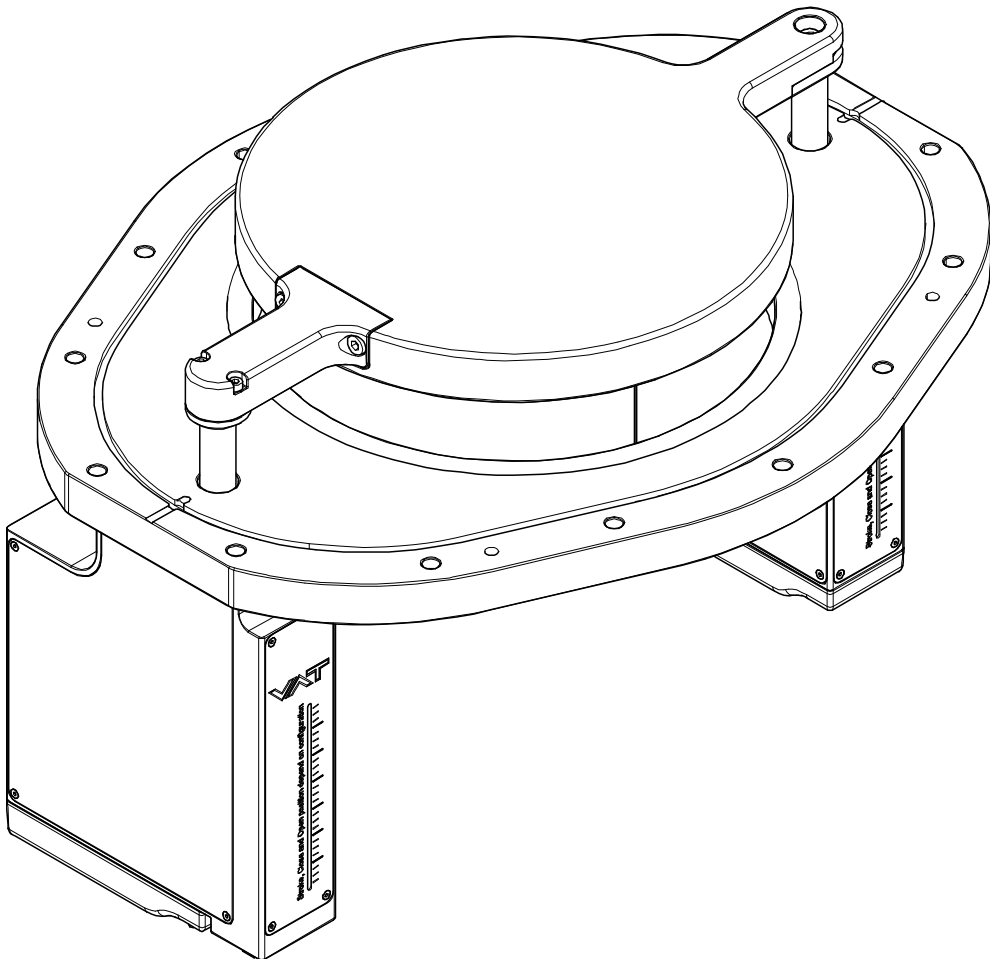
Installation, Operating & Maintenance Instructions

Series 670

Symmetrical flow control & isolation valve

DN125 – 500 mm (I.D. 5" – 20")



Publication details

Manufacturer

VAT Vakuumventile AG, CH-9469 Haag, Switzerland

Website: www.vatvalve.com

Phone: +41 81 771 61 61

E-mail: CH@vatvalve.com

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1 General information

1.1 Scope of delivery

The scope of delivery corresponds to your purchase order with VAT Vakuumventile AG. When you receive your purchase order, check it against your order list. If you find discrepancies between what was ordered and delivered, contact VAT Vakuumventile AG. Publication details [▷ 2]

1.2 Other applicable documents

The following documents belong to the product and must be observed:

- Product Data Sheet
- Dimension Drawing
- Operating instructions of external controller
- Heater assembly and operating instructions
- Programmers Reference

To obtain the Programmers Reference please contact your local VAT representative.

1.3 Typographical conventions

1.3.1 Requests of action

The signs used in actions have the following meaning:

Action with several steps

✓ Precondition that must be met before performing an action.

1. Step 1
   ⇨ Intermediate result of an action
2. Step 2

⇨ Result of a completed action

Actions in safety instructions or a single action step

▶ Step

1.3.2 Lists

1. Numbered list, first point
2. Numbered list, second point
   - Unnumbered list, 1st level
   - Unnumbered list, 2nd level

1.3.3 Important information

This icon indicates important and useful information.

1.3.4 Danger levels

To avoid injury and equipment damage, you must observe the warning and safety information in the instructions. The warnings describe the following danger levels:



⚠ DANGER

Situations which, if not avoided, will lead directly to death or serious injury.



⚠ WARNING

Situations which, if not avoided, could lead to death or serious injury.



⚠ CAUTION

Situations which, if not avoided, could lead to moderately serious or slight injury.

NOTICE

Situations which, if not avoided, could lead to equipment damage.

1.4 Forwarding

This document is part of the product and if the product is forwarded, the document must also be forwarded to the product recipient.

If the product becomes part of a machine by installation or combination with other parts or by any other method, this document must also be forwarded when the machine is sold. The only circumstance in which forwarding is not required is when all relevant parts of this document are included in the documentation that accompanies the new machine. In the latter two cases, the machine manufacturer, not the manufacturer of this product, is legally responsible for the safety and for the content and scope of the instructions that accompany the machine.

1.5 Abbreviations

Abbreviation	Description
CPA	Control Performance Analyzer
PFO	Power Failure Option
SFS	Sensor Full Scale
SPS	Sensor Power Supply
ADC	Analog-to-Digital Converter
SW	Software

1.6 Document number and index

The cover sheet includes the document number and indexing as well as the product definition and document type. The document number consists of at least 6 and at most 7 numbers. The index consists of 2 letters.

Example:

1234567DA

The document number allows the documentation to be assigned to the product. The index indicates the language and version.

Version **Language**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**…**
German	DA	DB	DC	DD	DE	DF	DG	D…
English	EA	EB	EC	ED	EE	EF	EG	E…

1.7 Representation of parameters

The parameters are described in the corresponding sections. In general, parameters are represented in the following form.

First, there is a description where the parameters can be found in the parameter window of the CPA, followed by the table in which the parameters are named and their functions are described.

Localized `CPA/Parameters: Pressure Control.Controller1…4.Control Settings`

Parameter	**Description**
Gain Factor	Main parameter to influence the control performance
Sensor Delay	Control parameter for compensating delays during pressure detection
Learn Data Selection	Four different learning data sets can be selected for the pressure control of the adaptive controller: *Bank 1* *Bank 2* *Bank 3* *Bank 4*

The parameters and parameter values are marked in these operating instructions as follows:

Parameter *Parameter Value*

Example: Set ***Learn Data Selection*** to *Bank 1*.

