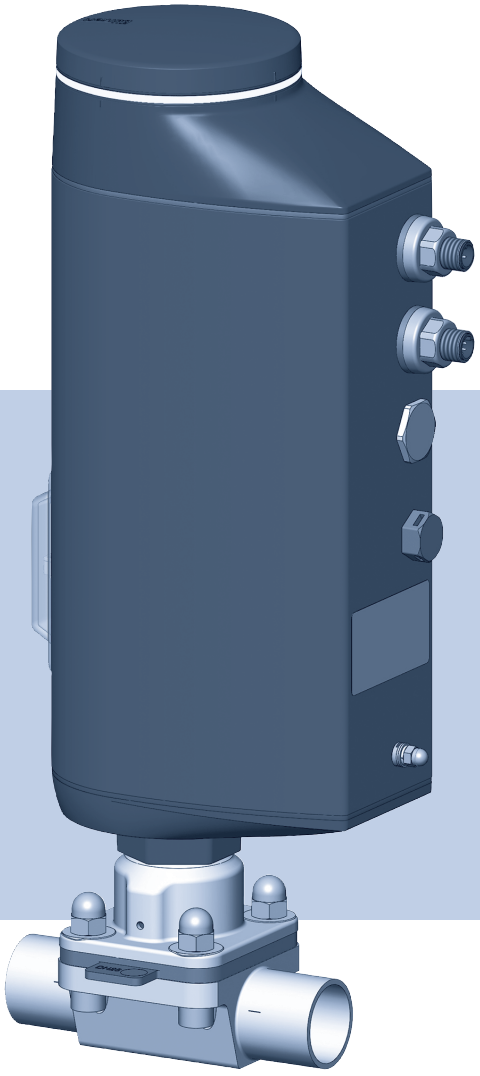
bürkert
FLUID CONTROL SYSTEMS

Type 3323, 3324, 3325
AE3363

Electromotive diaphragm valve



Operating instructions

MAN 1000303702 EN Version: H Status: RL (released | freigegeben) printed: 24.10.2019

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Operating Instructions 1910/03_EN-en_00810538 / Original DE

Electromotive diaphragm valve

Contents

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1 THE OPERATING INSTRUCTIONS

The operating instructions describe the entire life cycle of the device. Keep these instructions in a location which is easily accessible to every user and make these instructions available to every new owner of the device.

Important safety information.

Read the operating instructions carefully and thoroughly. 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 the warning will result in fatal or serious injuries.

WARNING!

Warns of a potentially dangerous situation!

▸ Failure to observe the warning may result in serious injuries or death.

CAUTION!

Warns of a possible danger!

▸ Failure to observe this warning may result in a moderate or minor injury.

ATTENTION!

Warns of damage to property.

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

Indicates important additional information, tips and recommendations.

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

▸ designates instructions for risk prevention.

→ designates a procedure which you must carry out.

Indicates a result.

MENUE Representation of software interface text.

1.2 Definitions of terms

- The term “device” used in these instructions applies to the electromotive diaphragm valve of Types 3323, 3324, 3325 and AE3363.
- In these instructions, the abbreviation “Ex” stands for “explosion-risk”.
- The term “büS” (Bürkert system bus) used in this manual stands for the communication bus developed by Bürkert, based on the CANopen protocol.

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2 INTENDED USE

Non-authorized use of the electromotive diaphragm valve of Types 3323, 3324 and 3325 may be a hazard to people, nearby equipment and the environment.

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

- Standard model devices must not be used in the potentially hazardous area. They do not have a separate Ex type label which indicates approval for the explosion-proof area.
- Do not use alkaline cleaning agents to clean the surface of the device.
- If the valve position is relevant as regards safety in the event of a power failure: Use only those devices which have the SAFEPOS energy-pack (optional energy pack).
- Use according to the authorized data, operating conditions, and conditions of use specified in the contract documents and operating instructions.
- Protect the device against harmful environmental influences (e.g. radiation, air humidity, vapors, etc.)! If in doubt, consult the relevant sales company.

