth control.*

2. Adjust instrument signals to ensure a full stroke.

3. Check the packing box bolting to ensure the correct adjustment (See Section 11: Valve Maintenance).

NOTICE *Over tightening can cause excessive packing wear and high stem friction that may impede plug movement.*

4. Continuously increase load until operation parameters are reached.

5. Minor relaxation of the flange bolting is possible after initial assembly. Retorque the bonnet flange bolting if necessary before installation or following an initial temperature excursion to ensure the bonnet gaskets do not leak (See Page 32, Table BONNET NUTs for Type V750 Threaded Seat or for Type V752 Clamped Seat).

11 Valve Maintenance

Maintenance intervals and service life of a valve can only be determined empirically on site. The intervals specified in the User Instructions are recommendations and serve only as a guide. Under problematic operating conditions, maintenance intervals may be significantly reduced. We strongly recommend a site survey followed by establishing a documented procedure for performing the maintenance work. Maintenance personnel should perform and log the work accordingly. The data collected can be used as a basis for dynamically determining the maintenance intervals and activities.

Recommended Maintenance Actions					
No.	Service	Interval	Valve Condition		
			Good	Adequate	Inadequate
1	Visual inspection of the valve	Bi-weekly	No action	Clean valve stem with a soft cloth	Overhaul or replace valve after product lifecycle
2	Visual inspection of the packing	Bi-weekly	No action	Retighten leaky packing box	Replace leaky packing box immediately
	Preventive change of the PTFE-packing	→	Dependent upon results of previous maintenance (see numbers 1 and 2 above) or a minimum of once every 24 months		
	Preventive change of the Graphite-packing	→	Dependent upon results of previous maintenance (see numbers 1 and 2 above) or a minimum of once every 18 months		
3	Visual inspection of body bolting	Yearly	No action	Retighten body bolting if bonnet gasket leaks.	Remove from service and replace body bolting immediately if gasket leakage persists or if bolting is damaged
4	Visual inspection of the actuator	Bi-weekly	No action	Clean actuator stem with a soft cloth	Overhaul or replace actuator after product lifecycle
5	Preventive overhaul of the valve	→	Dependent upon results of previous maintenance (see numbers 1 to 4 above) or a minimum once every 60 months		
6	Operation test	→	No action	Perform 3 full strokes if packing and / or bonnet tightening is modified; check for leakage	

Table 4: Service activities check list

Recommended maintenance actions using the Logix digital positioner with ValveSight diagnostic solution software					
No.	Service	Inter-val	Valve Condition		
			Good	Adequate	Inadequate
7	Visual inspection of diagnostic interface	Weekly	No action - valve is healthy	Take action per warning	Overhaul or replace required part per alarm
8	Check health parameter of valve	Warn-ing	No action - valve is healthy	Replace packing box compo-nents per warning	Overhaul or replace valve after alarm
9	Check health parameter of actuator	Warn-ing	No action - actuator is healthy	Check and retighten air supply	Overhaul or replace actuator after alarm
10	Check health parameter of control	Warn-ing	No action - control is healthy	Overhaul or replace valve; trim and bonnet components must be checked and / or repaired after alarm	
11	Check health parameter of positioner	Warn-ing	No action - posi-tioner is healthy	Start step test	Overhaul or replace positioner after alarm

Table 5: Service activities check list

Prior to valve operation, we require, that you check the following conditions to reduce the risk of malfunction and safety related incidents.

No.	Check	Possible malfunction or safety related incident
1	Check the packing follower for proper tightness.	*The standard version is described here. Further details are described on pages 28 - 29. The packing follower is factory adjusted. If leakage is detected around the packing follower tighten it clockwise using a wrench in quarter turn intervals until the leakage stops.*
2	Check for signs of gasket leakage through the bonnet and end flanges.	*Tighten the bonnet bolting nuts. See Section 13: Disassembly and Reassembly for instructions. Also see Torque Requirements on Page 32.*
3	Check if all nuts and bolts are securely fastened.	**Avoid critical operating conditions if excess noise or vibration levels occur during operation.**
4	Check valve for smooth, full-stroke operation. Unsteady stem movement could indicate an internal valve problem.	*Internal valve failure requires an immediate overhaul or control valve replacement by qualified stuff.*

Wrench Size		Adjustment Interval	Maximum Adjustment
SW 24	~ 15/16 AF	quarter turn	one, three-quarter turn
SW 32	~ 1 1/4 AF		
SW 46	~ 1 13/16 AF		one complete turn

Table 7: Packing Adjustment

Do not overtighten packing.

Overtightened packing can cause excessive packing wear and high stem friction that may impede plug movement.

If leakage cannot be stopped, the packing must be replaced.

Table 6: Basic safety massages for maintenance the valve

After these requirements are confirmed proceed with valve maintenance.

WARNING **Crushing hazard ! Failure to keep hands, hair, and clothing away from all moving parts when operating the control valve can cause serious injury.**

1. Clear all dirt and / or foreign material from the plug stem and control valve.
2. If leakage is detected, retighten the packing follower by one full turn clockwise (See Table 7: Packing Adjustment).
3. If retightening packing does not stop the leakage, overhaul the control valve and replace the packing (See Section 13: Disassembly and Reassembly).
4. If leakage is detected, retighten bonnet and flange bolting.
5. Make sure all nuts and bolts are securely fastened.
6. If possible, stroke the valve and check for smooth, full-stroke operation. Unsteady stem movement could indicate an internal valve problem.
7. Make sure all accessory brackets and bolting are securely fastened.
8. Check control valve health parameters:
    - Characteristic curves of the valve with flow
    - Upstream pressure
    - Downstream pressure

    into the control room.

NOTICE *Monitor trim and bonnet components. If nominal and actual values differ by more than 5%, maintenance may be required.*

12 Troubleshooting

Contact customer service department or contract partner for any fault or defect found, otherwise the manufacturer‘s guarantee shall be rendered null and void and the manufacturer released from any responsibility. If the user performs the repairs, these User Instructions must be adhered to and carried out in a competent manner. Original Equipment Manufacturer spare parts must be used to make the repair.

Defect	No.	Possible Causes	Remedy
Stem does not move	1.1	• No auxiliary energy supply (pneumatic air) to actuator and accessories (positioner, air filter regulator, solenoid valve, limit switch, and/ or special accessories)	• Pneumatic actuators: Check supply for leaks Check air pressure (usually 87 psig; 6 bar)
	1.2	• Mounted accessories do not work	• See User Instructions for accessory manufacturer
	1.3	• Pneumatic actuator is defective	• Contact customer service department or contract partner
	1.4	• Excessive tightening of the packing box	• Loosen packing follower until valve operates properly **NOTICE** ***Make sure there are no leaks.***
	1.5	• Valve trim worn or stuck	• Contact customer service department or contract partner
Jerky stem movement	2.1	• Damaged stem	• Contact customer service department or contract partner

Defect	No.	Possible Causes	Remedy
Jerky stem movement	2.2	• Actuator not powerful enough	• Compare actuator specifications on the serial plate with operation specifications of the facility. If incompatible, contact customer service department or contract partner
Stem travel less than full stroke (0 to 100 %)	3.1	• Air supply pressure too low	• Provide air at the pressure stated on the serial plate (European production only).
	3.2	• Pneumatic actuators: Improper handwheel position	• Move handwheel to limit position , otherwise contact factory for information.
	3.3	• Improperly adjusted or defective positioner	• Readjust positioner to positioner manufacturer‘s specification
	3.4	• Foreign particles in valve seat or damaged trim	• Contact customer service department or contract partner
Excessive valve seat leakage	4.1	• Damaged sealing surfaces on valve seat or plug	• Contact customer service department or contract partner
	4.2	• Foreign particles in seat area	• Contact customer service department or contract partner
	4.3	• Plug does not close fully	• Refer to No. 3.1 to 3.4
Leaking packing box system	5.1	• Compression force on packing box too low	• Slightly retighten packing box **NOTICE** ***Make sure stem can still move.***
	5.2	• Worn packing	• Slightly retighten packing box **NOTICE** ***Make sure stem can still move.*** If the packing does not stop leaking, contact customer service department or contract partner
	5.3	• Dirty stem	• Clean stem with suitable cleaning agent
	5.4	• Damaged stem	• Contact customer service department or contract partner
Leaking bonnet gasket	6.1	• Gasket compression is too low	• Properly retighten bonnet bolting nuts crosswise
	6.2	• Gasket defective	• Contact customer service department or contract partner
	6.3	• Corrosion	• Contact customer service department or contract partner
Leaking body	7.1	• Corrosion or high velocity related damage	• Contact customer service department or contract partner
No limit switch signal	8.1	• Power supply to limit switch interrupted	• Check power supply (connections, circuit breakers, voltage)
	8.2	• Limit switch out of adjustment	• Readjust limit switch operating distance; see limit switch data sheet
Unstable positioner	9.1	• Defective positioner	• See user instruction of the positioner manufacturer

Table 8: Trouble-shooting

13 Disassembly and Reassembly

The Valtek FlowTop control valve is allowed to be disassembled and reassembled only by qualified staff - personnel who are familiar with disassembling, reassembling, installation and commissioning of this product, and possess the relevant qualifications in their field of activity.

When performing repairs, personnel are to follow these instructions using only **original** equipment manufacturer (OEM) spare parts and recommended special tools to ensure the reliability of the Valtek FlowTop control valve.

Only Flowserve trained and authorized personnel are allowed to repair (disassemble and reassemble) the Valtek FlowTop in hazard areas.

Valves are provided for oil and grease-less service or oxygen service may only disassembled and reassembled in clean rooms (ISO 14644- ISO 8, US FED STD 209 E - M 6.5, or equivalent).

⚠ WARNING **Control valves are pressure vessels.**
Improper opening of the valve or actuator can result in bodily injury.

⚠ Prior to disassemble and reassemble, we require, that you check the following conditions to reduce the risk of malfunction and safety related incidents. After these requirements are confirmed the control valve can be maintained and repaired.