2 Safety

2.1 Intended use

This is a symmetrical flow valve with control and an isolation function and is intended for applications with Downstream pressure control. To ensure that the maximum lifetime of the valve can be reached, it should only be used for clean and dry vacuum applications in a commercial environment..

- The product is intended solely as a component for further use in a commercial context.
- The product may only be operated under the technical conditions described in the Product Data Sheet.
- The product may only be operated under the environmental conditions described in the Product Data Sheet.
- Examine the product prior to use and never operate if visibly damaged.
- Never technically modify the product.
- Never operate the product if it has not been completely mounted.
- Only connect and disconnect plug-in connections when not under voltage.
- Only connect and disconnect compressed air connections in an unpressurized state.
- If any change is made to the product that has not been agreed with VAT Vakuumventile AG, the guidelines applied and the corresponding declarations will become invalid.

2.2 Qualified personnel

Qualified personnel are the people authorized to operate devices, systems and electrical circuits in accordance with safety standards.

2.3 Predictable misuse and improper use

Any use of the product that does not comply with the intended use, be this intentional or negligent, is forbidden by the manufacturer.

2.4 Personal protective equipment

Personal protective equipment is not included in the scope of delivery.

To ensure the product is not contaminated or damaged, VAT recommends that the end user provides at least the following personal protective equipment for work with and on the product. If further protective clothing is required as a result of a special use of the product, the end user is responsible for making this known.

	Wear antistatic shoes
	Wear protective clothing
	Use gloves
	Use a hairnet

2.5 End user's obligations

The end user of the system is responsible for observing the safety regulations. Unqualified personnel working on the product or located in danger zones can cause risks that could lead to serious injury.

- ► Have all activities carried out by qualified personnel.
- ► Keep unqualified personnel away from danger zones.
- ► Make sure that everybody who works on or with the product has read and understood the document.
- ► Make sure that safety information is observed.
- ► File this document together with the documentation of the entire system and ensure that it can be accessed at all times.
- ► This document is part of the product. Pass it along with the product.
- ► Note the relevant accident protection regulations and the recognized local safety rules.
- ► Provide the necessary personal protective equipment.
- ► Provide possibilities for ESD measures.

2.6 Personnel obligations

To avoid equipment damage and injury when handling the product, personnel are obliged to:

- ► Read the operating instructions and in particular follow the safety information.
- ► Note the relevant accident protection regulations and the other generally recognized safety rules.
- ► Wear the necessary personal protective equipment.

2.7 Safety labels

The following safety labels can be found on the product. It is the responsibility of the end user to ensure that the safety labels are clean, legible and undamaged. Damaged safety labels must be replaced promptly.

	Electrical voltage
	Toxic substances
	Corrosive substances
	Danger of contusion
	Being pulled in

2.8 Damage to the product

2.8.1 Electrostatic discharge

Electrostatic discharge can cause injury and can damage electronic parts of the product.

- ► Provide counter measures to prevent Electrostatic Discharge (ESD) damage to control valve electronics.
- ► Carry out all work on the control and actuation unit under ESD-protected conditions.

2.8.2 Connections

Incorrectly connected cables can cause damage to the product and disrupt the voltage supply.

- ► Follow the instructions in the document when connecting the cables.
- ► Note the wiring diagrams.

2.8.3 Sparks

If plug connectors are connected and disconnected when the power is on, electrical arching (sparks) can damage connector pins and electronic parts.

- ► Do not plug in or remove plug connectors when the power is on.

2.8.4 Product contamination

To ensure correct operation of the product, the product must be protected from contamination.

Personal protective equipment is not included in the scope of delivery.

- ► When working on and with the product, wear clean-room gloves.

2.8.5 Hazardous materials

Improper handling of hazardous materials can cause injury and harm the environment.

- ► Remove, for example, any toxic, corrosive or microbiological hazardous materials before you send the product to VAT.
- ► Dispose of the product and parts in accordance with the local regulations.

2.9 Product handling

The default value can differ depending on the customer specification and firmware.

2.9.1 Moving parts

Moving parts of the product can cause serious injury.

- ► Make sure that moving parts cannot be touched.
- ► Make sure that the opening is free as soon as the product is connected to a supply line.
- ► Do not connect the product to the supply line until it has been completely installed.

2.9.2 Heated valves

Contact with heated valves can result in injury.

- ► Never touch the valve or heater during operation.
- ► Before you carry out work on the valve, switch off the heater and wait until the valve has fully cooled.

2.9.3 Unsuitable packaging

Unsuitable packaging material can cause product contamination.

- ► Keep the original packaging material.
- ► Use the original packaging material during transport and storage.
- ► Handle the product with care.

3 Technical data

See supporting documentation, Product Data Sheet.

4 Design and function

4.1 Type label

The article and serial number and the order number are indicated on the product or on a type label.

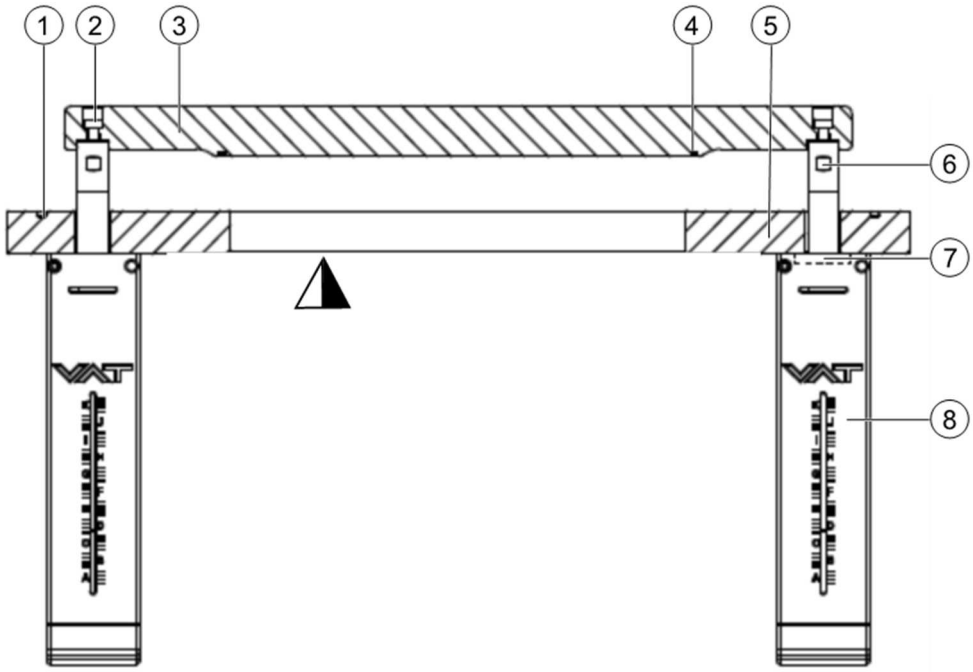


1 Article and serial number

2 Order number

The type label may vary in form and content.

4.2 Valve structure



1 Flange seal

2 Gate screw

3 Gate

4 Gate seal

5 Flange

6 Actuator shaft

7 Actuator shaft seal

8 Actuator (stepper motor)

Valve seat side

Valve may vary in shape and components.

