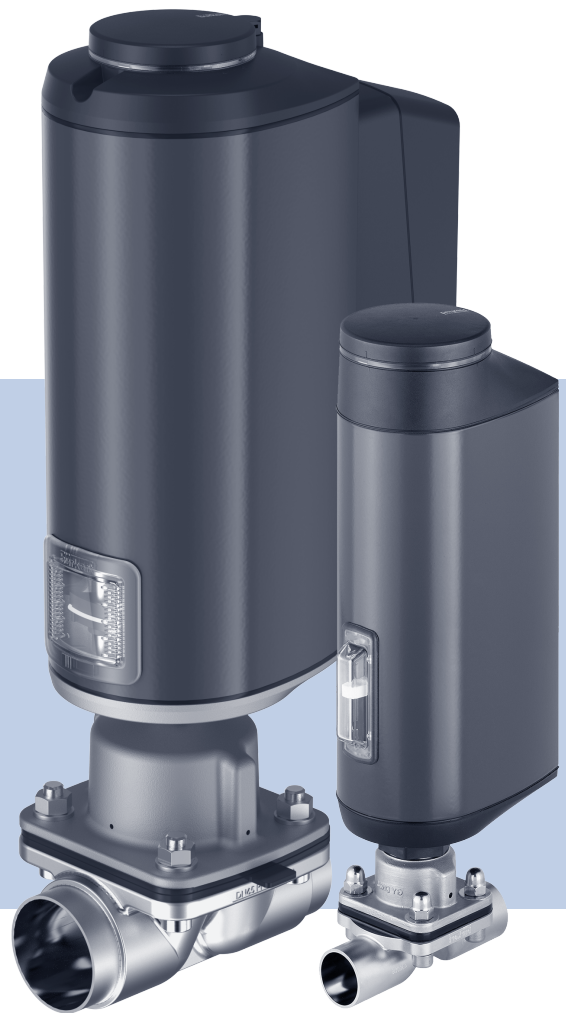


Type 3323, 3324, 3325 AE3363, AE33

Electromotive diaphragm valve



Operating instructions

We reserve the right to make technical changes without notice.
Technische Änderungen vorbehalten.
Sous réserve de modifications techniques.

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Operating Instructions 2309/04_EN-GB_00810538 / Original EN

Electromotive diaphragm valve

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1 OPERATING INSTRUCTIONS

The operating instructions describe the entire life cycle of the device. Keep these instructions in an easily accessible location for every user. The instructions must be available to each new owner of the device.

Important safety information.

Carefully read through the operating instructions. Study in particular the chapters entitled *Basic safety instructions* and *Intended use*.

- ▶ The operating instructions must be read and understood.

1.1 Symbols



DANGER!

Warns of an immediate danger.

- ▶ Failure to observe these instructions will result in death or serious injuries.



WARNING!

Warns of a potentially hazardous situation.

- ▶ Failure to observe these instructions may result in serious injuries or death.



CAUTION!

Warns of a potential danger.

- ▶ Failure to observe these instructions may result in moderate or minor injuries.

ATTENTION!

Warns of damage.

- Failure to observe the warning may result in damage to the device or the equipment.



Indicates important additional information, advice and recommendations.



refers to information in these operating instructions or in other documentation.

- ▶ Indicates an instruction to be carried out to avoid a danger, a warning or a possible risk.

→ Indicates a procedure to be carried out.



Indicates a result.



Symbol for software interface texts.

1.2 Definition of terms

- The term “device” used in these instructions applies to the Type 3323, 3324, 3325 and AE3363 electro-motive diaphragm valve.
- The abbreviation “Ex” used in these instructions stands for “potentially explosive”.
- The term “bÜS” (Bürkert system bus) used in this instruction stands for the communication bus developed by Bürkert and based on the CANopen protocol.
- AG2: Actuator size 2 with a nominal force of 2,500 N for diaphragm size 8-40
AG3: Actuator size 3 with a nominal force of 11500 N for diaphragm size 40-100
- In these instructions, the unit bar stands for relative pressure. The absolute pressure is stated separately in bar(abs).

2 INTENDED USE

Improper use of the Type 3323, 3324 and 3325 electromotive diaphragm valve may be dangerous to people, nearby equipment and the environment.

The type 3323, 3324 and 3325 electromotive diaphragm valve is designed to control the flow of liquid and gaseous media.

- ▶ Standard devices must not be used in the potentially explosive area. They do not possess the separate Ex type label denoting the approval for use in potentially explosive environments.
- ▶ The use of alkaline cleaning agents is not permitted for cleaning the surface of the device.
- ▶ If the position of the valve has a bearing on safety concerns in the event of a power failure: Only use devices that have a SAFEPOS energy-pack (optional energy storage system).
- ▶ To use the device, observe the permitted data, operating conditions and usage conditions. These specifications can be found in the contract documents, operating instructions and on the type label.
- ▶ Protect device from harmful environmental influences (e.g. radiation, air humidity, fumes, etc.)! For any matters requiring clarification, contact the relevant sales department.

Only use the device

- ▶ in conjunction with third-party devices and components recommended or approved by Bürkert.
- ▶ when in perfect condition, and always ensure proper storage, transportation, installation and operation.
- ▶ Use only as intended.

3 BASIC SAFETY INSTRUCTIONS

This safety information does not take into account any contingencies or occurrences that may arise during installation, use and maintenance of the device.

The operating company is responsible for the respect of the local safety regulations, including staff safety.



Risk of injury from high pressure.

- ▶ Switch off the pressure before working on the device or system. Vent or empty the lines.

Danger of burns and risk of fire.

Following an extended duty cycle or as a result of a hot medium, the surface of the device may become hot.

- ▶ Only touch the device when wearing protective gloves.
- ▶ Keep the device away from highly flammable substances and media.

Risk of crushing by mechanically powered parts.

- ▶ Installation work on the compressor, diaphragm and valve body must only be performed while electrically isolated.

For devices with SAFEPOS energy-pack: completely remove the SAFEPOS energy-pack. Wait until the LED ring is no longer lit and ensure that the LED status is not in **"LED off"** mode.

- ▶ Do not reach into the openings of the valve body.

Risk of uncontrolled process in the event of a power failure.

For devices without the optional SAFEPOS energy-pack, the valve will not stop in a defined position in the event of a power failure.

- ▶ If the valve position has a bearing on safety concerns in the event of a power failure: only use devices that have the SAFEPOS energy-pack (optional energy storage system).
- ▶ Select a valve position that is safe in respect of the process using the DIP switch.

Danger due to loud noises.

- ▶ Depending on the usage conditions, the device may generate loud noises. More detailed information on the likelihood of loud noises is available from the relevant sales department.
- ▶ Wear hearing protection when in the vicinity of the device.

Medium may leak out if the diaphragm is worn.

- ▶ Relief bore must be regularly inspected for any medium leakages.
- ▶ If medium is leaking from the relief bore, the diaphragm must be replaced.
- ▶ If the medium is hazardous, secure the area around the leakage to prevent risks.

General hazardous situations.

To prevent injury, ensure that:

- ▶ In potentially explosive atmosphere the device must only be used in accordance with the specifications on the separate type label.
- ▶ The additional information and safety instructions relating to potentially explosive atmospheres enclosed with the device or the separate operating instructions relating to potentially explosive atmospheres must be adhered to when deploying the device.

- ▶ In potentially explosive atmospheres, only use devices with a separate Ex type label.
- ▶ Only the media listed in Chapter “8 Technical data” should be fed into the medium ports.
- ▶ Do not make any internal or external changes to the device and do not subject it to mechanical stress.
- ▶ Secure the device to prevent unintentional operation.
- ▶ Note the system-specific safety regulations.
- ▶ Make sure only trained technicians carry out installation and maintenance work.
- ▶ Transport, install and dismantle a heavy device only with the aid of a second person and using suitable equipment.
- ▶ Following an interruption in the power supply, ensure that the process is restarted in a controlled manner.
Observe sequence:
 1. Connect supply voltage.
 2. Pressurise the device with medium.
- ▶ Observe the general rules of technology.
- ▶ Install the device according to the regulations applicable in the respective country.

ATTENTION!

Electrostatically sensitive components and assemblies.

The device contains electronic components that are susceptible to the effects of electrostatic discharging (ESD). Components that come into contact with electrostatically charged persons or objects are at risk. In the worst-case scenario, they will be destroyed immediately or will fail after start-up.

- Meet the requirements specified by EN 61340-5-1 to minimise or avoid the possibility of damage caused by sudden electrostatic discharge.
- Do not touch electronic components when the supply voltage is connected.

4 GENERAL NOTES

4.1 Contact address

Germany

Bürkert Fluid Control Systems
Sales Center
Christian-Bürkert-Str. 13-17
D-74653 Ingelfingen
Tel. + 49 (0) 7940 - 10-91 111
Fax + 49 (0) 7940 - 10-91 448
E-mail: info@burkert.com

International

The contact addresses can be found on the back pages of the printed operating instructions.

Also on the Internet at:

country.burkert.com

4.2 Warranty

A precondition for the warranty is that the device is used as intended in consideration of the specified operating conditions.

4.3 Information on the Internet

Operating instructions and data sheets for Types 3323, 3324 and 3325 can be found on the Internet at:

country.burkert.com

5 PRODUCT DESCRIPTION

5.1 General description

The type 3323, 3324, and 3325 electromotive diaphragm valve is suitable for controlling the flow of liquid and gaseous media. These can be neutral, ultra-pure, sterile as well as contaminated, aggressive or abrasive media of high to low viscosity.

The valve has an electromotive linear actuator with the actuating electronics assembly, which is actuated either via binary signals or (digitally) via a fieldbus. The electromotive linear actuator is set up such that it is optimally effective. At the same time, when idling without power, it also keeps the valve sealed even under the maximum specified operating medium pressure.

The device can also be equipped with the energy storage system (SAFEPOS energy-pack). In the event of a supply voltage failure, the energy storage system supplies the actuator with the energy required to move the valve to the desired position, which can be set in the menu.

The valve position can be manually changed in two ways.

1. Electrical manual override: used if supply voltage is present.
2. Mechanical manual override: must only be used if there is no supply voltage present.

The device can be operated with 2 capacitive buttons and 4 DIP switches. It is also always possible to set the device with the bÜS service interface and by using the PC software Bürkert Communicator. The USB bÜS interface set, available as an accessory, is required for configuration with Bürkert Communicator.

5.2 Properties

- Hermetic separation of the medium from the actuator by a diaphragm
- Any flow direction.
- Self-draining with appropriate installation. The ends of the connections used must be cylindrical.
- Minimum dead space.
- High flow rate values and low turbulence flow due to the valve body that aids in flow.
- Easy and quick replacement of the diaphragm. PTFE/EDPM diaphragms can be replaced by EPDM diaphragms.
- Mechanical position indicator shows the valve position even in the event of a supply voltage failure.
- 360° LED light ring for displaying device states, valve end positions and operating state.
- No electrical energy is required to hold the valve position even under maximum operating medium pressure, except for basic consumption for the control unit.
- Valve actuator can rotate 360°.
- Integrated control unit.
- Contact-free, high-resolution and wear-free position sensor.
- The actuator housing consists of a robust and heat-dissipating aluminium body. The coating is resistant to common detergents. The plastics used for the actuator housing are also detergent-resistant.

5.3 Variants

The following body variants are described in these instructions:

- Type 3323: 2-way valve body
- Type 3324: T-valve body
- Type 3325: Tank bottom body

5.4 Options

- Energy storage system (SAFEPOS energy-pack) for reaching safety position.
The safety position that the valve is supposed to take in the event of a supply voltage failure is specified with the DIP switch.
- SIM card for saving and transmitting device-specific values and settings.

6 STRUCTURE AND FUNCTION

The electromotive diaphragm valve of Types 3323, 3324 and 3325 consists of an electromotively driven linear actuator, diaphragm and a diaphragm valve body.

The control electronics and “SAFEPOS energy-pack” are housed in the side of the linear actuator.

The control electronics assembly consists of the microprocessor-controlled electronic mechanism and the position sensor.

Actuation occurs via binary signals (analogue) or fieldbus (digital).

The electromotive valve is designed with the three-wire technique. Operation is performed with 2 buttons and 4 DIP switches.

The electromotive linear actuator consists of a brushless direct current motor, a gear and a threaded spindle. The valve spindle connected to the threaded spindle transfers the force to the compressor and the diaphragm.

The linear actuator does not use any electrical energy when holding the valve position. This means that, when idling, only the control electronics require energy.

Port connections:

Welded connection, threaded socket connection, flange connection, clamp connection or bond connection (connection sizes on request).

6.1 Structure of the electromotive diaphragm valve

6.1.1 2-way valve

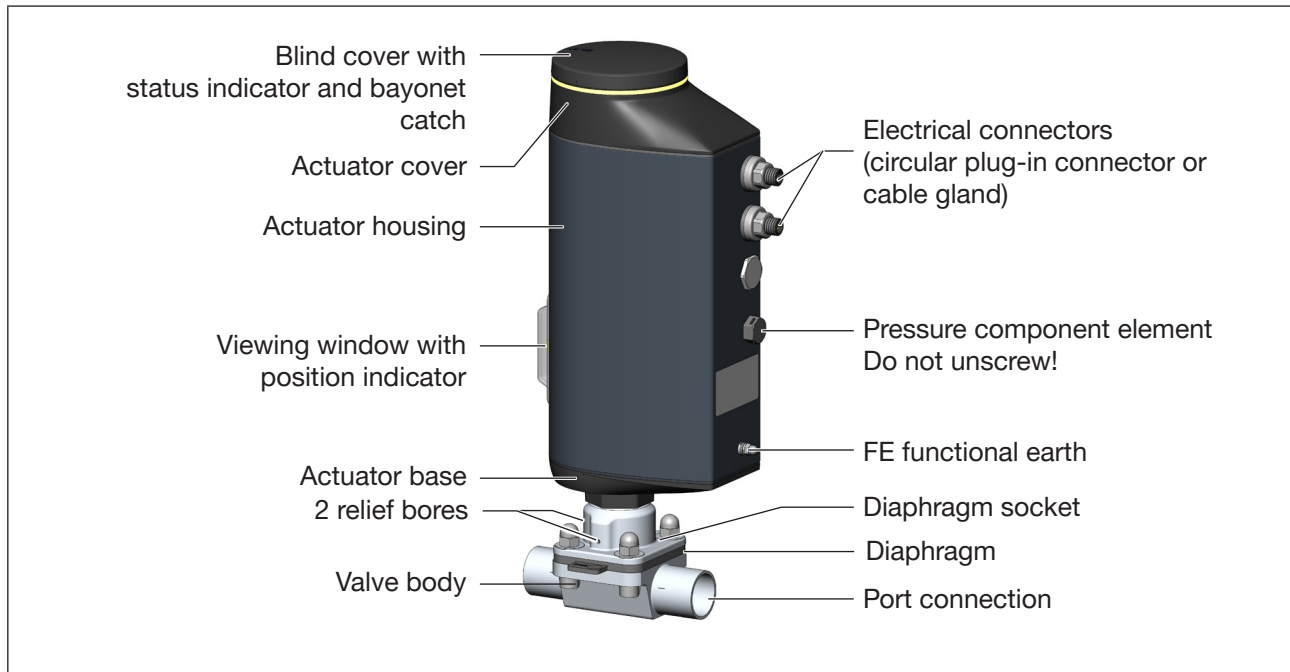


Fig. 1: Structure, electromotive diaphragm valve with 2-way valve body, type 3323 AG2

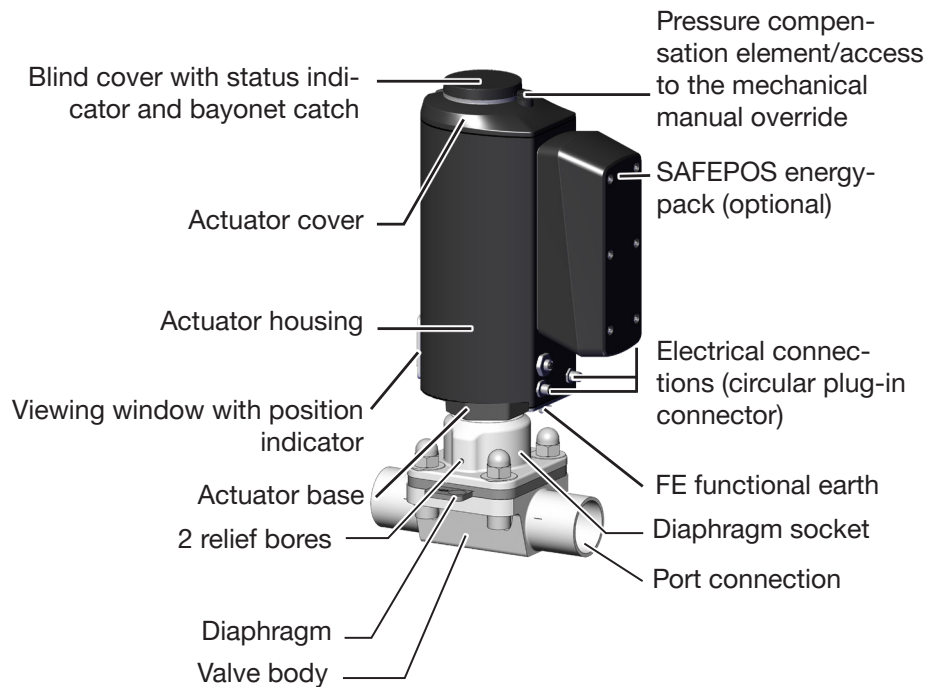


Fig. 2: Structure, electromotive diaphragm valve Type 2 AG3

6.1.2 T-valve body

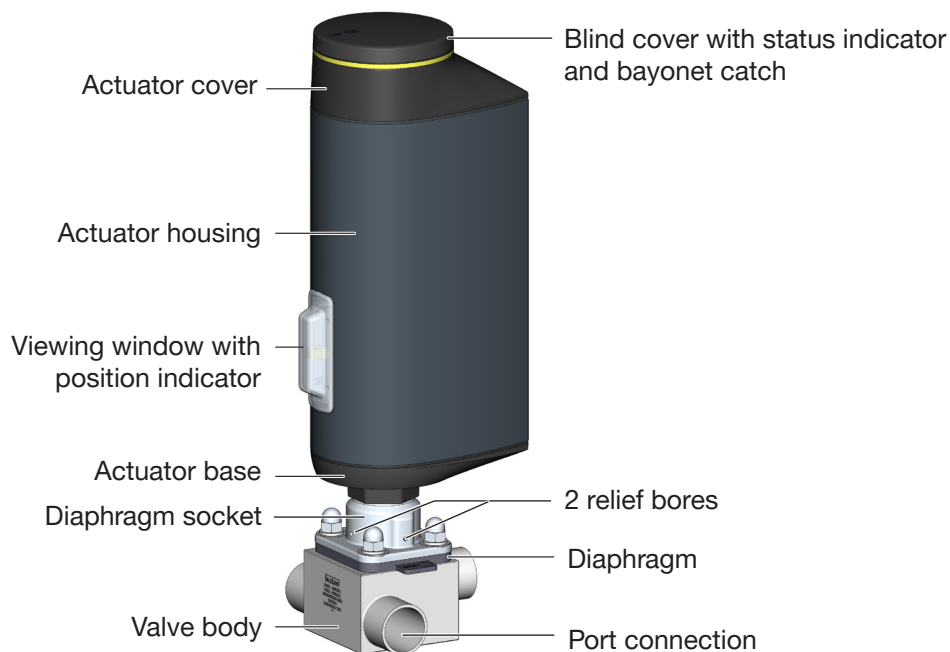


Fig. 3: Structure, electromotive diaphragm valve with T-valve body, type 3324

6.1.3 Tank bottom valve

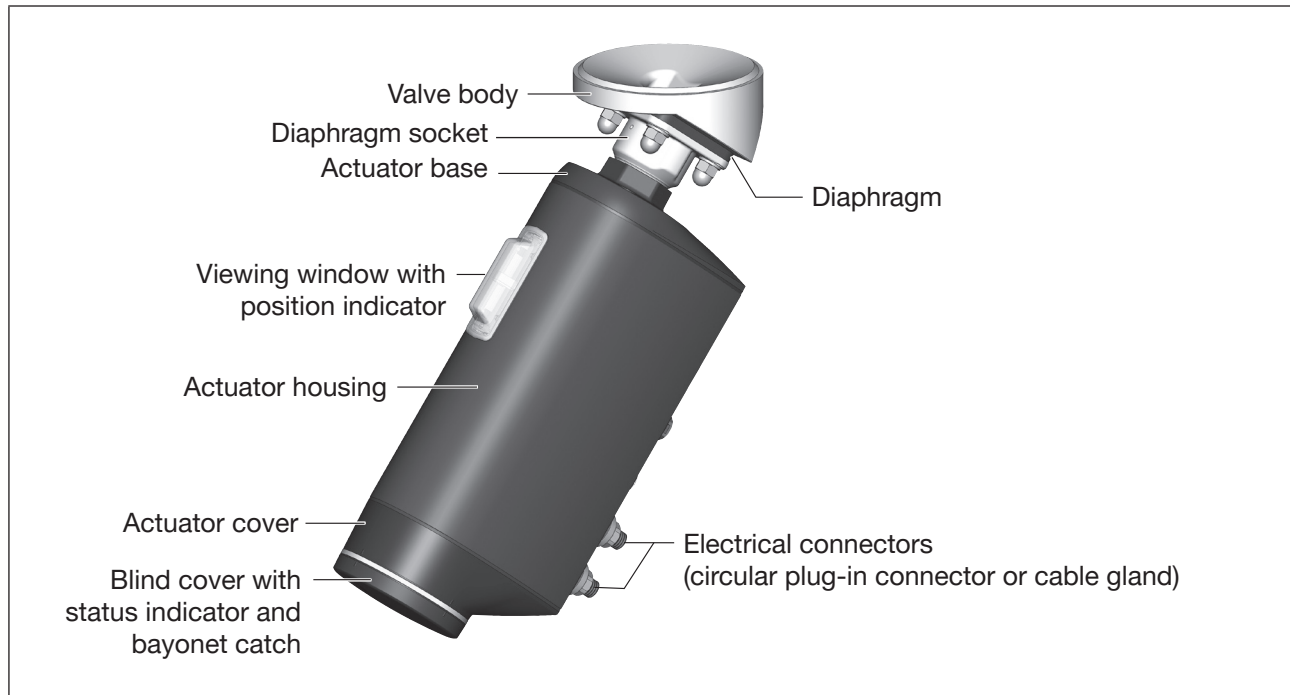


Fig. 4: Structure, electromotive diaphragm valve with tank body bottom, Type 3325

6.2 Valve position after supply voltage failure

Valve position for devices without the SAFEPOS energy-pack:

If the electromotive actuator idles upon a supply voltage failure, the valve remains in the last position that it was in.

If the supply voltage fails while the actuator is changing the valve position, the valve remains in an undefined position. The flywheel mass of the actuator and the operating medium pressure continue to influence the valve spindle until it finally idles.

Valve position for devices with the SAFEPOS energy-pack:

The valve adopts the safety position defined by the DIP switch position.



For a description of the SAFEPOS energy-pack, see chapter [“7.2”](#) on page 22

6.3 Safety position

The DIP switch defines the safety position that the valve assumes in the following scenarios:

- Internal error
- Supply voltage failure (optional)
This function is only available for devices that have the optional SAFEPOS energy-pack accessory.

The following safety positions are available for selection for SAFEPOS:

- Close = valve closed
- Open = Valve opened
- Inactive = valve remains in an undefined position in the event of a supply voltage failure.

6.4 Display of the device status

The device status is displayed on the LED light ring. Various LED modes may be configured to display the device's status and valve position:

- Valve mode
- Valve mode + warnings (factory pre-set)
- NAMUR operation mode



* The description for setting the LED mode can be found in chapter .

6.4.1 Valve mode

The valve position and device status "Failure" are displayed in the valve mode.



Notifications on device statuses "Out of specification", "Maintenance required" and "Function check" are not displayed in the valve mode.

The factory-set colours for displaying the valve positions "open" and "closed" can be switched. For a description, see chapter "14.4" on page 83.

Displays in valve mode:

For device status "Normal": Continuously lit in the colour of the valve position.

For device status "Failure": Alternating flashing between red and the valve position colour.

Valve position	Colour for valve position	Colour for device status "Failure"
open	yellow	red
in between	white	
closed	green	

Tab. 1: Display of device status in valve mode

6.4.2 Valve mode + warnings

In this operation mode, the valve position and device statuses "Failure", "Out of specification", "Maintenance required" and "Function check" are displayed.

If several device statuses exist simultaneously, the device status with the highest priority is displayed. The priority is based on the severity of the deviation from standard operation (red = failure = highest priority).

Displays in valve mode + warnings:

For device status "Normal": Continuously lit in the colour of the valve position.

For device statuses that deviate from "Normal": flashes alternately with the colours for the valve position and the device status.

Valve position	Colour for valve position	Colour for device status			
		Failure	Out of specification	Maintenance required	Function check
open	yellow	red	yellow	blue	orange
in between	white				
closed	green				

Tab. 2: Display of device status in valve mode + warnings

6.4.3 NAMUR operation mode

In NAMUR mode the LED light ring lights up in the colour specified for the device status as per NAMUR NE 107.

If several device statuses exist simultaneously, the device status with the highest priority is displayed. The priority is based on the severity of the deviation from standard operation (red = failure = highest priority).

Indicators in NAMUR operation mode:

Status indicator in line with NE 107, issue 2006-06-12			
Colour	Colour code	Description	Meaning
red	5	Failure, error or fault	Due to a malfunction in the device or its peripherals, closed-loop control mode is not possible.
orange	4	Function check	Work is being carried out on the device, which means that closed-loop control mode is temporarily not possible.
yellow	3	Out of specification	The environment conditions or process conditions for the device are not within the specified range. Internal device diagnostics indicate problems within the device or with the process properties.
blue	2	Maintenance required	The device is in closed-loop control mode, but function will soon be restricted. → Do the required maintenance operation.
green	1	Diagnostics active	Device is in error-free operation. Status changes are highlighted in colour. Messages are sent via any fieldbus that may be connected.
white	0	Diagnostics inactive	Device is switched on. Status changes are not displayed. Messages are not transferred via a fieldbus that may be connected.

Tab. 3: Indication of the device status in NAMUR operation mode



*A detailed fault description can be found in chapter „21 Fehlerbehebung“ auf Seite „21 Troubleshooting“ on page 113

6.4.4 Flashing of the LED light ring

Quick flashing of the LED light ring indicates that it a connection with the PC software Bürkert Communicator has been established.

6.4.5 Notifications on device status

Notifications on device statuses and errors are entered into the logbook. Chapter [“20 Maintenance”](#) contains the most common notifications and the measures that they require.

Notifications on device status “Function check”

The notifications are presented when operation is interrupted by work on the device.

Notifications on device status “Function check”
Manual operation active
M.Q0.TUNE active
M.SERVICE active
M.CLEAN active
Signal generator active

Tab. 4: Notifications on device status “Function check”

6.5 Factory settings



Operating state:

Devices in their factory default state have their operating state preset to MANUAL.

The pre-set factory settings can be found in chapter [“16 Operating structure and factory setting”](#).

The factory settings are depicted in blue in the operating structure to the right of the menu.

7 CONTROL ELECTRONICS

7.1 Function

The actuator (stroke) position is controlled by the digital input. The position is specified either by an external signal (analogue) or via a fieldbus (digital).

The position sensor records the current position of the electrical linear actuator and from this creates an end position signal via the digital outputs.

Technical characteristics:

- **Position sensor**
contact-free, high-resolution and wear-free.
- **Microprocessor-controlled electronics assembly**
for signal processing, control and motor control.
- **Electrical interfaces**
Circular plug-in connector or cable gland

7.1.1 Interfaces

AG2 variant

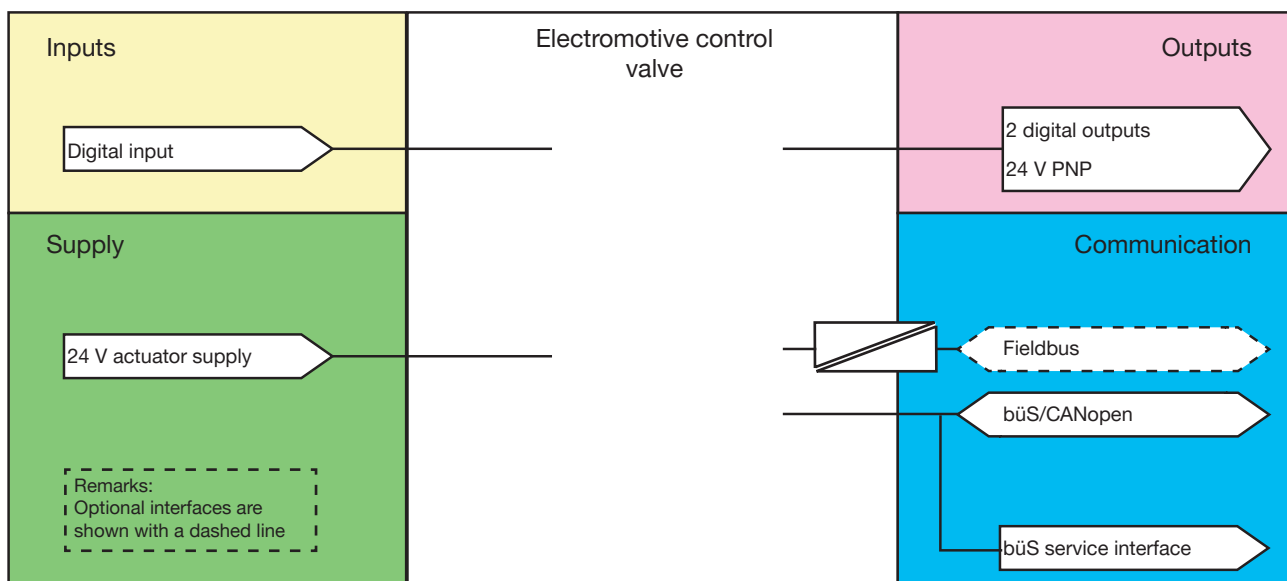


Fig. 5: Overview of galvanic isolations AG2

AG3 Variant

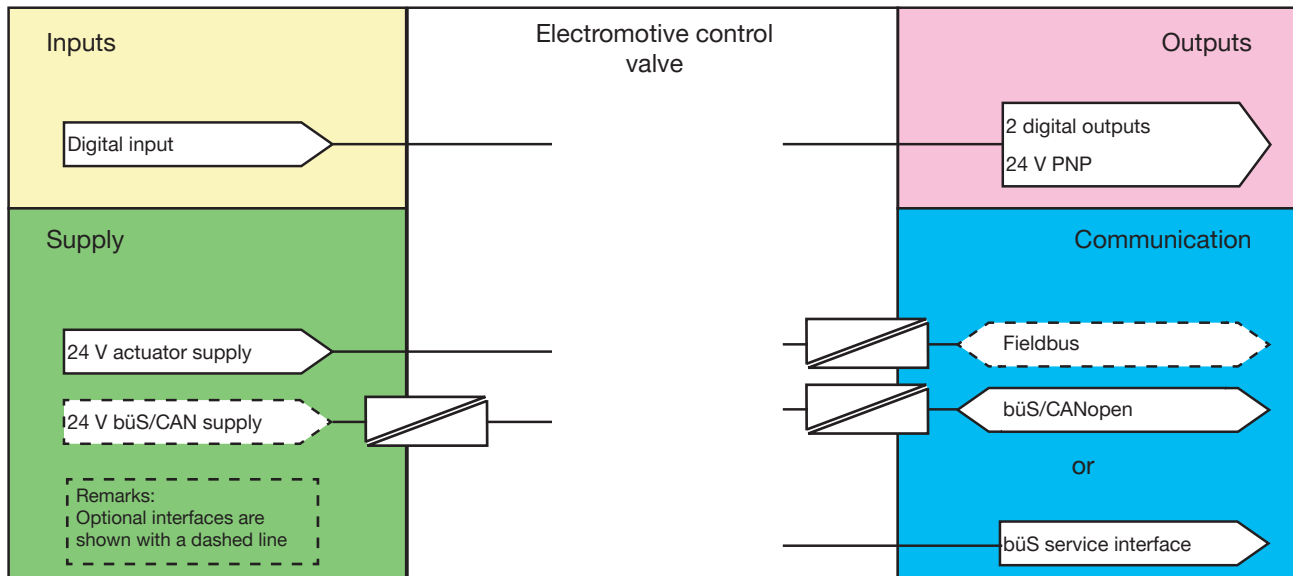


Fig. 6: Overview of galvanic isolations AG3



The electromotive valve is designed with the three-wire technique, i.e. the electrical supply (24 V \equiv) is separate from the position signal of the digital input.