No.	Important information	Possible malfunction or safety related incident
1	Disregarding these instructions may bring serious or harmful consequences.	*Failure to comply with these user instructions will render the manufacturer's guarantee and liability null and void. Unless otherwise agreed, the manufacturer's general terms and conditions of sale shall apply.*
2	**⚠ Always observe system safety instructions when preparing for and performing the repair procedure.**	**Potential hazards and their sources are under the operator's influence. The operator must observe national and international environmental regulations for control valve removal from the pipe and cleaning. Permissible exposure limits must be maintained, appropriate personal protective equipment must be used and service personnel must be properly instructed in performing the repair procedure.**
3	**⚠ Make sure the pipeline is depressurized and in ambient state, also a suitable rigging (e.g. Endless Sling) and securing devices (e.g. Vee Trough with Stands / Vise) are readily available.**	**Remove the Valtek FlowTop from the pipeline in a depressurized and ambient state. Failure to do so can cause serious personal injury.** **The control valve is not equipped with integral stands, therefore guard against the valve from tipping over. Bodily injuries can be the result. Use appropriate clamps, blocking or other stabilizing support. Attachment to overhead crane can ensure stability.**
4	Confirm that you have the required spare parts at the site.	*Not having the full complement of parts, accessories and tools can slow or stop repair work.*
5	**⚠ Confirm that you have the required tools available to manage the disassembly and reassembly (See Section 16: Special Tools).**	**Improper tools and / or improper use of tools can result in personal injury or damage to the parts.**
6	Review the serial plate information to identify the valve. The serial number and the part numbers needed are required when ordering spare parts.	*A serial plate used for product identification is attached on every control valve (See Section 3: Product Identification).*
7	Do not damage any valve surfaces during repair.	*Damaging the stem surface and / or packing area may lead to premature leakages in the packing area.*
8	Check all parts for damage such as scoring, deformities, corrosion or overexpansion.	*If in doubt, replace faulty parts.* *Never reuse gaskets.*

Table 9: Basic safety massages for repairing the control valve

Disassembly instructions of the Positioner and the Actuator

1. Disconnect the air supply from the actuator and / or assembled accessories.
2. Disassemble the positioner from the valve as necessary (See Figure 7: Remove the positioner).
3. Move the actuator to the open (retracted) position.
4. Turn the cap screws (240) counter clockwise to loosen (See Figure 8: Remove the actuator).
5. Turn the lock nut (113) clockwise to loosen. Keep actuator coupling (345) from turning by securing with a wrench.
6. Turn the yoke lock nut (76) counter clockwise to loosen.
7. Lift off and store the actuator safely.
8. Place the valve body assembly on a table for disassembly.

NOTICE *Before you start working, find out which valve variant you are dealing with. There are basically two different constructions that primarily relate to the seat design. This also applies to the bonnets and packing, which are all described individually due to the variety of combinations.*

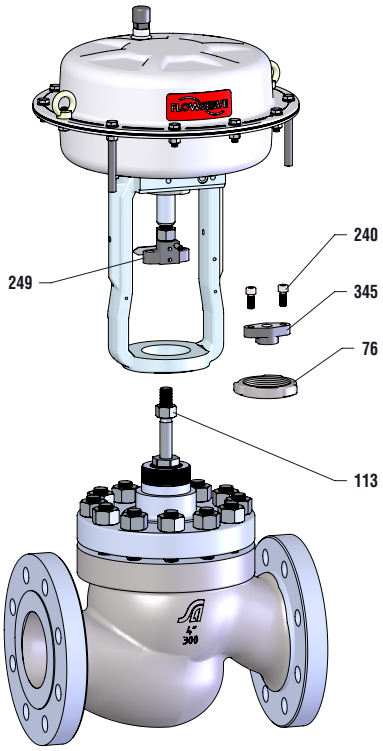


Figure 8: Remove the actuator

Item	Part
76	Yoke Lock Nut
113	Lock Nut
240	Socket Head Srew (2x)

Item	Part
249	Actuator Coupling
345	Valve Coupling

Table 10: Coupling parts identification

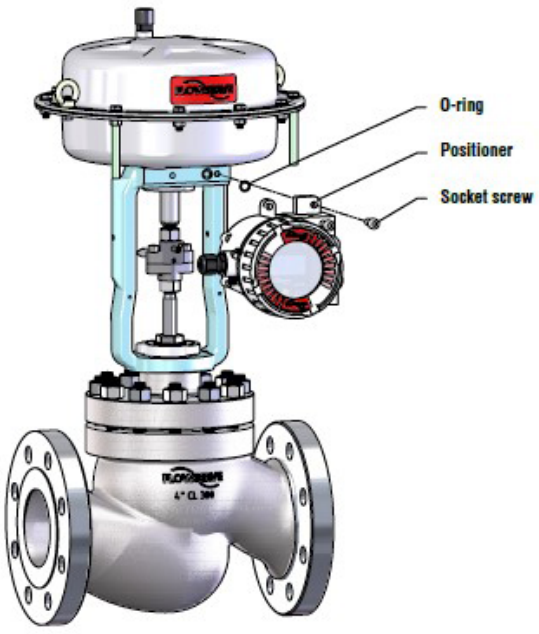


Figure 7: Remove the positioner

Disassembly instructions of the 3-Flange body assembly - Clamped seat ring

1. Turn the bonnet nuts (114) counter clockwise to loosen.
2. Place the Ring Nut Tool (See Section 16: Special Tools) on the stem (51) then slowly lift the bonnet assembly (40) upwards out of the body (1).

⚠ WARNING **Crushing hazard ! Lifting the bonnet and plug from the control valve involves personal physical risk by falling parts.**

Please exercise caution.

NOTICE *Exercise care with a pressure balanced plug design. While removing the pressure balanced plug, the retainer may stick to the bonnet then become detached while lifting the plug and stem out of the valve. Secure the seat retainer as you remove the plug and stem.*

3. Remove the bonnet gasket (58) and seat retainer gasket (56).

4. Remove the seat retainer (30), seat ring (20) and profile ring (55).

NOTICE *To remove the seat retainer (30) larger than 8" use the suggested lifting method shown in Figure 10 on page 16.*

5. Check stressed surface areas for damage such as scoring and deformities.

6. To disassemble the bonnet assembly, switch to the relevant description.

7. Use a standard brass scraper or other suitable tool to clean bolting. Check for corrosion or any other damage.

Reassembly instructions of the 3-Flange body assembly - Clamped seat ring

8. Lubricate all bolt and screw threads and bearing surfaces (stem, underside of the nuts) with a suitable, approved lubricant (See Section 15: Lubricants).

NOTICE *Never allow lubricants to come in contact with the bonnet or sealing surfaces.*

9. Install a new profile ring (55) and seat ring (20).

10. Lower the seat retainer (30) into the body and place it on top of the seat ring (See Figure 9).

11. Lower the plug assembly (50, 51, and 52) into the body with the plug touching the seat ring surface.

NOTICE *For details, see the associated bonnet variant (see Page 26 - 27).*

12. Install the new seat retainer gasket (56) and the new bonnet gasket (58).

13. Carefully lower the bonnet (40) onto the plug in the body of the valve (See Figure 9, for pressure balanced trim).

14. Install and finger tighten the bonnet nuts (114) to the bonnet bolts (108).

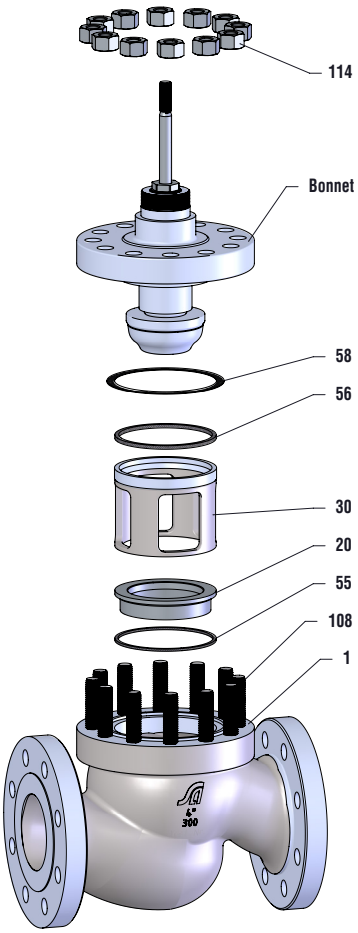


Figure 9: 3-flange clamped seat valve

Item	Part
1	Body
20	Seat ring
30	Seat retainer
40	Bonnet
55	Profile ring

Item	Part
56	Seat retainer gasket
58	Bonnet gasket
108	Stud bolt
114	Hex nut

Table 11: Valve parts

15. Install the new packing.

NOTICE *For details, see the associated packing variant (see Page 28 - 29). Install and push two packing rings consecutively using the Tamping Tool and pre-tighten it. Repeat the procedure with remaining rings. Rotate each ring 180° from the overlapping point. Make sure each ring is clean. Dirty rings result in stem leakage.*

16. Tighten the bonnet nuts (114) in four steps - 30%, 60%, 100%, and all around 100% - using a crosswise pattern (See Section 14: Torque Requirements).

NOTICE *Check the plug's freedom of movement by lifting it approximately ~10 mm (0.4 inch) between tightenings. Loosen the bolted connection and start again if it proves difficult to move the plug.*

NOTICE *When possible, it is a good practice to allow the seat ring to align and self-center with the plug before tightening bonnet bolting. This may be accomplished by installing the actuator and using the actuator to drive the plug into the seat or by special tooling to manually force the plug into the seat.*

17. Finish packing follower (80) tightening with a wrench (See Table 7 on Page10 or Page 32 - 33).

18. Replace the pneumatic diaphragm actuator and accessories (See Page 31).

19. After reinstalling the control valve in the pipeline, perform 3 full strokes and check the tightening of the packing follower and bonnet bolting.

NOTICE *Do not over tighten the packing. Over tightened packing may produce higher friction and reduce product service life.*

20. Log the maintenance interval and the work performed.

Suggested rigging method:

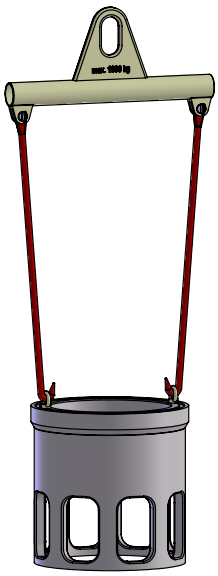
2 lifting eye bolts
from 8“ - 12“

Limited construction-related working load limit for the two eye bolts !

Figure 10: Retainer rigging method

Disassembly instructions of the 3-Flange body assembly - Screwed seat ring

1. Turn the bonnet nuts (114) counter clockwise to loosen.

2. Place the Ring Nut Tool (See Section 16: Special Tools) on the stem (51) then slowly lift the bonnet assembly (40) upwards out of the body (1).

WARNING **Crushing hazard ! Lifting the bonnet and plug from the control valve involves personal physical risk by falling parts.**

Please exercise caution.

NOTICE *Exercise care with a pressure balanced plug design. While removing the pressure balanced plug, the retainer may stick to the bonnet then become detached while lifting the plug and stem out of the valve. Secure the seat retainer as you remove the plug and stem.*

3. Remove the bonnet gasket (58).

4. Remove the seat ring (20) and profile ring (55).

NOTICE *Do a visual inspection. Only remove parts that are to be replaced.*

5. Check stressed surface areas for damage such as scoring and deformities.

6. To disassemble the bonnet assembly, switch to the relevant description.

7. Use a standard brass scraper or other suitable tool to clean bolting. Check for corrosion or any other damage.

Reassembly instructions of the 3-Flange body assembly - Screwed seat ring

8. Lubricate all bolt and screw threads and bearing surfaces (stem, underside of the nuts) with a suitable, approved lubricant (See Section 15: Lubricants).