4.3 Valve function

The valve gate acts as a throttling element and varies the conductance of the valve opening. Two synchronized linear drives perform actuation. Encoders monitor the position. This principle ensures fast and accurate process pressure control.

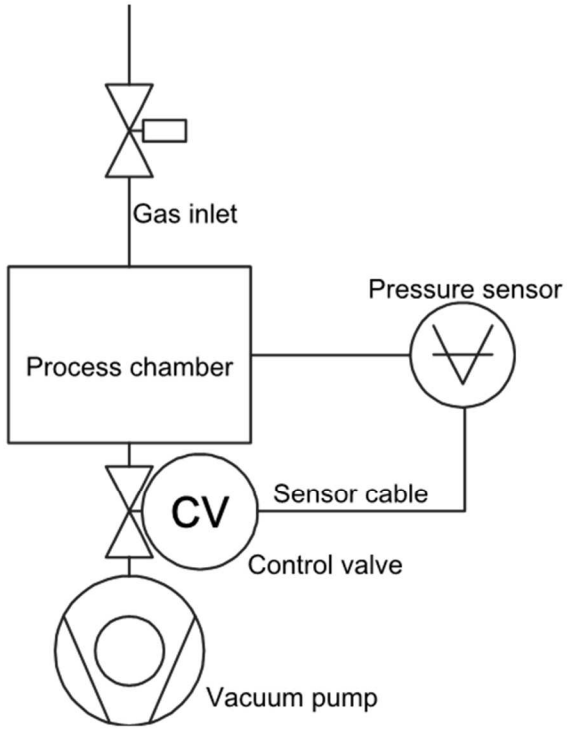
4.4 Way of operation

The controller compares the ***Actual Pressure*** in the process chamber given by the pressure sensor with the ***Target Pressure***. The controller uses the difference between ***Actual Pressure*** and ***Target Pressure*** to calculate the correct position of the control valve. The controller drives the control valve into the correct position and the ***Actual Pressure*** again equals the ***Target Pressure***.

This control operation is performed continuously. Pressure changes in the process chamber due to leaks, desorption, and gas flow, reaction products, variations in pumping speed etc. are always corrected at once.

4.5 Functional structure of Downstream Pressure Control

Downstream Pressure Control defines a tool layout where the pressure control valve is located between process chamber and vacuum pump.



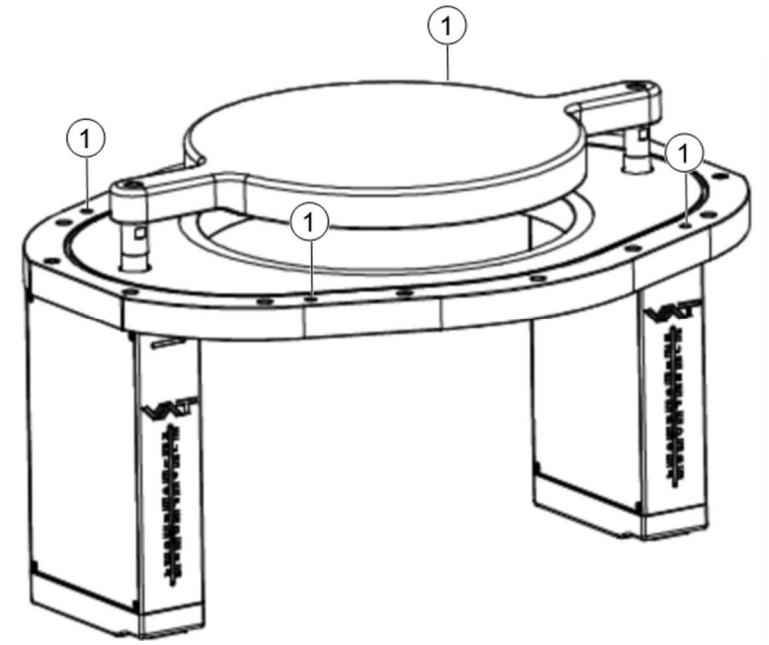
5 Installation

5.1 Unpacking

If the product or the packaging is damaged in any way, take a photograph of the damage and the type label and report the damage to the VAT service center.

Use a blunt object to open the plastic bag.

1. Make sure that the protective sleeves are not damaged.
2. Remove the packaging material.
3. Retain the packaging material for future transport.
4. Check whether the product is damaged. If it is, report this to VAT.
5. Fasten the lifting device to the anchor points. See drawing below.
6. Lift the product out of the packaging.
7. Leave the protective caps on the openings.



1 Anchor points (4 x 10M thru)

5.2 Installation in the system

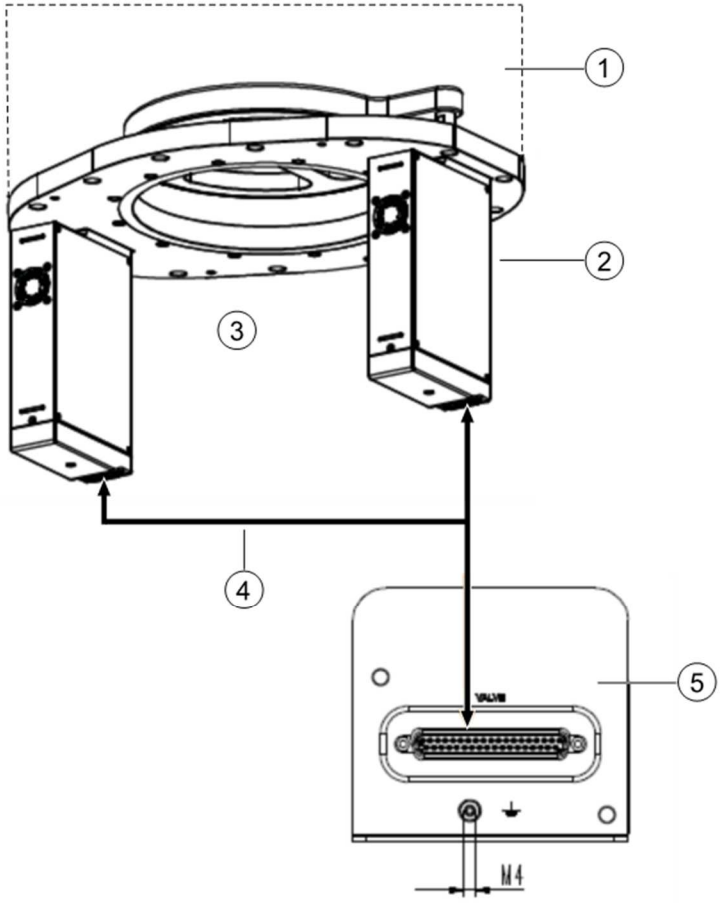


⚠ CAUTION

Risk of injury caused by heavy load!

Lifting heavy loads may lead to injury.