7.1.2 Functional diagram

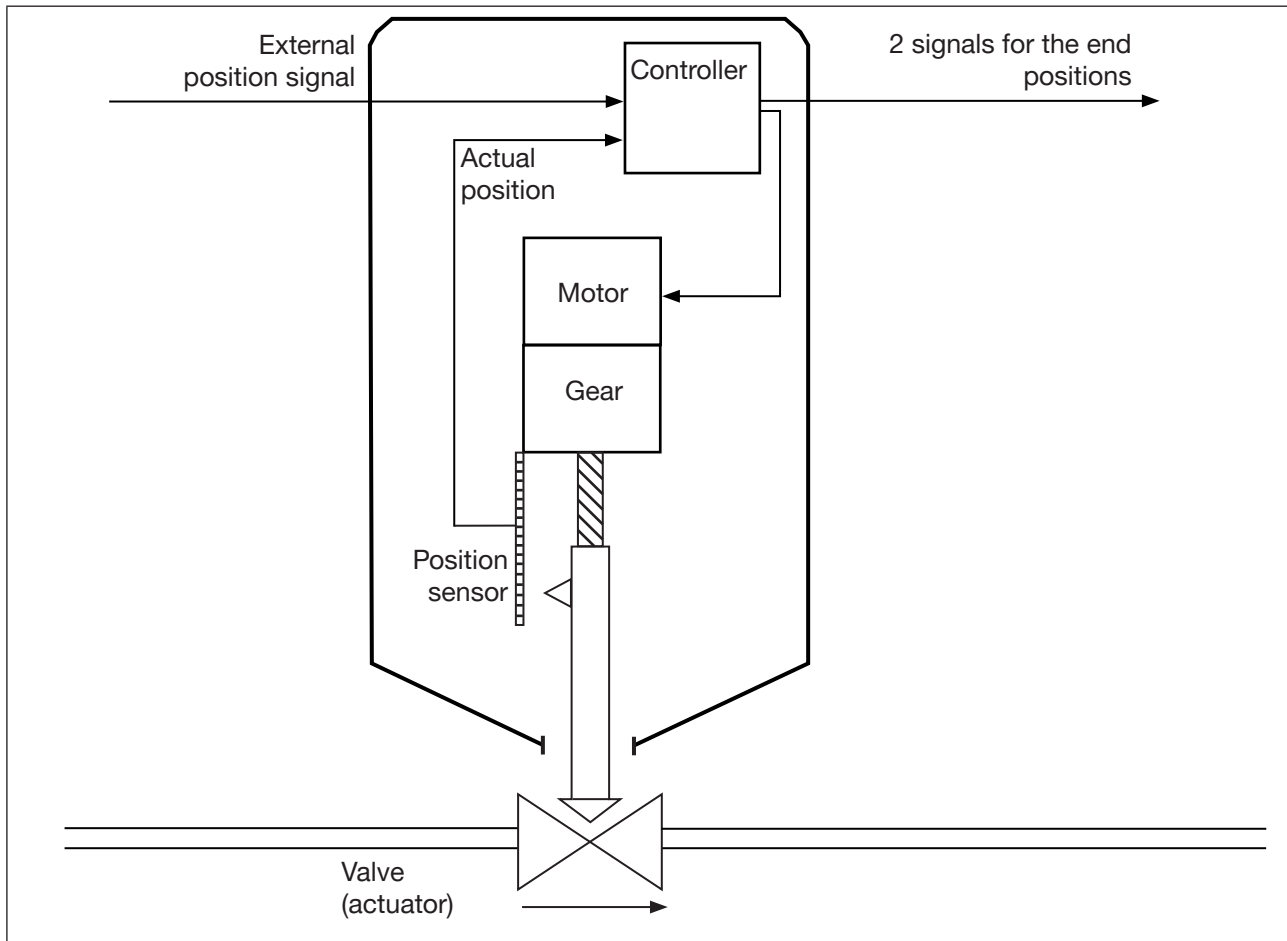


Fig. 7: Functional diagram

7.2 Energy storage SAFEPOS energy-pack (option)

The device can also be equipped with the energy storage system (SAFEPOS energy-pack). In the event of a supply voltage failure, the energy storage system supplies the actuator with the energy required to move the valve to the safety position.

The safety position is set using the DIP switch.

After a maximum of 120 seconds (depending on operating conditions), the energy storage is fully charged and ready for operation.

7.2.1 Service life

Service life: up to 15 years (depending on operating conditions).

The service life of 5 years was calculated based on the following conditions:

Ambient temperature	30 °C (AG2) / 65 °C (AG3)
Medium temperature	165 °C
Duty cycle	100%
Medium pressure	5 bar
Nominal diameter	DN32 (AG2) / DN65 (AG3)

ATTENTION!

The energy storage system SAFEPOS energy-pack is a wearing part. The service life figures are approximate values that cannot be guaranteed.

7.2.2 Notifications on the state of the SAFEPOS energy-pack

The device issues a warning:

the energy storage system capacity is greatly reduced. The energy storage system must be replaced soon.

 SAFEPOS energy-pack must be promptly replaced before the end of its service life.

The device issues an error alert and assumes the safety position:

The SAFEPOS energy-pack was not promptly replaced before issuance of the warning. The storage capacity is so low that assumption of the safety position can no longer be guaranteed.

7.2.3 Replace SAFEPOS energy-pack (AG2)**CAUTION!**

Risk of injury from electrical voltage.

- ▶ Turn off the supply voltage before removing the SAFEPOS energy-pack.
- ▶ Ensure that the SAFEPOS energy-pack is fully discharged. Wait until the LED ring is no longer lit and ensure that the LED status is not in **LED off** mode (see chapter [“14.3 Set LED operation mode”](#)).

The SAFEPOS energy-pack is located in the actuator housing. Remove the following parts from the actuator for replacement:



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

1. Blind cover
2. LED and storage module
3. Actuator cover

The process for removing these parts is described in detail in chapter [“10.3.1 Access to connection terminals”](#) on page 59.

Removing SAFEPOS energy-pack:

- Loosen the safety screw (hexalobular-internal screw T10).
- Completely pull the SAFEPOS energy-pack out from the clamp.

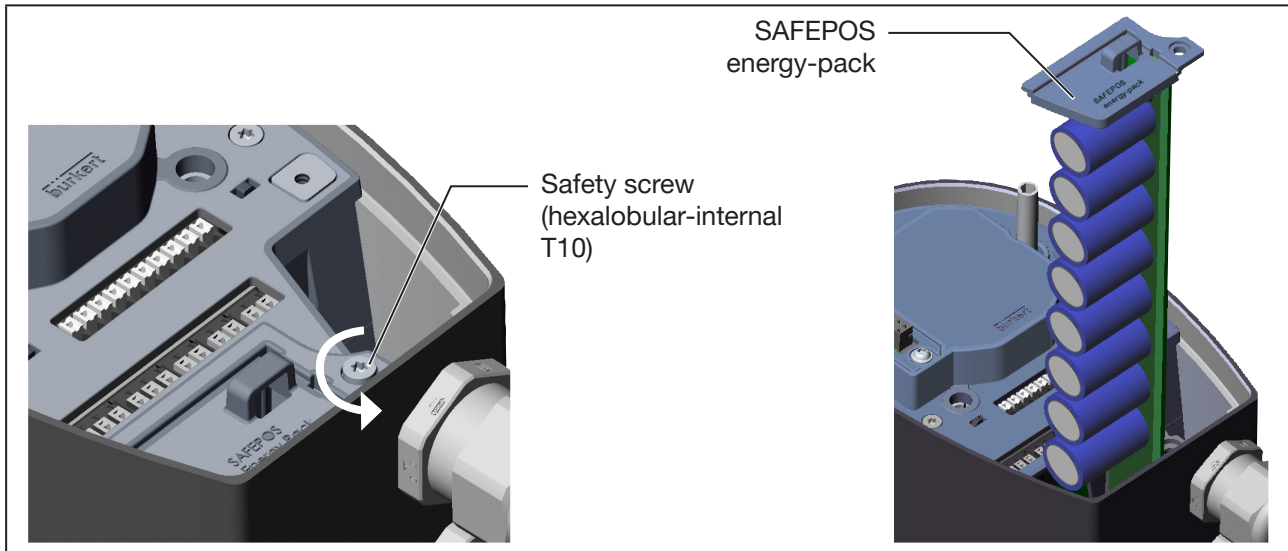


Fig. 8: Removing SAFEPOS energy-pack

Inserting new SAFEPOS energy-pack:

- Remove the SAFEPOS energy-pack from the transport packaging.
- Insert the SAFEPOS energy-pack into the two guide grooves on the side and push it in until it stops.

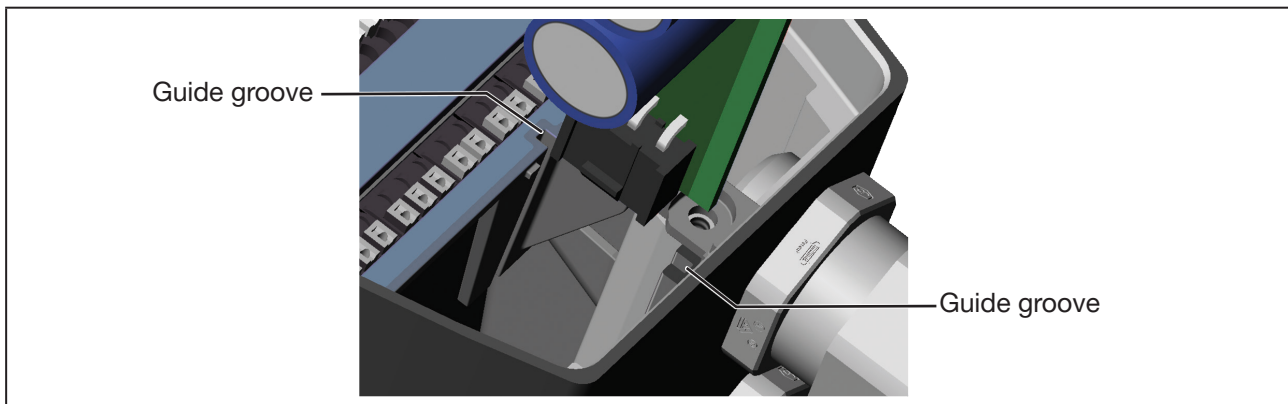


Fig. 9: Inserting SAFEPOS energy-pack

- Apply the safety screw (hexalobular-internal screw T10).
- Connect supply voltage.

7.2.4 Replace SAFEPOS energy-pack (AG3)

CAUTION!

Risk of injury from electrical voltage.

- ▶ Turn off the supply voltage before removing the SAFEPOS energy-pack.
- ▶ Ensure that the SAFEPOS energy-pack is fully discharged. Wait until the LED ring is no longer lit and ensure that the LED status is not in **LED off** mode (see chapter “14.3 Set LED operation mode”).

The SAFEPOS energy-pack is located on the actuator housing. Remove the following parts from the actuator for replacement:

Remove SAFEPOS energy-pack cover:

- Remove 6 fastening screws (hexalobular-internal screws T25).
- Remove the cover.

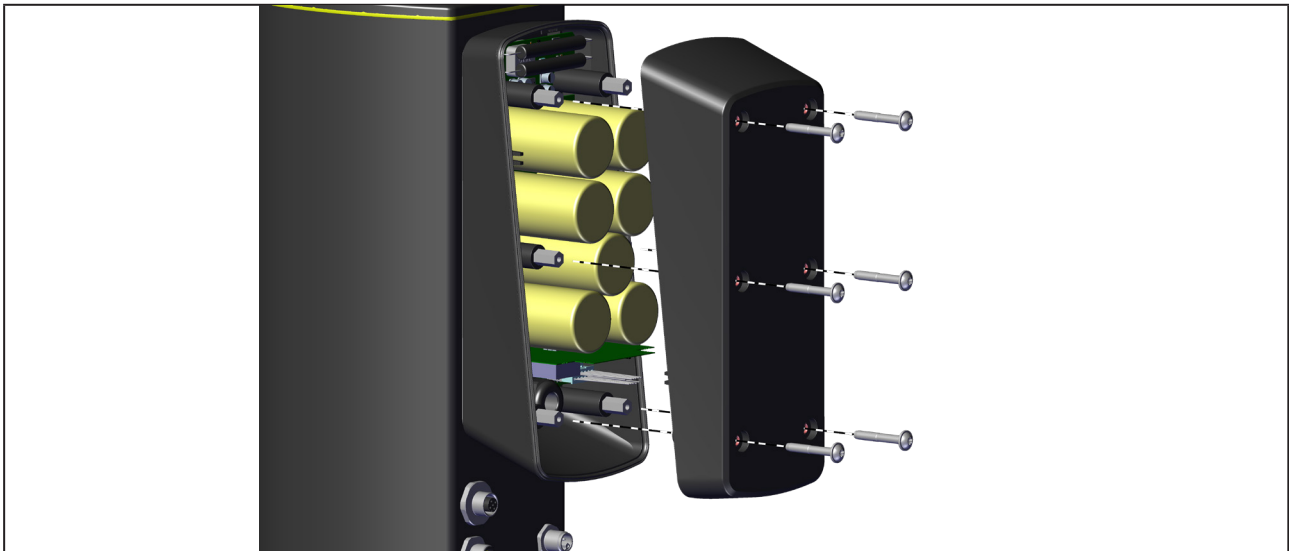


Fig. 10: Take off SAFEPOS energy-pack cover

Removing SAFEPOS energy-pack:



CAUTION!

Risk of injury from electrical voltage.

- ▶ Ensure that the red LED to display the residual voltage has gone out before the components are touched.

→ Remove printed circuit board

→ Remove adapter cable.

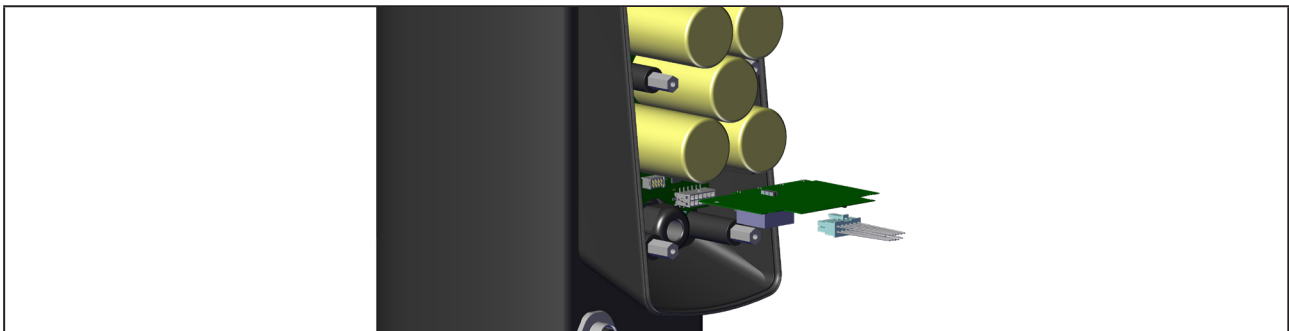


Fig. 11: Remove printed circuit board and adapter cable

→ Loosen 4 cheese head screws (socket head screw AF3).

→ Remove the SAFEPOS energy-pack.



Fig. 12: Loosen screws on the printed circuit board/remove SAFEPOS energy-pack

Inserting new SAFEPOS energy-pack:

→ Remove the SAFEPOS energy-pack from the transport packaging.

→ Installation in reverse order.



Tighten 4 cheese head screws (socket head screw AF3) to 1.1 Nm tightening torque.

Tighten 6 fastening screws (T25 hexalobular-internal screws) to 3 Nm tightening torque.

8 TECHNICAL DATA



The following product-specific information is provided on the type label:

- Voltage [V] (tolerance $\pm 10\%$) and current type
- Diaphragm material and valve body material
- Fieldbus standard
- Flow capacity
- Diaphragm size
- Actuator size
- Port connection
- Maximum permitted medium pressure

8.1 Standards and directives

The device complies with the valid EU harmonisation legislation. In addition, the device also complies with the requirements of the laws of the United Kingdom.

The harmonised standards that have been applied for the conformity assessment procedure are listed in the current version of the EU Declaration of Conformity/UK Declaration of Conformity.

8.2 Approvals

The product is cULus approved. Refer to chapter [“8.8 Electrical data”](#) on page 33 for information on use in UL environments.

8.3 Type label

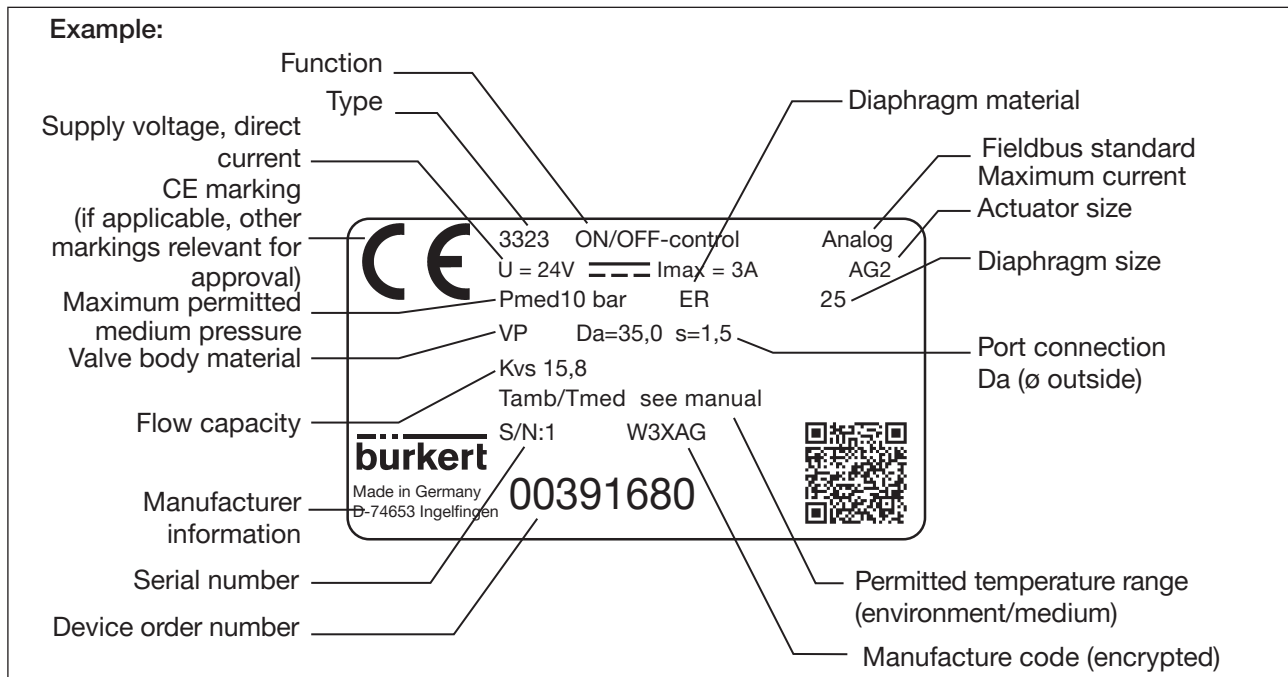


Fig. 13: Description of the type label (example)

8.3.1 UL additional label (example)

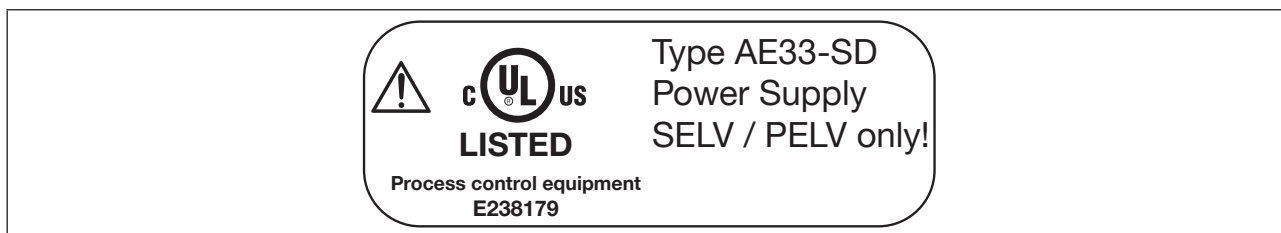


Fig. 14: UL additional label (example)

8.4 Labelling of forged steel valve body

Labelling may vary depending on variant.

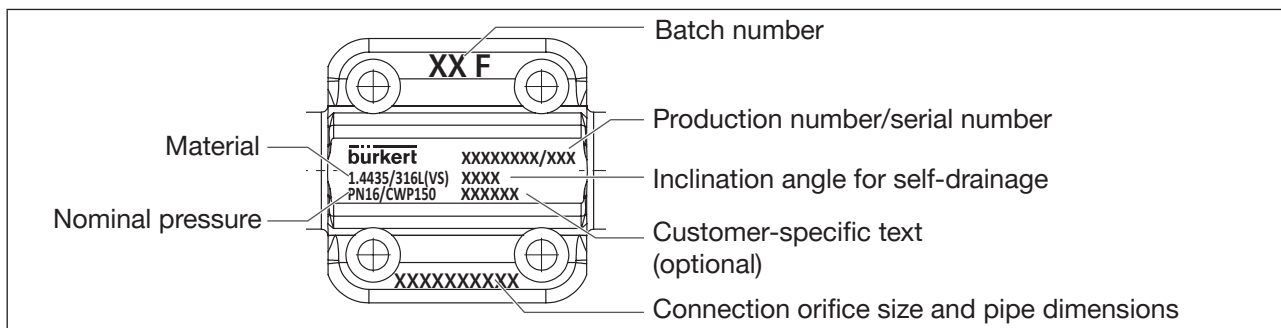


Fig. 15: Labelling of valve body from forged steel (example)

8.5 Labelling of tube valve body (VP)

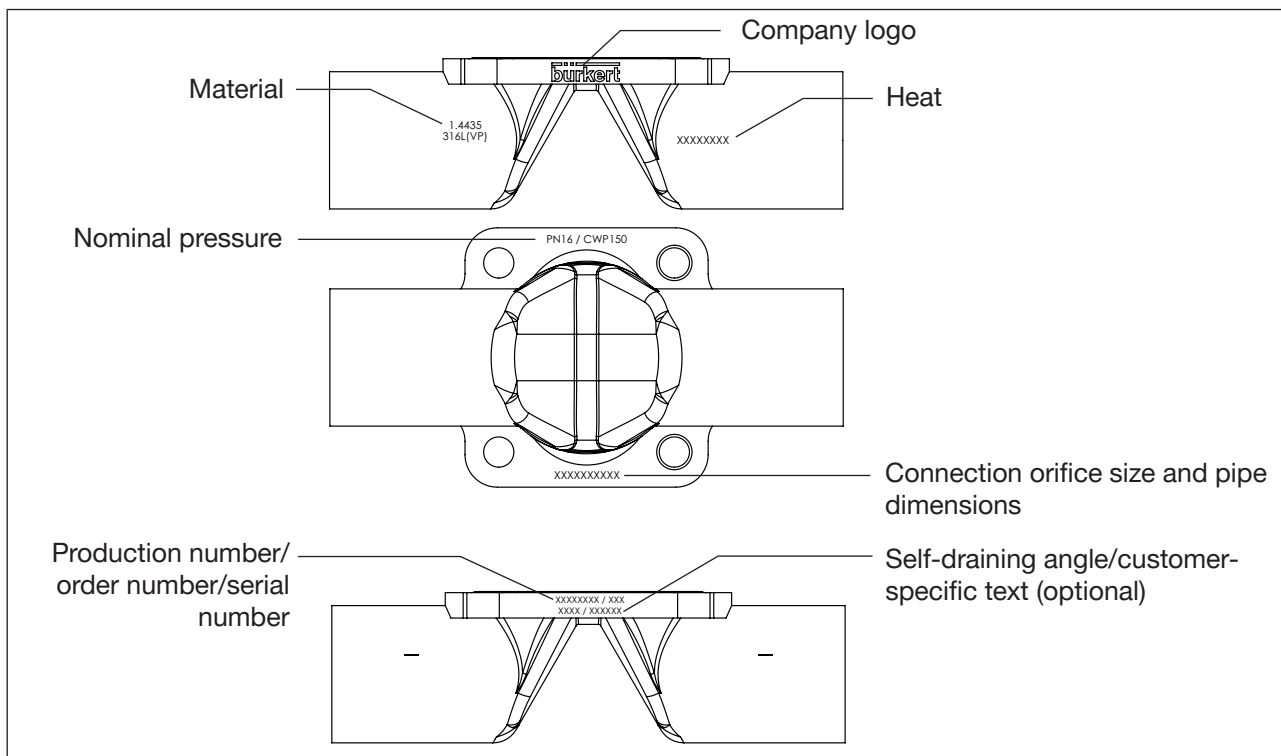


Fig. 16: Labelling of tube valve body (VP)

8.6 Operating conditions



The product-specific information on the type label must be heeded when operating the device.



WARNING!

Functional failure when exceeding or falling below the permissible temperature range.

- ▶ Never expose the device to direct sunlight in outdoor areas.
- ▶ The permissible ambient temperature range must not be exceeded or undercut.

Reduced sealing function if medium pressure too high.

Because the diaphragm valve is closed against the medium flow, an excessive medium pressure may cause the valve to not close tightly.

- ▶ The medium pressure must not exceed the maximum value specified on the type label.

Danger from leakage of hot medium

The diaphragm does not provide permanent protection against hot medium.

- ▶ Do not use the diaphragm valves for steam shut-off.

Maximum permitted medium pressure: see type label,
depending on usage limits of the armature
(Derating operating pressure)

Process medium: neutral, high-purity, sterile, contaminated, aggressive or abrasive media of high to very high viscosity.

Degree of protection: (checked by Bürkert/not assessed by UL)
IP65 and 67 according to IEC 529, EN 60529
NEMA 250 4x (not guaranteed if installation position: actuator at bottom)

Operating altitude: up to 2000 m above seal level

8.6.1 Permitted temperature ranges



The permitted temperature ranges for the medium and surrounding environment are dependent on various factors:

- **Medium temperature:** Dependent on valve body material and diaphragm material.
See tables in chapter [“8.6.2 Permitted medium temperature”](#)
- **Ambient temperature:** Dependent on medium temperature.
See [“Fig. 18: Temperature diagram AG2”](#).

All factors must be taken into consideration when calculating permitted temperatures.

Minimum temperatures Environment: -10 °C
Medium: Heed dependencies on ambient temperature and medium temperature. See chapter [“8.6.2 Permitted medium temperature”](#)

Maximum temperatures Heed dependencies on ambient temperature and medium temperature. See chapter [“8.6.3” on page 31](#)

8.6.2 Permitted medium temperature

ATTENTION!

Depending on the medium temperature the behaviour of the medium temperature in relation to the diaphragm material may change.

- ▶ The specified medium temperatures only apply to medium that do not attack the diaphragm materials or cause it to swell up.
- ▶ The functional properties and service life of the diaphragm may be diminished if the medium temperature is too high or too low.

Permitted medium temperature for diaphragm material

Diaphragm material	Temperature range	Steam sterilisation
PTFE/EPDM (EA)	-10...+130 °C	+140 °C/60 min.
EPDM (AD), advanced PTFE/EPDM (EU)	-5...+143 °C	+150 °C/60 min.
GYLON/EPDM lami- nated (ER)	-5...+130 °C	+140 °C/60 min.
FKM (FF)	0...+130 °C	Not suitable for steam/ dry heat up to +150 °C/60 min.

Tab. 5: Permitted medium temperature dependent on diaphragm material

Permitted medium temperature for metal valve body

Valve body material	Temperature range
Stainless steel block material	-10...+150 °C
Cast valve body	
Forged steel valve body	
Tube valve body	

Tab. 6: Medium temperature for metal valve body

Permitted medium temperature for plastic valve body

The permitted medium temperature for plastic valve bodies is dependent on the medium pressure. See pressure diagram "Fig. 17".

Valve body material	Permissible temperature range (depends on medium pressure)
PVC, see pressure diagram	-10...+60 °C
PVDF, see pressure diagram	-10...+120 °C
PP, see pressure diagram	-10...+80 °C

Tab. 7: Medium temperature for plastic valve body

Diagram for nominal diameter values (DN) 15 to 40:

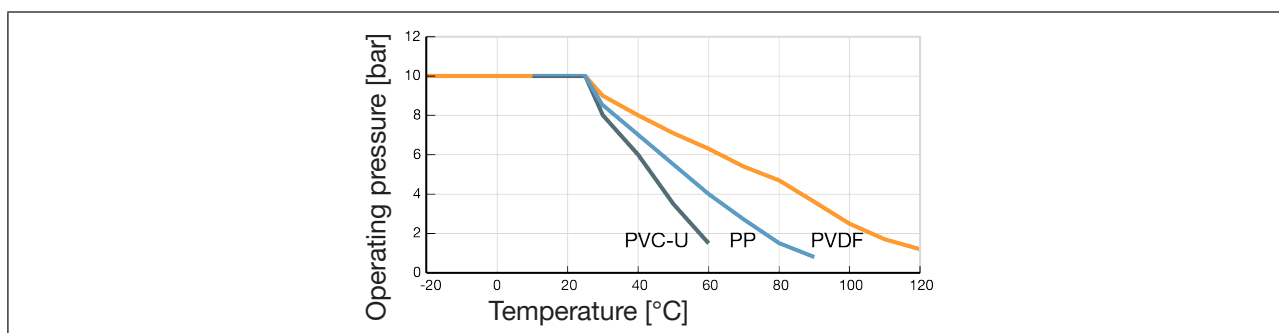


Fig. 17: Diagram: dependent on medium temperature and medium pressure for plastic valve body

8.6.3 Temperature diagram for medium and environment

The maximum permitted temperature for the environment and medium are dependent on one another. The permitted maximum temperatures of the device variants can be determined using the characteristics of the temperature diagram.

The values are calculated under the following maximum operating conditions: diaphragm size 25 at 100% duty cycle with 10 bar medium pressure.

Individual reviews may be performed under different operating conditions. For this, please contact your Bürkert branch office.

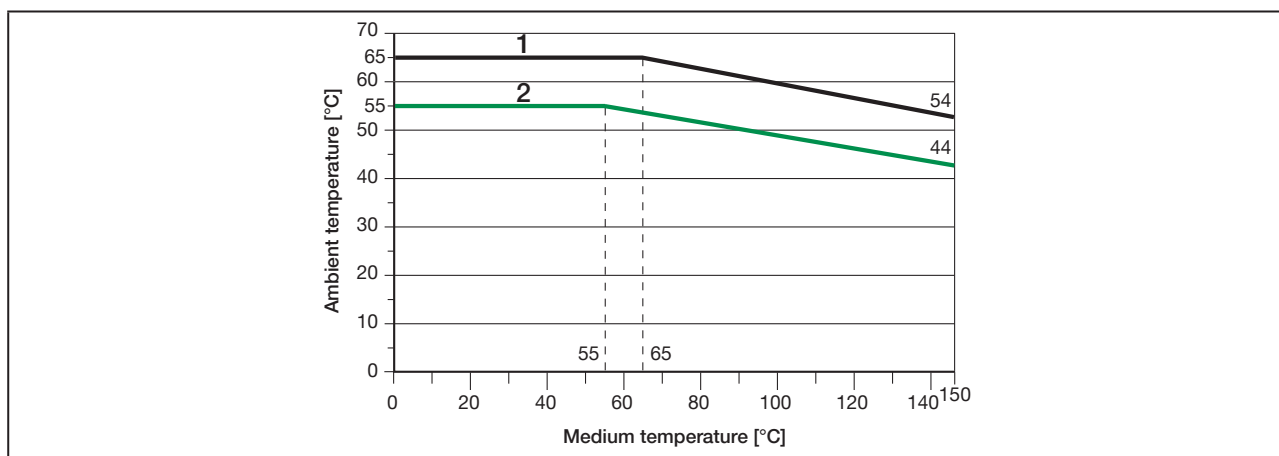


Fig. 18: Temperature diagram AG2

No.	Description
1	Device without module
2	Devices with SAFEPOS energy-pack* or with fieldbus gateway
* The service life of the SAFEPOS energy-pack is dependent on the medium temperature and ambient temperature (see chapter "Electrical data").	

Tab. 8: Description of temperature diagram AG2

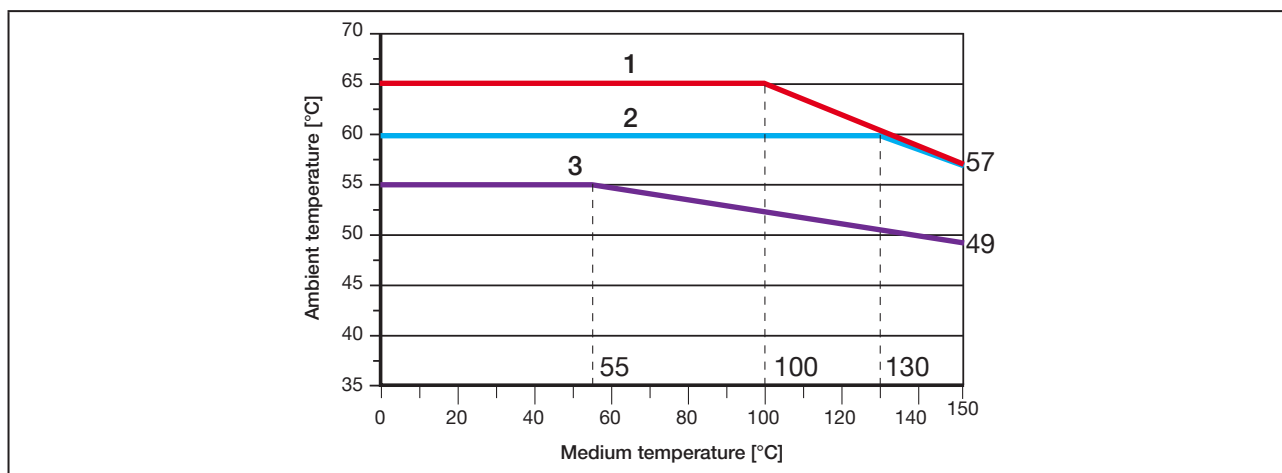


Fig. 19: Temperature diagram AG3

Item	Description
1	Device without module
2	Devices with SAFEPOS energy-pack*
3	Devices with fieldbus gateway
* The service life of the SAFEPOS energy-pack is dependent on the medium temperature and ambient temperature (see chapter "Electrical data").	

Tab. 9: Description of temperature diagram AG3

8.7 General technical data

Dimensions:	see data sheet		
Weight:	see data sheet		
Materials:	Actuator base:	PPS (AG2) / 1.4308 (AG3)	
	Actuator housing:	Aluminium EN AW 6063 powder-coated	
	Inspection view:	PC	
	Actuator cover:	PPS (AG2) / PC (AG3)	
	Valve body	Metal: Investment cast (VG), forged steel (VS), tube valve body (VP), plastic: PP, PVC and PVDF	
	Body connection:	CF-8 / 1.4308 / 1.4470	
	Spindle seal:	FKM	
	Seal material:	Actuator housing sealing element	EPDM
		valve seat seal: see type label	
	Diaphragm:	EPDM, PTFE or FKM (see type label)	
Fluid connection	Possible connection types:		
	Welded connection as per:	DIN EN ISO 1127 / ISO 4200 / DIN11866 B	
		DIN 11850 2 / DIN 11866 A	
		ASME BPE / DIN 11866 C	
		BS4825	
		SMS 3008	
		DIN 11850 0"	

Clamp connection as per: DIN 32676 B (ISO 4200)
 DIN 32676 A (DIN 11850 2)
 ASME BPE

Flange connection, threaded socket connection and bond connection
 (connection sizes on request).

Electrical connection: with connection terminal (only AG2) or circular plugs

Installation position: depends on body variant. See Chapter [“9.2 Installation position of the diaphragm valves”](#).

Noise level: <70 dB (A), may be higher depending on the usage conditions.

KvS value: see type label

8.8 Electrical data



WARNING!

Electrical shock.

Protection class III is only guaranteed when using an SELV or PELV power supply unit.