NOTICE *Never allow lubricants to come in contact with the bonnet or sealing surfaces.*

9. Install a new profile ring (55) and seat ring (20) if previously disassembled.

10. Lower the plug assembly (50, 51, and 52) into the body with the plug touching the seat ring surface.

NOTICE *For details, see the associated bonnet variant (see Page 26 - 27).*

11. Install the new bonnet gasket (58).
12. Carefully lower the bonnet (40) onto the plug in the body of the valve.
13. Install and finger tighten the bonnet nuts (114) to the bonnet bolts (108).

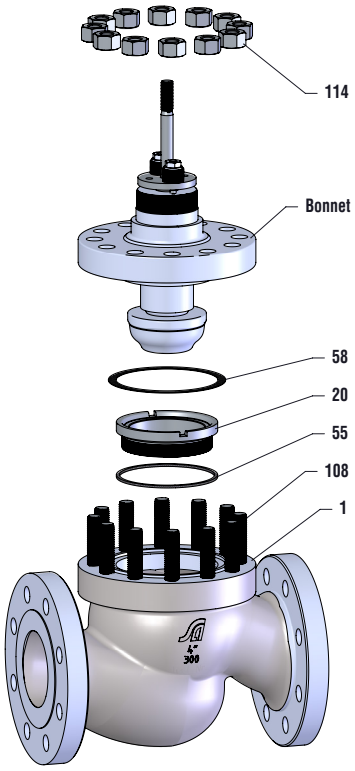


Figure 11: 3-flange screwed seat valve

Item	Part
1	Body
20	Seat ring
40	Bonnet
55	Profile ring

Item	Part
58	Bonnet gasket
108	Stud bolt
114	Hex nut

Table 12: Valve parts

14. Install the new packing.

NOTICE *For details, see the associated packing variant (see Page 28 - 29). Install and push two packing rings consecutively using the Tamping Tool and pre-tighten it. Repeat the procedure with remaining rings. Rotate each ring 180° from the overlapping point. Make sure each ring is clean. Dirty rings result in stem leakage.*

15. Tighten the bonnet nuts (114) in four steps - 30%, 60%, 100%, and all around 100% - using a crosswise pattern (See Section 14: Torque Requirements).

NOTICE *Check the plug's freedom of movement by lifting it approximately ~10 mm (0.4 inch) between tightenings. Loosen the bolted connection and start again if it proves difficult to move the plug.*

16. Finish packing follower (80) tightening with a wrench (See Table 7 on Page 10 and 32 - 33).
17. Replace the pneumatic diaphragm actuator and accessories (See Page 31).
18. After reinstalling the control valve in the pipeline, perform 3 full strokes and check the tightening of the packing follower and bonnet bolting.

NOTICE *Do not over tighten the packing. Over tightened packing may produce higher friction and reduce product service life.*

19. Log the maintenance interval and the work performed.

Disassembly instructions of the 4-Flange body assembly - top guided.

NOTICE *Do a visual inspection and only disassemble assemblies where necessary. This does not include full servicing after 7 years at the latest.*

Turn the Body over:
Due to the design, the valve with four flanged bodies must be rotated twice around its pipe axis in the following (pages 18 - 25). The application of two rope loops directly behind the pipe flanges has proven itself on site. Hanging on a crane, the valve can be turned in the rope loops, if necessary with the help of a second lifting device. In order to be able to set down the control valve safely, a trestle with a clear height of 1 meter and a load capacity of 5000kg is required. Ideally, this is equipped with a suitable V-profile for centering the valve pipe flanges.

1. Turn the bonnet nuts (114) counter clockwise to loosen.
2. Place a Lifting Tool - see Section 16: Special Tools (Page 34) - on the stem or bonnet and pull the bonnet assembly out of the body as one pice.

WARNING **Crushing hazard ! Lifting the bonnet and plug from the control valve involves personal physical risk by falling parts.**

Please exercise caution.

NOTICE *Using a Ring Nut is a tried and tested method up to a nominal diameter of 150 mm or 6". Above DN 150 or NPS 6, Flowserve recommends attaching the bonnet to the bonnet-thread (suitable Lifting Tool with M80 x 2) and pulling it out of the body. The plug with stem should remain in the body due to gravity.*

Exercise care with a pressure balanced plug design. While removing the pressure balanced plug, the retainer may stick to the bonnet then become detached while lifting the plug and stem out of the valve.

3. Remove the plug assembly out of the body if these is not done.
4. Remove the bonnet gasket (58).
5. Remove the screwed seat (20) by using the Seat Tool and remove the seat gasket (55).
6. Remove the bonnet gasket (58).
7. Turn the body over as described at the beginning.
8. Turn the Cover Nuts (114) counter clockwise to loosen.
9. Remove the cover (46) and cover gasket (58).
10. Depending on the attached bonnet, see instructions for disassembly the bonnet on page 26 to 27.
11. Check stressed surface areas for damage such as scoring and deformities.
12. Use a standard brass scraper or other suitable tool to clean bolting. Check for corrosion or any other damage.

Reassembly instructions of the 4-Flange body assembly - top guided.

13. Lubricate all bolt and screw threads and bearing surfaces (stem, underside of the nuts) with a suitable, approved lubricant (See Section 15: Lubricants).

NOTICE *Never allow lubricants to come in contact with the bonnet or sealing surfaces.*

14. Install the new cover gasket (58).
15. Carefully lower the cover (46) onto the studs in the valve body.
16. Install and tighten the cover nuts (114) in four steps - 30%, 60%, 100%, and all around 100% - using a crosswise pattern (See Section 14: Torque Requirements).
17. Turn the body over as described at the beginning.
18. Install a new seat gasket (55) and screwed seat (20) if previously reassembled.
19. Lower the plug assembly (50) into the body with the plug touching the seat ring surface.

NOTICE *There are different versions - for details see trim variant (Page 29 - 30).*

20. Install the new bonnet gasket (58).
21. Carefully lower the bonnet (40) onto the plug in the body of the valve.

NOTICE *There are different versions - for details see bonnet variant (Page 26 - 27).*

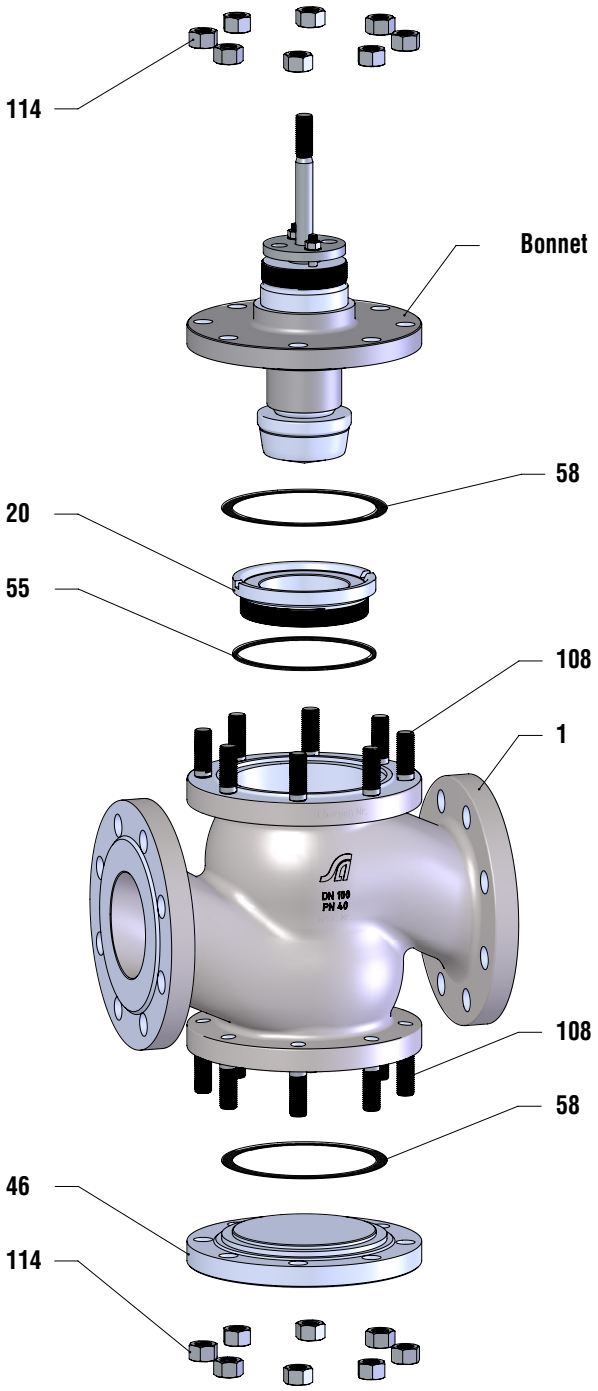


Figure 12: 4-flange top guided valve

Item	Part
1	Body
58	Bonnet Gasket
108	Body studs
114	Body nuts

Item	Part
20	Screwed seat
55	Seat gasket
40	Bonnet
46	Cover

Table 13: Valve parts

22. Install and finger tighten the bonnet nuts (114) to the bonnet bolts (108).

23. Install the packing box ring (93) and the new packing (88).

NOTICE *There are different versions - for details see packing variant (Page 28 - 29).*

24. Tighten the packing follower with your fingers clockwise until resistance can be felt.

25. Tighten the bonnet nuts (114) in four steps - 30%, 60%, 100%, and all around 100% - using a crosswise pattern (See Section 14: Torque Requirements).

NOTICE *Check the plug's freedom of movement by lifting it approximately ~10 mm (0.4 inch) between tightenings. Loosen the bolted connection and start again if it proves difficult to move the plug.*

26. Finish packing follower (80) tightening with a wrench (See Table 7 on Page 10 and 32 - 33).

27. Replace the actuator and accessories (See page 31).

28. After reinstalling the control valve in the pipeline, perform 3 full strokes and check the tightening of the packing follower and bonnet bolting.

NOTICE *Do not over tighten the packing. Over tightened packing may produce higher friction and reduce product service life.*

29. Log the maintenance interval and the work performed.

Disassembly instructions of the 4-Flange body assembly - top and bottom guided.

NOTICE *Do a visual inspection and only disassemble assemblies where necessary. This does not include full servicing after 7 years at the latest.*

1. Turn the bonnet nuts (114) counter clockwise to loosen.
2. Place a Lifting Tool - see 16 Special Tools (Page 34) - on the stem or bonnet and pull the bonnet assembly out of the body as one pice.

WARNING **Crushing hazard ! Lifting the bonnet and plug from the control valve involves personal physical risk by falling parts.**

Please exercise caution.