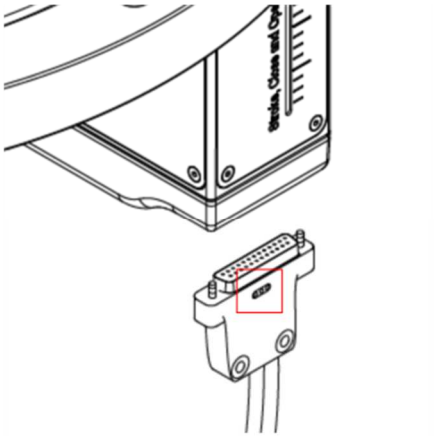
► Use suitable lifting equipment and the specified lifting points.



1 Chamber
2 Symmetrical flow valve
3 Pump side
4 Actuator cables
5 External controller

1. Remove the protective covers from body flanges.
2. Ensure that the sealing surfaces of the valve and the chamber are undamaged.
3. Ensure that the vacuum system is clean.
4. Mount the symmetrical flow valve (2) in the vacuum system in such a way that the valve seat side faces the process chamber. The valve seat side is indicated with the symbol Δ on the flange or in the drawing.
5. Do not tighten the flange screws stronger than indicated under Tightening torque [▷ 18].
6. Do not admit higher forces to the valve than indicated under Admissible forces [▷ 17].

7. Ensure there is enough space for connections, air circulation, and maintenance work. See the “Dimension Drawing” for required space.
8. Install the actuator cables (4) to the actuators and then to the external controller (5).
9. Take care to the connector position at actuators. Refer to 3 dots at connector for correct connection.



10. Install all electrical connections at external controller (5). See the “Operating instructions of external controller”
11. If the valve has a VAT heating device, connect it according to “Heater assembly and operating instructions”.

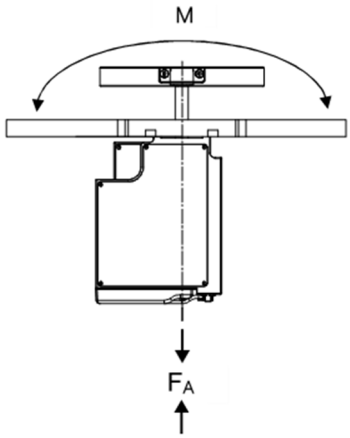
5.3 Admissible forces

NOTICE

Damage due to forces at valve!

The weight of other components can deform the valve and lead to malfunctions of the valve.

► Do not load the valve higher than specified.

Axial tensile or compressive force «FA»		Bending moment «M»		
N	Lb.	Nm	Lbf.	
4,000	880	160	120	

5.4 Tightening torque

The tightening torque plays a central role in ensuring the tightness of the vacuum system.

Note the user instructions for threaded inserts and make sure that the screws are not too long and are suitable for the tightening torque.

Lubricant under the screw head reduces the coefficient of friction between the screw head and the support surface. Additionally, the lubricant under the screw head can result in the screw head not completely resting on the support surface.

The tightening torque is dependent on the material, surface quality, surface treatment and lubrication. Excessively high tightening torques can damage the thread.

The specified tightening torques apply if the screw penetration depth corresponds to at least 1.5 times the diameter of the screw and the frictional resistance under the screw head is greater than 0.12. A coefficient of friction of less than 0.12 can damage the valve, because the pretensioning force would have to be increased and the tightening torques would thus exceed the values permitted for the screw. In this case, the tightening torque has to be adapted.

Tighten the screws in a cross-wise sequence to ensure a regular spacing and pressing force.

The coefficient of friction is below 0.12 for coated screws.

$$\mu_{total} = \frac{\mu_{screw\ thread\ helicoil} + \mu_{under\ screw\ head}}{2}$$

For milled threads, the screw length should be 1 mm / 0.03 in. shorter than the depth of the blind bore.

6 Operation

For operation, refer to the “Operating instructions external controller”.

7 Troubleshooting

For troubleshooting, refer to the “Operating instructions external controller”.

8 Maintenance

The maintenance intervals should be observed to ensure that the product works reliably throughout its lifetime. The type of application may make it necessary to shorten the maintenance intervals. In this case, the maintenance schedule must be adjusted accordingly.

In addition to the maintenance interval, the VAT Service Center also offers other services.

If you require further information about the maintenance intervals or services, contact VAT.

8.1 Maintenance schedule

For any deviating maintenance work or additional maintenance work that may be necessary, contact VAT. The VAT customer service will need the product serial number for this. See section Type label [▶ 13]

NOTICE

Non-original spare parts and consumable parts!

If you use non-original spare parts and consumable parts, you may damage the product.

► Only use original spare parts and consumable parts from VAT.

The frequency of the maintenance intervals depends on the process conditions.

Maintenance interval (not heated or not corrosive gaseous)	Maintenance section	Responsibility	Maintenance work
2,000,000 control cycles or 200,000 closing cycle	Gate seal	Customer	Clean or replace
2,000,000 control cycles or 200,000 closing cycle	Actuator	Customer	Clean or replace
2,500,000 cycles	Bellows	Customer	Clean and replace
2,500,000 cycles	Motion cable	VAT	Replace
2,000,000 control cycles or 200,000 closing cycle	Linear guide and screw spindle	VAT	Lubricate guide and spindle

8.2 Maintenance work

	NOTICE
	Scratches on sealing surfaces due to incorrect handling! Scratches on sealing surfaces cause leakage. ► Take care not to scratch the sealing surfaces when working.

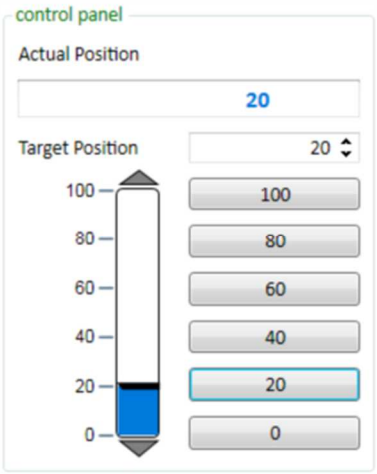
8.2.1 Start maintenance mode

For maintenance work, the valve must be set to maintenance mode via the Control Performance Analyzer (CPA) in the external controller.

1. Start the CPA software.
2. Set the valve to **Local** mode.



3. Set the **Target Position** to **20** (20% open).

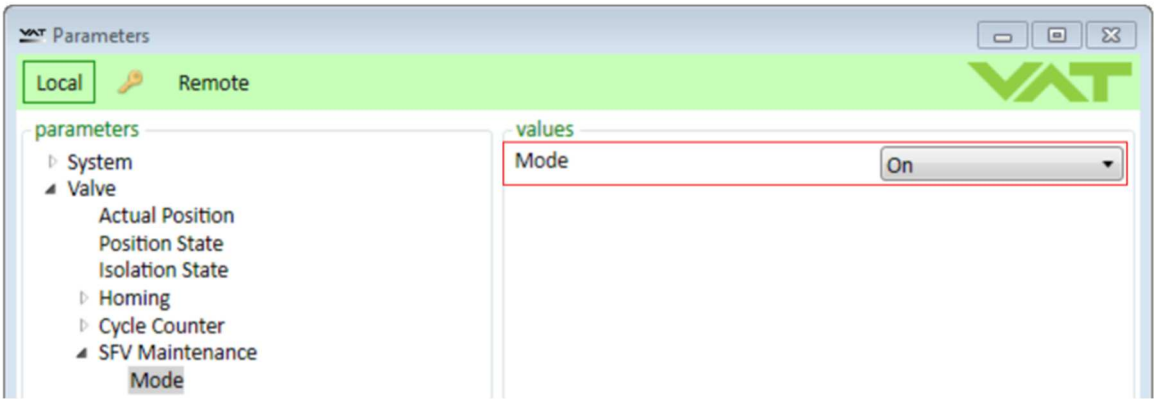


4. Disable the PFO:
   – Go to **Valve > Parameters > Power Fail Option > Enable.**
   – Select **False**.



5. Press the **Save** button or ENTER on keyboard.

6. If after removing the gate, the actuator must be replaced, enable the **SFV Maintenance Mode**:
   - Go to **Valve > Parameters > Valve > SFV Maintenance > Mode.**
   - Select **On**.