Protection class: 3 according to DIN EN 61140 (VDE 0140)

Electrical connections: Cable gland, 2 x M20 (only AG2) or
 2 circular plug-in connectors M12, 5-pin and 8-pin

ATTENTION!

Consider voltage drop on power supply cable.

Example: with a cable cross-section of 0.34 mm², a copper cable may be a maximum of 8 metres long.

Operating voltage: 24 V \pm 10% max. residual ripple 10%

Operating current [A]*:

	Typical (without charging current SAFEPOS energy-pack)	Maximum (for layout of power supply unit)
AG2	2 A	3 A
AG3	3.5A	5 A

Standby consumption (electronics assembly without actuator) [W]*:
 1...5 (depending on the level of disassembly)

* All values relate to a supply voltage of 24 V \pm 10% at an ambient and medium temperature of 25 °C.

Caution: At minimum ambient and medium temperature, the operating current can be up to 5 A (AG2) or 11 A (AG3) (incl. 1 A charging current of the optional SAFEPOS energy-pack).



The operating current can be reduced by the following measures, if necessary

1. For devices with the SAFEPOS energy-pack:

Setting the "Control if ready", reduces the max. operating current by 1 A.

Setting in the configuration area Positioner → **Parameter** → **ENERGY-PACK** → **FUNCTION** → **Control if ready.**

2. Reducing the control speed X.TIME.

Activate setting in configuration area Positioner → **Parameter** → **ADD.FUNCTION** → **X.TIME** → **X.TIME** → **Opening time** → **Closing time.**

Service life of energy storage system

SAFEPOS energy-pack Charging time: maximum 120 seconds (dependent on usage conditions).

Service life: up to 15 years (depending on usage conditions).

The service life of 5 years was calculated based on the following conditions:

ambient temperature 30 °C (AG2)/60 °C (AG3)

Medium temperature 165 °C

duty cycle 100 %

medium pressure 5 bar

DN DN32 (AG2) / DN65 (AG3)

Digital outputs (optional):

24 V PNP, current limit 100 mA

Digital inputs

for position signal: 0...5 V = log "0", 10...30 V = log "1" inverted input inverted accordingly (input current < 6 mA)

Communication interface

to PC: bÜS service interface, connection is established using the USB bÜS interface set

Communication software

for PC: "Bürkert Communicator"



The digital outputs are not galvanically isolated from the operating voltage. They relate to the GND potential of the operating voltage.

Current limit: output voltage is reduced in the event of overload.

8.9 Flow values for VS forged steel valve bodies

CV values for VS forged steel valve bodies							
Diaphragm size	DN connection	Sealing material	CV value [m ³ /h]				
			DIN	ISO	ASME	BS	SMS
8	6 / 1/8"	EPDM	1.1	-	-	-	-
		PTFE	1.1	-	-	-	-
	8 / 1/4"	EPDM	1.7	1.5	0.7	0.5	-
		PTFE	1.9	2.0	0.7	0.5	-
	10 / 3/8"	EPDM	1.5	1.5	1.6	1.4	-
		PTFE	1.9	2.0	1.8	1.6	-
	15 / 1/2"	EPDM	-	-	1.5	-	-
		PTFE	-	-	1.9	-	-
15	10 / 3/8"	EPDM	3.5	5.5	-	-	-
		PTFE	3.4	5.2	-	-	-
	15 / 1/2"	EPDM	6.5	6.5	3.1	3.7	-
		PTFE	6.0	6.0	3.1	3.6	-
	20 / 3/4"	EPDM	-	-	6.5	-	-
		PTFE	-	-	6.0	-	-
20	20 / 3/4"	EPDM	12.4	12.5	8.4	8.9	-
		PTFE	12.0	12.0	8.5	8.8	-
25	25 / 1"	EPDM	20.0	18.0	15.5	-	16.0
		PTFE	17.0	16.0	14.5	-	14.8
40	32 / 1 1/4"	EPDM	34.0	-	-	-	-
		PTFE	34.0	-	-	-	-
	40 / 1 1/2"	EPDM	40.0	41.0	37.0	-	38.0
		PTFE	40.0	40.0	37.5	-	38.0
50	50 / 2"	-	66	66	66	-	-
65	65 / 2 1/2"	-	-	110	110	-	-
80	80 / 3"	-	160	160	160	-	-
100	100 / 4"	-	235	235	235	-	-

Tab. 10: Cv values for forged steel valve bodies

8.10 Flow values for cast valve bodies and plastic valve bodies

CV values for VG cast and plastic (PD, PP, PV) valve bodies				
Diaphragm size	DN connection	Sealing material	CV value [m³/h]	
			Cast valve body VG (all standards)	Plastic valve body (all materials)
8	8 ¼"	EPDM	0.95	-
		PTFE	1.5	-
15	15 / ½"	EPDM	5.6	3
		PTFE	5.3	3
20	20 / ¾"	EPDM	10.7	7
		PTFE	10.5	6.7
25	25 / 1"	EPDM	14.6	11.4
		PTFE	13.6	10
32	32 / 1 ¼"	EPDM	-	17.5
		PTFE	-	17.1
40	40 / 1 ½"	EPDM	35.0	24.5
		PTFE	35.0	24.0
50	50 / 2"	-	-	41.5
65	65 / 2 1/2"	-	-	60
80	80 / 3"	-	-	105
100	100 / 4"	-	-	154

Tab. 11: CV values for VG cast and plastic (PD, PP, PV) valve bodies

8.11 Flow values for tube valve bodies

CV values for 3G tube valve bodies VP (IHU2)					
Diaphragm size	DN connection	Sealing material	CV value [m³/h]		
			DIN	ISO	ASME
8	8 / ¼"	EPDM	-	1.9	-
		PTFE	-	2.4	-
	10 / ⅜"	EPDM	1.9	-	-
		PTFE	2.4	-	-
	15 / ½"	EPDM	-	-	-
		PTFE	-	-	2.2
15	15 / ½"	EPDM	7.2	7	-
		PTFE	6.7	6.6	-
	20 / ¾"	EPDM	6.9	-	-
		PTFE	5.5	-	6.5
20	20 / ¾"	EPDM	-	13.5	-
		PTFE	-	12.1	-
	25 / 1"	EPDM	14.9	-	-
		PTFE	13.7	-	12.7
25	25 / 1"	EPDM	-	19.1	-
		PTFE	-	15.6	-
	32	EPDM	20.0	-	-
		PTFE	15.8	-	-
32	32	EPDM	-	36.0	-
		PTFE	-	36.0	-
	40 / 1 ½"	EPDM	35.0	-	-
		PTFE	34.5	-	32.0
40	40 / 1 ½"	EPDM	-	48.0	-
		PTFE	-	47.0	-
	50 / 2"	EPDM	46.0	-	-
		PTFE	43.5	-	45.0
50	50 / 2"	-	-	70	-
	65 / 2 1/2"	-	-	-	52
65	80 / 3"	-	-	-	75
80	100 / 4"	-	-	-	145

Tab. 12: Cv values for VP 3G tube valve body

9 INSTALLATION

9.1 Safety instructions for installation



WARNING!

Risk of injury due to improper assembly.

- ▶ Installation may be carried out by trained technicians only and with the appropriate tools.
- ▶ Secure the system to prevent unintentional activation.
- ▶ After installation, ensure that the process is restarted in a controlled manner. Observe the sequence.
 1. Connect supply voltage.
 2. Pressurise the device with medium.



CAUTION!

Risk of injury due to a heavy device.

A heavy device can fall down during transport or during installation and cause injuries.

- ▶ Secure heavy equipment to keep it from tipping or falling over.
- ▶ Transport, install and remove heavy device with the aid of a second person only.
- ▶ Use suitable tools.

9.2 Installation position of the diaphragm valves

Depending on the valve body, the installation position for the diaphragm valve is different.



One of the relief bores in the diaphragm socket for monitoring leakages must be at the lowest position.

9.2.1 Installation position for 2-way valve body

Installation position: any, preferably actuator facing up.

Ensuring self-drainage:



The installer and the operator are responsible for ensuring self-drainage.

Self-draining must be considered during the installation:

- **Inclination angle of the pipeline.**

To ensure that the pipeline is self-draining, we recommend the inclination angles according to the valid ASME BPE.

- **Self-draining angle for valve body:**

The self-draining angle (α) depends on the valve body size (diaphragm size) and the inner diameter of the port connection (DN).

The self-draining angle is specified as a value on forged steel valve bodies (VS) and tube valve bodies (VP) (see “Fig. 15” on page 28 and “Fig. 16” on page 28).

The marking on the port connection of valve bodies serves as an orientation aid (see “Fig. 20”). The marking must point upwards.

The actual self-draining angle must be set with a suitable measuring tool.

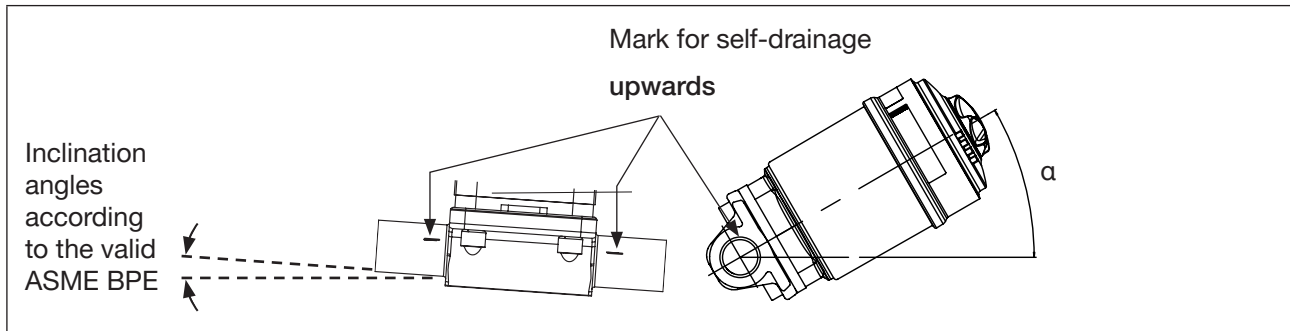


Fig. 20: Installation position for self-draining of body



Information about self-drainage on the Internet.

If the self-drainage angle is not specified on the valve body, please refer to the additional manual “Angle specifications for self-draining” on our website.

The installer and the operator are responsible for ensuring self-drainage.

country.burkert.com. Type / Manuals / Additional manual “Angle information for self-drainage”.

If you require clarification, contact your Bürkert sales department.

9.2.2 Installation position for T-valve body

Recommended installation position:

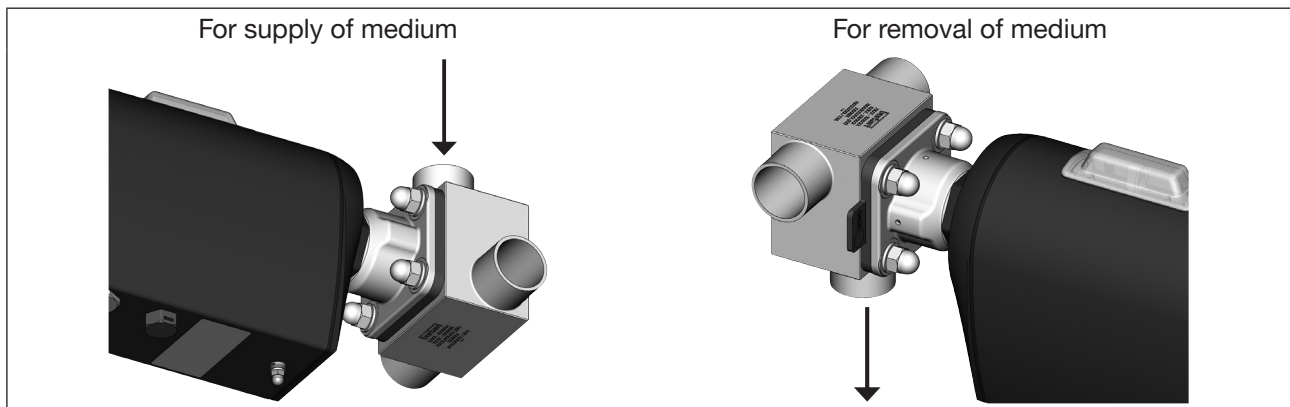


Fig. 21: Installation position for T-valve body, Type 3324

9.2.3 Installation position for tank bottom body

Preferably actuator facing downwards.

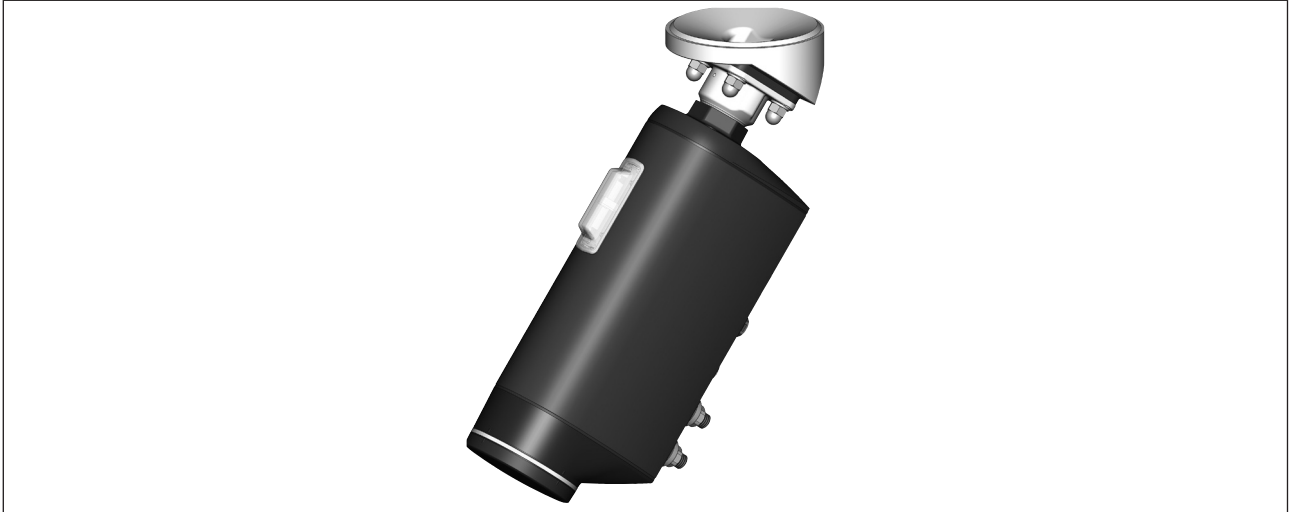


Fig. 22: Installation position of Type 3325

9.3 Installation of devices with threaded connection, flange connection, clamp connection or bonded connection

ATTENTION!

Damage to the diaphragm.

- To prevent damage, the device must be in MANUAL operating state during installation.

Devices in their factory default state already have their operating state set to MANUAL.

9.3.1 Required work steps

1. If not already preset, set MANUAL operating state, chapter [“13.1” on page 77](#).
2. If device is already electrically connected, shut off power supply. Wait until LED illuminated ring goes out.
3. Install device in pipeline, chapter [“9.3.3” on page 41](#).
4. Electrical installation, chapter [“10” on page 54](#).
5. Connect supply voltage.
6. Execute TUNE function for position control, chapter [“11.3” on page 66](#) (AG2) and [“11.4” on page 67](#) (AG3).
7. Set AUTOMATIC operating state, chapter [“13.1” on page 77](#).

9.3.2 Installation conditions

Pipelines: Ensure that pipelines are in alignment.

Preparation: Clear impurities from pipelines (seal material, metal chips, etc.).
Support and align pipelines.
To ensure that the pipeline is self-draining, we recommend the inclination angles according to the valid ASME BPE.

9.3.3 Install device in the pipeline

Prerequisite: MANUAL operating state.

ATTENTION!

The following must be heeded when installing the device in the system.

The device and relief bore must be accessible for inspections and maintenance work.



DANGER!

Risk of injury from high pressure.

- Before working on the system, switch off the pressure and vent or empty the lines.




WARNING!

Risk of crushing by mechanically powered parts.

- Do not reach into the openings of the valve body.

→ Connect valve body to pipeline.

 Ensure that there is no voltage present and minimal vibration during installation.

**Holding device**

To protect the valve actuator from damage resulting from forces and vibrations, a holding device is recommended. This is available as an accessory. See chapter [“23 Accessories, replacement parts”](#).

Next steps:

- Electrical installation, chapter [“10” on page 54](#).
- Connect supply voltage.
- Execute TUNE function for position control, chapter [“11.3” on page 66](#) (AG2) and [“11.4” on page 67](#) (AG3).

ATTENTION!**Damage to the diaphragm.**

- ▶ To prevent damage, execute TUNE function first after establishing the electrical connection. Only then should the operating mode be set to AUTOMATIC.

- Set AUTOMATIC mode, chapter [“13.1” on page 77](#).

9.4 Installation of devices with welded connections

ATTENTION!

National regulations regarding welder qualifications and the performance of welding work must be observed.

⚠ For devices with a tank bottom body, special measures must be observed when they are welded in.

The following must be heeded when installing the device in the system.

The device and relief bore must be accessible for inspections and maintenance work.

ATTENTION!

The diaphragm and the electronics in the actuator will be damaged by the effects of heat.

► Remove the actuator before welding in the valve body.

Damage to the diaphragm

► To prevent damage, the device must be in MANUAL mode during installation and removal of the actuator and diaphragm.

► The actuator must be in the position "valve 100% open".



Delivery condition for units with welding connection The units are delivered disassembled.

Operating state: MANUAL.

Actuator position: valve open.

9.4.1 Required work steps

The device must not be welded into the pipeline while the actuator is still installed. Installation is broken down into the following steps:

1. If not already preset, set MANUAL operating state, chapter ["13.1" on page 77](#).
2. If the valve is in the closed position, switch it to the position "valve 100% open", chapter ["15" on page 84](#).
3. If the device is already electrically connected, shut off supply voltage. Wait until LED illuminated ring goes out.
4. If the device is not removed, remove the actuator and diaphragm from the valve body, chapter ["9.7.2" on page 51](#).
5. Weld the valve body into the pipeline,
 - 2-way valve body or T-valve body, chapter ["9.4.3" on page 44](#).
 - Tank bottom body, chapter ["9.4.4" on page 45](#).
6. Install the actuator on the valve body, chapter ["9.5" on page 46](#).
7. Execute TUNE function for position control, chapter ["11.3" on page 66 \(AG2\)](#) and ["11.4" on page 67 \(AG3\)](#).
8. Set AUTOMATIC mode, chapter ["13.1" on page 77](#).

9.4.2 Required tool

- Allen key, width across flats 3 mm.
Required when no supply voltage is applied to the device in order to move the valve into the open position.
- Open-end wrench

9.4.3 Welding 2-way valve body or T-valve body into pipeline

Precondition: The actuator and diaphragm must be removed from the valve body.



DANGER!

Risk of injury from high pressure.

- Before working on the system, switch off the pressure and vent or empty the lines.

Installation conditions:

Installation position: 2-way valves, see chapter [“9.2.1” on page 38](#).
T-valves, see chapter [“9.2.2” on page 39](#).

Pipelines: Ensure the pipelines are aligned.

Preparation: Clear impurities from pipelines (seal material, metal chips, etc.).
Support and align pipelines. To ensure that the pipeline is self-draining, we recommend the inclination angles according to the valid ASME BPE.

Welding valve body:

ATTENTION!

The diaphragm and the electronics in the actuator will be damaged by the effects of heat.

- The actuator must be removed before the valve body is welded in.



Observe the laws in force in the country regarding the qualification of welders and the execution of welding work.

→ Weld the valve body into the pipeline.



Ensure that there is no voltage present and minimal vibration during installation!

9.4.4 Welding tank bottom body

Precondition: The actuator and diaphragm must be removed from the valve body.



DANGER!

Risk of injury from high pressure.

- ▶ Before working on the system, switch off the pressure and vent or empty the lines.



Recommendations:

Observe sequence:

1. **Note:** Weld the tank bottom body to the container base before the container is assembled.
It is possible to weld onto a ready-assembled container but it is more difficult. The tank bottom body must be welded into the middle of the container base so that the container can be drained optimally.
2. Assemble the container.
3. Weld the tank bottom body into the pipeline.

Installation conditions:

Installation position: See chapter [“9.2.3”](#) on page 40.

Prepare container: Clear impurities from container (sealants, metal chips, etc.).

Prepare pipeline: Clear impurities from pipelines (seal material, metal chips, etc.).
Support and align pipelines. To ensure that the pipeline is self-draining, we recommend the inclination angles according to the valid ASME BPE.

Welding valve body:

ATTENTION!

The diaphragm and the electronics in the actuator will be damaged by the effects of heat.

- ▶ The actuator must be removed before the valve body is welded in.



For information on containers and instructions for welding, refer to the ASME VIII Division I standard.
Check the batch number indicated on the manufacturer's certificate 3.1.B supplied before starting welding.



Observe the laws in force in the country regarding the qualification of welders and the execution of welding work.

ATTENTION!

Note when welding:

- ▶ Only use welding materials that are suitable for the tank bottom body.
- ▶ The tank bottom valve must not collide with any other part of the equipment, and it must be possible to assemble and dismantle the actuator without any problems.

→ Welding the tank bottom body to the container.

→ Assemble the container.

→ Weld the tank bottom body into the pipeline



Ensure that there is no voltage present and minimal vibration during installation!

Next steps:

- If the diaphragm is not mounted, mount it on the actuator, chapter [“9.5.3” on page 46](#)
- Install the actuator onto the valve body and establish electrical connection, chapter [“9.5.4” on page 48](#).
- Execute TUNE function for position control, chapter [“11.3” on page 66](#) (AG2) and [“11.4” on page 67](#) (AG3).

ATTENTION!

Damage to the diaphragm.

- ▶ To prevent damage, execute TUNE function first after establishing the electrical connection. Only then should the operating mode be set to AUTOMATIC.

- Set AUTOMATIC mode, chapter [“13.1” on page 77](#).

9.5 Installing actuator on valve body

9.5.1 Required work steps

1. If the diaphragm is not mounted, mount it on the actuator. Chapter [“9.5.3” on page 46](#).
2. Mount the actuator onto the valve body and establish electrical connection. Chapter [“9.5.4” on page 48](#).
3. Execute TUNE function for position control, chapter [“11.3” on page 66](#) (AG2) and [“11.4” on page 67](#) (AG3).
4. Set AUTOMATIC operating state, chapter [“13.1” on page 77](#).

9.5.2 Required tool

- Allen key, width across flats 3 mm
Only required when no supply voltage is applied to the device in order to move the valve into the open position.
- Open-end wrench

9.5.3 Mounting the diaphragm on the actuator

There are different fixture types for the diaphragm depending on the size of the diaphragm.

Diaphragm size	Fixture types for diaphragms	
	PTFE	EPDM / FKM / laminated PTFE
08	Buttoned diaphragm	Buttoned diaphragm
15, 20	Diaphragm with bayonet catch	Diaphragm with bayonet catch
25-100	Diaphragm with bayonet catch	Diaphragm screwed in

Tab. 13: Fixture types for diaphragms

Fixture of diaphragms with bayonet catch:

→ Place diaphragm in compressor and turn 90° to lock into place.

Fixture of screw-in diaphragm:

→ If there is no insert in the compressor, place the insert into the compressor as shown in the image.

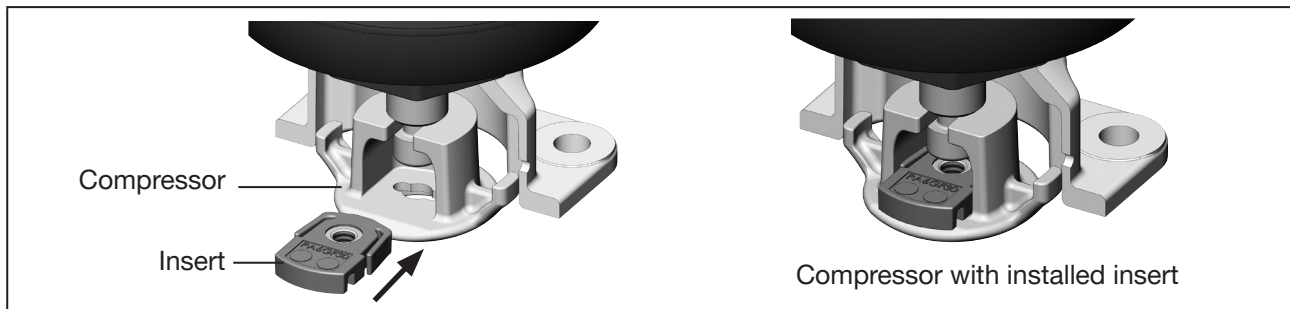


Fig. 23: Place insert into compressor

- Screw diaphragm into compressor by hand.
- Loosen by half a turn.
- Align diaphragm. The mark tab of the diaphragm must protrude from the valve body at a right angle to the longitudinal axis of the pipeline (see [“Fig. 24”](#)).

Fixture of buttoned diaphragm:

- Attach buttons of diaphragm in compressor.
- Align diaphragm. The mark tab of the diaphragm must protrude from the valve body at a right angle to the longitudinal axis of the pipeline (see [“Fig. 24”](#)).

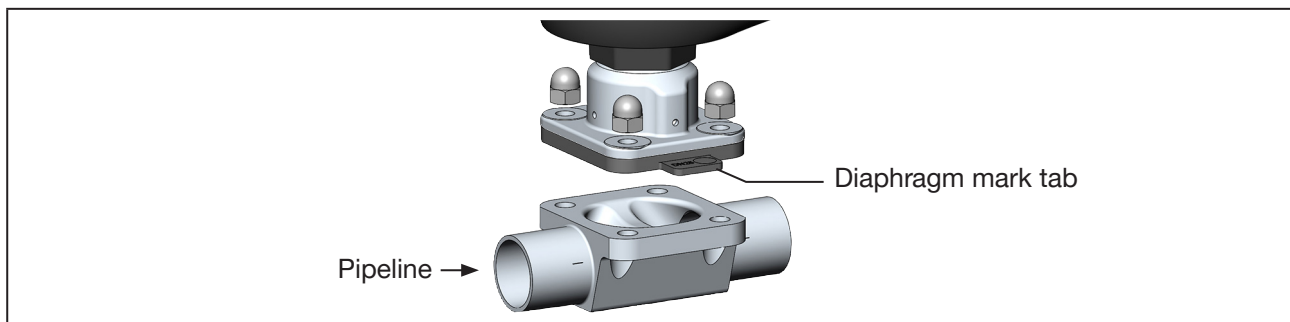


Fig. 24: Aligning the diaphragm (example 2-way body)

9.5.4 Mount the actuator onto the valve body and establish electrical connection



WARNING!

- Risk of injury from electric shock.
- Risk of crushing by mechanically powered parts.
- Switch off the supply voltage.

ATTENTION!

- Damage to the diaphragm.
- To prevent damage, the device must be in MANUAL operating state during installation.
- The actuator must be in the position “valve 100% open”.

- Before installing the actuator, check whether the diaphragm is free of damage and correctly aligned. The mark tab of the diaphragm must protrude from the valve body at a right angle to the longitudinal axis of the pipeline (see “Fig. 24”).
- Replace the damaged diaphragm.
- Place actuator on the valve body.
In the case of T-valve bodies and tank button bodies, stud bolts are pre-fitted.
With 2-way bodies, insert screws into the valve body.
- Tighten the nuts in a diagonal pattern lightly until the diaphragm is seated between the valve body and actuator.
 Do not tighten the nuts yet.
- Electrically connect the device.
The position of the ports can be changed by turning the actuator 360°. For a description see chapter “9.6 Rotating the actuator”.



The description of the electrical connection process can be found in chapter “10 Electrical installation”

- Execute M.SERVICE as described below.

Execute M.SERVICE:

ATTENTION!

- Malfunction is valve position is not fully open.
- The valve must be in the position “valve 100% open” before the M.SERVICE is triggered.

The two buttons for triggering M.SERVICE are located beneath the blind cover.



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

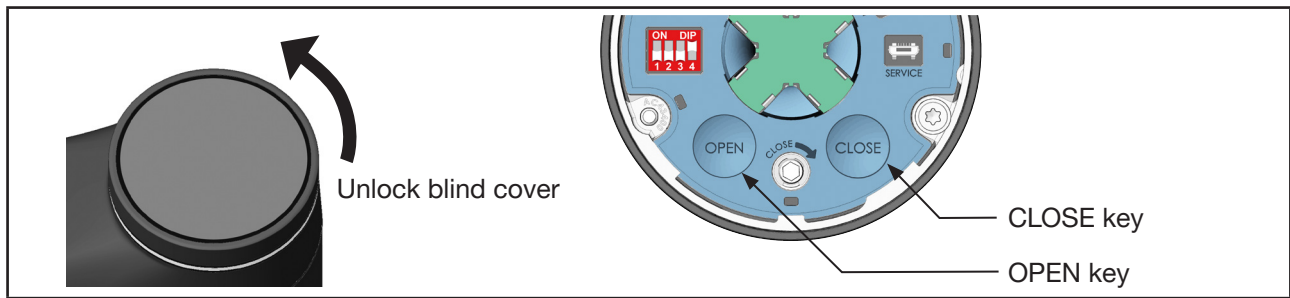


Fig. 25: Execute M. SERVICE

→ To unlock the blind cover, turn it counterclockwise and remove.

→ Hold down the OPEN and CLOSE keys together at the same time for 5 seconds.

✓ This will execute the M.SERVICE function.

→ Wait until M.SERVICE is finished and the actuator stops.

Tighten nuts gradually:



WARNING!

Risk of injury when failing to observe tightening torque value.

Failure to observe the tightening torque value is dangerous due to the risk of damage to the device.

► Observe the tightening torque value.

→ Follow a crosswise pattern in tightening the nuts to 1/3 of the tightening torque value.

→ Then follow a crosswise pattern again in tightening the nuts to 2/3 of the tightening torque value.

→ Finally, follow a diagonal pattern in tightening the nuts to their permitted tightening torque value.

Tightening torque value for installation of the actuator

Diaphragm size	Tightening torques for diaphragms [Nm]*	
	EPDM/FKM	PTFE/advanced PTFE/laminated PTFE
08	2.5	2.5
15	3.5	4
20	4	4.5
25	5	6
32	6	8
40	8	10
50	12	15
65	20	30
80	30	40
100	40	50

* A tolerance of +10% of the respective tightening torque applies to all values

Tab. 14: Tightening torques for diaphragms



Holding device

To protect the valve actuator from damage resulting from forces and vibrations, a holding device is recommended. This is available as an accessory. See chapter [“23 Accessories, replacement parts”](#).

Next steps:

- Execute TUNE function for position control, chapter [“11.3” on page 66](#) (AG2) and [“11.4” on page 67](#) (AG3).

ATTENTION!

Damage to the diaphragm.

- ▶ To prevent damage, execute TUNE function first after establishing the electrical connection. Only then should the operating mode be set to AUTOMATIC.

- Set AUTOMATIC mode, chapter [“13.1” on page 77](#).

9.6 Rotating the actuator

ATTENTION!

Damage to the diaphragm.

- ▶ When turning the actuator, the valve must be open to prevent damage to the diaphragm.

The position of the ports can be changed by turning the actuator through 360°.

- For devices that have not been installed, clamp the valve body in a holding device.
- Place a suitable open-end wrench (width across flats M41) on the hexagon head of the actuator.
- Turn the actuator into the required position.

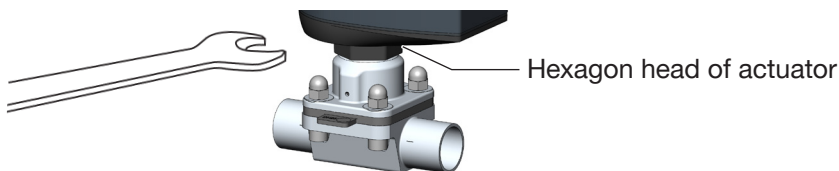


Fig. 26: Turn actuator



The actuator cannot be rotated on devices that have a holding device fitted.

9.7 Disassembling the actuator



DANGER!

Risk of injury from high pressure.

- ▶ Before working on the system or device, switch off the pressure and ventilate or empty the lines.



WARNING!

Risk of injury due to improper installation work.

- ▶ The actuator may be removed only by trained technicians and with the appropriate tools.

9.7.1 Required work steps

1. Set MANUAL operating state, chapter [“13.1” on page 77](#).
2. Switch the valve to the position “valve 100% open”, chapter [“15” on page 84](#).
3. Switch off the supply voltage. Wait until LED illuminated ring goes out.
4. Remove actuator from the valve body, chapter [“9.7.2” on page 51](#).

9.7.2 Removing actuator from the valve body

Prerequisites:

MANUAL operating state, valve position 100% open, supply voltage switched off.



WARNING!

Risk of injury from electric shock.

Risk of crushing by mechanically powered parts.

- ▶ Switch off the supply voltage.
- ▶ For devices with SAFEPOS energy-pack: completely remove the SAFEPOS energy-pack. Wait until the LED ring is no longer lit and ensure that the LED status indicator is not in **“LED off”** mode.

ATTENTION!

Damage to the diaphragm

- ▶ To prevent damage, the device must be in MANUAL mode during installation and removal of the actuator and diaphragm.
- ▶ The actuator must be in the position “valve 100% open”.

→ Loosen the 4 nuts on the diaphragm socket crosswise.