NOTICE *Using a Ring Nut is a tried and tested method up to a nominal diameter of 150 mm or 6". Above DN 150 or NPS 6, Flowserve recommends attaching the bonnet to the bonnet-thread (suitable Lifting Tool with M80 x 2) and pulling it out of the body. The plug with stem should remain in the body due to gravity.*

Exercise care with a pressure balanced plug design. While removing the pressure balanced plug, the retainer may stick to the bonnet then become detached while lifting the plug and stem out of the valve.

3. Remove the plug assembly out of the body if these is not done.
4. Remove the bonnet gasket (58).
5. Remove the screwed seat (20) by using the Seat Tool and remove the seat gasket (55).
6. Remove the bonnet gasket (58).
7. Turn the body over as described on page 18.
8. Turn the Cover Nuts (114) counter clockwise to loosen.
9. Remove the cover (46) and cover gasket (58).
10. Depending on the attached bonnet, see instructions for disassembly the bonnet on page 26 to 27.
11. Check stressed surface areas for damage such as scoring and deformities.
12. Use a standard brass scraper or other suitable tool to clean bolting. Check for corrosion or any other damage.

Reassembly instructions of the 4-Flange body assembly - top and bottom guided.

13. Lubricate all bolt and screw threads and bearing surfaces (stem, underside of the nuts) with a suitable, approved lubricant (See Section 15: Lubricants).

NOTICE *Never allow lubricants to come in contact with the bonnet or sealing surfaces.*

14. Install the new cover gasket (58).
15. Carefully lower the cover (46) onto the studs in the valve body.
16. Install and finger tighten the cover nuts (114) to the cover bolts (108).
17. Turn the body over as described on page 18.
18. Install a new seat gasket (55) and screwed seat (20) if previously reassembled.
19. Lower the plug assembly (50) into the body with the plug touching the seat ring surface.

NOTICE *There are different versions - for details see trim variant (Page 29 - 30).*

20. Install the new bonnet gasket (58).
21. Carefully lower the bonnet (40) onto the plug in the body of the valve.

NOTICE *There are different versions - for details see bonnet variant (Page 26 - 27).*

22. Install and finger tighten the bonnet nuts (114) to the bonnet bolts (108).
23. Install the packing box ring (93) and the new packing (88).

NOTICE *There are different versions - for details see packing variant (Page 28 - 29).*

24. Tighten the packing follower with your fingers clockwise until resistance can be felt.
25. Tighten the cover, bonnet nuts (114) in four steps - 30%, 60%, 100%, and all around 100% - using a crosswise pattern (See Section 14: Torque Requirements).

NOTICE *Check the plug's freedom of movement by lifting it approximately ~10 mm (0.4 inch) between tightenings. Loosen the bolted connection and start again if it proves difficult to move the plug.*

26. Finish packing follower (80) tightening with a wrench (See Page 32 - 33).
27. Replace the actuator and accessories (See page 31).
28. After reinstalling the control valve in the pipeline, perform

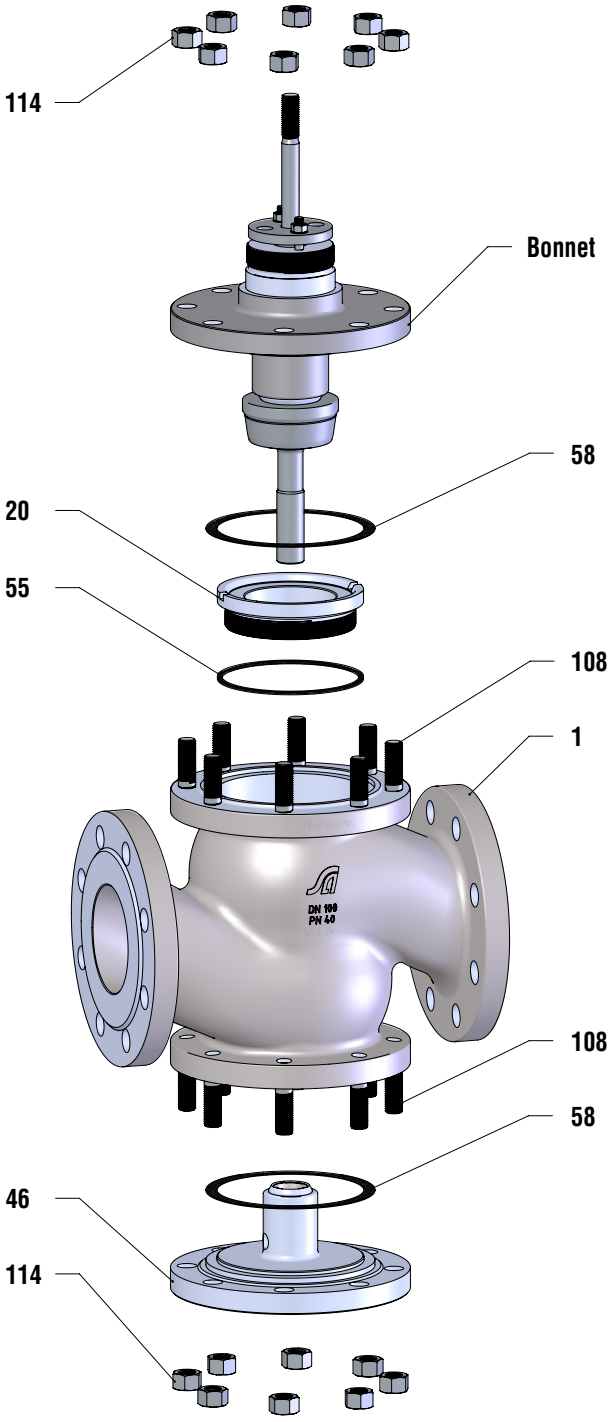


Figure 13: 4-flange top and bottom guided valve

Item	Part
1	Body
58	Bonnet Gasket
108	Body studs
114	Body nuts

Item	Part
20	Screwed seat
55	Seat gasket
40	Bonnet
46	Cover

Table 14: Bonnet parts

3 full strokes and check the tightening of the packing follower and bonnet bolting.

NOTICE *Do not over tighten the packing. Over tightened packing may produce higher friction and reduce product service life.*

29. Log the maintenance interval and the work performed.

Disassembly instructions of the 3-way mixing valve.

NOTICE *Do a visual inspection and only disassemble assemblies where necessary. This does not include full servicing after 7 years at the latest.*

1. Turn the bonnet nuts (114) counter clockwise to loosen.

NOTICE *Exercise care with bellows seal bonnet design. For a better understanding, refer to page 26 - 27 bellows seal bonnets. The bellows is welded with the stem and screwed with the plug and also clamped / screwed to the bonnet. Depending on the design, the plug must be prepared so that it can be pulled out downwards.*

2. Place a Lifting Tool - see 16 Special Tools (Page 34) - on the bonnet and pull the bonnet assembly out of the body as one pice.

NOTICE *Flowserve recommends attaching the bonnet to the bonnet-thread (suitable Lifting Tool with M64 x 2 resp. M80 x 2) and pulling it out of the body. The plug with stem should remain in the body.*

3. Remove the bonnet gasket (58).
4. Turn the body over as described on page 18.
5. Turn the connection piece nuts (114) counter clockwise to loosen.
6. Remove the connection piece (2).
7. Remove the gasket (58), seat ring (24) and the second gasket (58).
8. Pull out the plug (50) assembly.

9. Remove the screwed seat (20) by using the Seat Tool and remove the seat gasket (55).

10. Depending on the attached bonnet, see instructions for disassembly the bonnet on page 26 - 27.

11. Check stressed surface areas for damage such as scoring and deformities.

12. Use a standard brass scraper or other suitable tool to clean bolting. Check for corrosion or any other damage.

Reassembly instructions of the 3-way mixing valve.

13. Lubricate all bolt and screw threads and bearing surfaces (stem, underside of the nuts) with a suitable, approved lubricant (See Section 15: Lubricants).

NOTICE *Never allow lubricants to come in contact with the bonnet or sealing surfaces.*

14. Install a new seat gasket (55) and screwed seat (20) if previously reassembled.

15. Lower the plug assembly (50) into the body with the plug touching the seat ring surface.

NOTICE *Exercise care with bellows seal bonnet design. For a better understanding, refer to page 26 - 27 bellows seal bonnets. The bellows is welded with the stem and screwed with the plug and also clamped / screwed to the bonnet. Depending on the design, the plug must be prepared so that it can be installed.*

16. Install a new gasket (58), seat ring (24) and the second gasket (58).

17. Install the connection piece (2).

18. Install and finger tighten the connection piece nuts (144) to the bolts (108).

19. Turn the body over as described on page 18.

20. Install the new bonnet gasket (58).

21. Carefully lower the bonnet (40) onto the plug in the body of the valve.

NOTICE *There are different versions - for details see bonnet variant (Page 26 - 27).*

22. Install and finger tighten the bonnet nuts (114) to the bonnet bolts (108).

23. Install the packing box ring (93) and the new packing (88).

NOTICE *There are different versions - for details see packing variant (Page 28 - 29).*

24. Tighten the packing follower with your fingers clockwise until resistance can be felt.

25. Tighten the cover, bonnet nuts (114) in four steps - 30%, 60%, 100%, and all around 100% - using a crosswise pattern (See Section 14: Torque Requirements).

NOTICE *Check the plug's freedom of movement by lifting it approximately ~10 mm (0.4 inch) between tightenings. Loosen the bolted connection and start again if it proves difficult to move the plug.*

26. Finish packing follower (80) tightening with a wrench (See Table 7 on Page 10 and 32 - 33).

27. Replace the actuator and accessories (See page 31).

28. After reinstalling the control valve in the pipeline, perform 3 full strokes and check the tightening of the packing follower and bonnet bolting.