Use the device

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

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3 BASIC SAFETY INSTRUCTIONS

These safety instructions do not consider any contingencies or incidents which occur during installation, operation and maintenance.

The operator is responsible for observing the location-specific safety regulations, also with reference to the personnel.

Risk of injury from high pressure.

- Before working on the system or device, switch off the pressure and vent or drain 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 due to mechanically moving parts.

- Perform installation work on the pendulum disc, diaphragm and valve body only when they have been isolated from the power supply. Devices with SAFEPOS energy-pack: Completely drain SAFEPOS energy-pack. Wait until LED illuminated ring goes out; the LED status must not be in LED off mode.
- Keep clear of the openings in the valve body.

Danger due to an uncontrolled process in the event of a power failure.

If devices do not have the optional SAFEPOS energy-pack, the valve remains in an undefined position in the event of a power failure.

- If the valve position is relevant as regards safety in the event of a power failure: Use only those devices which have the SAFEPOS energy-pack (optional energy pack).
- Using DIP switches, select a valve position which is safe for the process.

Danger due to loud noises.

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

Leaking medium when the diaphragm is worn.

- Regularly check relief bore for leaking medium.
- If medium is leaking out of the relief bore, change the diaphragm.
- If the media is hazardous, protect the area surrounding the discharge point against dangers.

General hazardous situations.

To prevent injuries:

- In a hazardous area, the device may be used only in accordance with the specification on the separate Ex type label.
- To use the device in an explosion-risk area, observe the additional information with safety instructions for the explosion-risk area enclosed with the device or the separate explosion-risk operating instructions.

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- Devices without a separate Ex type label may not be used in a potentially explosive area.
- Only feed in the media types specified in chapter "8 Technical data" to the media connections.
- Do not make any internal or external changes on the device and do not subject it to mechanical stress.
- Secure the system from unintentional actuation.
- Note the system-specific safety regulations.
- Only trained technicians may perform installation and maintenance work.
- Transport, install and dismantle a heavy device with the help of another person and with appropriate tools.
- After an interruption, ensure that the process is restarted in a controlled manner. Observe sequence.
  1. Apply supply voltage.
  2. Charge the device with medium.
- Observe the general rules of technology.
- The valves must be installed in accordance with the regulations applicable in the country.

ATTENTION!

Electrostatic sensitive components and modules.

The device contains electronic components which react sensitively to electrostatic discharge (ESD). Contact with electrostatically charged persons or objects are hazardous to these components. In the worst case scenario, they will be destroyed immediately or will fail after starting up.

- Observe the requirements in accordance with EN 61340-5-1 to minimize or avoid the possibility of damage caused by sudden electrostatic discharge!
- Do not touch electronic components while the supply voltage is switched on!

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4 GENERAL INFORMATION

4.1 Contact address

Germany

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

International

Contact addresses can be found on the final pages of the printed operating instructions.

And also on the Internet at:

www.burkert.com

4.2 Warranty

The warranty is only valid if the device is used as intended in accordance with the specified application 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:

www.buerkert.com

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5 PRODUCT DESCRIPTION

5.1 General description

The electromotive diaphragm valve Type 3323, 3324 and 3325 is suitable for the control of flow rate 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 diaphragm valve has an electromotive linear actuator with the electronic control system which is actuated either via binary signals or via a fieldbus (digital). The electromotive linear actuator has been designed in such a way that it has an optimum degree of efficiency. At the same time the actuator keeps the valve tight in a de-energised state even at the maximum specified medium pressure.

Optionally there is the energy pack (SAFEPOS energy-pack) for the device. If the supply voltage fails, the energy pack supplies the actuator with the required energy to move the valve into the required position which can be adjusted in the menu.

The valve position can be manually changed in 2 ways.
1. Electrical manual control: is used when supply voltage applied.
2. Mechanical manual control: may only be used if no supply voltage applied.