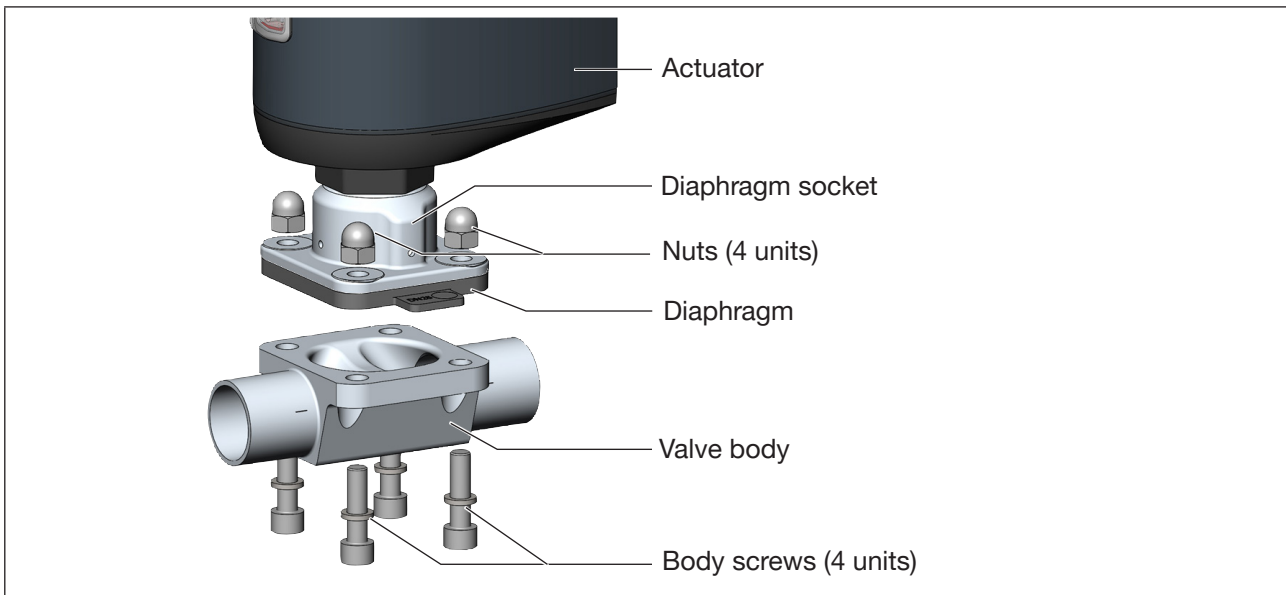


Fig. 27: Disassembly of the diaphragm using the 2-way body as an example

→ Remove the body screws.

→ Remove valve body.

9.8 Holding device

The holding device protects the valve actuator and body from damage resulting from forces and vibrations. The holding device is available as an accessory. See chapter [“23 Accessories, replacement parts”](#).

9.8.1 Install the holding device

→ Install holding device as shown in the image on the hexagon head of the actuator.

ATTENTION!

Ensure that the actuator is rotated to the correct position beforehand.

→ Fix the holding device in place by suitable means.

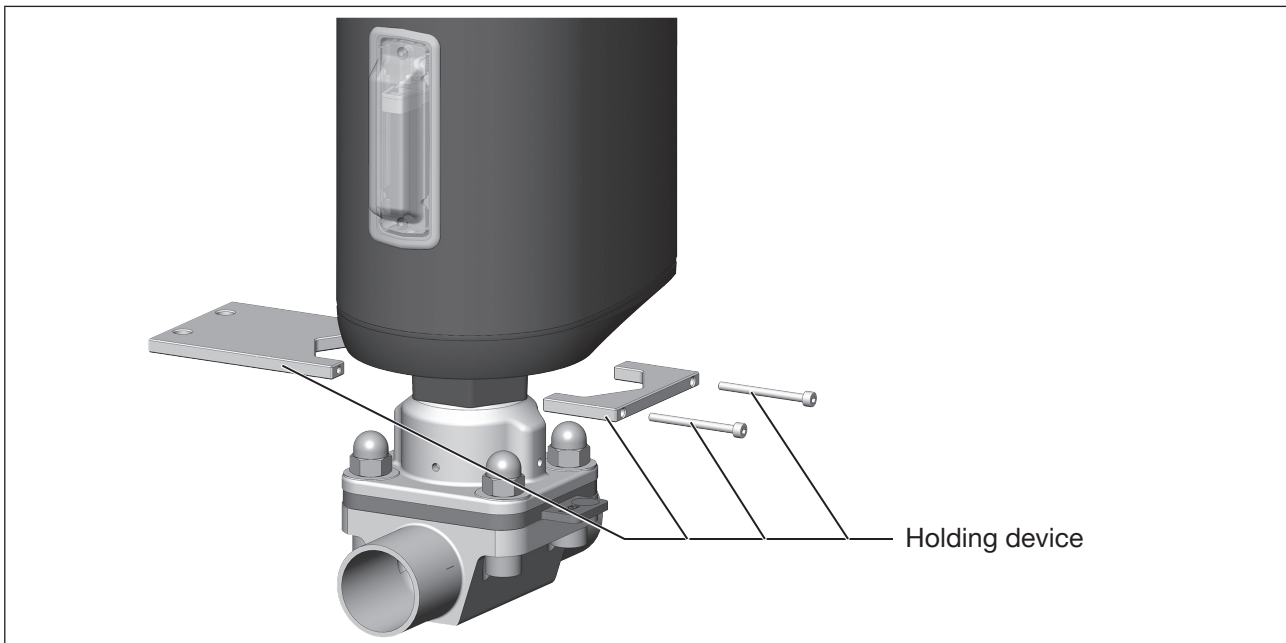


Fig. 28: Install the holding device



The actuator cannot be rotated on devices that have a holding device fitted.

10 ELECTRICAL INSTALLATION

The electromotive diaphragm valve is available in 2 connection variants:

- With a circular plug-in connector (multi-pin variant)
- Cable gland with connection terminals (only AG2)

Signal values

Operating voltage: 24 V \equiv

Digital input for position signal: \equiv 0...5 V = log "0"; 10...30 V = log "1"

10.1 Electrical installation with circular plug-in connector

10.1.1 Safety instructions



WARNING!

Risk of injury from improper installation.

- ▶ Installation may be carried out by authorised technicians only and with the appropriate tools.
- ▶ Observe general engineering standards & rules during installation.

Risk of injury due to unintentional activation of the system and uncontrolled restart.

- ▶ Secure the system to prevent unintentional activation.
- ▶ Following installation, ensure a controlled restart.

ATTENTION!

To ensure electromagnetic compatibility (EMC) the functional earth must be connected to earth with a short line (max. 1 m). The functional earth must have a cross-section of at least 1.5 mm².



Choice of connection line:

When choosing the length and cross-section of the individual wires, take into account the voltage drop in relation to the maximum supply current.

→ Connect the device in accordance with the tables.

→ After applying the operating voltage, make the necessary base settings and adjustments for the electromotive diaphragm valve. For a description, see chapter ["11 Start-up"](#).

10.1.2 Description of circular plug-in connectors

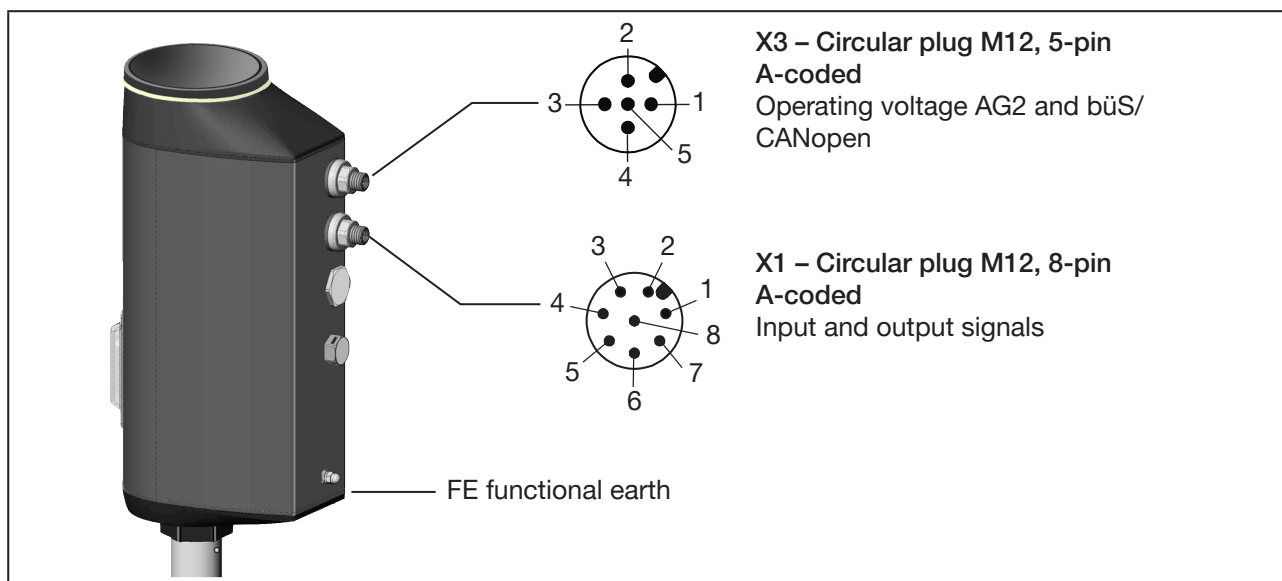


Fig. 29: Description of circular plug-in connectors

AG3 variant

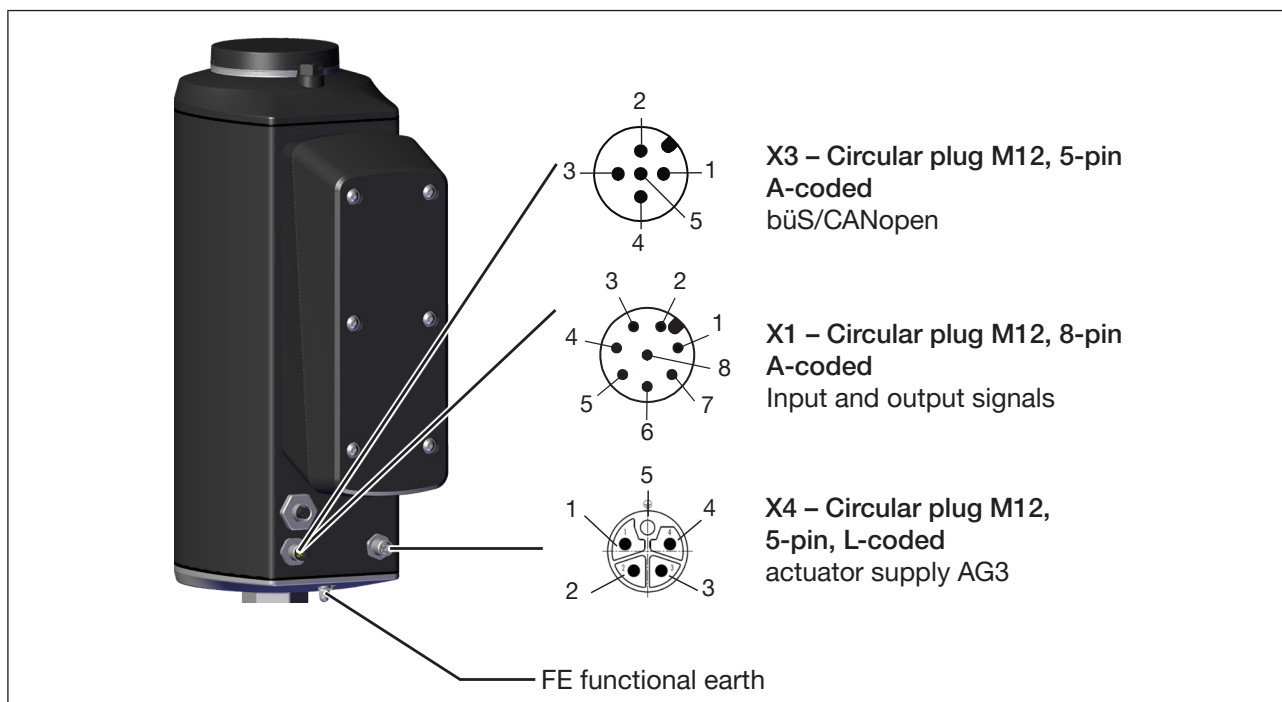



Fig. 30: Description of circular plug-in connectors

Circular plug-in connector	AG2			AG3		
	Analogue	with fieldbus gateway	büS/CAN- open	Analogue	with fieldbus gateway	büS/CAN- open
X1	X	-	-	X	-	-
X3	X	X	X	-	X	X
X4	-	-	-	X	X	X

Tab. 15: Use of circular plug-in connector AG2/AG3

10.1.3 X1 – Circular plug M12, 8-pin Input and output signals

Pin	Wire colour*	Assignment (from device perspective)	
Input signals from control centre (e.g. PLC)			
1	white	Digital input +	 0-5 V (log. 0) 10-30 V (log. 1)
Output signals to control centre (e.g. PLC) only required with analogue output and/or digital output option			
4	yellow	Digital output 1	24 V/0 V
3	green	Digital output 2	24 V/0 V
2	brown	Digital inputs and digital outputs GND	
* The specified wire colours refer to the connection cable, which is available as an accessory with ID no. 919061.			

Tab. 16: X1 – M12 circular plug, 8-pin

10.1.4 X3 – Circular plug M12, 5-pin, bÜS/CANopen network and operating voltage AG2



Electrical installation with or without bÜS network: In order to be able to use the bÜS network (CAN interface), a 5-pin circular plug and a shielded 5-wire cable must be used.

If the bÜS network is not used, a 4-pin circular plug can be used as a counterpart.

Pin	Wire colour		Assignment (from device perspective)
	without bÜS network 4-pin connection*	with bÜS network	
1	-	CAN shield	
2	white	red	24 V $\pm 10\%$ max. residual ripple 10%
3	blue	black	GND/CAN_GND
4	-	white	CAN_H
5	-	blue	CAN_L
* The specified wire colours relate to the 4-pin M12 connection cable, which is available as an accessory with ID no. 918038.			

Tab. 17: X3 – M12 circular plug, 4-pin or 5-pin, operating voltage

10.1.5 X3 – Circular plug M12, 5-pin, bÜS/CANopen network AG3



For variants with fieldbus gateway, using this connection is optional for service bÜS.

Pin	Wire colour with bÜS network*	Assignment (from device perspective)
1	CAN shield	
2**	red	24 V $\pm 10\%$ max. residual ripple 10%
3**	black	GND/CAN_GND
4	white	CAN_H
5	blue	CAN_L

*The specified wire colours relate to the bÜS cable, which is available as an accessory. See cabling guideline on our website country.burkert.com.

** This system supply must be galvanically isolated from the actuator supply.

Tab. 18: X3 – Circular plug M12, 5-pin, bÜS/CANopen network AG3

10.1.6 X4 – Circular plug M12, L-coded, 5-pin, actuator supply AG3

Pin	Wire colour*	Assignment
1	brown	+24 V $\pm 10\%$, max. residual ripple 10%
2	white	Do not connect
3	blue	GND
4	black	Do not connect
5	grey	FE connected to housing

* The specified wire colours relate to the 5-pin M12 connection cable, which is available as an accessory with ID no. 20010840.

Tab. 19: X4 – Circular plug M12, L-coded, actuator supply AG3

10.2 Electrical connection fieldbus gateway

The fieldbus gateway for Industrial Ethernet is connected using 4-pin M12 circular plug-in connectors.

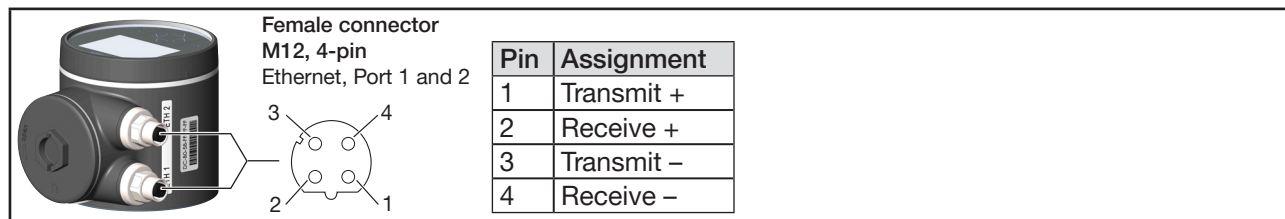


Fig. 31: Electrical connection and pin assignment, fieldbus gateway

ATTENTION!

To ensure electromagnetic compatibility (EMC), a shielded Ethernet cable must be used. Connect the cable shielding on both sides to earth (i.e. on each of the connected devices).

Use a short line (max. 1 m) with a cross-section of at least 1.5 mm² for connecting to earth.

For versions with Fieldbus gateway, the Fieldbus gateway must also be connected to earth along with the actuator. This connection to earth is made with the ground terminal supplied, to the circular plug-in connector of the connected Ethernet cable.

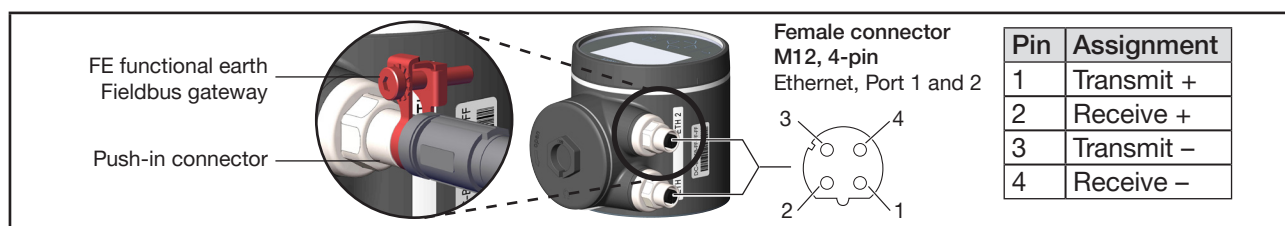


Fig. 32: Electrical connection, pin assignment and FE functional earth at fieldbus gateway

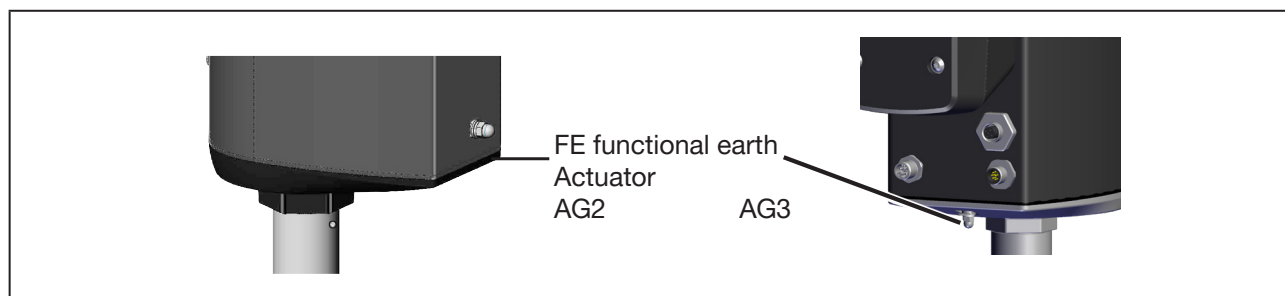


Fig. 33: FE functional earth at actuator

10.3 Electrical installation with cable gland (only AG2)



WARNING!

Risk of injury from improper installation.

- ▶ Installation may be carried out by authorised technicians only and with the appropriate tools.
- ▶ Observe general engineering standards & rules during installation.

Risk of injury due to unintentional activation of the system and uncontrolled restart.

- ▶ Secure the system to prevent unintentional activation.
- ▶ Following installation, ensure a controlled restart.

ATTENTION!

To ensure electromagnetic compatibility (EMC) the functional earth must be connected to earth with a short line (max. 1 m). The functional earth must have a cross-section of at least 1.5 mm².

10.3.1 Access to connection terminals



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

To access the terminals, open the device as described below.

1. Remove blind cover:

→ To unlock the blind cover, turn it anticlockwise and remove.

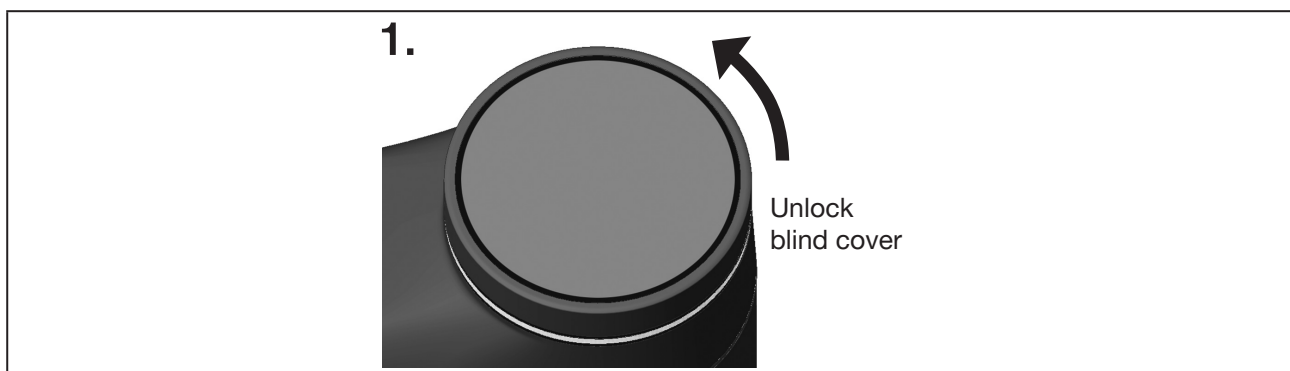
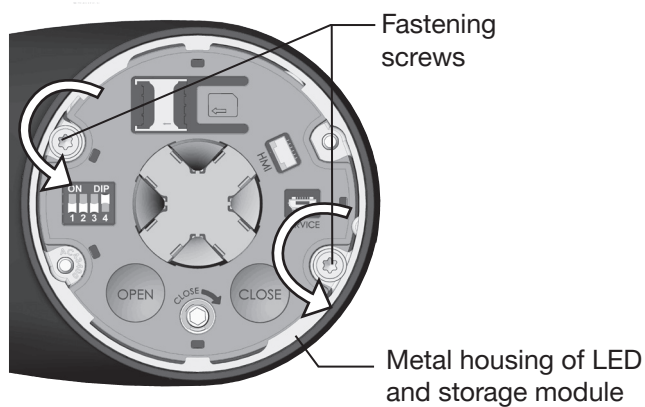


Fig. 34: Remove blind cover

2. Remove the LED and storage module:

2. Remove the LED and storage module:



3. Removing actuator cover:

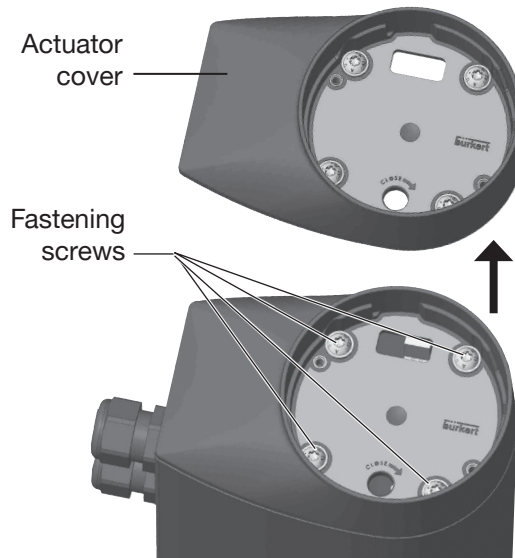


Fig. 35: Remove the LED and storage module and remove the actuator cover

3. Removing actuator cover:

→ Loosen the 4 fastening screws (hexalobular-internal screws T25).
The screws are integrated securely in the actuator cover.

→ Remove the actuator cover.

The connection terminals are now accessible.

10.3.2 Connecting the cable

→ Push the cable through the cable gland.

ATTENTION!

Take note for connection to spring-loaded terminals.

- ▶ Minimum length of wire ferrules: 8 mm
- ▶ Maximum cross-section of the wire ferrule: 1.5 mm² (without collar), 0.75 mm² (with collar).

→ Strip at least 8 mm of insulation from the wires and crimp ferrules on.

→ Attach the wires to the terminals. The terminal layout is provided in the tables below from [Page 62](#).

→ Tighten union nut of cable gland (tightening torque approx. 1.5 Nm).

ATTENTION!

The ingress of dirt or moisture may cause damage or malfunction.

To preserve IP65 and IP67 protection, ensure the following:

- ▶ Unused cable glands must be sealed using dummy plugs.
- ▶ The union nuts of cable glands must be tightened. Tightening torque, dependent on the cable size or dummy plugs, approx. 1.5 Nm.

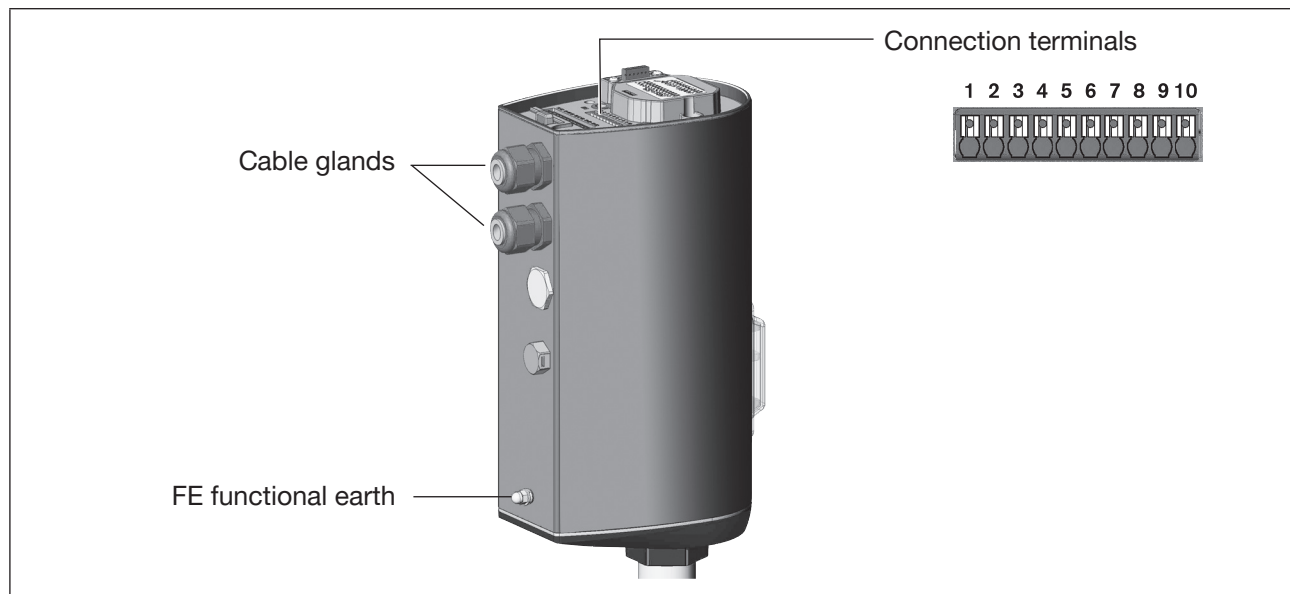
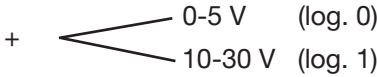


Fig. 36: Connecting the cable



→ Connect the device in accordance with the tables.

10.3.3 Terminal layout – input signal from control centre (e.g. PLC)

Terminal	Assignment (from device perspective)
5	Digital input + 
4	Digital input, GND relates to GND operating voltage (GND terminal)
8	Digital output 1 24 V/0 V
6	Digital output 2 24 V/0 V
7	Digital output GND

Tab. 20: Terminal layout – input signal from control centre (e.g. PLC)

10.3.4 Terminal layout – operating voltage and bÜS network

Terminal	Assignment (from device perspective)
	CAN shield
10	24 V  ± 10% max. residual ripple 10%
9	GND
1*	CAN_GND  Only connect when a separate line is used for CAN.
2*	CAN_H
3*	CAN_L

Tab. 21: Terminal layout – operating voltage and bÜS network



*** Electrical installation of the bÜS network:**

Terminals 1, 2 and 3 (CAN interface) are for the bÜS network connection.
Terminal 1 is bridged internally with terminal 9, however it is not designed for the operating voltage.

10.3.5 Closing the actuator housing

ATTENTION!

The ingress of dirt or moisture may cause damage or malfunction.

To preserve IP65 and IP67 degree of protection, ensure the following before closing the device:

- ▶ The seal in the actuator housing/actuator cover must be inserted and undamaged.
- ▶ The seal surfaces must be clean and dry.

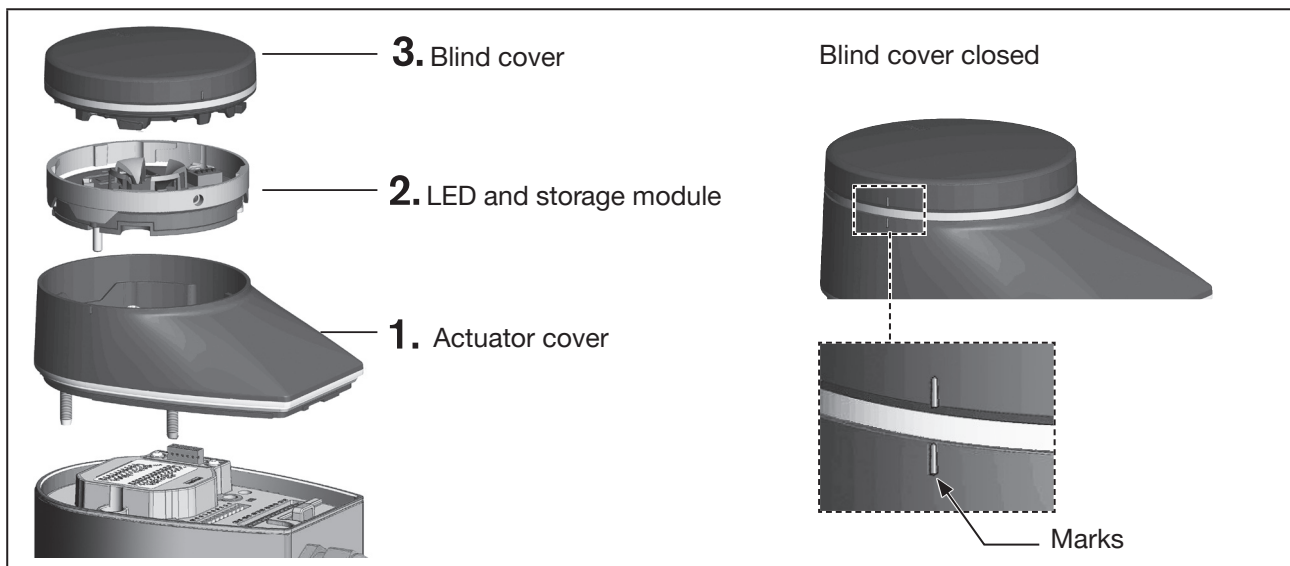


Fig. 37: Closing the actuator housing

1. Install actuator cover

→ Place actuator cover on the actuator housing.

→ First screw in the four fastening screws (hexalobular-internal screws T25) by hand lightly, then tighten them (tightening torque: 5.0 Nm).

2. Mount LED and storage module:

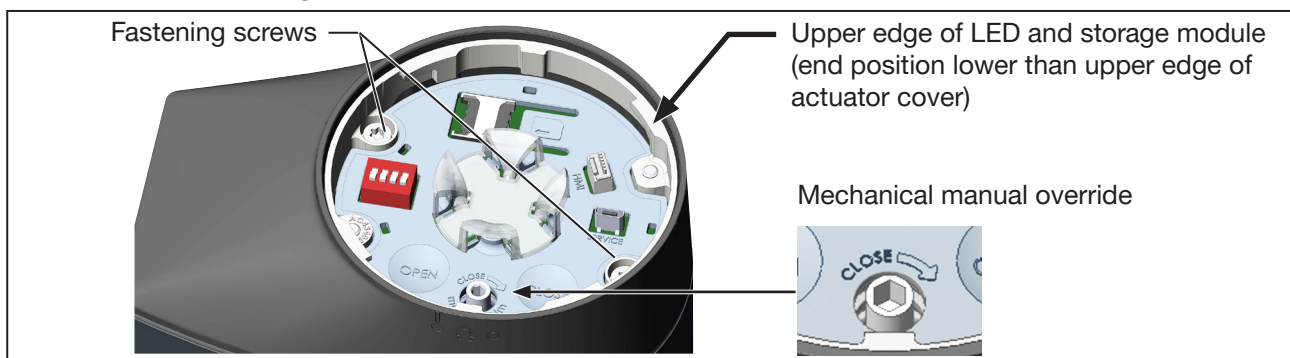


Fig. 38: Mount LED and storage module:

→ Place the LED and storage module onto the actuator cover.

Align the recess for the manual override in the centre, paying attention to the correct alignment of the electrical plug connection.

- Carefully press down the LED and storage module by hand.
The end position is reached if the upper edge of the module is fully and evenly recessed in the actuator cover.

ATTENTION!

The plug connection will be damaged if the LED and storage module is not correctly inserted.

- ▶ Before the fastening screws are tightened, the LED and storage module must be fully recessed in the actuator cover.

- Tighten 2 fastening screws (hexalobular-internal screws T20).
Observe tightening torque 1.1 Nm!

3. Close blind cover:



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

Closing the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

- Fit the blind cover and turn clockwise until the marking at the edge is directly over the marking for the actuator cover.

After applying the operating voltage, make the necessary base settings and adjustments for the electromotive diaphragm valve. For a description, see chapter [“11 Start-up”](#).

11 START-UP



WARNING!

Risk of injury due to improper operation.

Improper operation may result in injuries as well as damage to the device and the surrounding area.

- ▶ The operating personnel must know and understand the contents of the operating instructions.
- ▶ The safety instructions must be followed and the device used only as intended.
- ▶ Only adequately trained personnel may start up the system/device.

11.1 Base settings

Type of base setting (observe sequence)		Factory default setting
1.	Set effective direction	NC (normally closed)
	Enable/disable safety position	enabled
2.	Adjustment of position control (Function M.Q0.TUNE)	—
3.	Set AUTOMATIC operating state	MANUAL

Tab. 22: Overview: base settings for the diaphragm valve

11.2 Set safety position and effective direction

The effective direction and safety position are set using DIP switches 1 and 2.

DIP switch 2				DIP switch 1	
Effective direction	Switch position	Set-point value		Switch position (safety position enabled/disabled)	Safety position
		(0-5 V) Log 0	(10-30 V) Log 1		
NC	OFF	Valve closed	Valve open	ON	Valve closed
				OFF	none (actuator stops)
NO	ON	Valve open	Valve closed	ON	Valve open
				OFF	none (actuator stops)

Tab. 23: Set effective direction and safety position

11.3 Adjustment of position control on AG2



The position control is preset and adjusted at the factory for devices with a fitted valve body when delivered.

When executing the function M.Q0.TUNE the position control is adjusted at the actual stroke of the proportional valve in use and the required closing force is determined.

To this end, the seal closure point must be approached manually. It is important that the diaphragm valve is not entirely closed.

Based on this position the device uses an algorithm to calculate the optimum force for sealing. This ensures that the diaphragm closes seal-tight under the specified conditions and that the service life of the diaphragm is optimised.