NOTICE *Do not over tighten the packing. Over tightened packing may produce higher friction and reduce product service life.*

29. Log the maintenance interval and the work performed.

Item	Part
1	Body
58	Bonnet Gasket
108	Body studs
114	Body nuts
20	Screwed seat

Item	Part
50	Plug
55	Seat gasket
24	Seat Ring
40	Bonnet
2	Connection Piece

Table 15: Valve parts

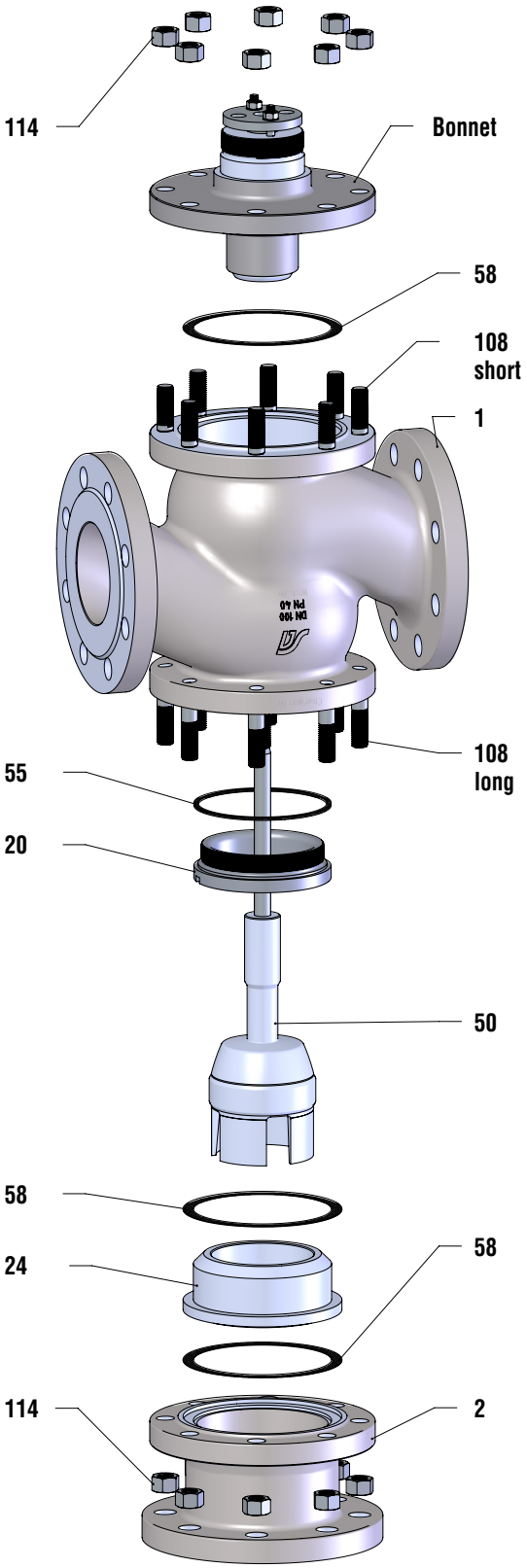


Figure 14: 3-way mixing valve

Disassembly instructions of the 3-way distributing valve.

NOTICE *Do a visual inspection and only disassemble assemblies where necessary. This does not include full servicing after 7 years at the latest.*

1. Turn the bonnet nuts (114) counter clockwise to loosen.

   NOTICE *Exercise care with bellows seal bonnet design. For a better understanding, refer to page 26 - 27 bellows seal bonnets.*

2. Place a Lifting Tool - see 16 Special Tools (Page 34) - on the bonnet and pull the bonnet assembly.

   NOTICE *Flowserve recommends attaching the bonnet to the bonnet-thread (suitable Lifting Tool with M64 x 2 resp. M80 x 2) and pulling it out of the body. The plug with stem should remain in the body.*

3. Remove the bonnet gasket (58).
4. The plug unit (50) must be secured against shifting and subsequent twisting using a suitable clamping tool.
5. Turn the valve over as described on page 18.
6. Turn the connection piece nuts (114) counter clockwise to loosen.
7. Remove the connection piece (2).
8. Remove the gasket (58).

   NOTICE *Also remove the stud bolts (108) for better handling.*

9. Turn the hex nut (154) counter clockwise to loosen.
10. Remove the spring washer (153), V-port plug (152), seal ring (151), seat ring (24) and gasket (58).
11. Turn the body over as described on page 18.
12. Remove clamping tool and pull out the plug (50) assembly.
13. Remove the screwed seat (20) by using the Seat Tool and remove the seat gasket (55).
14. Depending on the attached bonnet, see instructions for disassembly the bonnet on page 26 - 27.
15. Check stressed surface areas for damage such as scoring and deformities.
16. Use a standard brass scraper or other suitable tool to clean bolting. Check for corrosion or any other damage.

Reassembly instructions of the 3-way distributing valve.

17. Lubricate all bolt and screw threads and bearing surfaces (stem, underside of the nuts) with a suitable, approved lubricant (See Section 15: Lubricants).

NOTICE *Never allow lubricants to come in contact with the bonnet or sealing surfaces.*

18. Install a new seat gasket (55) and screwed seat (20) if previously reassembled.

19. Lower the plug assembly (50) into the body with the plug touching the seat ring surface.

NOTICE *Exercise care with bellows seal bonnet design. For a better understanding, refer to page 26 - 27 bellows seal bonnets. The bellows is welded with the stem and screwed with the plug and also clamped / screwed to the bonnet. Depending on the design, the plug must be prepared so that it can be installed.*

20. The plug unit (50) must be secured against shifting and subsequent twisting using a suitable clamping tool.

21. Turn the valve over as described on page 18.

22. Install the new connection piece gasket (58) and seat ring (24).

23. Install the seal ring (151), V-port plug (152), spring washer (153) and fasten the hex nut (154).

24. If the stud bolts (108) are previously removed, install it.

25. Install the second connection piece gasket (58) and carefully lower the connection piece (40) onto the body.

26. Install and finger tighten the connection piece nuts (114) to the bolts (108).

27. Turn the body over as described on page 18.

28. Remove clamping tool.

29. Install a new bonnet gasket (58).

30. Carefully lower the bonnet (40) onto the body.

NOTICE *There are different versions - for details see bonnet variant (Page 26 - 27).*

31. Install and finger tighten the bonnet nuts (114) to the bolts (108).

32. Install the packing box ring (93) and the new packing (88).

NOTICE *There are different versions - for details see packing variant (Page 28 - 29).*

33. Tighten the packing follower with your fingers clockwise until resistance can be felt.

34. Tighten the cover, bonnet nuts (114) in four steps - 30%, 60%, 100%, and all around 100% - using a crosswise pattern (See Section 14: Torque Requirements).

NOTICE *Check the plug's freedom of movement by lifting it approximately ~10 mm (0.4 inch) between tightenings. Loosen the bolted connection and start again if it proves difficult to move the plug.*

35. Finish packing follower (80) tightening with a wrench (See Table 7 on Page 10 and 32 - 33).

NOTICE *Do not over tighten the packing. Over tightened packing may produce higher friction and reduce product service life.*

36. Replace the actuator and accessories (See page 31).

37. After reinstalling the control valve in the pipeline, perform 3 full strokes and check the tightening of the packing follower and bonnet bolting.

38. Log the maintenance interval and the work performed.

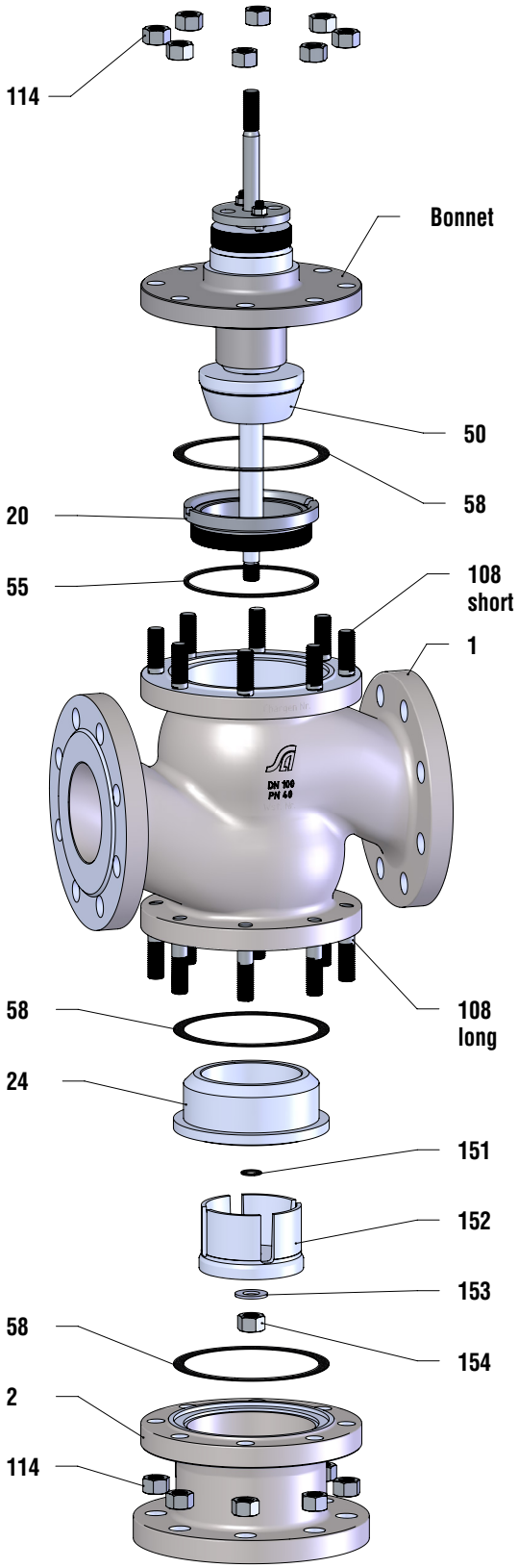


Figure 15: 3-way distributing valve

Item	Part
1	Body
25	Bonnet Gasket
108	Body studs
114	Body nuts
20	Screwed seat
50	Plug
55	Seat gasket

Item	Part
24	Seat Ring
151	Seal Ring
152	V-Port Plug
153	Spring Washer
154	Hex Nut
40	Bonnet
2	Connection Piece

Table 16: Valve parts

Disassembly instructions - Standard and Extension Bonnet design

1. Remove the plug assembly (50, 51, and 52) from the bonnet (40).
2. To disassemble the packing assembly, switch to the relevant description (see Page 28 - 29).

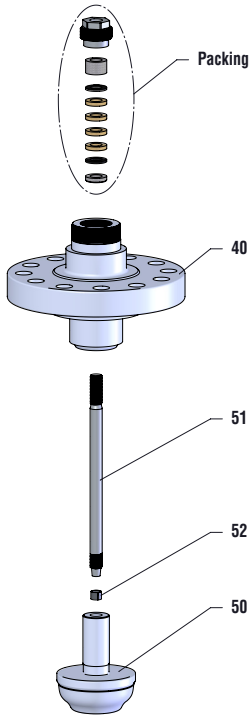


Figure 16: Disassemble / Reassemble the bonnet

Disassembly instructions - Standard and Extension Bonnet design with a pressure balanced trim

1. Remove the sleeve (30) from the plug assembly (50, 51, and 52).
2. Remove the plug assembly (50, 51, and 52) from the bonnet (40).
3. Remove the backing ring (66) and O-ring (65) from the plug (50).

NOTICE *The disassembly and reassembly of the plug and stem is only possible with special tools.*

4. To disassemble the packing assembly, switch to the relevant description (see Page 28 - 29).
5. Reassemble the pressure balanced plug with new backup rings (66) and a new O-ring (65).