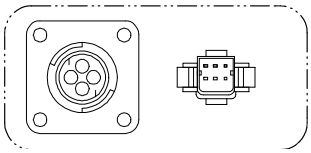
7. Press the **Save** button or ENTER on keyboard.

8.2.2 Removing gate

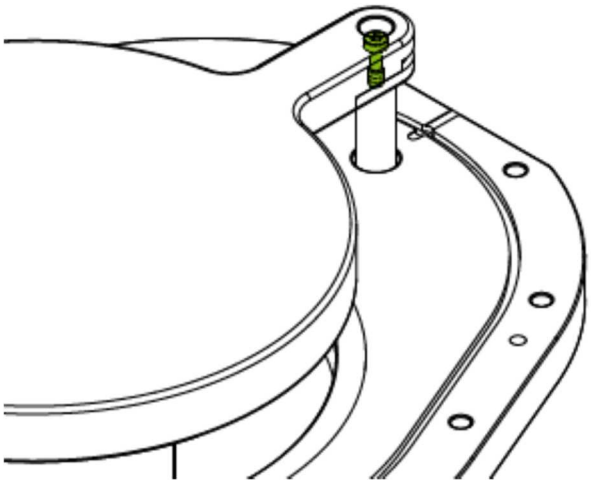
Required tools:

- Allen wrench 4 mm
- Allen wrench 5 mm
- Clean room gloves

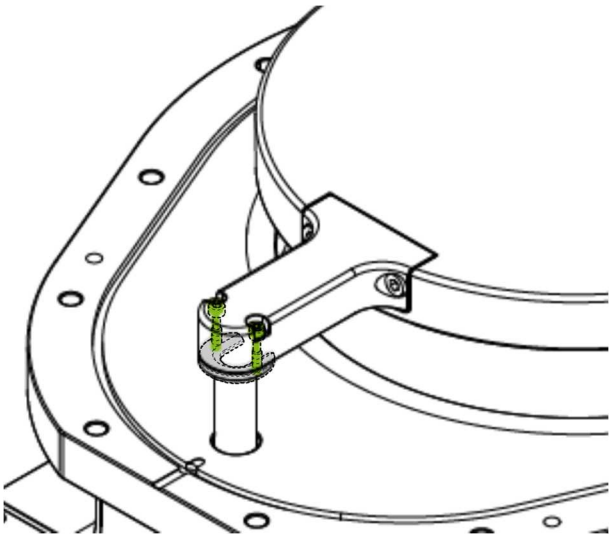
1. Switch off the power supply of the heating device on external controller.
2. Disconnect the heater cables.



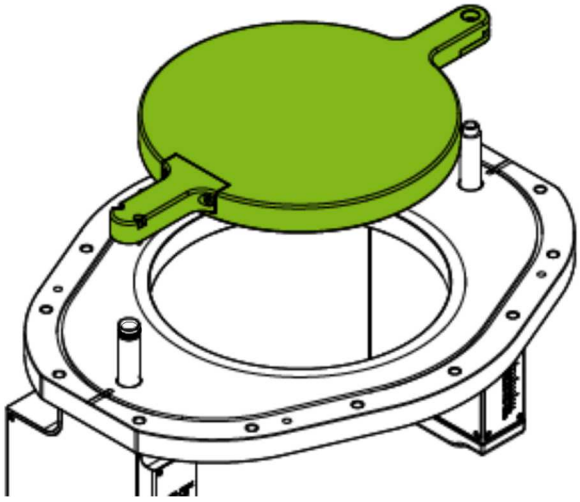
3. Open the service cover. See the manual of customized process chamber.
4. Loosen the screw on the right side of the gate with the 5 mm Allen wrench. Do not remove the screw.



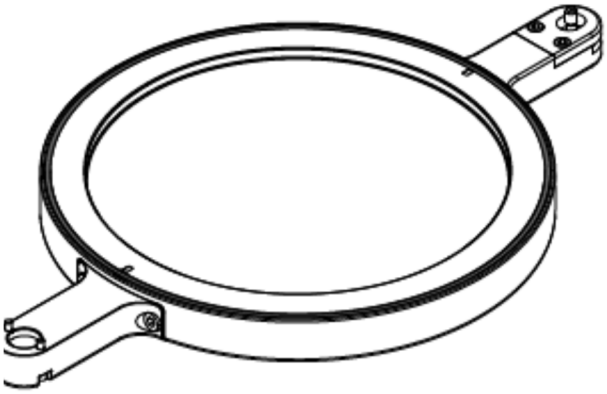
5. Loosen the screws on the left side of the gate with the 4 mm Allen wrench. Do not remove the screws.



6. Lift the gate carefully and remove it from the chamber. **NOTICE! Do not scratch the sealing surface and the valve surface.**



7. Place the gate with the seal side up on a clean surface.

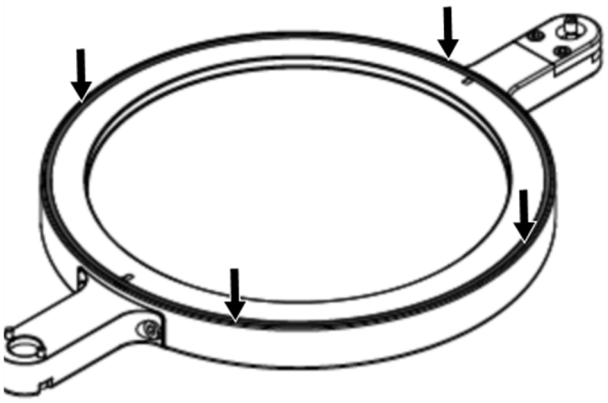


8.2.3 Changing gate seal

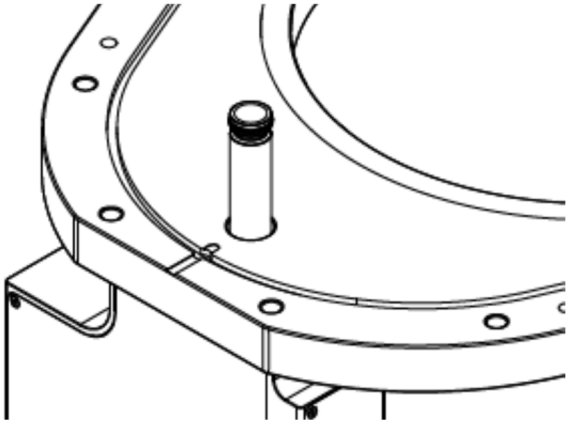
Required tools:

- O-ring removal tool
- Cleanroom wiper
- Isopropyl alcohol
- Clean room gloves

1. Remove the seal.
2. Clean the gate and the seal groove.
3. Install the new seal equally around 360° in the seal groove.