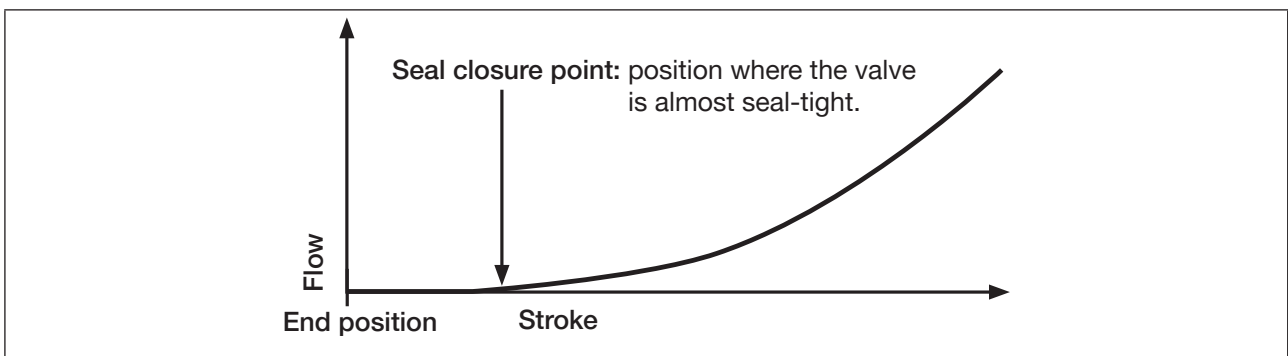


Fig. 39: Seal closure point

11.3.1 Adjustment of the position control – M.Q0.TUNE for AG2

NOTE!

Execute M.Q0.TUNE.

- ▶ Execute M.Q0.TUNE to ensure that the diaphragm closes seal-tight under the specified conditions and that the service life of the diaphragm is optimised.
- ▶ After changing the actuator or valve body, or if the operating conditions change, the M.Q0.TUNE must be carried out again.

NOTE!

- ▶ The function M.Q0.TUNE must be executed in MANUAL operating state.



WARNING!

Danger due to uncontrolled process after executing the M.Q0.TUNE function.

Executing M.Q0.TUNE without operating pressure will cause incorrect actuator adjustment. This will result in an uncontrolled process caused by non-leak-tight actuator or damage to the diaphragm.

- ▶ Execute M.Q0.TUNE only under operating pressure.

11.3.2 Adjust with buttons in the device

The two buttons for approaching the seal closure point and for triggering M.Q0.TUNE are located under the blind cover.

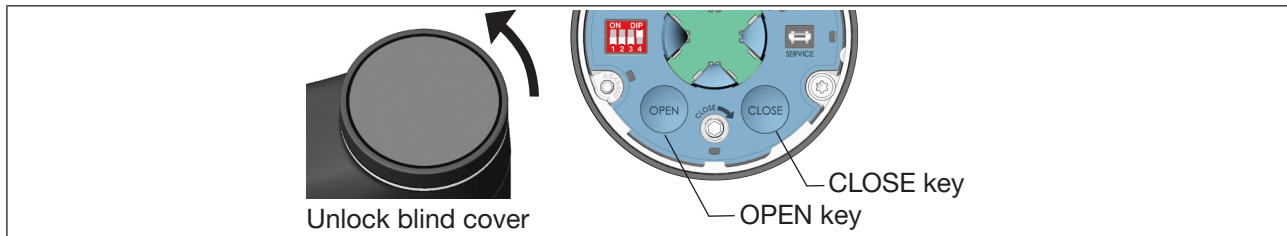


Fig. 40: Adjustment of the mechanical end position with keys in device

→ To unlock the blind cover, turn it anticlockwise and remove.



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

How to trigger the M.Q0.TUNE function:

⚠ Make sure operating pressure is applied and the operating state is set to MANUAL.

→ Establish operating conditions (operating pressure and temperature)

→ Use the CLOSE key to approach the seal closure point.

→ Hold down the OPEN and CLOSE buttons at the same time for five seconds.



The M.Q0.TUNE function is executed.

The device will now calculate the optimum force for the valve seal closure point.



If M.Q0.TUNE is aborted due to an error, a message will appear.

Possible messages when M.Q0.TUNE is aborted	Description
Device error present.	There is an error present that makes it impossible to execute M.Q0.TUNE.
Timeout.	M.Q0.TUNE could not be executed within the time limit due to an error.
It was not possible to determine the seal closure point.	M.Q0.TUNE was unable to determine the seal closure point due to an error.

Tab. 24: Possible error messages after the M.Q0.TUNE function is aborted

11.4 Adjustment of position control on AG3



The position control is preset and adjusted at the factory for devices with a fitted valve body when delivered.

Check the diaphragm material settings and maximum operating pressure in the menu **Position controller** > **DIAPHRAGM** > **Force Level** before adjusting the position controller.

⚠ An incorrectly set diaphragm material, incorrectly set operating pressure or deviating force adjustment may impact the service life of the diaphragm and/or the tightness of the valve. The valves are delivered with the maximum adjustable operating pressure. If the operating pressure in the system is significantly lower, it is recommended to adjust the operating pressure settings. The TUNE must then be run again.

ATTENTION!

Only run TUNE if necessary.

It is only necessary to adjust the position control again if the actuator has been dismantled and/or the diaphragm or the valve body has been replaced, or if the valve is loose.



With the M.Q0.TUNE function, the tight closing point and the tight closing force can be adapted to the current operating conditions. Due to the adapted sealing force, the service life of the diaphragm can be increased, especially at low operating pressures.

With the X.TUNE function, the tight closing point is determined via the default settings for the maximum operating pressure.

When executing X.TUNE or M.Q0.TUNE, the position control is adapted to the physical stroke of the proportional valve used and the required sealing force is determined.

M.Q0.TUNE

With the M.Q0.TUNE function, the tight closing point must be approached manually. It is important that the valve is completely moved to the end position (see “Fig. 39”), only to the necessary seal closure point. Based on this position the device uses an algorithm to calculate the optimum force for sealing

If necessary, adjust the position control using the M.Q0.TUNE function, see chapter “11.3.1” on page 66.”

X.TUNE

Adjust the position control using the X.TUNE function, see chapter “11.4.1” on page 68.”

When executing the X.TUNE function, the position control is adapted to the physical stroke of the proportional valve used and the required sealing force is determined using the default settings.

Applying the operating pressure is not required, but does optimise the result of the X.TUNE.

The LED illuminated ring will light up orange while the X.TUNE is executed.

When X.TUNE is finished, the LED illuminated ring returns to its previous status.

11.4.1 Adjustment of position controller with keys in device

The 2 keys for triggering X.TUNE are located beneath the blind cover.

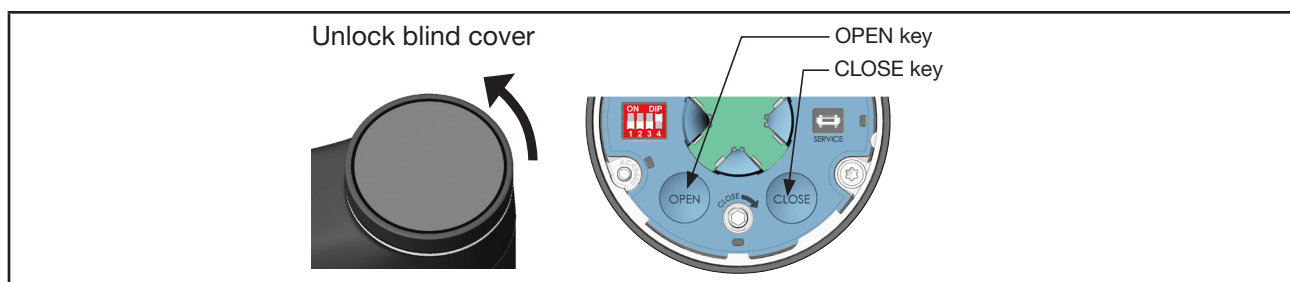


Fig. 41: Adjustment of position controller with keys in device

→ To unlock the blind cover, turn it anticlockwise and remove.



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

How to trigger the X.TUNE function:

Checking the diagram material and maximum operating pressure settings

→ Hold down the OPEN and CLOSE keys together at the same time for 5 seconds.

11.4.2 Adjustment of position control on PC

! Adjustments are performed on a PC via the bÜS service interface using the “Bürkert Communicator” PC software. It requires the USB-bÜS-Interface available as an accessory.

To avoid damage to the device, only use the power supply unit supplied in the USB-bÜS-interface set.

To trigger the X.TUNE function, you must switch to the “Maintenance” detailed view for position controllers.

How to trigger the X.TUNE function:

Check diaphragm material settings and maximum operating pressure in the menu **Position controller** > **DIAPHRAGM** > Force Level.

→ When using Bürkert Communicator for the configuration, select **Position Controller** in the navigation area and switch to **MAINTENANCE**.

→ Select **CALIBRATION**.

→ Select **X.TUNE**.

The following question appears: “Do you really want to start X.TUNE?”

→ Start X.TUNE.

✓ This will execute the X.TUNE function.

! If X.TUNE is aborted due to an error, a message will appear (see subsequent table).

Possible messages when X.TUNE is aborted	Description
Device error present.	There is an error present that makes it impossible to execute X.TUNE.
Timeout.	X.TUNE could not be executed within the time limit due to an error.
The motor current is too great.	The motor current is too great to perform the X.TUNE function.
The lower end position of the valve is not recognised.	The lower end position of the valve cannot be recognised by the position sensor.

Tab. 25: Possible error messages after abort of the X.TUNE function

11.5 Set AUTOMATIC operating state

Set AUTOMATIC operating state:

→ Set DIP switch 4 to AUTOMATIC.

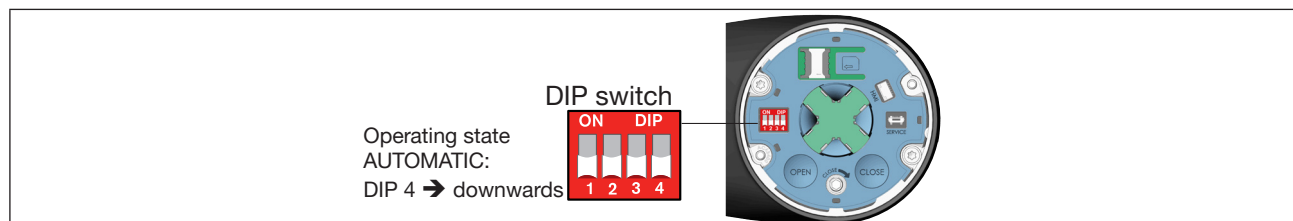


Fig. 42: Set AUTOMATIC operating state

12 OPERATION



WARNING!

Risk of injury from improper operation.

Improper operation may result in injuries as well as damage to the device and its surroundings.

- ▶ The operating personnel must know and understand the contents of the operating instructions.
- ▶ The safety instructions must be followed and the device used only as intended.
- ▶ Only adequately trained personnel may operate the equipment/the device.

Different operating elements are available for operating the device.

- **Standard device**

Operation is via 2 capacitive buttons and 4 DIP switches.

- **Additional operating options**

Expanded functions can be set using a PC or tablet. Settings are created using the büS service interface and the “Bürkert Communicator” PC software.

It requires the USB-büS-Interface available as an accessory.

12.1 Overview: availability of the operating elements

Operating element	Function
4 DIP switches	Enable safety position
	Select safety position
	Not assigned
	Switch to AUTOMATIC, MANUAL operating state
OPEN key	Opening the valve
CLOSE key	Closing the valve:
Mechanical manual override	Mechanically opening or closing the valve
SIM card holder	Holder for using the SIM card available as an accessory
büS service interface	For connecting a CAN adapter or the USB büS interface set available as an accessory
Bürkert Communicator PC software	Software for configuration and setting the device on a PC

Tab. 26: Operating possibilities

12.2 Display elements

Description of the display elements:

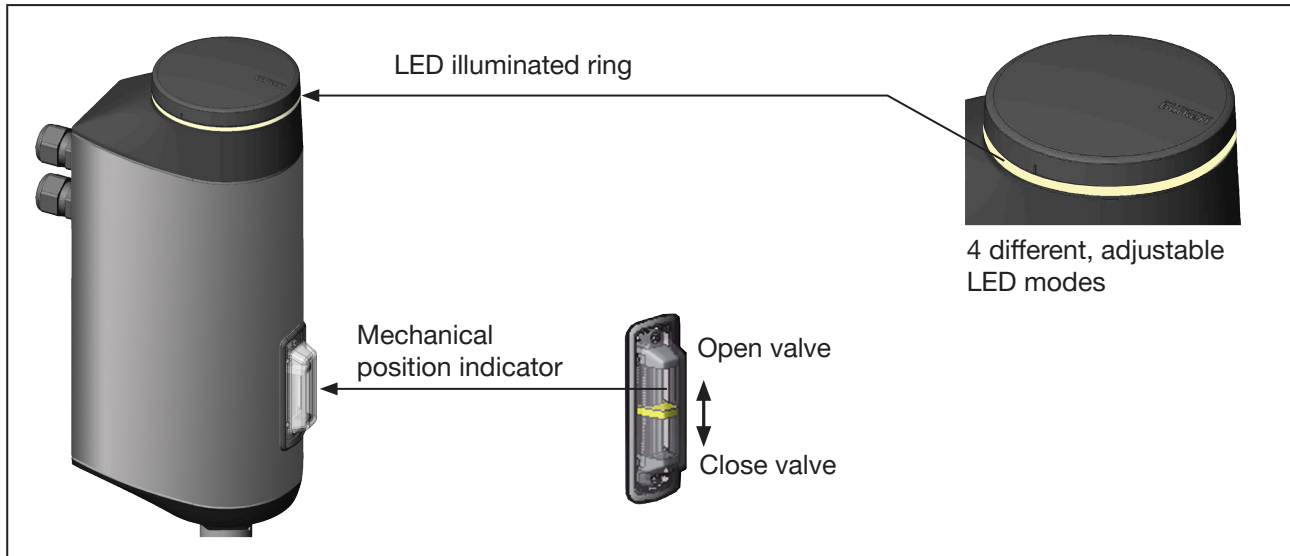


Fig. 43: Display elements

12.2.1 LED illuminated ring

The transparent LED illuminated ring that transmits the light of the LEDs to the outside is fitted to the blind cover. The LED illuminated ring lights up or flashes slowly or quickly in one or several alternating colours to indicate the device's state.

4 different LED modes can be set for the LED light ring:

- NAMUR mode*
- Valve mode*
- Valve mode + warnings* – factory pre-set operation mode
- LED off

Set LED mode:

The LED modes are set using the Bürkert Communicator PC software. For a description see chapter [“14.3 Set LED operation mode”](#).



* The complete description of the device states, errors and warnings that are displayed in LED mode can be found in chapter [“6.4 Display of the device status”](#).

12.2.2 Mechanical position indicator

The mechanical position indicator shows the valve position independently of the supply voltage (see [“Fig. 43: Display elements”](#))

12.3 Operating elements

Presentation of the operating elements:

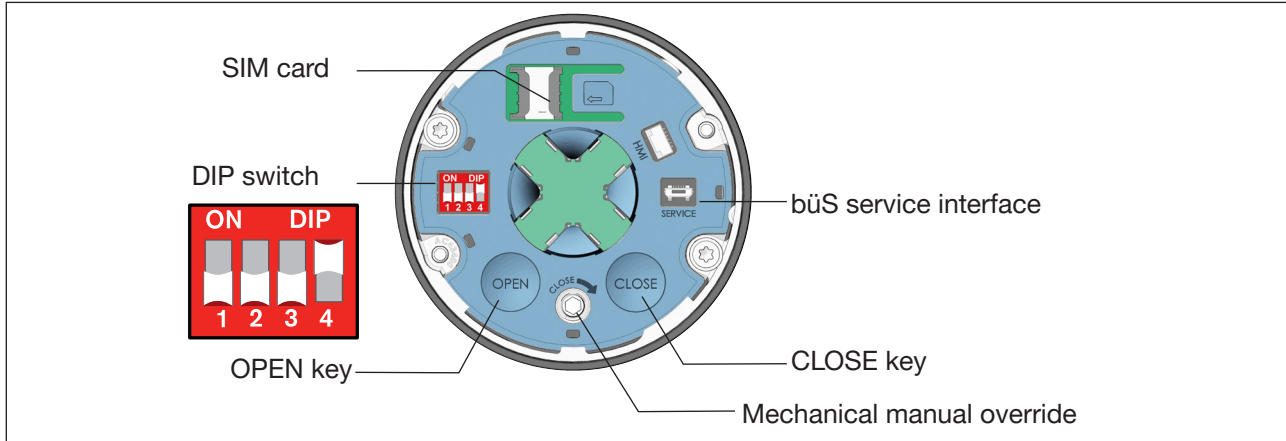


Fig. 44: Operating elements

12.3.1 DIP switch

Settings

- Switch 1: Enable or disable safety position, see chapter [“13.2” on page 78](#).
- Switch 2: Select safety position between NO and NC, see chapter [“13.2” on page 78](#).
- Switch 3: Not assigned.
- Switch 4: Switches between AUTOMATIC and MANUAL mode. See chapter [“13.1” on page 77](#).

12.3.2 OPEN key and CLOSE key

Electrical manual override:

- Open valve: to open, press OPEN button
- Close valve: press CLOSE button



When closing the valve:
Carefully close the valve with minimal force to prevent damage to the diaphragm. Do not press the CLOSE key again when the valve is closed.

Trigger M.Q0.TUNE: For a description, see chapter [“11.3 Adjustment of position control on AG2”](#).

Trigger M.SERVICE: See chapter [“9.5.4 Mount the actuator onto the valve body and establish electrical connection”](#).

12.3.3 Mechanical manual override

If there is no supply voltage, e.g. during installation or in the event of a power failure, the valve can be opened or closed using the mechanical manual override.

For a description see chapter [“15.2 Actuating the valve mechanically”](#).

12.4 bÜS service interface

The bÜS service interface can be used for quick service.

- Configuration of the device, e.g. the base setting for start-up with the PC software Bürkert Communicator. It requires the USB-bÜS-Interface set available as an accessory.
- Configuration of the bÜS network.
- Parameterising of operation parameters
- Error diagnostics
- Software update

Only connect the matching CAN adapter to the bÜS service interface. This CAN adapter is part of the USB bÜS interface set available as an accessory (see [“Tab. 36: Accessories”](#) on page 118).

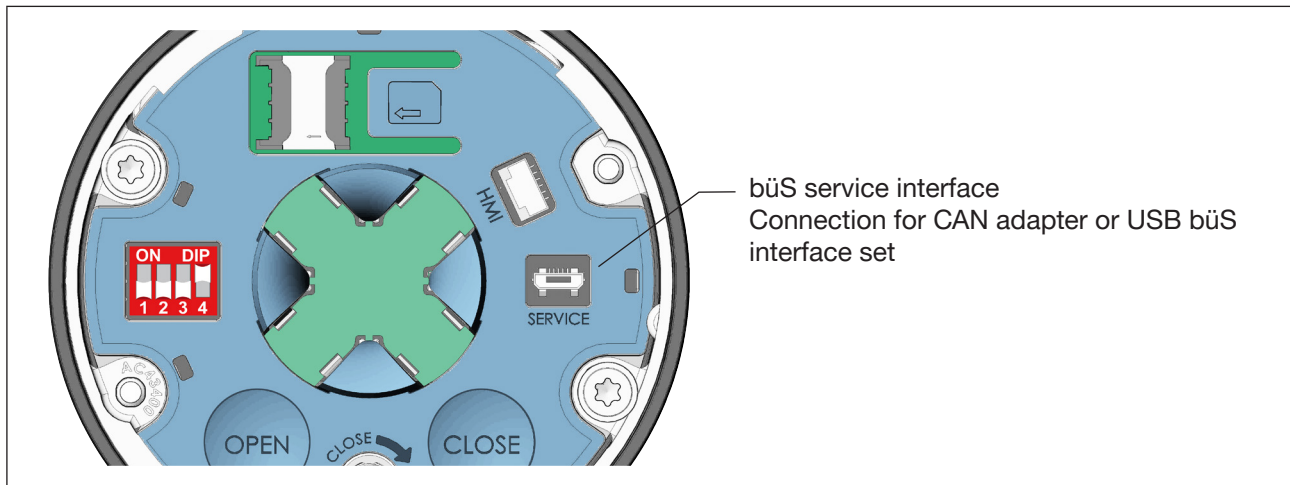


Fig. 45: bÜS service interface



For devices with a fieldbus gateway, the bÜS service interface is inside the fieldbus gateway (see chapter [“12.4 bÜS service interface”](#) on page 73)

12.5 SIM card – acquire and save data (option)

The optional SIM card can be used to store device-specific values and user settings and transfer them to another device.



The configuration client (for BÜS devices) is disabled when the SIM card is inserted. Further information can be found by searching for “central configuration management” on our website country.burkert.com

The SIM card is detected when the device starts and is checked for available data. This data will be transferred or overwritten accordingly:

- The SIM card does not contain any data.
The existing device-specific values and user settings are saved to the SIM card.
- The SIM card contains data compatible with the device.
The data on the SIM card are transferred by the device. The existing device-specific values and user settings are overwritten.
- The SIM card contains data that are not compatible with the device.
The device overwrites the data on the SIM card with its own device-specific values and user settings.

ATTENTION!

Do not use a standard SIM card for the device.

The SIM card used is a special industrial version that offers additional durability and temperature-resistance. Only purchase the SIM card for the electromotive valves from your Bürkert sales department. See chapter “23 Accessories, replacement parts”.

Do not remove the SIM card during operation.

During operation parameter changes are immediately saved to the SIM card.

If the SIM card is removed during operation, data may be lost and the SIM card damaged.



The SIM card can be inserted during operation. A restart is required to ensure that the device detects the SIM card.

Inserting the SIM card:

- Place the SIM card on the surface with the SIM card symbol. The position must correspond to that shown on the symbol.
- Gently push the SIM card to the left into the holder until it stops.
- Restart the device. The new data are transmitted.

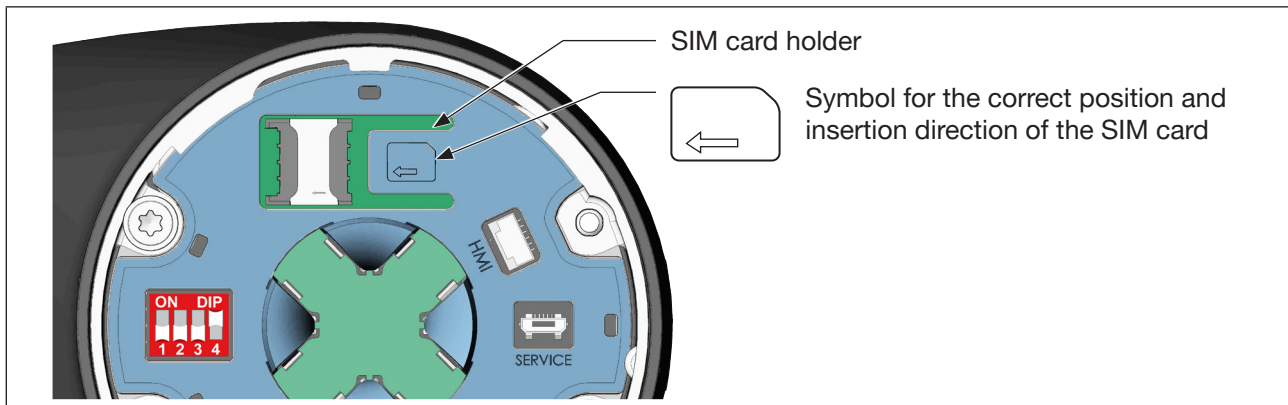


Fig. 46: Using the SIM card

12.6 User interface of the Bürkert Communicator PC software

Configuration area view:

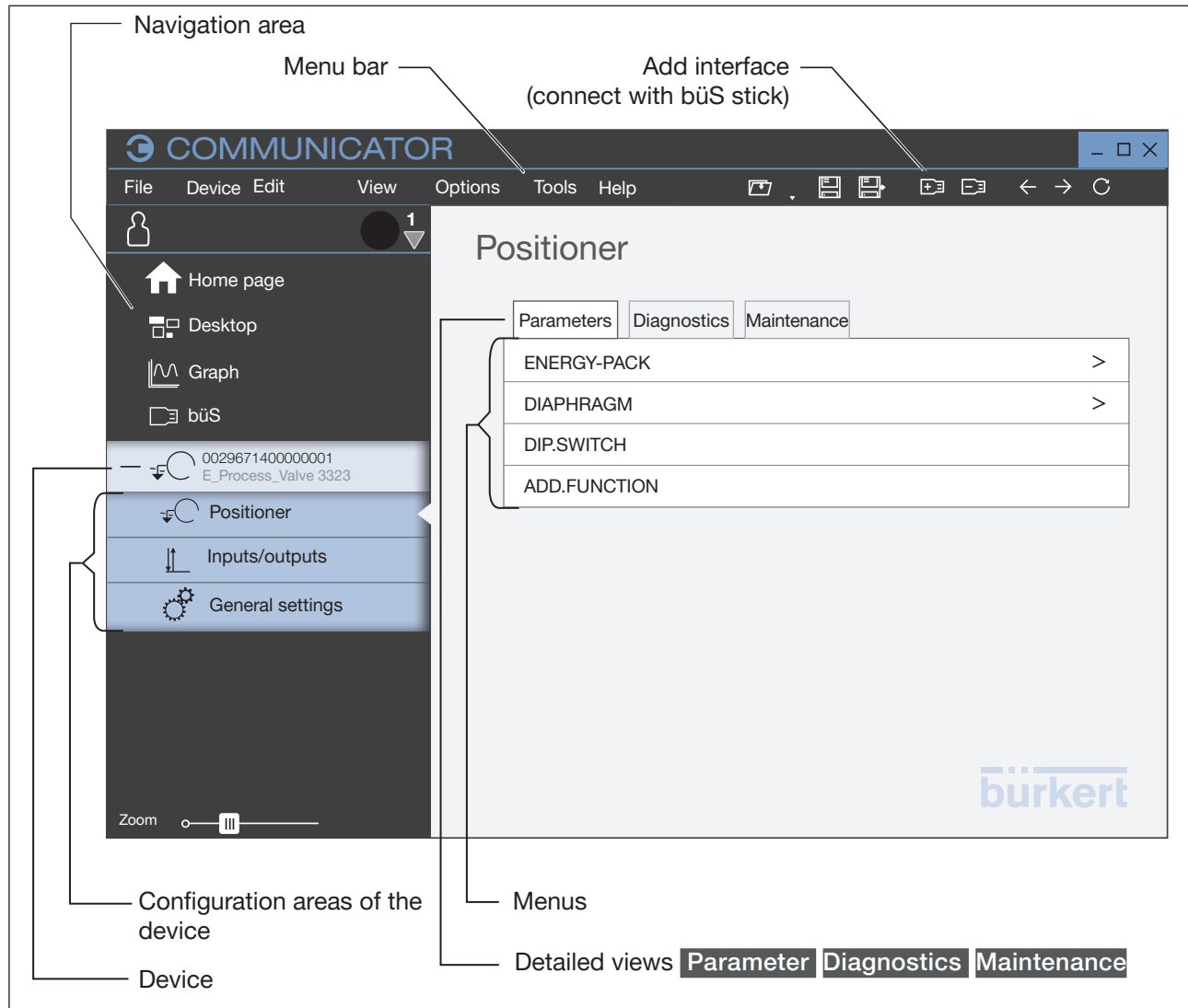


Fig. 47: Bürkert Communicator, configuration area view

View of the application area:

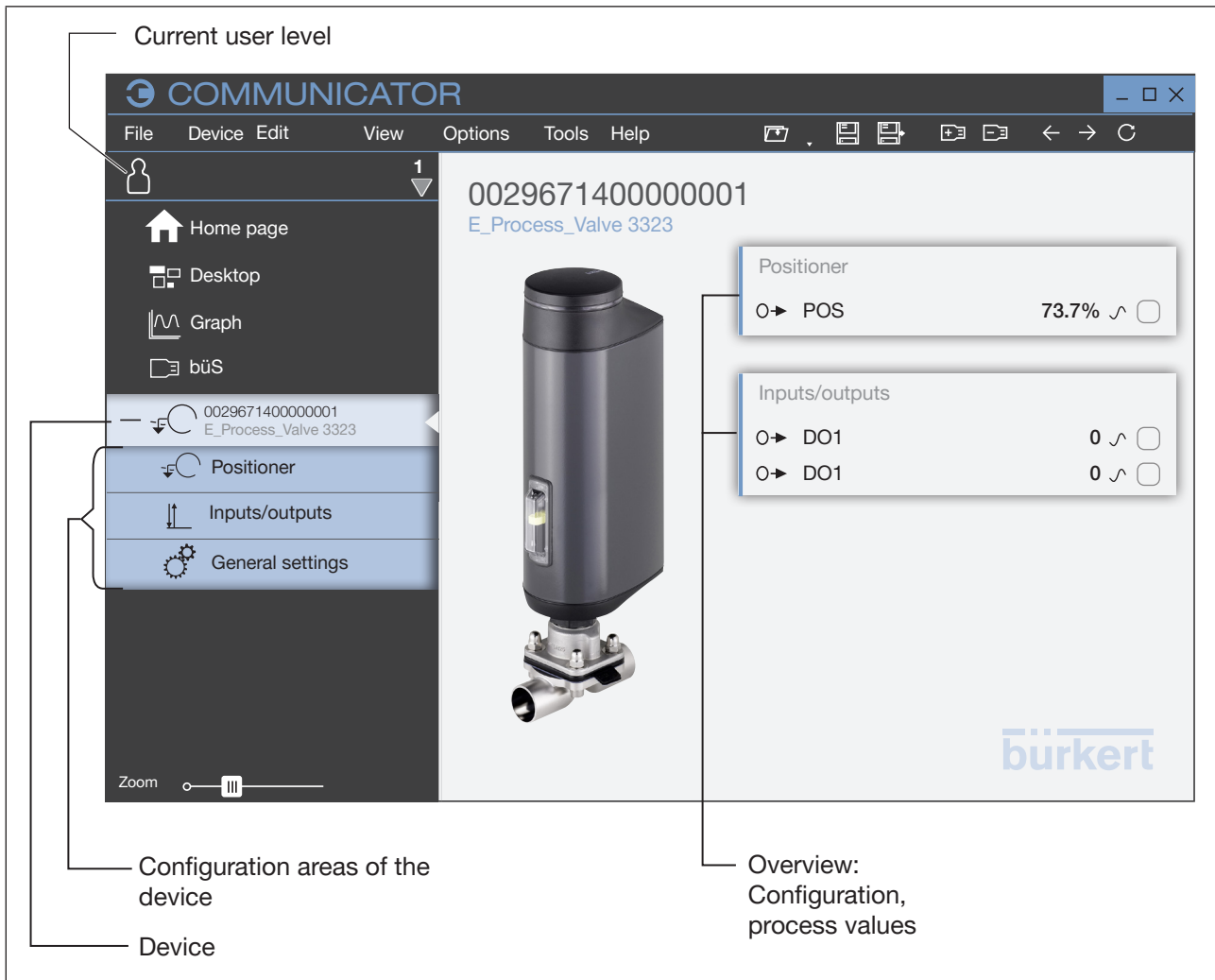



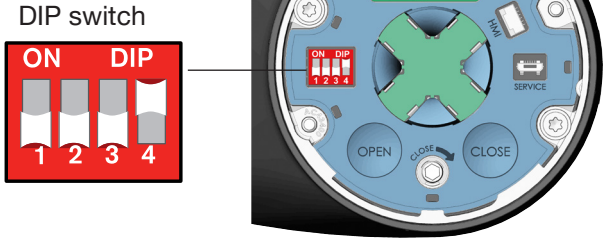
Fig. 48: Bürkert Communicator, "Application area" view

12.7 Establish the connection between device and Bürkert Communicator

- Install the Bürkert Communicator software on the PC.
- Use the büS stick to establish the connection between device and PC.
- Open Bürkert Communicator.
- In the menu bar, click the icon  for **Add interface**.
- **Select büS stick** or **büS over network**.
- ✓ You have established the connection between the device or network and Bürkert Communicator. The device or devices in the network are displayed in the navigation area.

13 BASIC FUNCTIONS

The basic functions are set using the DIP switch position.

DIP switch	Basic function	
1	Enable or disable safety position	
2	Set safety position and effective direction (NC and NO)	
4	Switches between AUTOMATIC and MANUAL mode.	

Tab. 27: Overview of basic functions

13.1 Changing the operating state, AUTOMATIC, MANUAL

Factory setting: Devices in their factory default state have their operating state preset to MANUAL.

DIP switch 4, which is located under the blind cover, is used to change operating state.

→ To unlock the blind cover, turn it anticlockwise and remove.



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

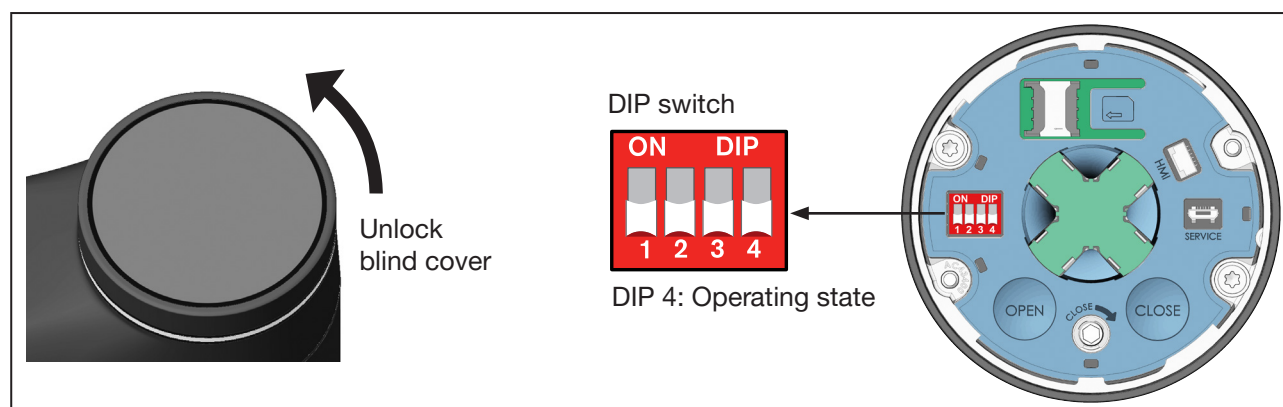
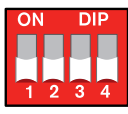


Fig. 49: Setting the operating state

→ Set the operating state with DIP switch 4.

	Operating state	
	AUTOMATIC: DIP 4 → down	MANUAL: DIP 4 → up (ON)

→ Close the blind cover.