NOTICE *Use lubricant for proper seal function when reassembling the PB O-ring configuration.*

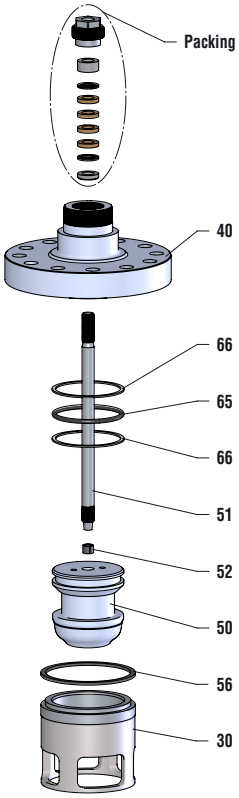


Figure 17: Disassemble / Reassemble the bonnet

Disassembly instructions - Bellows Seal Bonnet design NPS 1/2 - 2

1. To disassemble the packing assembly, switch to the relevant description (see Page 28 - 29).
2. Turn the hex nuts (110) counter clockwise to loosen.
3. Remove the head (7) and upper head gasket (59).
4. Lower the plug (50) into a three jaw-chuck with soft brackets and turn the plug from the stem and bonnet (51 / 40) counter clockwise to loosen then move the bellows seal assembly up and out then also remove the lower head gasket (59).

NOTICE *The bolting between plug and stem are secured against twisting. The bellows seal assemblies are secured with a lock bushing (52). The lock bushing (52) usually remains in the plug (50) and can be reused. If the plug (50) is damaged and replaced, a new lock bushing (52) must be used.*

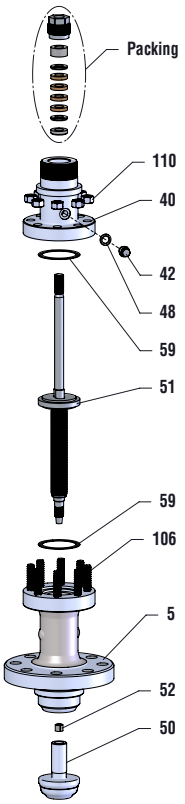


Figure 18: Disassemble / Reassemble the bonnet

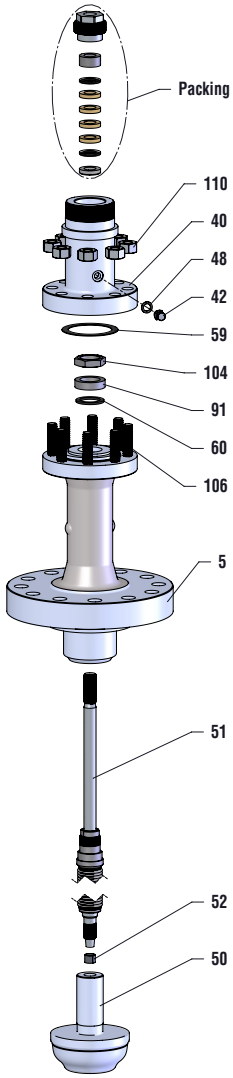


Figure 19: Disassemble / Reassemble the bonnet

Item	Part
7	Head
30	Sleeve
40	Bonnet
42	Plug screw
56	Seat retainer gasket
48	Plug gasket
50	Plug
51	Stem
52	Lock bushing

Item	Part
59	Head gasket
60	Profile ring
65	O-ring
66	Backup ring
91	Seal carrier
104	Hex nut
106	Stud bolt
110	Hex nut

Table 17: Bonnet parts for Figure 18, 19 and 20

Disassembly instructions - Bellows Seal Bonnet design NPS 3 - 6

1. To disassemble the packing assembly, switch to the relevant description (see Page 28 - 29).
2. Turn the hex nuts (110) counter clockwise to loosen.
3. Remove the head (7) and head gasket (59).
4. Remove the hex nut (110) counter clockwise to loosen then pull off the seal carrier (91) and remove the profile ring (60).
5. Pull the plug assembly (50, 51, and 52) out downwards of the bonnet (40).

Disassembly and reassembly instructions of the packing designs

Check stressed surface areas for damage such as scoring or deformities.

Use a standard brass scraper or other suitable tool to clean all bolting. Check for corrosion or any other damage.

Always replace damaged parts with original spare parts.

The reassembly takes place in reverse order.

NOTICE *Before you start working, find out which packing variant you are dealing with. There are basically two different constructions. Internal Packing and external Packing design.*

Disassembly instructions - Internal packing design, live loaded

1. Turn the packing follower (80) counter clockwise to loosen, remove the belleville springs (138) and upper stem guide (87).
2. Use an Packing Driver Tool to remove the packing box ring (93) and packing (88) by knocking out from below.

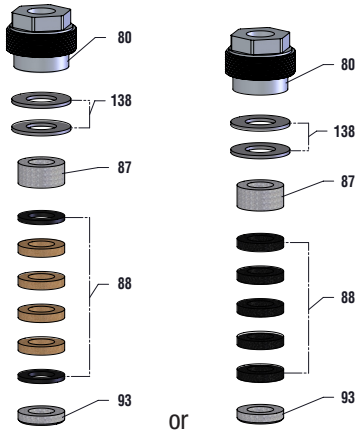


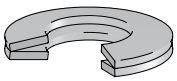
Figure 20: Disassemble / Reassemble the packing

Item	Part
80	Packing follower
87	Upper stem guide
88	Packing

Item	Part
93	Packing box ring
138	Belleville spring

Table 18: Packing parts

NOTICE The belleville springs must be stacked in series !



Disassembly instructions - External packing design, live loaded

1. Turn the nuts (117) counter clockwise to loosen, remove the washer (112) belleville springs (138) and gland flange (80).
2. Use an Packing Driver Tool to remove the packing box ring (93) and packing (88) by knocking out from below.

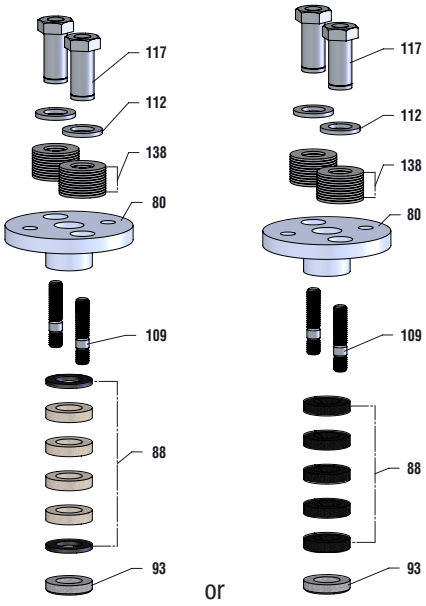


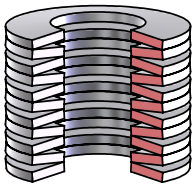
Figure 21: Disassemble / Reassemble the packing

Item	Part
80	Gland flange
88	Packing
93	Packing box ring
109	Studs

Item	Part
112	Washer
117	Nuts
138	Belleville spring

Table 19: Packing parts

NOTICE The belleville springs must be stacked in series !



Disassembly instructions - External packing design, non-live loaded

Traditional design, the long-term function depends on the maintenance interval and the skill of the maintenance personnel. For a rough orientation see Tightening Torques Gland Hex Nuts (117) on page 33.

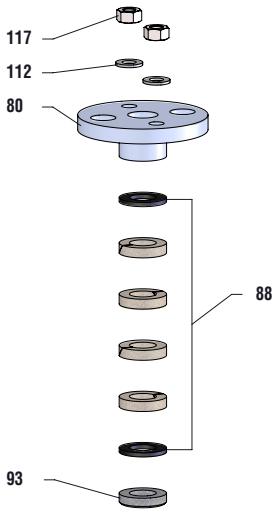


Figure 22: Disassemble / Reassemble the packing

Item	Part
93	Packing box ring
88	Packing
80	Gland flange

Item	Part
117	Hex Nut
112	Washer

Table 20: Packing parts

3. Loosen the hex nut (117) counter clockwise and remove the washer (112) and the gland flange (80).
4. Use a Packing Driver Tool to remove the packing box ring (93) and packing (88) by knocking out from below.
5. Carefully clean the packing chamber of all deposits using a suitable tool.

NOTICE *Do not damage high-quality surfaces !*

6. Installation is the reverse order. Always use new original parts and internalize the information. In this way you avoid annoying rework.

Severe Service - Trim Options up to 8”

MegaStream - noise reduction:

MegaStream replaces the standard seat retainer with a drilled hole retainer. The plug and bonnet are typically identical to the standard design for post guided configurations but may be different for cage guided configurations. Assembly and disassembly of the valve follows the standard procedures. MegaStream retainers, plugs and seats should be examined for damage when disassembled. Holes in the retainer should be checked for worn or eroded surfaces. Check for plugged holes in the retainer. Multi-stage MegaStream retainers cannot be disassembled. Repair and replacement of damaged parts is critical to maintaining noise control.



Figure 23: MegaStream

WARNING **To function properly, multi-stage MegaStream is always installed flow under.**

NOTICE *When possible, it is a good practice to allow the seat ring to align and self-center with the plug before tightening bonnet bolting. This may be accomplished by installing the actuator and using the actuator to drive the plug into the seat or by special tooling to manually force the plug into the seat.*

CavStream - anti-cavitation:

CavStream should be treated the same as the plug assembly. Follow the instructions for standard trim assembly.

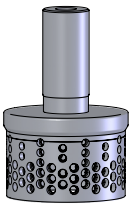


Figure 24: CavStream

WARNING **To function properly, CavStream is always installed flow over.**

NOTICE *Care should be taken to observe any wear on the CavStream plug head.*

CavControl - anti-cavitation:

CavControl replaces the standard retainer with a drilled, stepped-hole retainer. The plug and bonnet have dimensional differences from the standard design. Assembly and disassembly of the valve follows the standard procedures.

CavControl retainers, plugs and seats should be examined for excessive cavitation damage when disassembled. Holes in the retainer should be checked for worn or eroded surfaces. Check for plugged holes in the retainer. Plugs and retainer mating surfaces should be examined for damage. Repair and replacement of damaged parts is critical to maintaining cavitation resistance.

⚠ WARNING **To function properly, CavControl is always installed flow over.**

NOTICE *When possible, it is a good practice to allow the seat ring to align and self-center with the plug before tightening bonnet bolting. This may be accomplished by installing the actuator and using the actuator to drive the plug into the seat or by special tooling to manually force the plug into the seat.*

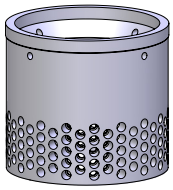


Figure 25: CavControl

DiamondBack - anti-cavitation:

DiamondBack replaces the standard retainer with a stacked-disk retainer that is either welded or bolted and pinned. Several of the parts, including the plug, seat ring and bonnet may have dimensional differences from the standard design. Assembly and disassembly of the valve follows the standard procedures.