4. If necessary, replace the shaft seal.



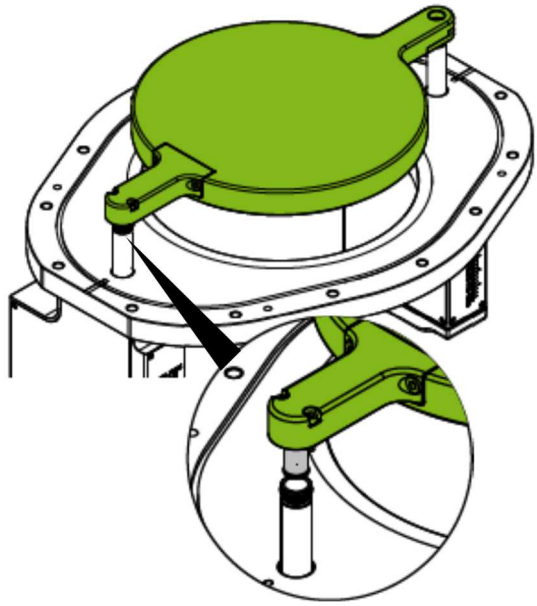
5. Clean the shaft and the seal groove.
6. Clean the internal valve.

8.2.4 Installing gate

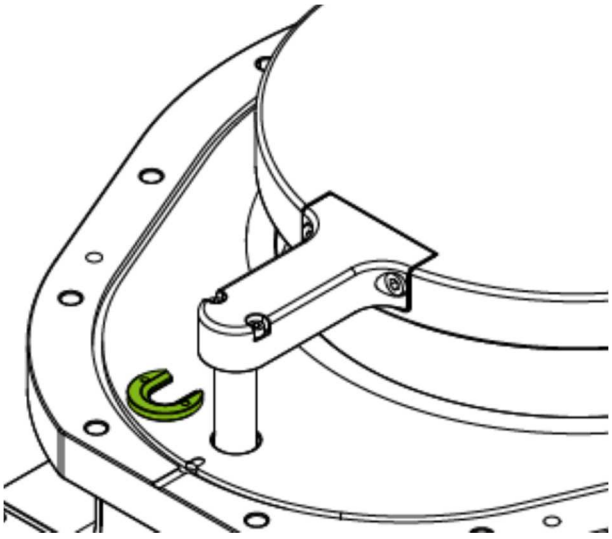
Required tools:

- Allen wrench 4 mm
- Allen wrench 5 mm
- Clean room gloves

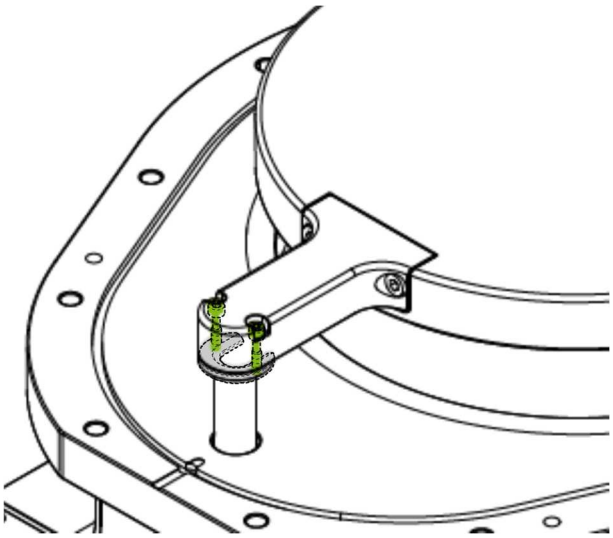
1. Install the gate carefully in the valve exact on both shafts until stop. Pay attention to the correct position of the heating connection.



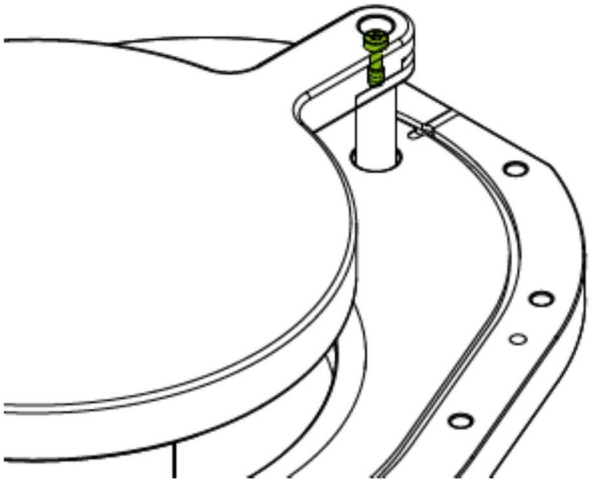
2. Insert the fixation disc until stop.



3. Fasten the screws on the left side of the gate with the 4 mm Allen wrench, tightening torque 5 Nm.



4. Fasten the screw on the right side of the gate with the 5 mm Allen wrench, tightening torque 8 Nm.



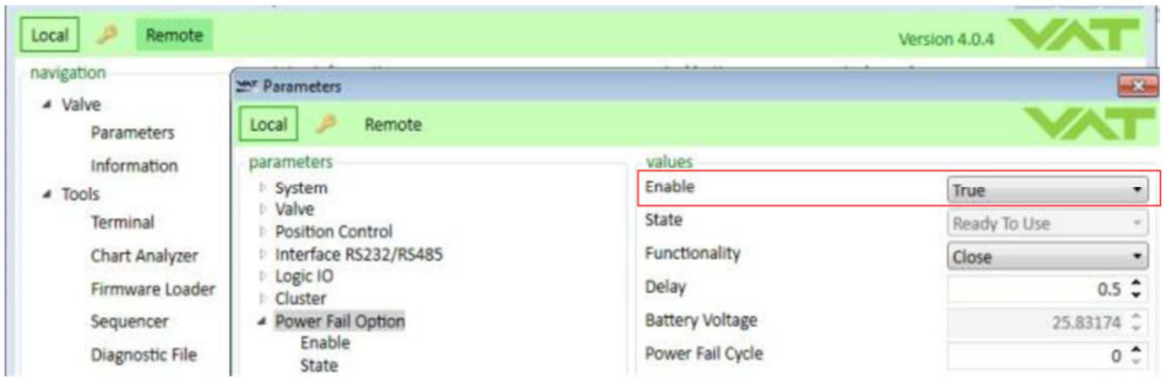
5. Switch on the power supply.