13.2 Set safety position and effective direction

The effective direction and safety position are set using DIP switches 1 and 2.

DIP switch 2				DIP switch 1	
Effective direction	Switch position	Set-point value		Switch position (safety position enabled/disabled)	Safety position
		(0-5 V) Log 0	(10-30 V) Log 1		
NC	OFF	Valve closed	Valve open	ON	Valve closed
				OFF	none (actuator stops)
NO	ON	Valve open	Valve closed	ON	Valve open
				OFF	none (actuator stops)

Tab. 28: Set effective direction and safety position

14 ADVANCED FUNCTIONS

14.1 X.TIME – limitation of control speed

This auxiliary function can be used to set the opening and closing times for the entire stroke, and thus limit the control speeds.



When performing M.Q0.TUNE function, the minimum opening and closing time are entered for the entire stroke for Open and Close. This facilitates movement at maximum speed.

Factory setting: factory-set values through the M.Q0.TUNE function

If the control speed is to be reduced, values can be entered for Open and Close which lie between the minimal values to be determined by X.TIME and 60 s.

Effect of a limitation of the opening speed in the event of a spike in set-point value

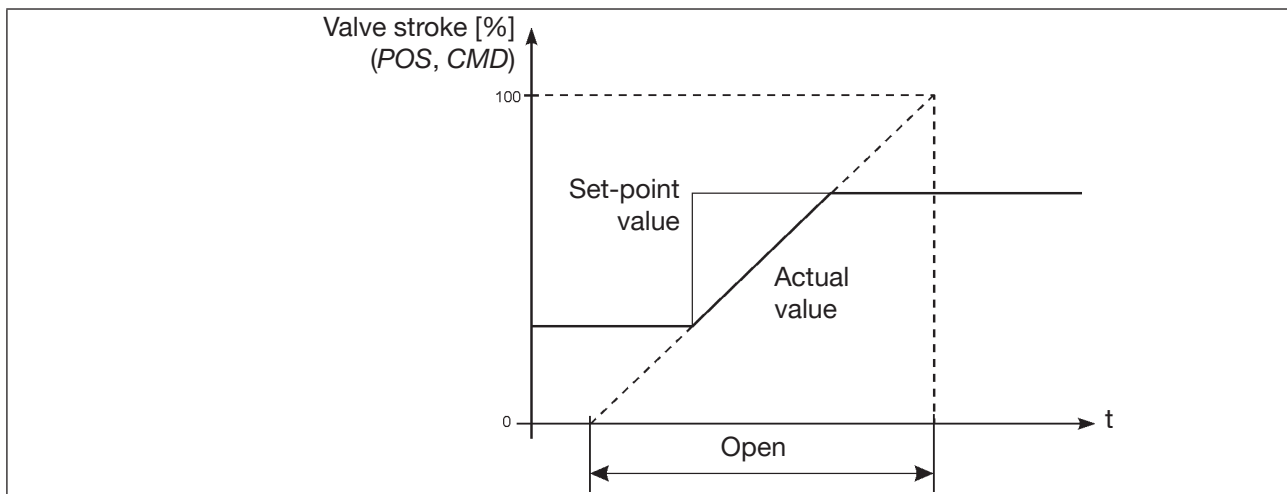


Fig. 50: Diagram X.TIME

Configuration using the Bürkert Communicator software on PC:



The Bürkert Communicator PC software can be downloaded free of charge from the Bürkert website. It requires the USB-büS-Interface available as an accessory. Communication is performed via the device's büS service interface.

The setting is made in the detailed view "Parameter for positioner".

How to switch to detailed view:

→ Select **positioner** in the navigation area.

✓ You are now in the "Parameter" detailed view.

How to enable the control time limit:

→ Select **ADD.FUNCTION**.

→ Select **X.TIME**.

✓ The sealing function is enabled and the menu **X.TIME** for configuration is now available.

How to configure the control time limit:

- Select **X.TIME** in the “Parameter” detailed view.
- Select **Opening time**.
- Enter and confirm the lower limit value.
- Select **Closing time**.
- Enter and confirm the upper limit value.
- ✓ You have enabled and configured the control time limit.

14.2 X.LIMIT – mechanical stroke range limit

This auxiliary function limits the (physical) stroke to defined per cent values (minimum and maximum). The stroke range of the limited stroke is thereby set to 100%.

If the limited stroke range is left during operation, negative *POS* values or *POS* values greater than 100% are displayed.

Factory setting: $Min = 0\%$, $Max = 100\%$

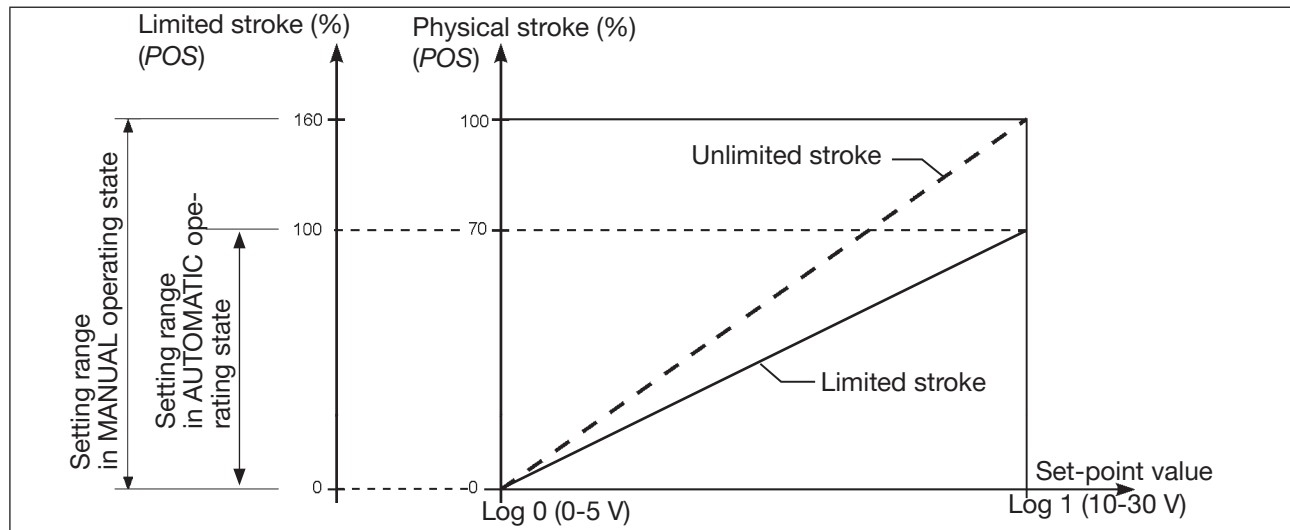


Fig. 51: Diagram X.LIMIT

ATTENTION!

The safety position (closed or open) is located at the end positions of the physical stroke.

Configuration using the Bürkert Communicator software on PC:



The Bürkert Communicator PC software can be downloaded free of charge from the Bürkert website. It requires the USB-büS-Interface available as an accessory. Communication is performed via the device's büS service interface.

The setting is made in the Parameter detailed view in the positioner navigation area.

How to switch to detailed view:

→ Select **Positioner**.

✓ You are now in the "Parameter" detailed view.

How to enable the mechanical stroke limit:

→ Select **ADD.FUNCTION**.

→ Select **X.LIMIT**.

✓ The mechanical stroke limit is enabled and the menu **X.LIMIT** for configuration is now available.

How to configure the mechanical stroke limit:

- Select **X.LIMIT** in the detailed view “Parameter”.
- Select **Maximum**.
- Enter and confirm the upper limit value.
- ✓ You have enabled and configured the mechanical stroke limit.

14.3 Set LED operation mode

Configuration using the Bürkert Communicator software on PC:



The Bürkert Communicator PC software can be downloaded free of charge from the Bürkert website. It requires the USB-büS-Interface available as an accessory. Communication is performed via the device's büS service interface.

The setting is made in the Parameter detailed view in the General Setting navigation area.

How to switch to detailed view:

- Select **General settings**.
- ✓ You are now in the “Parameter” detailed view.

How to set LED operation mode:

- Select **Status LED**.
- Select **Operation mode**.

The following LED modes are available:

- NAMUR operation mode**
- Valve mode**
- Valve mode + warnings**
- LED off**

- ✓ You have set the LED operation mode.

14.4 Setting the colours for indicating valve position

The colours on the LED light ring that indicate the valve positions can be set individually.

Configuration using the Bürkert Communicator software on PC:



The Bürkert Communicator PC software can be downloaded free of charge from the Bürkert website. It requires the USB-büS-Interface available as an accessory. Communication is performed via the device's büS service interface.

The setting is made in the Parameter detailed view in the **General Setting** navigation area.

How to switch to detailed view:

→ Select **General settings**.

✓ You are now in the “Parameter” detailed view.

How to set the colour for the valve position.

→ Select **Status LED**.

→ Select **Valve mode** or **Valve mode + warnings**.

→ In the submenus **“Valve opened”** and **“Valve closed”**, select the colour for the respective valve position.

✓ You have set the colours that are used to indicate the valve positions on the LED light ring.

15 MANUAL OVERRIDE OF VALVE

The actuation of the valve can be manually overridden by electrical or mechanical means. Electrical manual override is usually used to manually open and close the valve.

The mechanical manual override must only be used to open and close the valve if there is a power failure. The manual override may only be used while in a de-energised state.

15.1 Electrical override of valve

ATTENTION!

Diaphragm may be damaged as a result of electrical manual override.

- ▶ Do not press the CLOSE key while the valve is closed or else the diaphragm may be damaged.

To actuate the valve, the device must be in MANUAL operating state.

The 2 buttons for actuating the valve and for setting the mode are located under the blind cover.

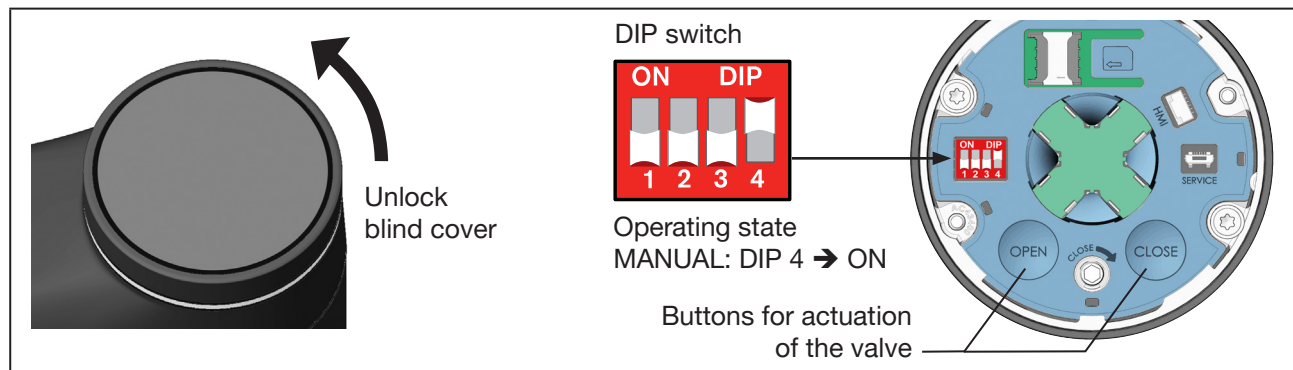


Fig. 52: Set MANUAL operating state and actuate valve

Remove the blind cover:



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

→ To unlock the blind cover, turn it anticlockwise and remove.

Switch to MANUAL operating state:

→ Set DIP switch 4 to ON.

The device is in MANUAL operating state.

Change valve position:

→ To open, press the OPEN button

→ To close, press the CLOSE button.

ATTENTION!

Do not press the CLOSE button again while the valve is closed or else the diaphragm may be damaged.

Switch to AUTOMATIC operating state:

→ Push DIP switch 4 down.

The device is back in AUTOMATIC operating state.

Close blind cover:

→ Mount blind cover and turn clockwise until the 2 marks (one vertical line on the blind cover and on the actuator) are vertically aligned.

15.2 Actuating the valve mechanically

If there is no supply voltage, e.g. during installation or in the event of a power failure, the valve can be opened or closed using the mechanical manual override.

ATTENTION!

Damage to device or diaphragm caused by mechanical manual override.

- ▶ Only use mechanical manual override while in a de-energised state.
- ▶ Carefully close the valve with minimal force to prevent damage to the diaphragm (max. 2 Nm).

15.2.1 Required work steps

1. Switch off the supply voltage. Wait until LED illuminated ring goes out.
2. AG2: remove blind cover.
AG3: Unscrew the pressure compensation element (AF 17).
2a. Only for devices with fieldbus gateway: Remove fieldbus gateway from the actuator (see Chapter [“15.2.2”](#)).
3. Actuate valve mechanically.
4. AG2: close the blind cover.
AG3: Screw on the pressure compensation element (AF17) to 1.25 Nm.
4a. Only for devices with fieldbus gateway: first install fieldbus gateway on the actuator (see Chapter [“15.2.3”](#)), then seal blind cover or display module (see Chapter [“15.2.4”](#)).
5. Connect supply voltage.

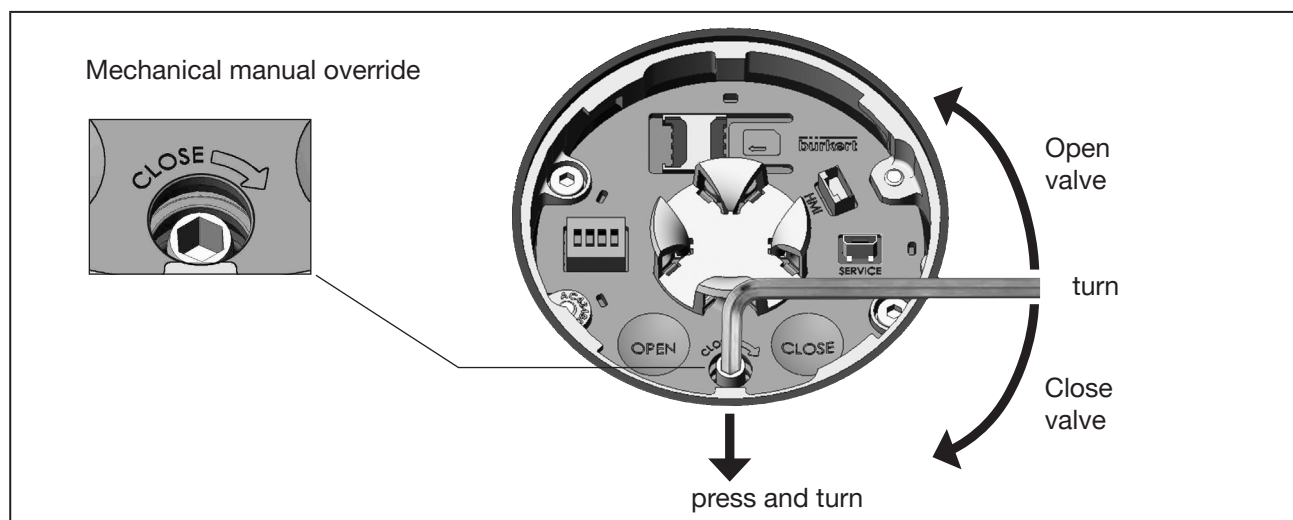


Fig. 53: Mechanical manual override AG2

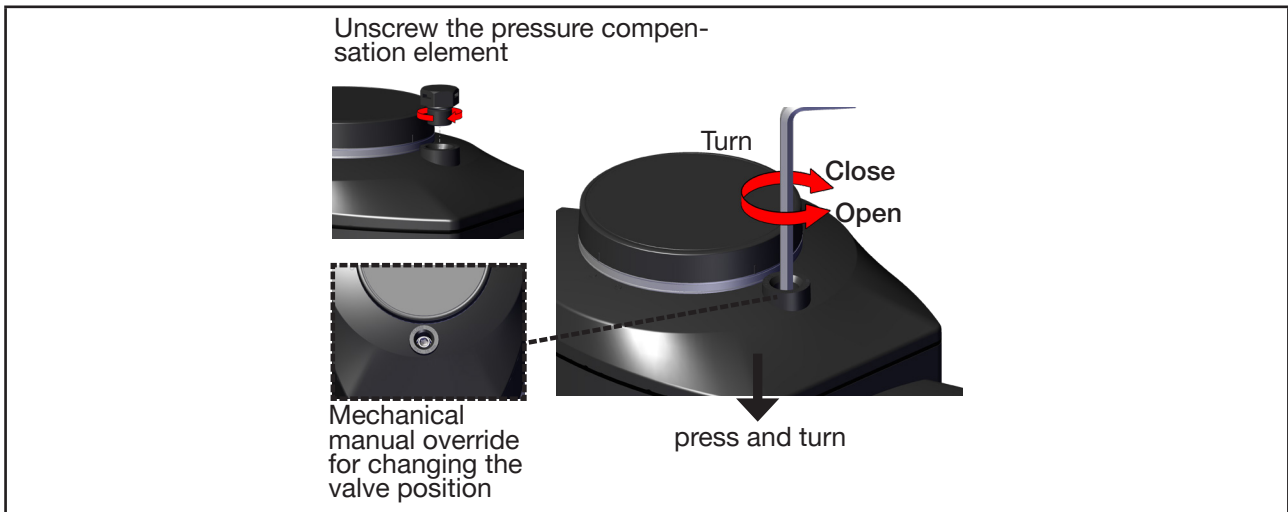


Fig. 54: Mechanical manual override AG3

Remove the blind cover:

! Devices with ATEX approval or IECEx approval are secured with a magnetic lock. The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

→ To unlock the blind cover, turn it anticlockwise and remove.

Actuating valve mechanically:

→ To operate the valve mechanically, use an Allen key with width across flats of 3 mm (AG2)/5 mm (AG3).

ATTENTION!

Maximum torque 2 Nm (AG2)/10 Nm (AG3). Exceeding the torque when the valve end position is reached will damage the mechanical manual override or damage the device.

→ Apply light pressure to lock the mechanical manual override mechanism into place while turning the Allen key at the same time (see “Fig. 53” and “Fig. 54”).

⚠ Maximum tightening torque 2 Nm (AG2)/10 Nm (AG3)!

- Turn counterclockwise to open.
- Turn clockwise to close.

The position indicator shows that the valve end positions have been reached (see “Fig. 55”).

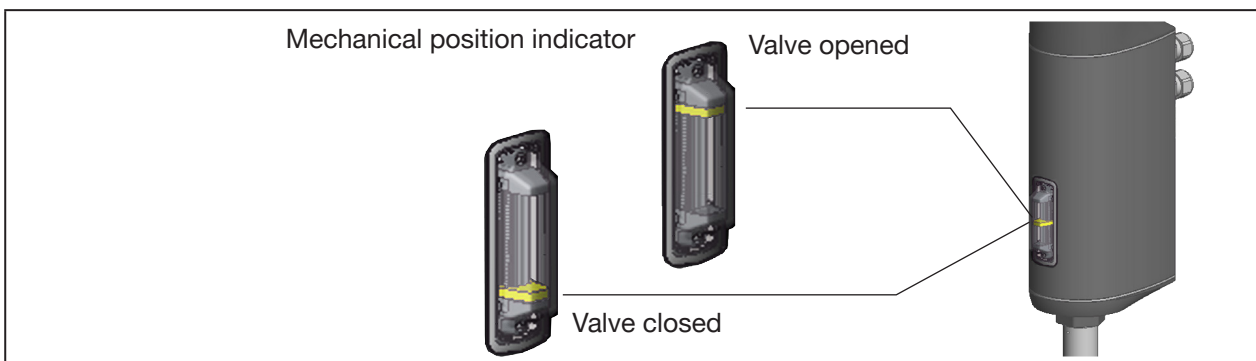


Fig. 55: Mechanical position indicator

- Once the desired valve position is achieved, remove the Allen key.
The mechanical manual override mechanism will disengage automatically.

Close blind cover:

- Mount blind cover and turn clockwise until the 2 marks (one vertical line on the blind cover and on the actuator) are vertically aligned.

15.2.2 Removing the fieldbus gateway from the actuator (AG2)

Prerequisites:

Supply voltage switched off, blind cover removed.

ATTENTION!

The fieldbus gateway may be removed only when it is deenergised, otherwise the device may be damaged.

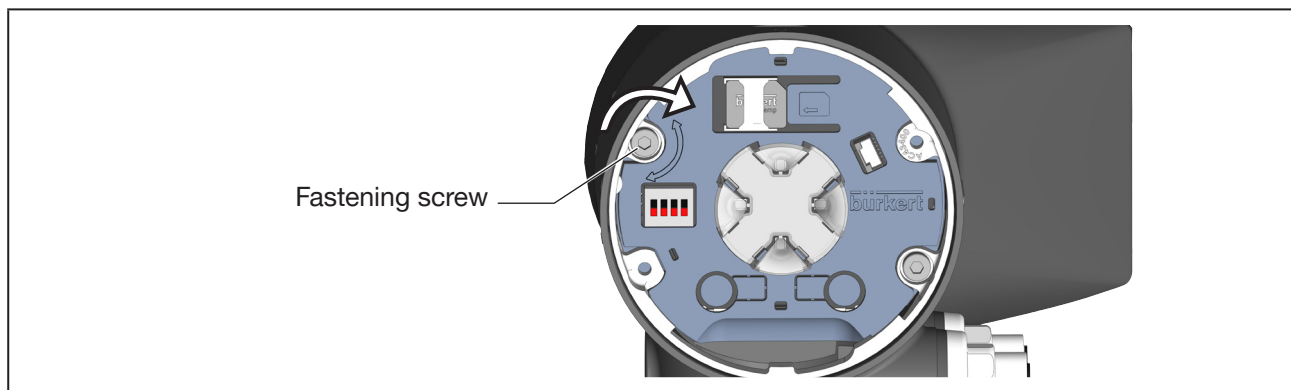


Fig. 56: Remove fieldbus gateway

- Remove fastening screw (socket head screw, width across flats 3 mm).

ATTENTION!

Caution when removing the fieldbus gateway. Fieldbus gateway and actuator are connected to each other by a cable.

- To release the fieldbus gateway, turn it counterclockwise and carefully remove it.
→ Disconnect connection cable from the fieldbus gateway.

15.2.3 Mount fieldbus gateway on the actuator (only AG2)

Prerequisites: supply voltage switched off.

ATTENTION!

The fieldbus gateway may be mounted only when it is deenergised, otherwise the device may be damaged.

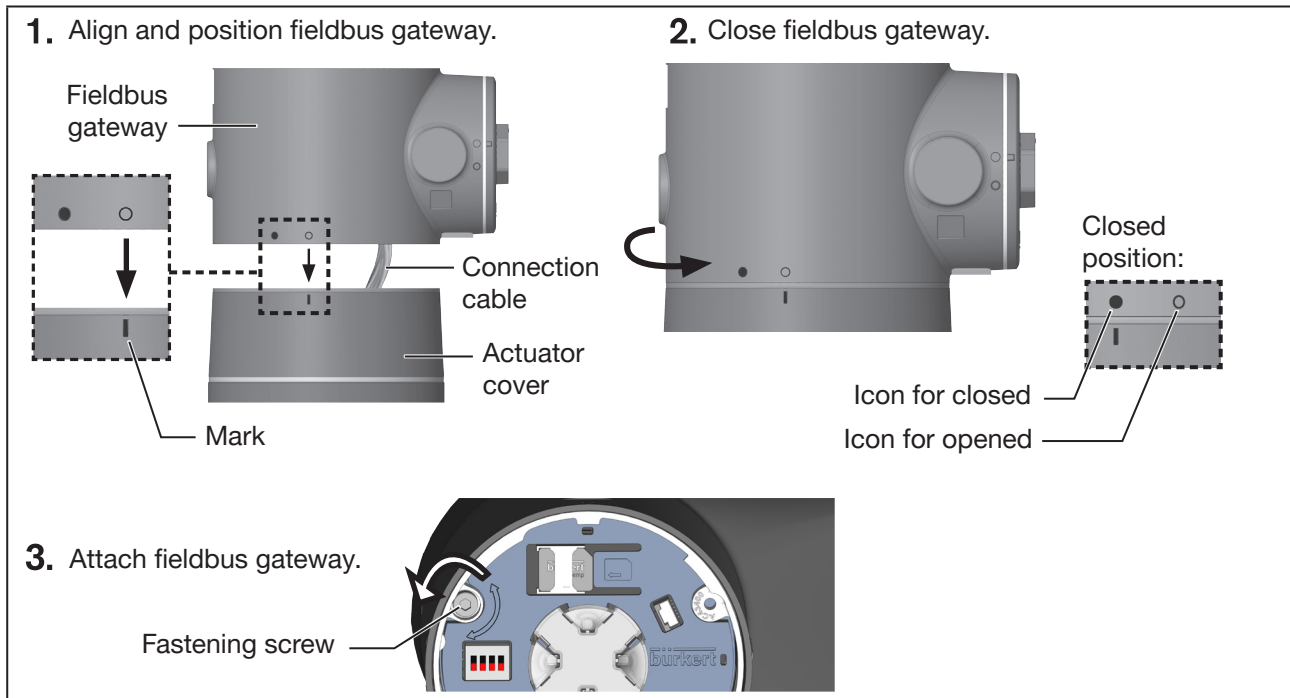


Fig. 57: Mounting fieldbus gateway:

- Insert connection cable into the actuator on the fieldbus gateway.
- Align and position fieldbus gateway on the actuator cover.
Centre the icon for opened over the mark on the actuator.
- Manually turn fieldbus gateway clockwise until the icon for closed is positioned over the mark.
- Tighten fastening screw (socket head screw, width across flats 3 mm).
Observe the tightening torque of 1.1 Nm!

15.2.4 Close blind cover (only AG2)







Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

Closing the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

- Mount the blind cover and turn it clockwise until the 2 marks are vertically aligned. Vertical lines are affixed as marks to the blind cover and actuator.

16 OPERATING STRUCTURE AND FACTORY SETTING

The factory default settings are depicted in blue in the operating structure to the right of the menu.

Examples:  /  Factory-enabled or selected menu options
 /  Factory-disabled or unselected menu options
 2%, 10 sec, ... Factory-set values

16.1 Operating structure of the configuration area

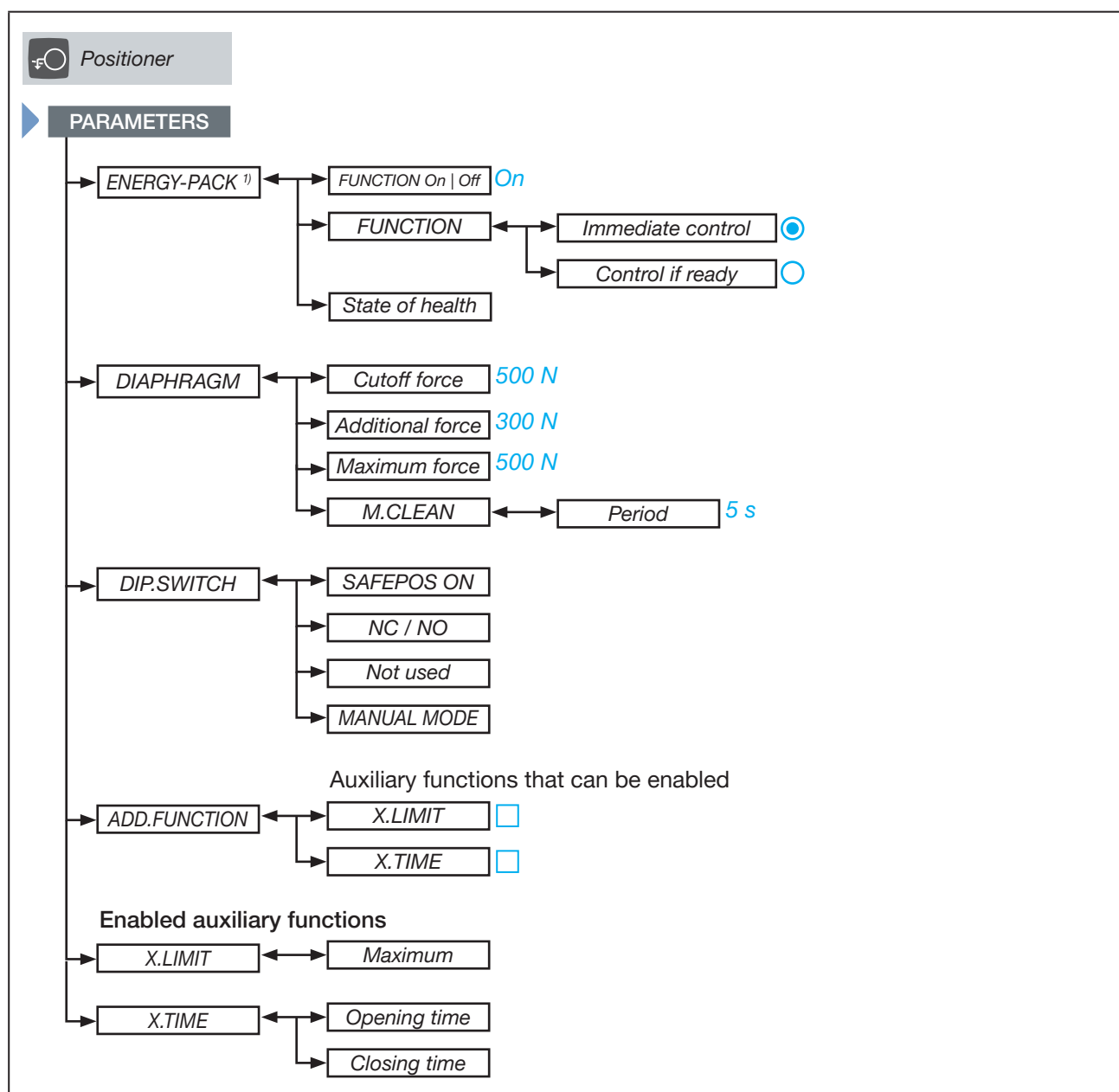


Fig. 58: Operating structure – 1-a, "Positioner" configuration area

1) Only available in devices with SAFEPOS energy-pack (option).