The device can be operated with 2 capacitive buttons and 4 DIP switches. There is also the option of setting the device via the büS service interface and by using the PC software „Bürkert Communicator“. To make the setting using the „Bürkert Communicator“, the USB-büS-interface set, available as an accessory, is required.

5.2 Properties

- Medium hermetically separated from the actuator by the diaphragm.
- Any flow direction.
- Self-draining in appropriate installation. The ends of the utilised connections must be cylindrical.
- Minimum dead space.
- High flow values and low-turbulence flow through the stream-lined valve body.
- Simple and fast replacement of the diaphragm. PTFE/EPDM diaphragms can be replaced with EPDM diaphragms.
- Mechanical position indicator which shows the valve position even if the supply voltage fails.
- 360° LED illuminated ring for displaying the device statuses, valve end positions and operating state.
- To keep the valve position, no electrical energy is required even at maximum medium pressure, except for the basic consumption for actuation.
- Valve actuator can be rotated through 360°.
- Integrated control.
- Non-contact, high-resolution and wear-free position sensor.

The actuator housing consists of a robust and heat-dissipating aluminium body. The coating is resistant to the usual cleaning agents. The plastic materials used for the actuator housing are also resistant to cleaning agents.

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5.3 Variants

The following variants are described in these instructions:

- Type 3323: 2-way body
- Type 3324: T-body
- Type 3325: tank bottom body

5.4 Options

- Energy pack (SAFEPOS energy-pack) for approaching the safety position.
  The safety position, which the valve is to occupy if the supply voltage fails, is specified with the Dip switch.
- SIM card for saving and transferring device-specific values and settings.

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6 STRUCTURE AND FUNCTION

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

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

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

The electronic control system for position control or process control are controlled either via standard signals (analogue) or via a fieldbus (digital).

The electromotive diaphragm valve is designed using three-wire technology. Operation is on standard devices with 2 buttons and 4 DIP switches.

The electromotive linear actuator consists of a brushless direct current motor, gears and a threaded spindle. The valve spindle, which is connected to the threaded spindle, transfers the force to the control cone and diaphragm.

- The linear actuator is designed in such a way that it does not require electrical energy to keep the valve position, i.e. when it is at a standstill, only the electronic control consumes energy.

Port connections:

Welded connection, socket connection, flanged connection, clamp connection, bonded connection.

(Connection sizes on request).