8.2.5 Exit maintenance mode

1. Set the valve in the CPA to **Local** mode.



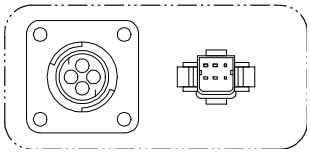
2. Enable the PFO:
   - Go to **Valve > Parameters > Power Fail Option > Enable**.
   - Select **True.**



3. Press the **Save** button or ENTER on keyboard.
4. Select **Close Valve**.



   ⇨ The valve is synchronizing and moves to close position.
5. Close the service cover. See the manual of customized process chamber.
6. Connect the heater cables.



7. Switch on the power supply of the heating device.

⇨ The valve is ready for use.

8.2.6 Replacing actuator

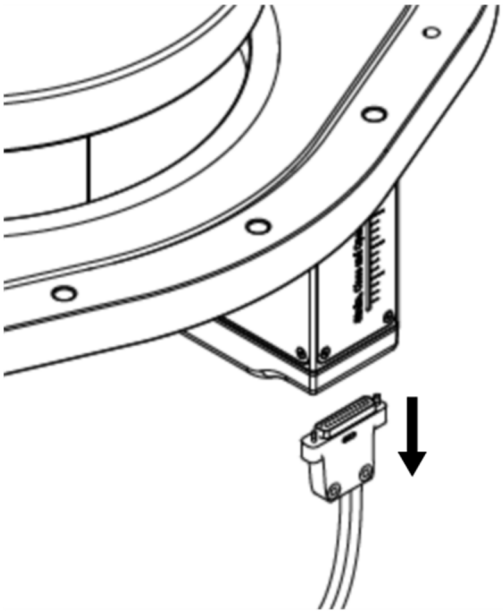
Required tools:

- Allen wrench 4 mm
- Allen torque wrench 4 mm
- Pozidriv screwdriver No. 1

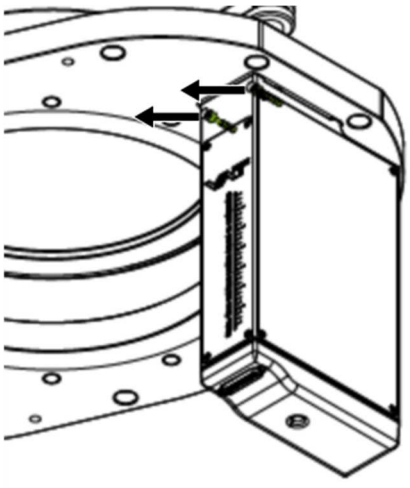
Preconditions:

✓ The gate is dismantled.

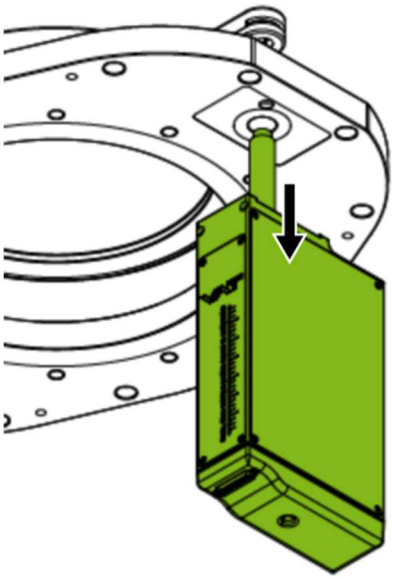
1. Disconnect the power cable from the actuator with the Pozidriv screwdriver No. 1.



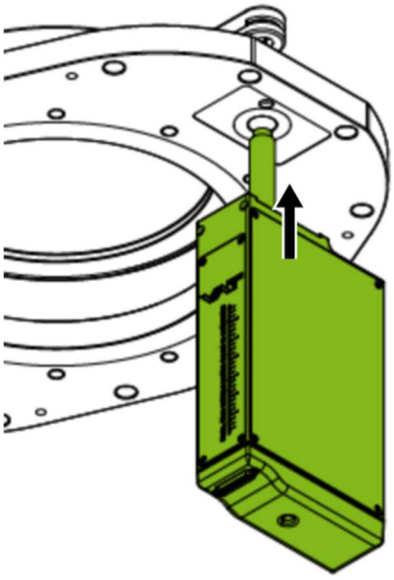
2. Loosen the screws of the actuator complete with the 4 mm Allen wrench. **NOTICE! Do not scratch the sealing surface of flange and actuator.**



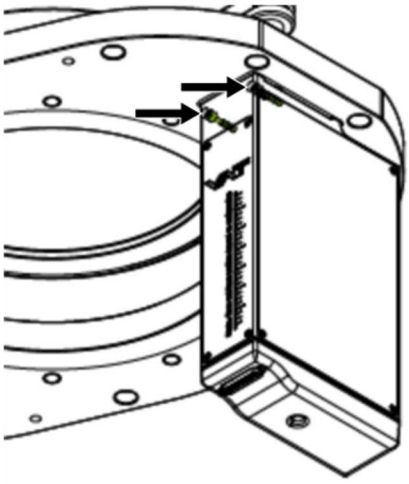
3. Remove the actuator. Ensure that the actuator do not drop down, use both hands.



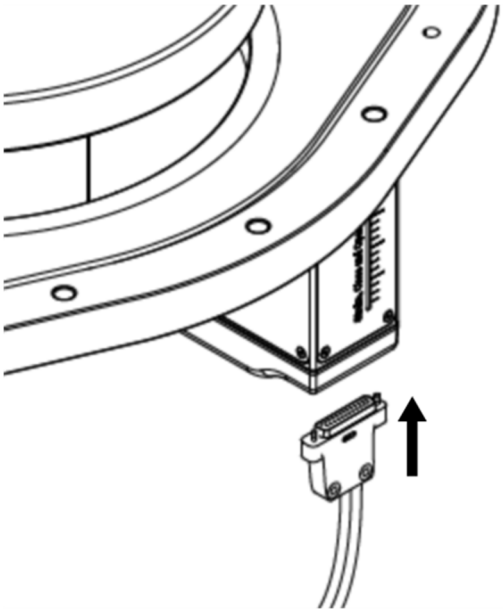
4. Insert the new actuator.



5. Fasten the actuator screws with the 4 mm Allen wrench, tightening torque 8 Nm.



6. Connect the power cable. Refer to 3 dots at connector for correct connection.



7. Switch on the power supply.

8.2.7 Executing homing

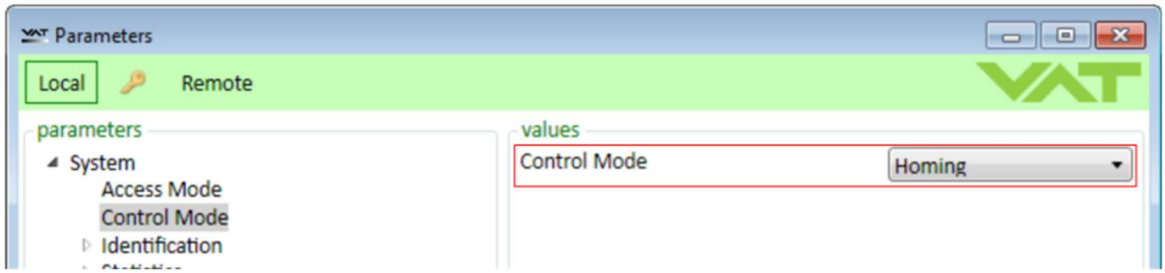
Preconditions:

✓ The gate is dismantled.