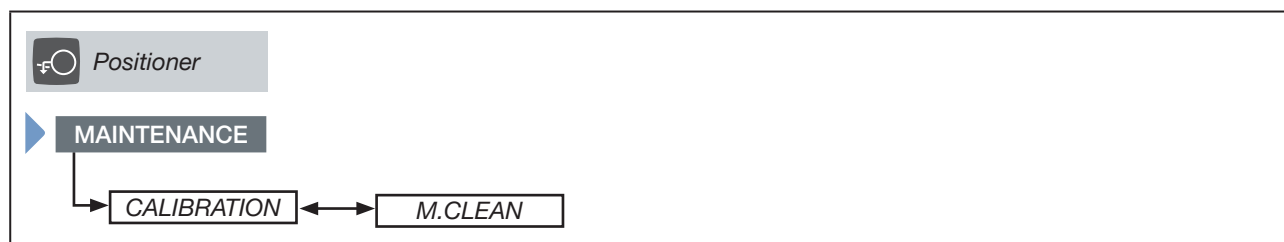


Fig. 59: Operating structure – 1-b, positioner maintenance

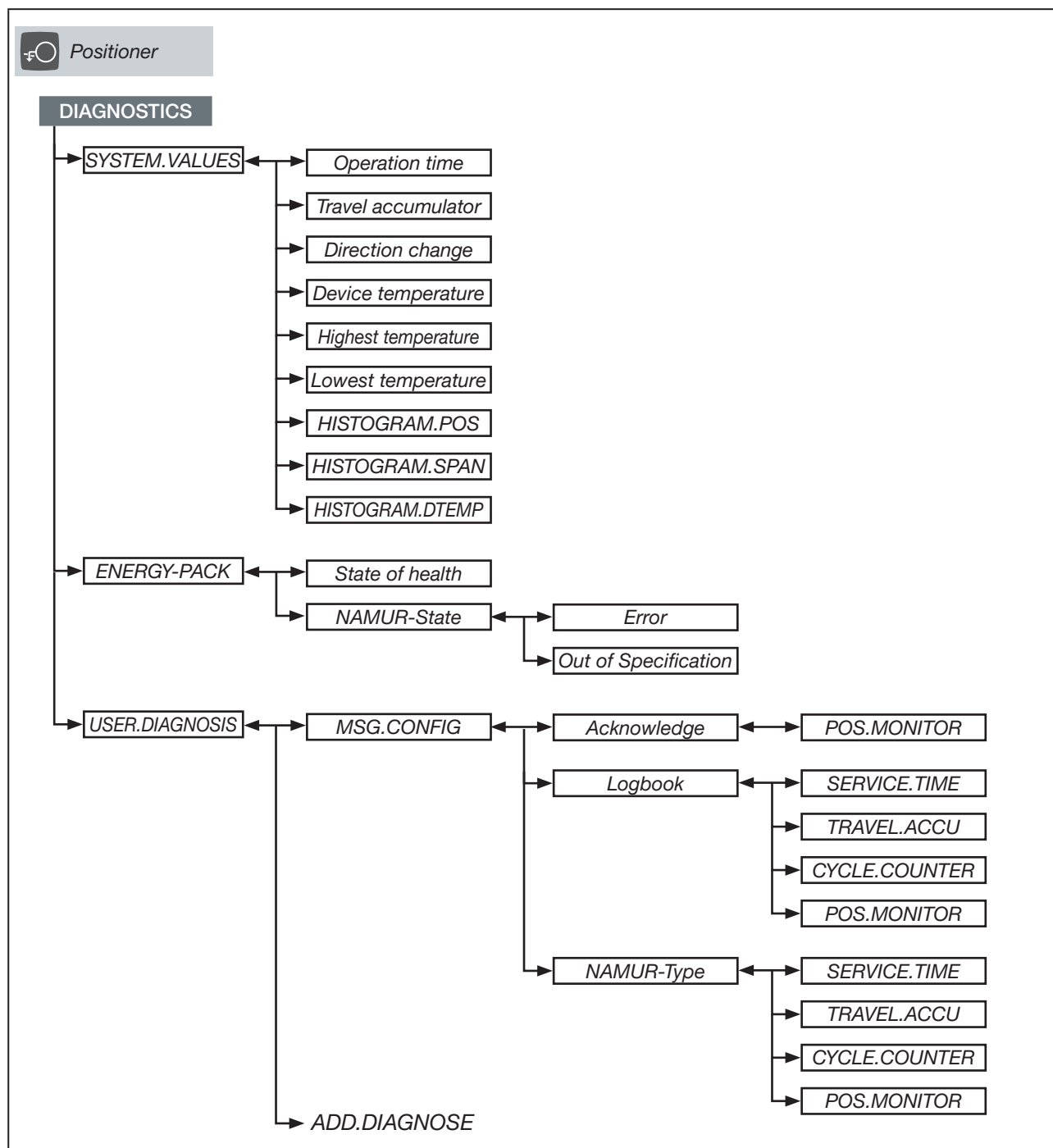


Fig. 60: Operating structure – 1-c, positioner diagnostics

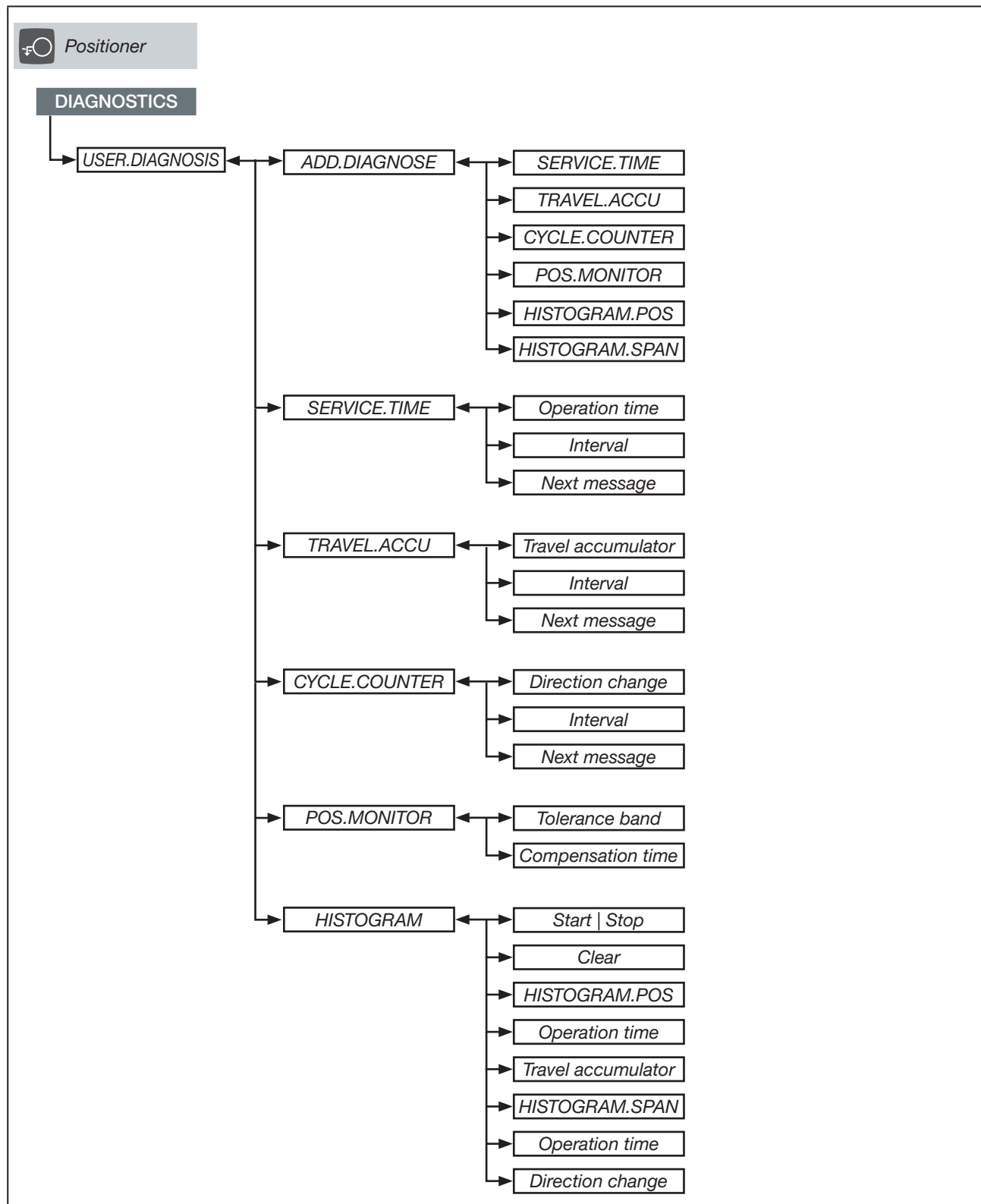


Fig. 61: Operating structure – 1-d, positioner diagnostics

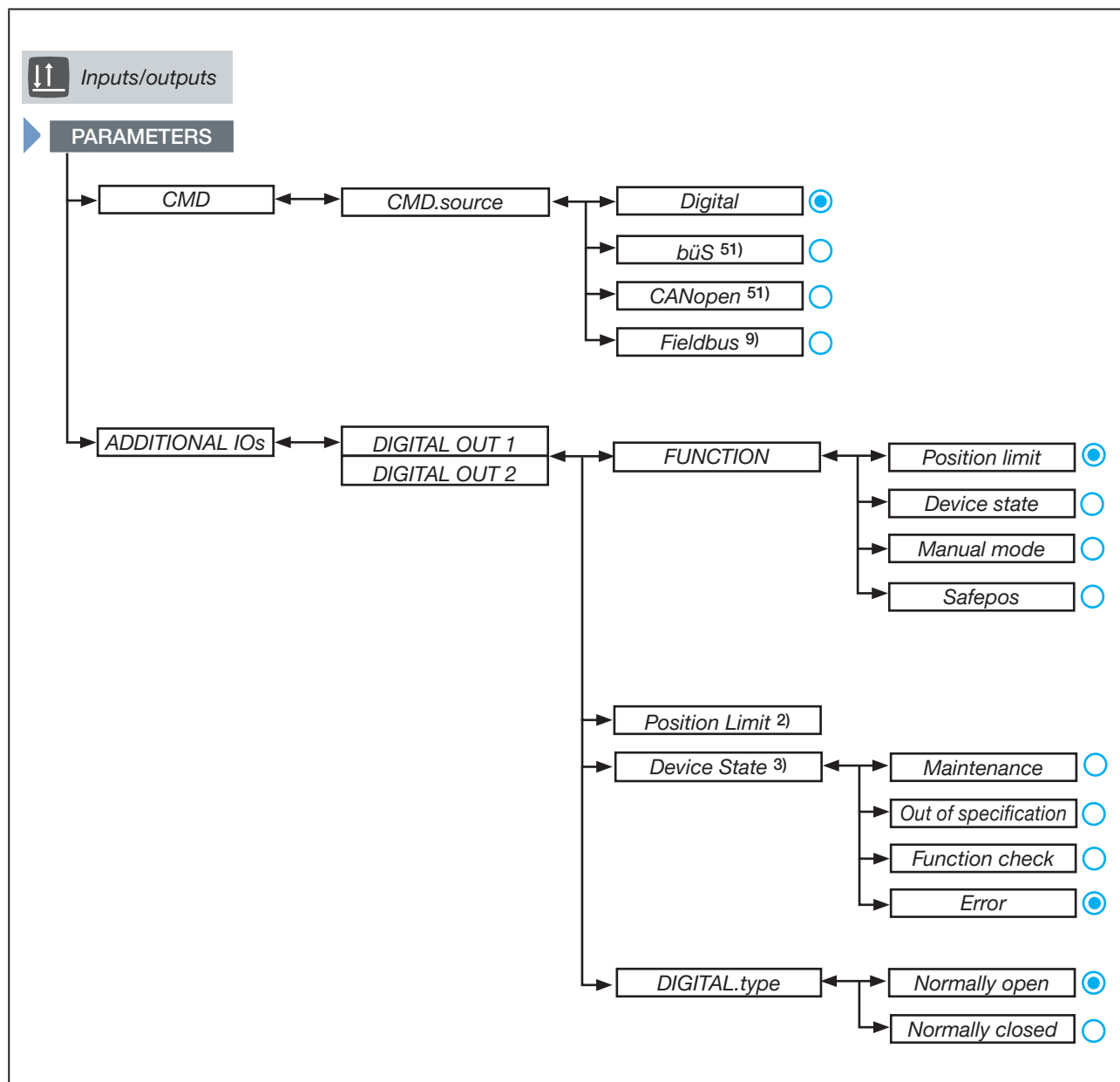


Fig. 62: Operating structure – 2-a, “Inputs/outputs” configuration area

2) Only available if selected in submenu **FUNCTION** → **Position limit**.

3) Only available if selected in submenu **FUNCTION** → **Device state**.

9) Only available in devices with gateway option.

51) Only available in devices with corresponding protocol

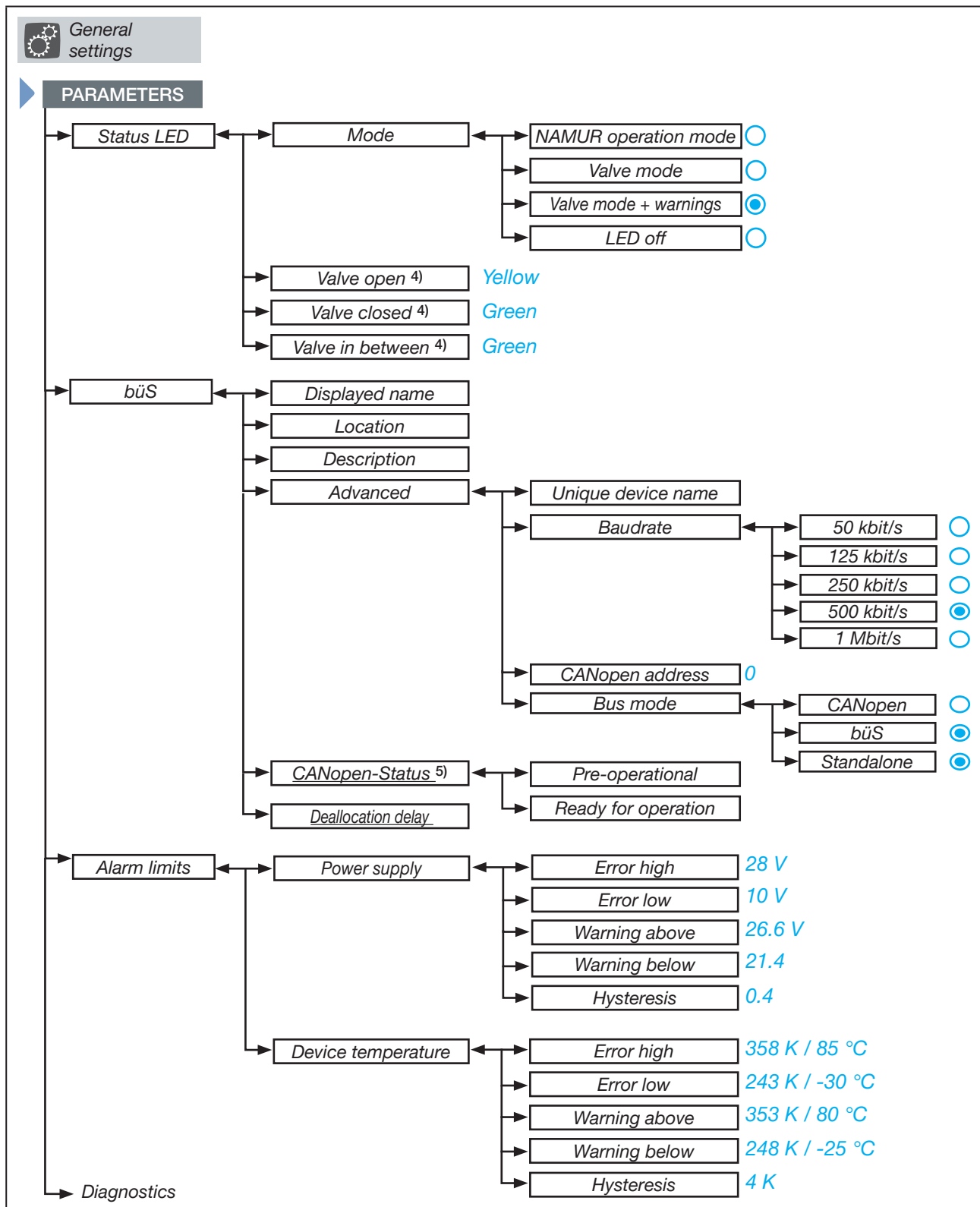


Fig. 63: Operating structure – 3-a, configuration area "General settings"

4) Only available if selected in the menu **Operation mode** → **Valve mode** or **Valve mode+warnings**.

5) Only available if selected in the menu **Bus operation mode** → **CANopen**.

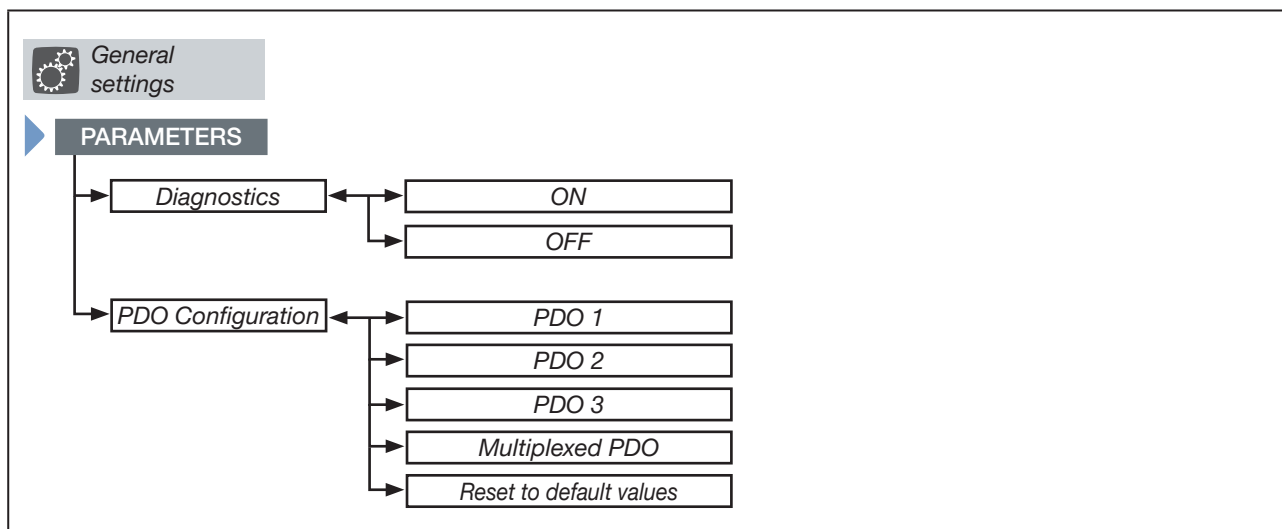


Fig. 64: Operating structure – 3-b, configuration area “General settings”

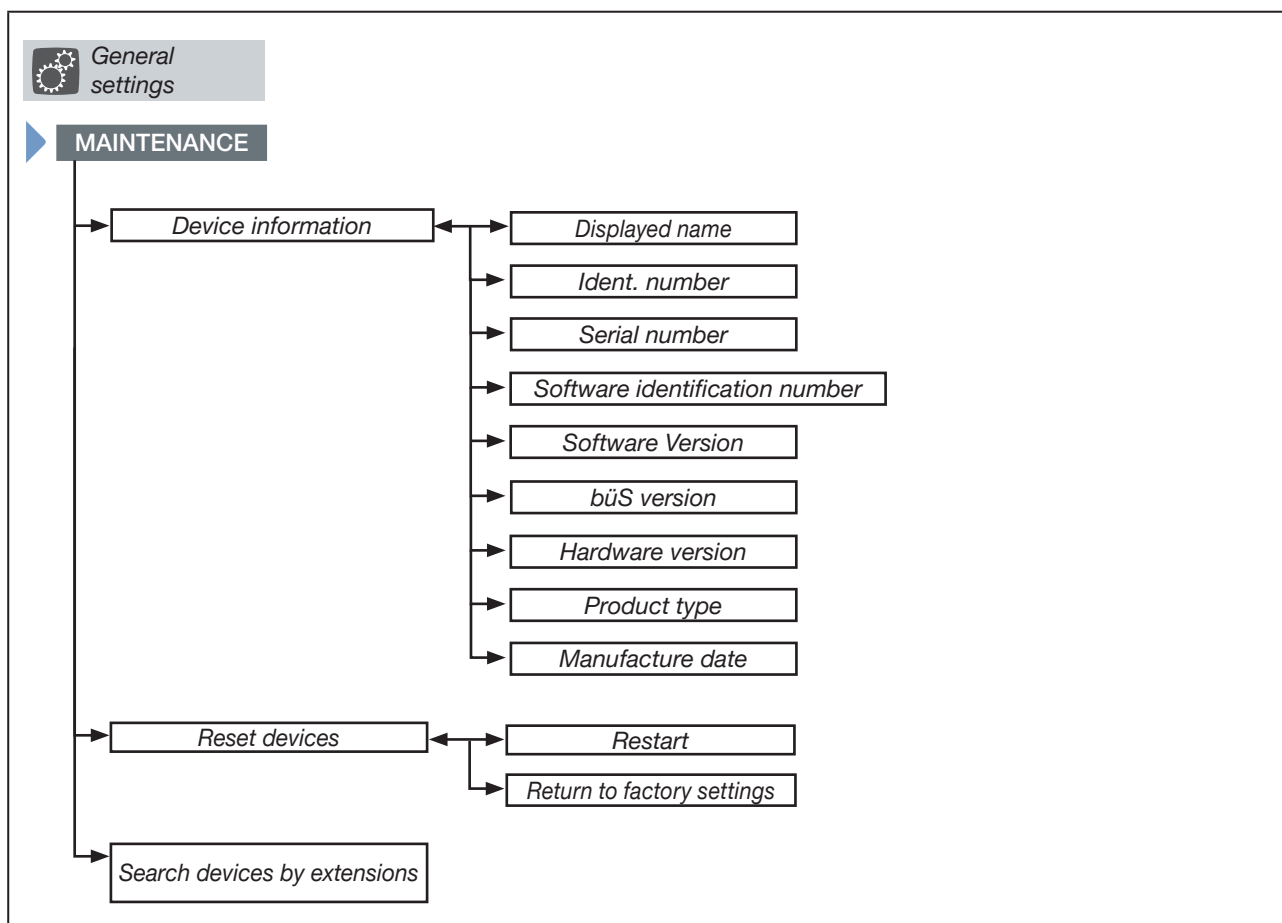


Fig. 65: Operating structure – 3-c, general settings maintenance

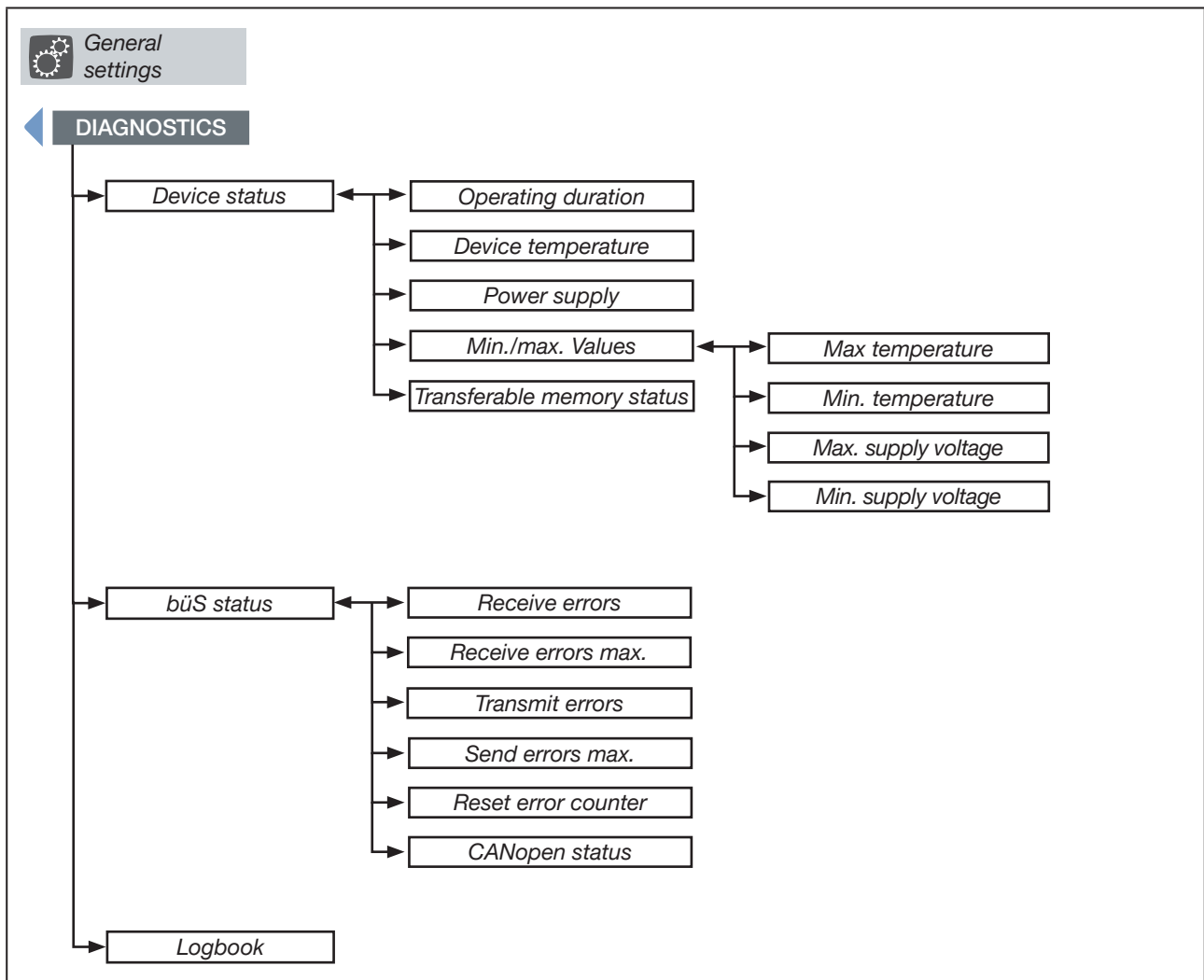


Fig. 66: Operating structure – 3-d, general settings diagnostics

17 INDUSTRIAL ETHERNET

To allow connection to an Ethernet network, the electromotive control valve with integrated fieldbus gateway is optionally available.

Supported fieldbus protocols: Ethernet/IP, PROFINET, Modbus TCP.

17.1 Fieldbus gateway description

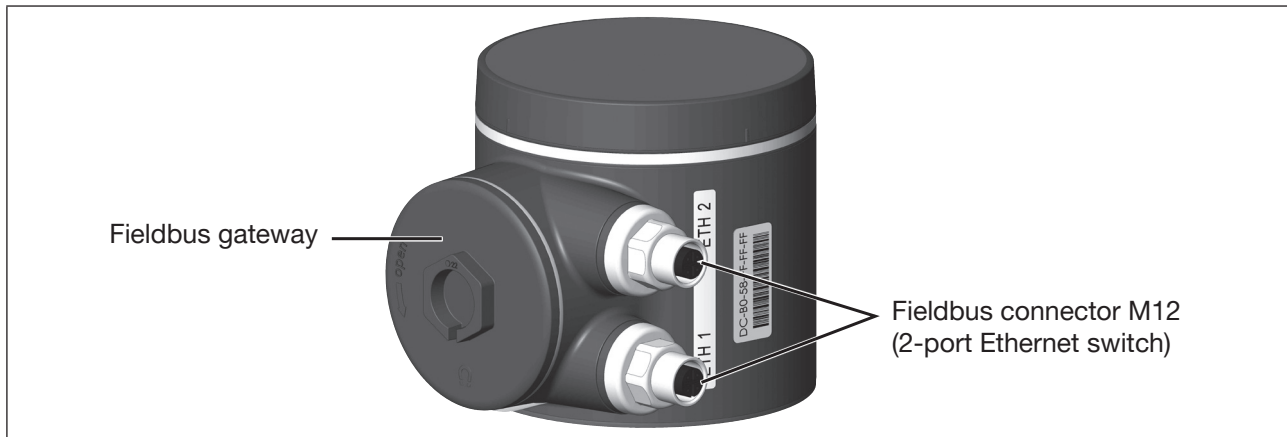


Fig. 67: Fieldbus gateway

17.1.1 LEDs for indicating network connection status

The LEDs for indicating network connection status are located inside the fieldbus gateway.

To access it, turn the cover counterclockwise.

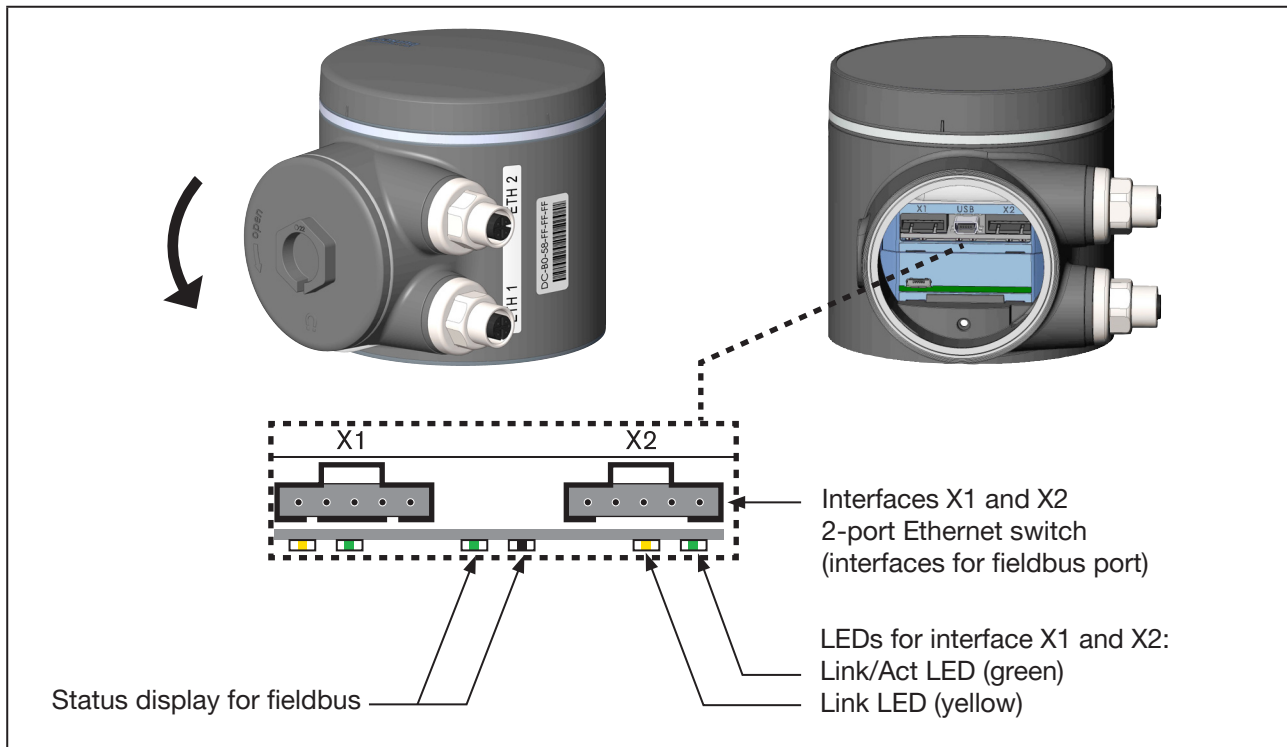


Fig. 68: LEDs for indicating network connection status

LED state		Fault description/cause	Action
Link/Act LED (green)	Active	Rapid flashing: Connection with overriding protocol layer EtherNet/IP has been established. Data are being transmitted. Slow flashing: there is no connection to the protocol layer. This is normally the case for approx. 20 seconds after restarting.	
	Not active	No connection to the network available.	Check cable.
Link LED (yellow)	Active	Connection to network active.	-
	Not active	No connection to the network available.	Check cable.

Tab. 29: LED status indicators of interfaces X1 and X2 (fieldbus port)

17.2 Technical data Industrial Ethernet

17.2.1 PROFINET IO specifications

Topology recognition	LLDP, SNMP V1, MIB2, Physical Device
Minimum cycle time	10 ms
IRT	not supported
MRP media redundancy	MRP client is supported
Additional supported features	DCP, VLAN Priority Tagging, Shared Device
Transmission speed	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3
PROFINET IO specification	V2.3
(AR) Application Relations	The device can simultaneously process up to 2 IO ARs, 1 Supervisor AR, and 1 Supervisor DA AR.

17.2.2 EtherNet/IP specifications

Pre-defined standard objects	Identity Object (0x01)
	Message Router Object (0x02)
	Assembly Object (0x04)
	Connection Manager (0x06)
	DLR Object (0x47)
	QoS Object (0x48)
	TCP/IP Interface Object (0xF5)
	Ethernet Link Object (0xF6)
DHCP	supported
BOOTP	supported
Transmission speed	10 and 100 MBit/s
Duplex modes	Half duplex, full duplex, auto-negotiation
MDI modes	MDI, MDI-X, Auto-MDIX

Data transport layer	Ethernet II, IEEE 802.3
Address Conflict Detection (ACD)	supported
DLR (ring topology)	supported
Integrated switch	supported
CIP reset service	Identity Object Reset Service types 0 and 1

17.2.3 Modbus TCP specifications

Modbus function codes	1, 2, 3, 4, 6, 15, 16, 23
Mode	Message mode: Server
Transmission speed	10 and 100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3

17.3 Projecting via fieldbus

For project planning, you need the suitable start-up file for the respective fieldbus protocol.

Fieldbus	Start-up file
EtherNet/IP	EDS file
PROFINET	GSDML file
Modbus TCP	not required

The start-up files required for the respective project planning software and their description are available on the Internet.



Download at:

www.burkert.com / Type 3323 / Downloads "Software" / Device Description Files

Please refer to the documentation of your project design software for instructions regarding the installation of the start-up files.

17.3.1 Setting the Ethernet parameters for EtherNet/IP, PROFINET, Modbus TCP



With Modbus TCP, it is essential to set the Ethernet parameters.



Setting option:

Using the Bürkert Communicator PC software, using the web server or on the display of the device (option).

Settings are created on the PC using the bÜS service interface and the "Bürkert Communicator" PC software. It requires the USB bÜS interface set available as an accessory.

Display operation: button functions

	Select, activate		Confirm		Back
--	------------------	--	---------	--	------

To set the Ethernet parameters, you must switch to the detailed view "Parameters for Industrial Communication".

How to switch to detailed view:

- For setting with Bürkert Communicator, select **Industrial Communication** in the navigation area.
- When using the display for the configuration, switch to **CONFIGURATION** on the home screen and select **Industrial Communication**.

✓ You are now in the “Parameter” detailed view.



The Ethernet parameters can only be set when the corresponding fieldbus protocol has been selected. **Parameter** → **Protocol settings** → **Protocol** → Select protocol.

Setting the Ethernet parameters:

- Select **Protocol settings**.
- Select **Protocol** and set the desired fieldbus protocol.

Settings:

- Select **IP settings** and create settings.
- **DNS compatible name** can only be set with PROFINET. Factory default setting: not assigned
- **Fixed IP address** Factory default setting: 192.168.0.100
- **Network mask** Factory default setting: 255.255.255.0
- **Standard gateway** Factory default setting: 192.168.0.1.



With PROFINET, the factory default setting for the standard gateway is 0.0.0.0.

Setting for EtherNet/IP fieldbus protocol:

- Select **IP settings**.
- Select **IP operation mode** and set the desired operation mode. Factory default setting: **Fixed IP address**.

✓ You have set the Ethernet parameters to connect the device to the PLC network.

17.4 Web server

The configuration of the Ethernet participant, required to connect to the network, can be run via a web server.

17.4.1 Connecting to the web server

→ Only for PROFINET: Assign IP addresses and DNS-compatible name with a suitable start-up tool for PROFINET attachments.

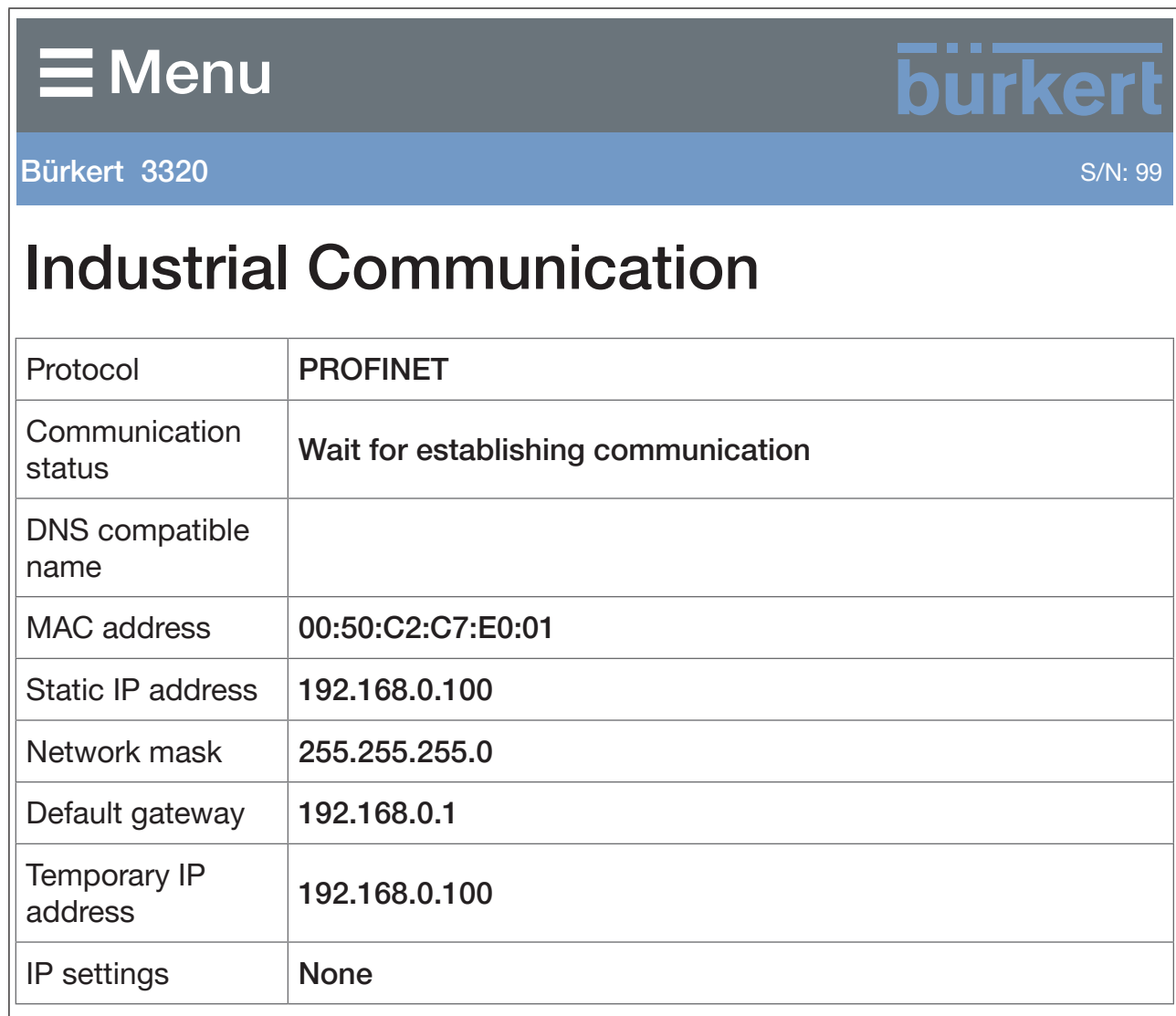
→ Set IP address in the PC network card.