6.1 Structure of the electromotive diaphragm valve

6.1.1 2-way valve

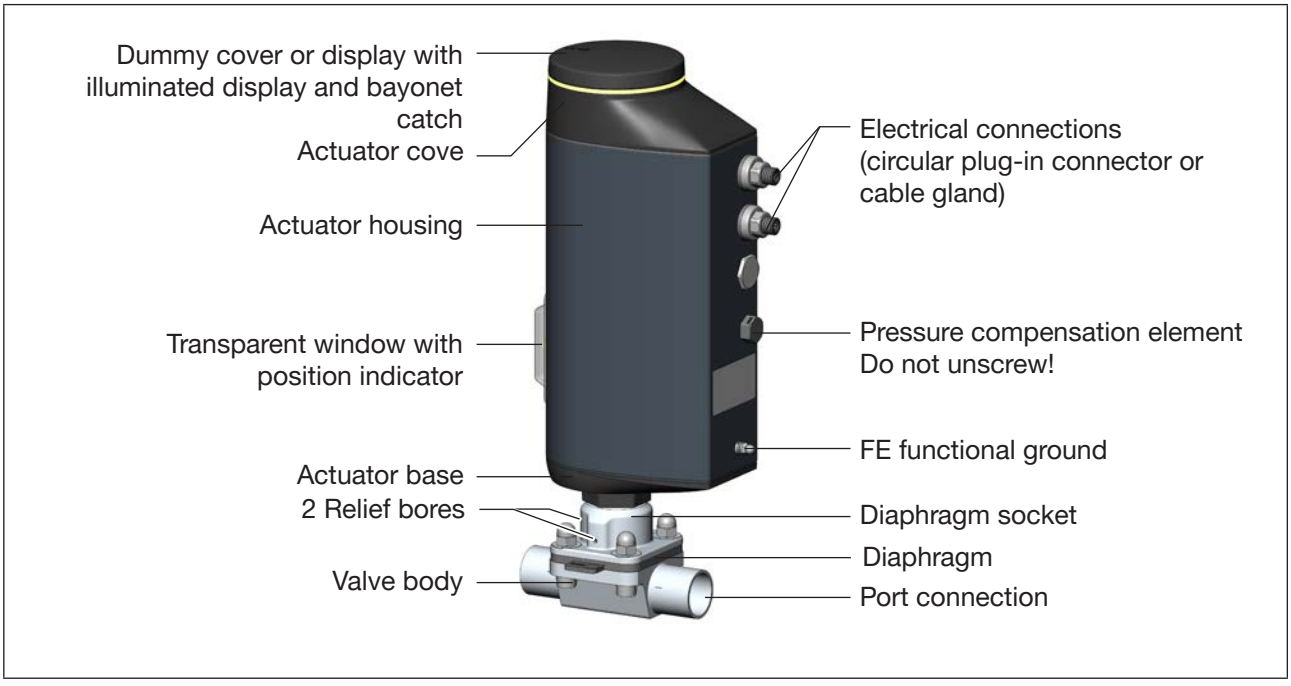

Figure 1: Structure, electromotive diaphragm valve with 2-way body, Type 3323

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6.1.2 T-body

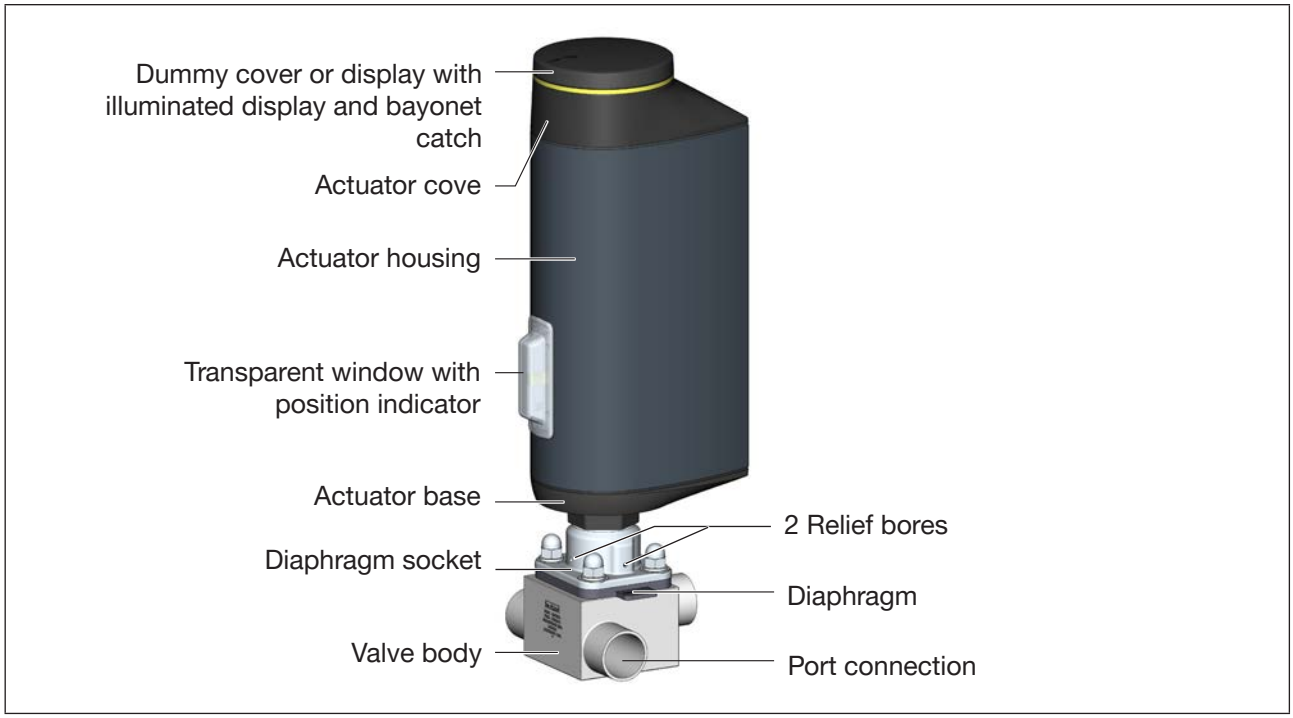

Figure 2: Structure, electromotive diaphragm valve with T-body, Type 3324

6.1.3 Tank bottom valve