DiamondBack retainers, plugs and seats should be examined for excessive cavitation damage when disassembled. The inner holes in the retainer should be checked for wear or erosion, evidence of erosion should require that the retainer is disassembled or replaced. Plugs and retainer mating surfaces should be examined for damage. Repair and replacement of damaged parts is critical to maintaining cavitation resistance.

DiamondBack retainers should be cleaned of debris whenever the valve is opened.

It is rare that DiamondBack stacks require disassembly to clean. The passages of the DiamondBack can be cleaned by pushing a wire through the passages from the inside of the stack, by air or by water rinsing. When required, pinned and bolted DiamondBack retainers can be disassembled and cleaned in the field. Welded DiamondBack retainers should not be disassembled outside a qualified service center.

Disassembly of Bolted DiamondBack Retainers: Remove the nuts from the bolts/studs. Place the retainer with the crown disk facing down and remove the bolts/studs from the stack. Remove the bottom indexed disk. Press the pins out away from the crown disk. Take the discs apart, maintaining the order of assembly. Replace damaged discs, alignment pins bolts or nuts. Inspect and clean out disc passages.

⚠ WARNING **To function properly, DiamondBack is always installed flow over.**

NOTICE *When possible, it is a good practice to allow the seat ring to align and self-center with the plug before tightening bonnet bolting. This may be accomplished by installing the actuator and using the actuator to drive the plug into the seat or by special tooling to manually force the plug into the seat.*

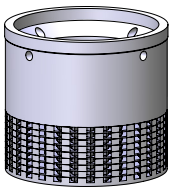


Figure 26: DiamondBack

Reassembly:
Care should be taken when reassembling to stack up the discs in the same order and the same rotation. Start by driving the pins into the crown disk. Then place each disk in descending order until all disks, except the bottom indexed disc, are in place. Drive the pins until they are bottomed out. Place the bottom disk on and replace the bolts/studs. Bolts must be torqued, torque values are available from your local Flowserve contact.

Reassemble instructions of the actuator and positioner

1. Mount the pneumatic diaphragm actuator onto the bonnet and tighten the yoke lock nut (76) clockwise (see Section 14: Required Torques).

   NOTICE *Position the actuator with the vent plug positioned at the rear.*

2. Move the actuator to the open position.

3. Screw in the lock nut (113) and actuator coupling (345) and adjust the distance between the valve coupling (345) and actuator coupling (249) by adjusting the stroke length.

Size	Stroke	
1/2“ - 2“	20 $^{+0,5}$ mm	0.787 $^{+0.02}$ in.
3“ - 4“	40 $^{+0,5}$ mm	1.574 $^{+0.02}$ in.
6“	60 $^{+0,8}$ mm	2.362 $^{+0.03}$ in.
8“ - 12“	80 $^{+0,8}$ mm	3.149 $^{+0.03}$ in.

Table 21: Stroke adjustment length

4. Adjust the valve coupling (345) until the actuator coupling (249) lines up.

   NOTICE *Press the stem / plug into the seat by hand.*

5. Move the actuator to the close position and install the cap screws (240).

6. Secure the lock nut (113). Keep actuator coupling (249) from turning by securing with a wrench.

7. Reassemble the positioner on the valve as necessary (see relevant accessory User Instruction).

8. Connect the valve into the pipeline (See Section 9: Installation).

9. After reinstalling the control valve into the pipeline, perform three full strokes and check the tightness of the packing follower and bonnet bolting (See Section 10: Valve Quick-Check).

10. Log the maintenance interval and the work performed.

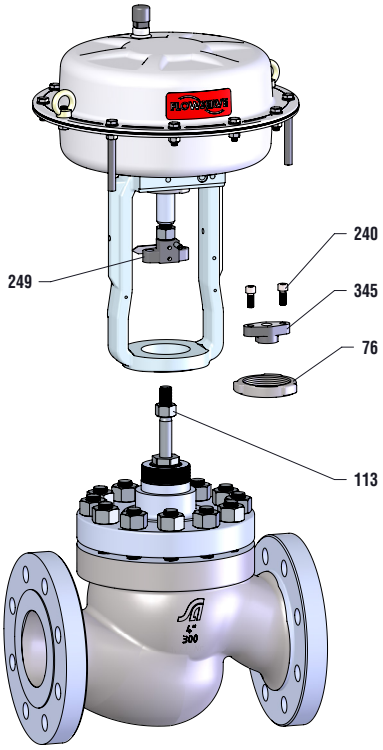


Figure 27: Reassemble the actuator

Item	Part
76	Actuator Lock Nut
113	Lock Nut
240	Socket Head Screw (2x)

Item	Part
249	Actuator Coupling
345	Valve Coupling

Table 22: Coupling parts identification

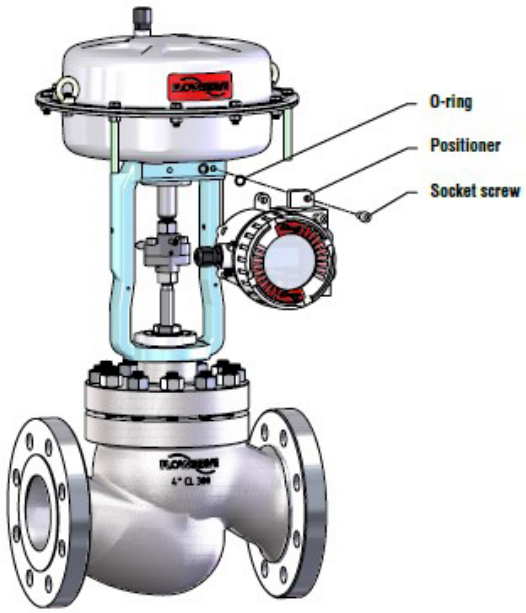


Figure 28: Reassemble the positioner

14 Torque Requirements

Presssure Class		Torque Requirements for **BONNET NUTs (114) – V750 Threaded Seat** per nominal diameter										
		1/2“	3/4“	1“	1 1/2“	2“	3“	4“	6“	8“	10“	12“
150	Nm	15			17	22	26	46	76	143	250	367
300					21	27	43	76	146			
150	ft lb	11			13	16	19	34	56	106	184	271
300					16	20	32	56	108			

Note: Torque values listed above are target torque values with a tolerance of ±10%

Stud Material	Pressure Class		Torque Requirements for **BONNET NUTs (114) – V752 Clamped Seat** per nominal diameter										
			1/2“	3/4“	1“	1-1/2“	2“	3“	4“	6“	8“	10“	12“
B8/B8M Class 2, B7, L7, B16	150	Nm	27			68		110	200		260	380	530
	300								200	260			
	150	ft lb	20			50		80	150		190	280	390
	300								150	190			
B8/B8M Class 1, B7M, L7M	150	Nm	16			40		80	150		240	360	530
	300								150	240			
	150	ft lb	12			30		60	110		180	270	390
	300								110	180			

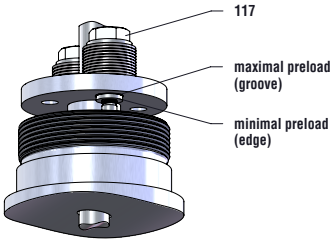
Note: Torque values listed above are target torque values with a tolerance of ±10%

Presssure Class		Torque Requirements for **HEAD NUTs (110)** per nominal diameter										
		1/2“	3/4“	1“	1 1/2“	2“	3“	4“	6“	8“	10“	12“
150	Nm	13			14		30		24	32		
300		10			12		25		46	49		
150	ft lb	9.6			10.3		22		17.7 / 23.6			
300		7.4			8.9		18.4		34 / 25			

Presssure Class		Torque Requirements for **SCREWED SEATs (20)** per nominal diameter										
		1/2“	3/4“	1“	1 1/2“	2“	3“	4“	6“	8“	10“	12“
150 / 300	Nm	40			100	162	457	841	1 653	2 550	3 900	6 200
150 / 300	ft lb	30			74	120	337	620	1 219	1 881	2 877	4 573

Presssure Class		Torque Requirements for **PLUG and STEM (50, 51)** per nominal diameter										
		1/2“	3/4“	1“	1 1/2“	2“	3“	4“	6“	8“	10“	12“
150 / 300	Nm	40					80		170			
150 / 300	ft lb	30					59		125			

Pressure Class		Torque Requirements for **HEX NUTs (154) screw connection** per nominal diameter										
		1/2“	3/4“	1“	1 1/2“	2“	3“	4“	6“	8“	10“	12“
150 / 300	Nm	-		7	15		60		270	700	1 250	1 950
150 / 300	ft lb	-		5	11		44		200	520	925	1 450

Torque Requirements for **External Packing System (117)** - live loaded		
Minimum preload	**Maximum preload**	**Figure**
Is marked by the lower edge of the nut (117)	Is marked by the groove in the nut (117)	

NOTICE *The yoke lock nut (76) should be tighten with a rounded chisel and a 1,5 kg (3.5 lbs) hammer before the 'kickback' effect occurs. The coupling part bolting should be tighten properly by hand in accordance with the relevant technical standards.*

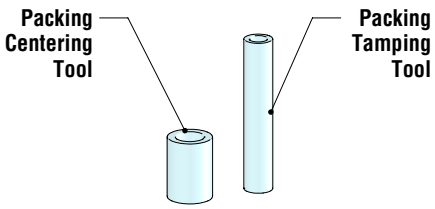
Torque Requirements for **ADJUSTABLE PACKING (117)** screw connection in **Nm** per stem diameter - lubricated - non-live loaded								
Packing	**Pressure Class**		**Wrench size SW 13**					**SW 16 [17]**
			Stem diameter					
			Ø 12 mm [1]	**Ø 16 mm [2]**	**Ø 20 mm [3]**	**Ø 24 mm**	**Ø 30 mm**	**Ø 50 mm**
PTFE A	Class 150	Nm	2,3	3,6	4,2	4,9	8,2	20
		ft lb	1,7	2,7	3,1	3,6	6,1	15
	Class 300	Nm	5,6	8,6	10	12	20	49
		ft lb	4,1	6,3	7,4	8,9	15	36
Graphite H, B, Y	Class 150	Nm	2,7	4,2	4,9	5,7	9,6	24
		ft lb	2,0	3,1	3,6	4,2	7,1	18
	Class 300	Nm	6,5	10	12	14	23	57
		ft lb	4,8	7,4	8,9	10	17	42

[1] 12 mm stem used for valve sizes: ½ through 2" sizes
[2] 16 mm stem used for valve sizes: 3" and 4" sizes
[3] 20 mm stem used for valve sizes: 6"through 12" sizes