IP address: **192.168.0.xxx**

For xxx, enter any numerical value other than 100
(100 is occupied by the IP address of the Ethernet participant by default).

→ Connect the PC via a network cable to the Ethernet participant.

17.4.2 Access to the web server



Protocol	PROFINET
Communication status	Wait for establishing communication
DNS compatible name	
MAC address	00:50:C2:C7:E0:01
Static IP address	192.168.0.100
Network mask	255.255.255.0
Default gateway	192.168.0.1
Temporary IP address	192.168.0.100
IP settings	None

Fig. 69: Access to the web server via the default IP

With EtherNet/IP, DHCP or BOOTP can also be set (NOT by default).
In this process, the IP address is acquired from a DHCP server.

→ Open an internet browser.

→ Enter default IP **192.168.0.100**.

(On EtherNet/IP devices, the IP address is assigned by a DHCP server. If no address is assigned via DHCP within 1 minute, the device uses the default IP 192.168.0.100.)

The software for configuring the Ethernet participant is now available on the PC.



Configuration of multiple devices:

On delivery, all devices have the same IP address (192.168.0.100 or 0.0.0.0 for PROFINET). So that the device can be identified for configuration, only 1 unconfigured device may be on the network.

- Successively connect the devices (Ethernet participants) to the network individually and configure them.

17.4.3 Configuring Ethernet participants

Logging onto the system:

→ Enter your user name and password. Username: **admin**
Password: **admin**

Menu		bürkert
Bürkert 3320		S/N: 99
User login		
User name	admin	
User password	admin x	
Login		

Fig. 70: Logging onto the system

Configuration:

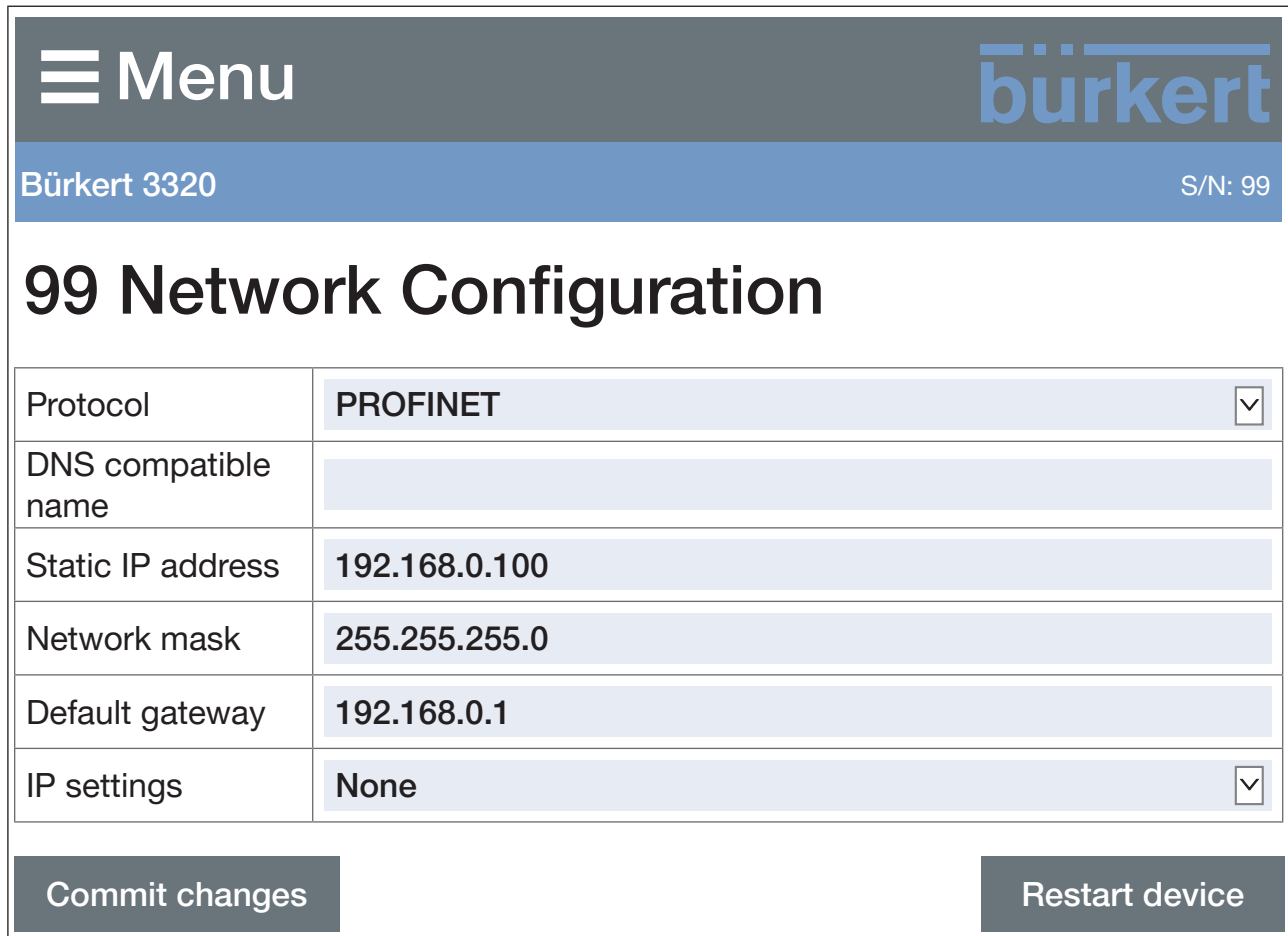
→ Enter the device name and IP address for the Ethernet participant.

The device name assigned here is used later during project planning (e.g. under STEP 7).

→ Confirm with **Commit changes**.

Conduct a power reset of the Ethernet participant to incorporate the changed parameters.

→ Restart the device with **Restart device**.



Menu bürkert	
Bürkert 3320 S/N: 99	
<h2>99 Network Configuration</h2>	
Protocol	PROFINET ▼
DNS compatible name	
Static IP address	192.168.0.100
Network mask	255.255.255.0
Default gateway	192.168.0.1
IP settings	None ▼
<div>Commit changes</div> <div>Restart device</div>	

Fig. 71: Configuring Ethernet participants

18 CANopen



Electrical installation of devices with CANopen network:

For a description, see chapter [“10.1 Electrical installation with circular plug-in connector”](#) on page 54.

18.1 Projecting via fieldbus

For project planning, you need an eds file as a start-up file for CANopen.

The eds file and the associated description are available on the Internet.



Download at:

www.burkert.com / Type 3323 / Downloads “Software” / Device Description Files

Please refer to the documentation of your project design software for instructions regarding the installation of the start-up files.

18.2 CANopen network configuration

Instructions for the network configuration based on the CANopen protocol are available on the Internet.



Download at:

www.burkert.com / Type 3323 / Downloads “Operating instructions” / “Software instructions | CANopen network configuration”

19 büS

Definition: The term “büS” (Bürkert System buS) refers to the communication buS developed by Bürkert, based on the CANopen protocol.



Electrical installation of devices with büS network:

For a description, see chapter [“10.1 Electrical installation with circular plug-in connector”](#) on page 54.

19.1 Cabling of büS networks



Additional information about cabling for büS networks is available at the following link:

[Guideline for cabling of büS networks](#)

19.2 Configuration of büS networks

Additional information about the configuration of büS networks can be found on the Internet.



Download at:

www.burkert.com / Type 8922 / Downloads / User Manuals / [Software instructions Type 8922, MExx](#) | [Software of f\(x\) configuration](#)

20 MAINTENANCE



WARNING!

Risk of injury due to improper maintenance work.

- ▶ Maintenance may be carried out only by trained specialist technicians and with the appropriate tools.
- ▶ Secure the system against unintentional activation.
- ▶ Ensure a controlled restart after maintenance is completed.

The following maintenance must be performed on the diaphragm valve

- After initial steam sterilisation and whenever necessary
→ Re-tighten body screws crosswise.
- After a maximum of 10^5 switching cycles
→ Check diaphragm for wear and replace if necessary.



Muddy and abrasive media require correspondingly shorter inspection intervals.

- Replacement of SAFEPOS energy-pack
The device issues a maintenance message as soon as the SAFEPOS energy-pack needs to be replaced.
Message: The remaining service life of the energy storage system is around 25%!
The energy storage system needs to be replaced soon.

20.1 Visual inspection

According to the usage conditions, perform regular visual inspections:

- Check medium ports for tightness.
- Check relief bore for leaks.

20.2 Replacing the diaphragm



DANGER!

Risk of injury from high pressure.

- ▶ Before working on the system or device, switch off the pressure and ventilate or empty the lines.



WARNING!

Risk of injury due to improper installation work.

- ▶ The diaphragm may be replaced only by trained technicians and with the appropriate tools.

20.2.1 Required work steps

To replace the diaphragm, ensure that the device is in the MANUAL operating state and the valve is in the position “valve 100% open”. Replacement of the diaphragm is broken down into the following steps:

1. Set MANUAL operating state, chapter [“13.1” on page 77](#)
2. Switch the valve to the position “100% open“, chapter [“15” on page 84](#).
3. Switch off the supply voltage. Wait until LED illuminated ring goes out.
4. Remove actuator from the valve body, chapter [“20.2.3” on page 107](#).
5. Replace diaphragm, chapter [“20.2.4” on page 108](#).
6. Mount the actuator onto the valve body and establish electrical connection, chapter [“20.2.5” on page 110](#).
7. Execute TUNE function for position control, chapter [“11.3” on page 66 \(AG2\)](#) and [“11.4” on page 67 \(AG3\)](#).
8. Set AUTOMATIC operating state, chapter [“13.1” on page 77](#).

20.2.2 Required tool

- Open-end wrench

20.2.3 Removing actuator from the valve body

Prerequisites: MANUAL operating state, valve position 100% open, supply voltage switched off.



WARNING!

Risk of injury from electric shock.

Risk of crushing by mechanically powered parts.

- ▶ Switch off the supply voltage.
- ▶ For devices with SAFEPOS energy-pack: completely remove the SAFEPOS energy-pack. Wait until the LED ring is no longer lit and ensure that the LED status indicator is not in "LED off" mode.

ATTENTION!

Damage to the diaphragm

- ▶ To prevent damage, the device must be in MANUAL mode during installation and removal of the actuator and diaphragm.
- ▶ The actuator must be in the position "valve 100% open".

→ Loosen the 4 nuts on the diaphragm socket crosswise.

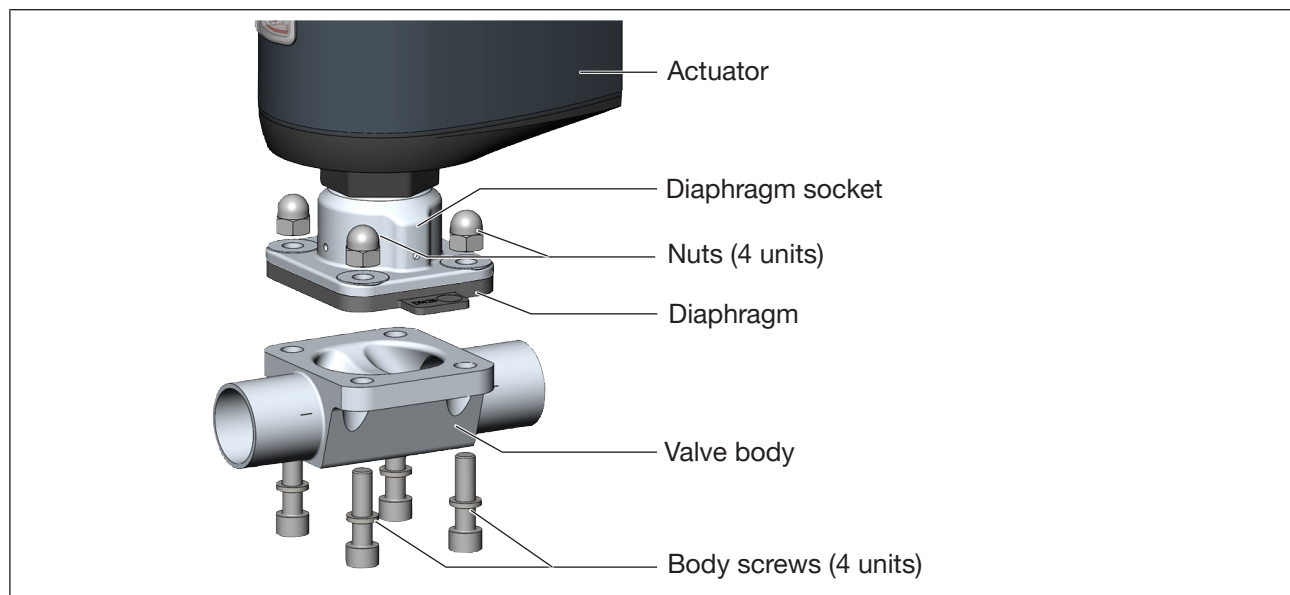


Fig. 72: Disassembly of the diaphragm using the 2-way body as an example

→ Remove the body screws.

→ Remove valve body.

20.2.4 Replacing the diaphragm

- Unbutton or unscrew the old diaphragm (see [“Tab. 30: Fixture types for diaphragms”](#)).
- If the diaphragm has a bayonet catch: → Detach the diaphragm by turning it 90° and remove it.

Mount the new diaphragm:

There are different fixture types for the diaphragm depending on the size of the diaphragm.

Diaphragm size	Fixture types for diaphragms	
	PTFE	EPDM / FKM / laminated PTFE
08	Buttoned diaphragm	Buttoned diaphragm
15, 20	Diaphragm with bayonet catch	Diaphragm with bayonet catch
25-100	Diaphragm with bayonet catch	Diaphragm screwed in

Tab. 30: Fixture types for diaphragms

Fixture of diaphragms with bayonet catch:

- Place diaphragm in compressor and turn 90° to lock into place.

Fixture of screw-in diaphragm:

- If there is no insert in the compressor, place the insert into the compressor as shown in the image.

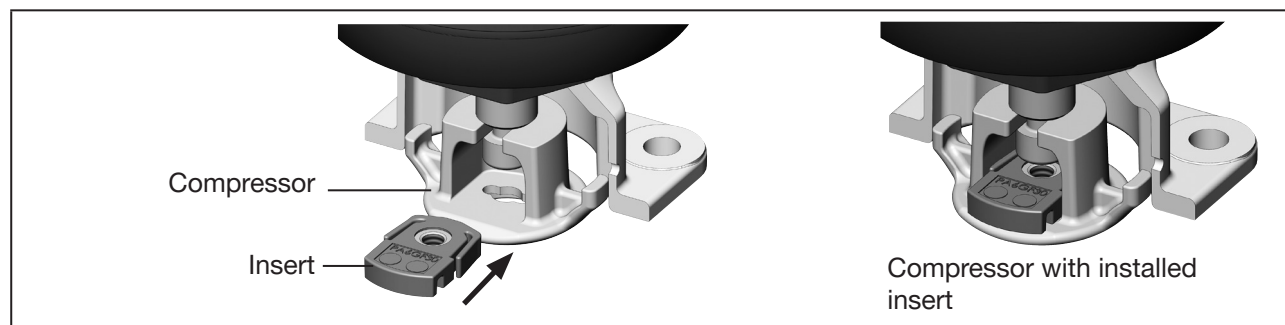


Fig. 73: Place insert into compressor

- Screw diaphragm into compressor by hand.
- Loosen by half a turn.
- Align diaphragm.
The mark tab of the diaphragm must protrude from the valve body at a right angle to the longitudinal axis of the pipeline (see [“Fig. 74”](#)).

Fixture of buttoned diaphragm:

→ Attach buttons of diaphragm in compressor.

→ Align diaphragm. The mark tab of the diaphragm must protrude from the valve body at a right angle to the longitudinal axis of the pipeline (see “Fig. 74”).

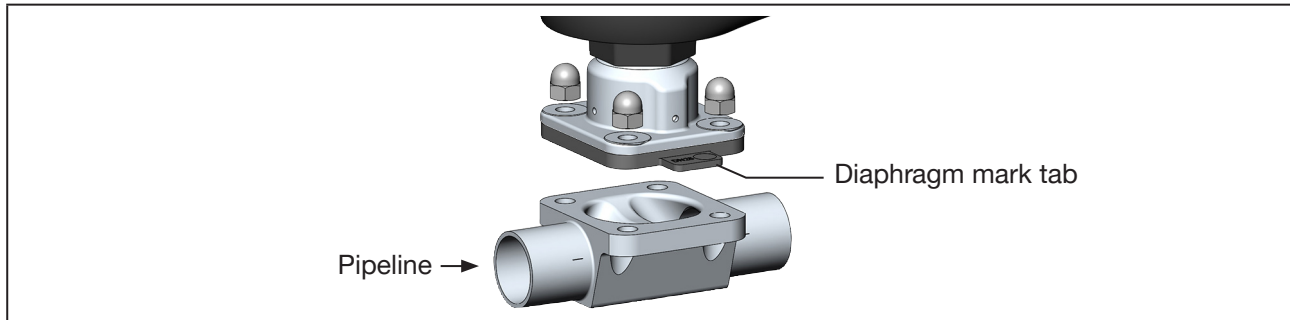


Fig. 74: *Aligning the diaphragm (example 2-way body)*

20.2.5 Mount the actuator onto the valve body and establish electrical connection



WARNING!

- Risk of injury from electric shock.
- Risk of crushing by mechanically powered parts.
- Switch off the supply voltage.

ATTENTION!

- Damage to the diaphragm.
- To prevent damage, the device must be in MANUAL operating state during installation.
- The actuator must be in the position “valve 100% open”.

- Before installing the actuator, check whether the diaphragm is free of damage and correctly aligned. The mark tab of the diaphragm must protrude from the valve body at a right angle to the longitudinal axis of the pipeline (see “Fig. 74”).
- Replace the damaged diaphragm.
- Place actuator on the valve body.
In the case of T-valve bodies and tank button bodies, stud bolts are pre-fitted.
With 2-way bodies, insert screws into the valve body.
- Tighten the nuts in a diagonal pattern lightly until the diaphragm is seated between the valve body and actuator.
 Do not tighten the nuts yet.
- Connect supply voltage.
- Execute M.SERVICE as described below.

Execute M.SERVICE with buttons in the device:

ATTENTION!

- Malfunction is valve position is not fully open.
- The valve must be in the position “valve 100% open” before the M.SERVICE is triggered.

The two buttons for triggering M.SERVICE are located beneath the blind cover.



Devices with ATEX approval or IECEx approval are secured with a magnetic lock.

The removal of the cover is described in the supplementary instructions for the electromotive control valves with ATEX approval and IECEx approval.

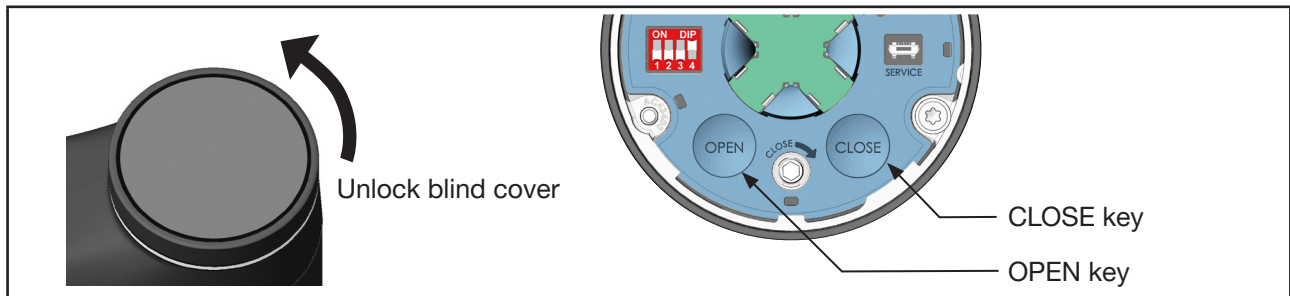


Fig. 75: Execute M.SERVICE

→ To unlock the blind cover, turn it counterclockwise and remove.

→ Hold down the OPEN and CLOSE keys together at the same time for 5 seconds.

✓ This will execute the M.SERVICE function.

→ Wait until M.SERVICE is finished and the actuator stops.

Tighten nuts gradually:



WARNING!

Risk of injury when failing to observe tightening torque value.

Failure to observe the tightening torque value is dangerous due to the risk of damage to the device.

▶ Observe the tightening torque value.

→ Follow a crosswise pattern in tightening the nuts to 1/3 of the tightening torque value.

→ Then follow a crosswise pattern again in tightening the nuts to 2/3 of the tightening torque value.

→ Finally, follow a diagonal pattern in tightening the nuts to their permitted tightening torque value.

Tightening torque value for installation of the actuator

Diaphragm size	Tightening torques for diaphragms [Nm]*	
	EPDM/FKM	PTFE/advanced PTFE/laminated PTFE
08	2.5	2.5
15	3.5	4
20	4	4.5
25	5	6
32	6	8
40	8	10
50	12	15
65	20	30
80	30	40
100	40	50

* A tolerance of +10% of the respective tightening torque applies to all values

Tab. 31: Tightening torques for diaphragms

Next steps:

- Execute TUNE function for position control, chapter [“11.3” on page 66](#) (AG2) and [“11.4” on page 67](#) (AG3).

ATTENTION!

Damage to the diaphragm.

- ▶ To prevent damage, execute the function M.Q0.TUNE first after establishing the electrical connection. Only then should the operating mode be set to AUTOMATIC.

- Set AUTOMATIC mode, chapter [“13.1” on page 77](#).

20.3 Maintenance notifications

Maintenance notifications are displayed in the following LED operation modes:

- Valve mode + warnings (factory pre-set).
The LED light ring alternately flashes blue and the colour indicating the valve position.
- NAMUR operation mode.
The LED light ring glows blue.



If the LED mode is set to “valve mode”, maintenance notifications are not displayed.

Message	Device behaviour	Action
The capacity of the energy storage system is strongly decreased. The energy storage system must be replaced soon.	Maintenance notification.	The SAFEPOS energy-pack must be promptly replaced before the end of its service life.

Tab. 32: Maintenance notifications

21 TROUBLESHOOTING

21.1 Notifications on device status “Out of specification”

Notifications on device status “Out of specification” are displayed in the following LED operation modes:

- Valve mode + warnings (factory pre-set).
The LED light ring alternately flashes yellow and the colour indicating the valve position.
- NAMUR operation mode.
The LED light ring glows yellow.



In LED mode “valve mode”, notifications on the device status “Out of specification” are not displayed.

Message	Description	Device behaviour	Action
Motor temperature is high.	Increased friction in the actuator train.	Notification “Out of specification”	Contact Bürkert Service if problem persists.
Temperature warning limit exceeded.	Ambient temperature too high or increased friction in actuator train.	Notification “Out of specification”	Reduce ambient temperature. Contact Bürkert Service if problem persists.
Temperature warning limit undershot.	Ambient temperature is too low.	Notification “Out of specification”	Increase ambient temperature
Voltage warning limit exceeded. (AG2) Voltage of actuator supply is above the warning limit (AG3)	Supply voltage is too high.	Notification “Out of specification”	Check supply voltage.
Voltage warning limit undershot. (AG2) Voltage of actuator supply is below the warning limit (AG3)	Supply voltage is too low.		

Tab. 33: Notifications on device status “Out of specification”

21.2 Error notifications

Device error notifications are displayed as follows:

- Valve mode
The LED light ring alternately flashes red and the colour indicating the valve position.
- Valve mode + warnings (factory pre-set).
The LED light ring alternately flashes red and the colour indicating the valve position.
- NAMUR operation mode.
The LED light ring glows red.

Message	Description	Device behaviour	Action
Motor temperature is too high. Motor is moving to the safety position.	Too much friction in the actuator train for operation.	Error notification. Actuator is moving to the safety position.	Contact Bürkert service.
Motor temperature is too high. Motor is idling to prevent thermal damage.	Too much friction in the actuator train for operation.	Error notification. Motor switches off. Actuator remains in place. MANUAL operating state not possible.	Contact Bürkert service.
Excess temperature detected.	Device temperature too high for operation.	Error notification. Actuator is moving to the safety position. MANUAL operating state possible.	Reduce ambient temperature. Contact Bürkert Service if problem persists.
Low temperature detected.	Device temperature too low for operation.	Error notification. Actuator is moving to the safety position. MANUAL operating state possible.	Increase ambient temperature.
Overvoltage detected. (AG2) Overvoltage actuator supply detected (AG3)	Supply voltage too high for device operation.	Error notification. Actuator is moving to the safety position. MANUAL operating state possible.	Check supply voltage.
Undervoltage detected. (AG2) Undervoltage actuator supply detected (AG3)	Supply voltage failure, or supply voltage too low for device operation.	Error notification. Actuator is moving to the safety position. MANUAL operating state not possible.	Check supply voltage. Contact Bürkert Service if problem persists.
Motor current too high.	Increased friction in the actuator train or incorrect detection of the end positions.	Error notification. Motor switches off. Actuator remains in place. MANUAL operating state not possible.	Carry out the X.TUNE function. Contact Bürkert Service if problem persists.
Motor peak current too high.	Increased friction in the actuator train or incorrect detection of the end positions.		

Message	Description	Device behaviour	Action
Internal error: reverbation sensor signal failure.	Signal failure of the position sensor.	Error notification. Actuator is moving to safety position. MANUAL operating state not possible.	Contact Bürkert service.
Internal error: ...	Internal error in the device.	Error notification. Actuator is moving to the safety position.	Contact Bürkert service.
Persistent memory unusable: defective or not available.	Reading or writing error of internal data storage EEPROM.	Error notification. Actuator is moving to the safety position	Restart the device. Contact Bürkert Service if problem persists.
BueS event: producer(s) not found.	Assigned external bÜS producer cannot be found.	Error notification. Actuator is moving to the safety position.	Check signal to bÜS partner.
BueS event: bus connection lost/not available.	bÜS network cannot be found.	Error notification. Actuator is moving to the safety position.	Check bÜS network.
BueS event: producer is not operational.	Producer not operational in this state.	Error notification. Actuator is moving to the safety position.	Check bÜS producer.
BueS event: a device is using the same address.	Another bÜS participant is using the same address.	Error notification. Actuator is moving to the safety position.	Assign a unique address to the device and bÜS participant.
External CMD not assigned.	"EXTERNAL" is set as the source of the input signal. Missing assignment of the external bÜS partner.	Error notification. Actuator is moving to the safety position.	Assign external bÜS partner or set "Internal" or "Gateway" as the source for the input signal. Setting the input signal: In the "inputs/outputs" configuration area.
External ExtError not assigned.			
External DigitalOut1 not assigned.			
External DigitalOut2 not assigned.			
Energy storage system must be replaced.	Storage capacity of the energy storage system is too low. Assumption of the safety position cannot be guaranteed.	Error notification. Actuator is moving to the safety position.	Replace SAFEPOS energy-pack.
No energy storage system available.	Energy storage SAFEPOS energy-pack not detected.	Error notification. Actuator is moving to the safety position.	Check whether the SAFEPOS energy-pack is correctly installed.

Tab. 34: Error notifications

21.3 Notifications on device status “Function check”

Notifications on device status “Function check” are displayed in the following LED operation modes:

- Valve mode + warnings (factory pre-set).
The LED light ring alternately flashes orange and the colour indicating the valve position.
- NAMUR operation mode.
The LED light ring glows orange.



In LED mode “valve mode”, notifications on the device status “Function check” are not displayed.

Message	Description	Device behaviour	Action
MANUAL operating state active.	Device is in the MANUAL operating state.	Notification “Function check”.	Switch to AUTOMATIC operating state.
Signal generator active	Devices is in simulation mode: input signals are simulated.	Notification “Function check”.	Switch off signal generator.
M.Q0.TUNE active	M.Q0.TUNE function is run (adjustment of position control).	Notification “Function check”.	Wait until the M.Q0.TUNE function is exited.
External CMD not assigned.	<p>“bÜS” is set as the source of the input signal.</p> <p>Missing assignment of the external bÜS/ CANopen partner.</p>	Notification “Function check”.	<p>Assign an external bÜS/ CANopen fieldbus consumer or set a different source.</p> <p>Setting the input signal: In the “inputs/outputs” configuration area.</p>

Tab. 35: Notifications on device status “Function check”

22 CLEANING

ATTENTION!

The use of alkaline cleaning agents is not permitted for cleaning the surface of the device.

22.1 Rinsing the valve body

The device has a M.CLEAN function for residue-cleaning of parts in contact with media.

When running the M.CLEAN function, the valve continuously changes between the 80% and 100% open positions. This means that all parts in contact with media are accessible for cleaning during the flushing process.

22.1.1 Run M.CLEAN

Run the M.CLEAN function for residue-free cleaning of parts in contact with media during the flushing process.

Configuration using the Bürkert Communicator software on PC:



The Bürkert Communicator PC software can be downloaded free of charge from the Bürkert website. It requires the USB-büS-Interface available as an accessory. Communication is performed via the device's büS service interface.

To start the M.CLEAN function, you must switch to the "Maintenance" detailed view for position controllers.

How to switch to detailed view:

→ Select **positioner** in the navigation area and switch to **MAINTENANCE**.

✓ You are now in the "Maintenance" detailed view.

How to run the M.CLEAN function:

→ Select **CALIBRATION**.

→ Select **M.CLEAN**.

The following question appears: "Do you really want to start M.CLEAN?"

→ Start M.CLEAN.

M.CLEAN is run. The valve now continuously changes its position between 80% and 100%. The following text appears: "--OPERATION-

End M.CLEAN by pressing"

→ End M.CLEAN.

23 ACCESSORIES, REPLACEMENT PARTS

23.1 Accessories



CAUTION!

Risk of injury and/or damage due to incorrect parts.

Incorrect accessories and unsuitable spare parts may cause injuries and damage to the device and the area around it

► Use only original accessories and original spare parts from Bürkert.



You can find and assembly tools under the following link (device identification number required):
[Wear parts and accessories](#)



Additional information about cabling for bÜS networks is available at the following link:
[Guideline for cabling of bÜS networks](#)

Accessories	Order number
Connection cable with M12 socket, 4-pin, (length 5 m) for operating voltage (AG2 (without communication) for X3	918038
Connection cable with M12 socket, 8-pin, (length 2 m) for input and output signals for X1	919061
Connection cable with M12 socket, 5-pin, L-coded (length 5 m) for operating voltage AG3 for X4	20010840
USB-bÜS interface set:	
bÜS stick set 1 (including power supply unit, bÜS stick, terminating resistor, Y-dis- tributor, 0.7 m cable with M12 plug)	772426
bÜS stick set 2 (includes bÜS stick, terminating resistor, Y-distributor, 0.7 m cable with M12 plug)	772551
bÜS adapter for bÜS service interface (M12 to micro-USB bÜS service interface)	773254
bÜS cable extensions from M12 plug to M12 socket:	
Connection line, length 1 m	772404
Connection line, length 3 m	772405
Connection line, length 5 m	772406
Connection line, length 10 m	772407
Bürkert Communicator	Info at country.burkert.com
SIM card	291773
Holding device for diaphragm size 08* to 40	697473
Plastic blind cover	277881
* For diaphragm size 08 the holding device is included in delivery.	

23.2 Communication software

The PC software Bürkert Communicator is designed for communication with Bürkert devices.



A detailed description of the installation and operation of the PC software can be found in the associated operating instructions.

Download the software at: country.burkert.com

23.2.1 USB interface

To communicate with the devices the PC requires a USB interface and the USB bÜS interface set available as an accessory (see [“Tab. 36: Accessories”](#)).

24 DISASSEMBLY



DANGER!

Risk of injury due to high pressure and escaping medium.

If the device is pressurised while being disassembled, there is a risk of injury due to sudden depressurisation and medium discharge.

- ▶ Turn off the pressure before dismantling the device. Vent or empty the lines.



CAUTION!

Risk of injury due to a heavy device.

During transportation or installation work, the device may fall down and cause injuries.

- ▶ Transport, install and remove heavy device with the aid of a second person only.
- ▶ Use suitable tools.

ATTENTION!

Installing in the AUTOMATIC operating state will damage the device.

Devices that are installed while they are in the AUTOMATIC operating state may be irreparably damaged.

- ▶ If devices are to be re-used, set the MANUAL operating state before they are removed.

→ If the device is to be re-used, set the MANUAL operating state.

→ Disconnect the electrical connection.

→ Dismantle the device

25 PACKAGING, TRANSPORT



CAUTION!

Risk of injury due to a heavy device.

During transportation or installation work, the device may fall down and cause injuries.

- ▶ Transport, install and remove heavy device with the aid of a second person only.
- ▶ Use suitable tools.

ATTENTION!

Damage due to transport.

Inadequately protected devices may be damaged during transport.

- Use shock-resistant packaging to protect the device against moisture and dirt during transport.

26 STORAGE

ATTENTION!

Incorrect storage may damage the device.

- Store the device in a dry and dust-free location.
- Avoid storage above or below the permitted storage temperature.

Devices with diaphragms:

- Storage temperature -20...+70 °C
(the higher the storage temperature, the faster the elastomers age.)
- While in storage, the fastening screws of the diaphragm should be loosened
- Leave the valve open while in storage.

Devices without diaphragms:

- Storage temperature -40...+70 °C

27 DISPOSAL

Environmentally friendly disposal



- ▶ Follow national regulations regarding disposal and the environment.
- ▶ Collect electrical and electronic devices separately and dispose of them as special waste.

Further information can be found at country.burkert.com