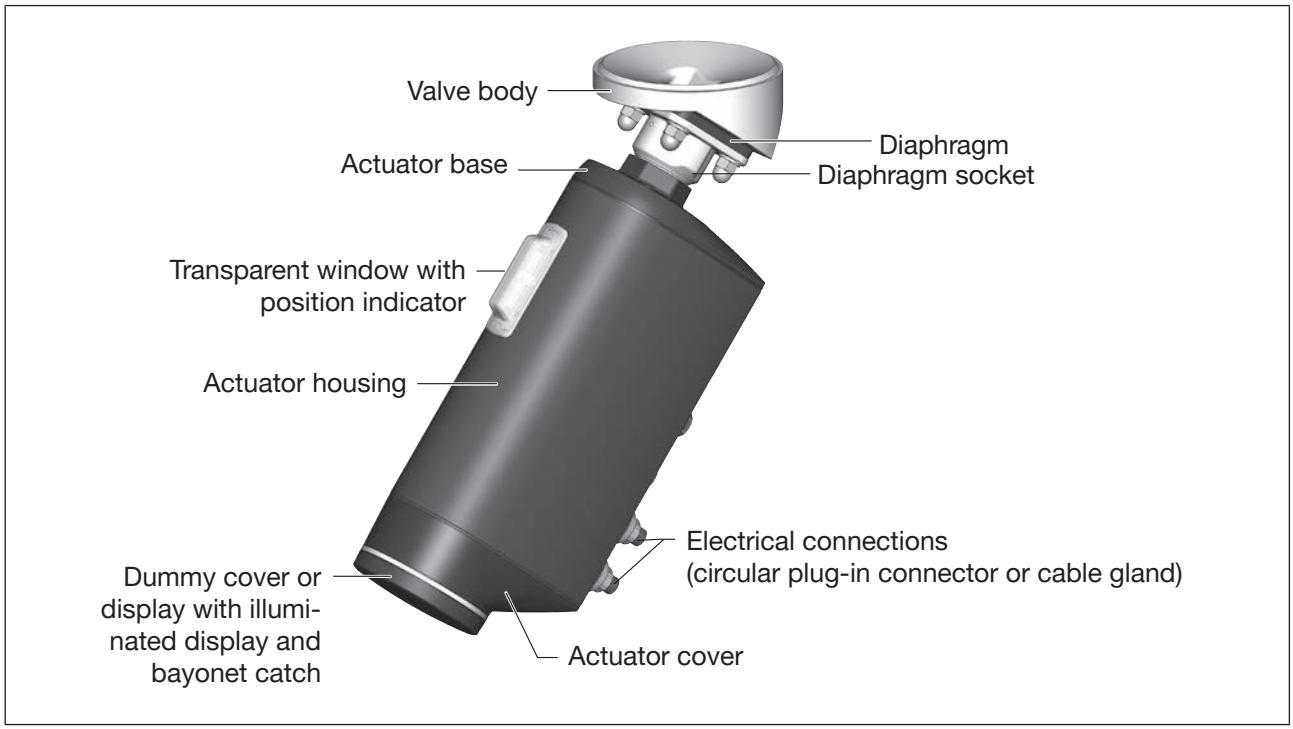

Figure 3: Structure, electromotive diaphragm valve with tank bottom body, Type 3325

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6.2 Valve position after failure of the supply voltage

Valve position when using devices without the SAFEPOS energy-pack:

If the electromotive actuator is at a standstill due to failure of the supply voltage, the valve remains in the last occupied position.