15 Lubricants

Application site			**Valve - working temperature**		**Actuator - ambient temperature**	
			Standard	**Low**	**Standard**	**Optionally**
			-40°C to +425°C	**-60°C to -41°C**	**-40°C to 80°C**	**-60°C to +80°C**
Static lubrication / release agents	Valve:	Threads of the stem (50/51) and twist-lock of the stem (52), thread of the seat (20) and hex nut (104); Bonnet-bolting (108/114) and head-bolting (106/110)	Klüberpaste HEL 46-450 [Chesterton 785 (FG)] [FastLubeAG]		N/A	
		Threads of the packing-follower (80), coupling (113, 345, 249, 240) and yoke locknut (76)				
	Actuator:	Threads of the stem bushing flange bolting (336/6.45), O-ring (276/6.9, 336/6.45), threads of the stem (211/6.12) and actuator casing bolting (335/6.3.1, 336/6.3.2, 351/6.4)	N/A		Klüber Unisilikon L250L	Klüber Unisilikon L250L
Initial lubrication on sliding surfaces	Valve:	O-ring balancing (65)	HEL 46-450 [Krytox GPL 206] [Klüber Unisilkon L250L]	without	N/A	
		Graphite packing (88)	Chesterton 785 (FG) [Chesterton 725]			
	Actuator:	O-ring's (272/6.17, 271/6.50, 275/6.10, 278/6.51) and guide (254/6.8.2)	N/A		Klüber Unisilikon L250L	Klüberalfa YV 93-1202

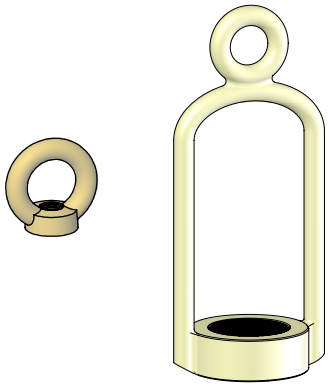
16 Special Tools

<table>
<tr><th>Special Tool</th><th>Use</th></tr>
<tr><td>
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Packing Tamping Tool

Recommended tool for assembling.

Description	Part N°		
	Stem Ø 12 mm	Stem Ø 16 mm	Stem Ø 20 mm
Packing Centering Tool	1-9516-03 [ID 329834]	1-9516-05 [ID 329836]	1-9516-08 [ID 329844]
Packing Tamping Tool	1-9516-04 [ID 329835]	1-9516-06 [ID 329842]	1-9516-07 [ID 329843]

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Ring Nut Tool

Recommended tool for disassembling and reassembling.

Lifting eye nut according to DIN 582 - size M12, M16, M20

Bonnet Lifting Tool

Recommended tool for disassembling and reassembling about DN 150 / NPS 6”:

for bonnet thread

M64 x 2 - 240mm
M80 x 2 - 370mm

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Packing Driver Tool

Recommended tool for disassembling.

Description	Dimension (Brass rod)		
	Stem Ø 12 mm	Stem Ø 16 mm	Stem Ø 20 mm
Packing Driver Tool	Ø 15^{-1} x 250 mm	Ø 21^{-1} x 300 mm	Ø 25^{-1} x 400 mm

</td></tr>
</table>

17 Disposal

Up to 95 % of the FlowTop control valve is metal. The remaining materials are synthetic, rubber, polytetrafluoroethylene (PTFE), graphite, paint, and lubricants.

The valve should be professionally disassembled and reassembled. Metal parts should be scrapped, with the remaining materials disposed of according the national conditions.

Peripheral units (accessories) should be recycled according the relevant manufacturer‘s User Instructions.

NOTICE *Potential hazards and their sources are under the operator‘s influence. The operator must observe national and international environmental conditions for control valve removal from the pipeline and cleaning. Permissible limit values must be maintained to ensure suitable protective measures; service personnel must be properly instructed in performing the disassembly and reassembly procedure.*

18 Parts List

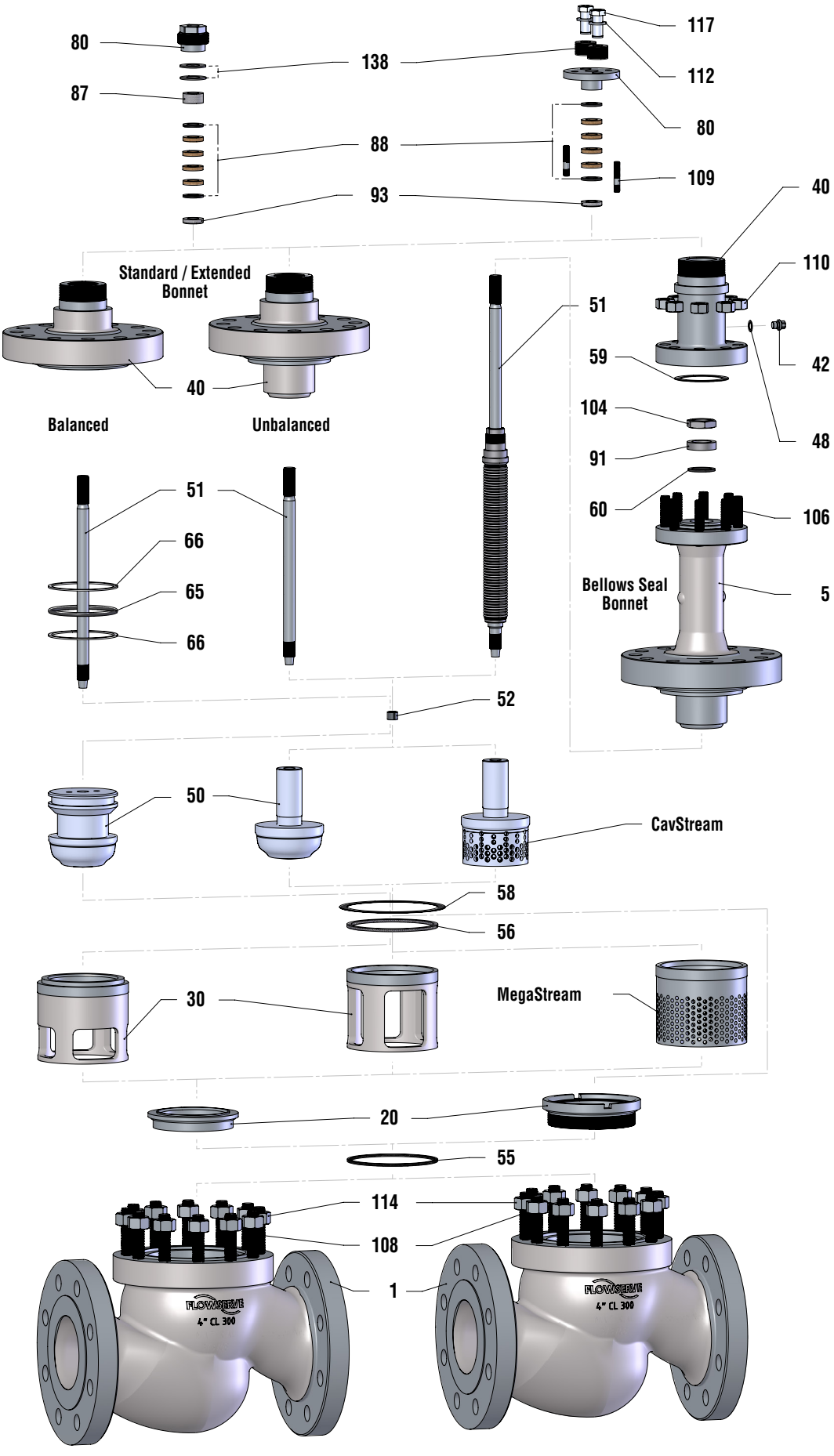
Item WW	Item EU	Part	Common Materials		
1	1.1	Body	A216 WCC	A351 CF8M	A351 CF3M
2	4.2	Connection Piece	A216 WCC	A351 CF8M	A351 CF3M
7	3.15	Head	A105 or WCC	F316 or CF8M	F316L or CF3M
20	2.1	Seat Ring	316SS		316L
24	2.2	Seat Ring (3-way)	316SS (nitrided)		316L (nitrided)
30	2.26	Seat retainer [1]	316SS		316L
		Sleeve [1]	316SS (nitrided)		316L (nitrided)
40	3.1	Bonnet	A105 or WCC	F316 or CF8M	F316L or CF3M
42	3.14	Plug screw	A2		
46	4.1	Cover	A216 WCC	A351 CF8M	A351 CF3M
48	3.13	Plug gasket	Pure Graphite		
50	2.2	Plug [3]	316SS		316L
51	2.4	Stem [3]	316 (strain hardened level 2)		
52	2.3	Lock bushing [3]	316SS		
55	2.5	Profile ring	Pure Graphite		
56	2.10	Seat retainer gasket	316SS - Gaphite Layer		
58	1.2	Bonnet gasket	316SS - Gaphite Layer		
59	2.15	Head gasket	Pure Graphite		
60	2.8	Profile ring	Pure Graphite		
65	2.12	O-ring [1]	Buna-N, Viton, EPDM, Kalrez or Chemraz		
66	2.21	Backup ring [1]	PTFE or PEEK		
76	5.10	Yoke lock nut [2]	316SS		
80	3.4	Packing follower	316SS		
87	3.6	Upper guiding	316SS (nitrided)		
88	3.3	Packing	PTFE or Graphite		

Item WW	Item EU	Part	Common Materials	
91	2.7	Seal carrier	316SS	
93	3.2	Packing box ring	316SS	
104	2.6	Hex nut	316SS	
106	3.17	Stud bolt	A193 B7	A193 B8 Cl 2
108	1.3	Stud bolt	A193 B7	A193 B8 Cl 2
109	3.5	Studs	A193 B8M2 Cl 2B	
110	3.16	Hex nut	A194 2H	A194 8
112	3.8	Washer	316SS	
113	5.2	Lock nut [2]	316SS	
114	1.4	Hex nut	A194 2H	A194 8
117	3.9	Nuts	316L	
138	3.11	Belleville spring	1.4310	
151	2.31	Seal Ring	Graphite	
152	2.32	V-Port Plug	316SS	
153	2.33	Spring Washer	316SS	
154	2.34	Hex Nut	316 SS (nitrided)	
240	5.5	Socket head screw [2]	316SS	
249	5.3	Actuator coupling [2]	316SS	
345	5.1	Valve coupling [2]	316SS	

[1] see page 15 and page 26
[2] see page 14
[3] The complete plug assembly (50, 51, and 52 assembled at the factory) is recommended for spare parts

NOTICE *The materials listed are the most commonly used. The specified materials may differ from the delivered product in detail. So they are for rough orientation only. If you need the materials actually used orient yourself to the bill of materials (BOM).*

Extract of possible combinations



Space for notes

Space for notes

Space for notes

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