1. Set the valve in the CPA to **Local** mode.

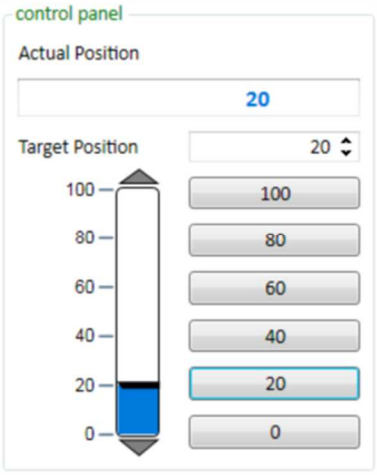


2. If the valve do not start the homing procedure automatically, initiate homing manually:
   – Go to **Valve > Parameters > System > Control Mode**.
   – Select **Homing**.

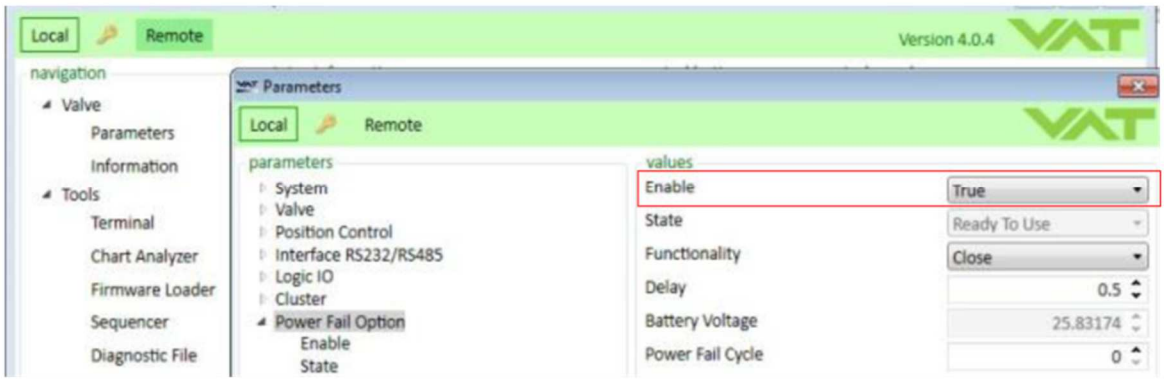


3. Press the **Save** button or ENTER on keyboard.
   ⇨ The homing procedure starts. If the **SFV Maintenance Mode** is enabled, the valve controller tolerates a position deviation at the homing procedure.
   ⇨ After homing, the **SFV Maintenance Mode** will be automatically disabled.

4. Set the **Target Position** to **20** (20% open).



5. Enable the PFO if it was disabled before removing the gate:
   - Go to **Valve > Parameters > Power Fail Option > Enable**
   - Select **True**.



6. Press the **Save** button or ENTER on keyboard.
7. Install the gate. See section Installing gate [▷ 26]
8. Restart the valve.



9. Execute a new homing so that the valve can find the reference position on the gate seal.

⇨ The valve is ready for use.

9 Repair and service

1. Have repairs carried out by VAT service personnel.
2. Only carry out repairs yourself if you have first consulted VAT.
3. Contact a VAT service center, see www.vatvalve.com.

9.1 Fixed Price Refurbishment

During the Fixed Price Refurbishment (FPR), the VAT customer service can refurbish the product or individual components for you. Consumable parts are replaced, and the guarantee on the replaced parts is extended.

1. Select the desired service from our comprehensive FPR service program for the refurbishment.
2. Contact your assigned sales person or the nearest VAT service center to learn about the options for the product in question. VAT Service Center.

10 Dismantling and storage

10.1 Removing valve



⚠ WARNING

Danger of burns from hot valve surface!

Serious burns on the skin.

► Let the system cool down before you perform work on it.



⚠ CAUTION

Risk of injury caused by heavy load!

Lifting heavy loads may lead to injury.

► Use suitable lifting equipment and the specified lifting points.



⚠ CAUTION

Danger of contusion because of Power Failure Option!

The Power Failure Option can close the valve gate if it has been configured accordingly.

► Do not reach into the area of movement of the valve gate.

► Look to see whether the valve gate is moving after the power supply was turned off.



⚠ CAUTION

Risk of injury due to unknown operating state!

If the operating state is unknown, the product behavior cannot be predicted.

► Disconnect all supply lines.

1. Disconnect the valve power supply.
2. Disconnect the interface from the valve.
3. Disconnect the connection to the pressure sensors.
4. Disconnect the grounding cable from the valve.
5. Disconnect the valve compressed air supply.
6. Remove the valve.

⇨ The valve is dismounted.

10.2 Storing valve

1. Clean and decontaminate the valve.
2. Cover all valve openings with a protective cap.
3. Pack the valve in the original packaging material.
4. Store the valve at the permitted environmental conditions, see Product Data Sheet.

11 Transport packaging and shipping



⚠ CAUTION

Risk of injury caused by heavy load!

Lifting heavy loads may lead to injury.

► Use suitable lifting equipment and the specified lifting points.

11.1 Packing and transporting valve

1. Close the valve.
2. Cover all valve openings with a protective cap.
3. Pack the valve in the original packaging material.
4. Transport the valve in the original packaging only.

11.2 Sending returns

The end user is responsible for decontaminating the products and may only send decontaminated products back to VAT. When products are sent back to VAT, the declaration regarding chemical contamination must be completed and sent to VAT beforehand.

If contaminated products are sent to VAT, VAT will perform a decontamination process at the cost of the customer. The party sending the products is responsible for ensuring that the valve is sent in appropriate packaging.

1. Download the declaration form regarding chemical contamination of vacuum valves and valve components from the following website: http://www.vatvalve.com.
2. Fill out the form and send it in advance to VAT or the relevant sales company.
3. If the product is radioactively contaminated, ask VAT for the following form: Notification of contamination and radiation.

If you have any questions regarding the issue of decontamination and shipping, consult your VAT service center or the relevant sales company.

12 Disposal



⚠ CAUTION

Risk of injury caused by heavy load!

Lifting heavy loads may lead to injury.

► Use suitable lifting equipment and the specified lifting points.

12.1 Disposing

The product and its components are made of various materials, which must be disposed of correctly.

1. Dispose of the product and its components in accordance with local regulations.
2. Hire an authorized contractor to dispose of your waste in the proper manner and in accordance with environmental requirements.

Find out more and connect to your local VAT contact on

WWW.VATVALVE.COM

VAT Vakuumventile AG
(Headquarters)
Seelistrasse 1
9469 Haag