If the supply voltage fails while the actuator is changing the valve position, the valve stops in an undefined position. The actuator flywheel mass and the medium pressure continue to affect the valve spindle until it finally comes to a standstill.

Valve position when using devices with the SAFEPOS energy-pack:

The valve occupies the safety position defined in the SAFEPOS menu.

Description of the SAFEPOS energy-pack see chapter “7.2 SAFEPOS energy-pack (option)”, page 22

6.3 Safety position

The DIP switch defines the safety position which the valve occupies in the following cases:

- Internal error
- Failure of the supply voltage (optional)
  This function is available only on devices which have the optionally available SAFEPOS energy-pack.

The following safety positions are selected for SAFEPOS:

- Close = Valve closed
- Open = Valve open
- Inactive = Valve stops in an undefined position if the supply voltage fails.

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6.4 Display of the device status

The device status is indicated at the LED illuminated ring. To indicate the device status and the valve position, different LED modes can be set:

- Valve mode
- Valve mode + warnings (mode set in the factory)
- NAMUR mode

* The description for setting the LED mode can be found in chapter “14.3 Setting LED mode”

6.4.1 Valve mode

The valve position and the device status “Failure” are indicated in the valve mode.

Messages for device status "Out of specification", "Maintenance required", and "Function check" are not displayed in valve mode.
The factory default colors for indicating the open and closed valve positions can be changed.
The description can be found in chapter “14.4 Setting the colours for indicating the valve position”.

Displays in valve mode:

When device status “Normal”: Permanently lit in the colour of the valve position.
When device status “Failure”: Flashes alternately red and in the colour of the valve position.

Valve position	Color for valve position	Color for device status "Failure"
Open	yellow	red
In between	white	
Closed	green	

Table 1: Display of device status in valve mode

6.4.2 Valve mode + warnings

The valve position as well as the device status „Failure“, „Out of specification“, „Maintenance required“, and „Function check“ are displayed in this mode.

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

Displays in valve mode + warnings:
When device status „Normal“: Permanently lit in the colour of the valve position.
If device status deviates from „Normal“: The colours for valve position and device status flash alternately.

Valve position	Color for valve position	Color for device status			
		Failure	Out of specification	Maintenance required	Function check
Open	yellow	red	yellow	blue	orange
In between	white				
Closed	green				

Table 2: Display of device status in valve mode + warnings

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6.4.3 NAMUR mode

In NAMUR mode, the LED illuminated ring lights up according to NAMUR NE 107, in the colour specified for the device status.

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

Displays in NAMUR mode:

Status display in accordance with NE 107, edition 2006-06-12			
Color	**Color code**	**Description**	**Meaning**
Red	5	Failure, error or fault	Due to a malfunction in the device or on its periphery, controlled operation is not possible
Orange	4	Function check	The device is being worked on; controlled operation is therefore temporarily not possible.
Yellow	3	Out of specification	The ambient conditions or process conditions for the device are outside the specified area. Device internal diagnostics point to problems in the device or with the process properties.
Blue	2	Maintenance required	The device is in controlled operation, however function is briefly restricted. → Maintain device.
Green	1	Diagnostics active	Device is operating faultlessly. Status changes are shown in color. Messages are transmitted via any connected fieldbus.
White	0	Diagnostics inactive	Device is switched on. Status changes are not shown. Messages are not transmitted via any connected field bus.

Table 3: Display of device status in NAMUR mode

* A detailed fault description can be found in chapter “21 Troubleshooting and messages”.

6.4.4 Flashing of the LED illuminated ring

The LED illuminated ring, which flashes briefly, indicates that a connection to the PC software „Bürkert Communicator“ has been established.

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6.4.5 Device status messages

Device status messages and error messages are recorded in the logbook. Chapter "20 Maintenance, troubleshooting" describes the most common messages and the required measures.
Device status messages for „Function check"
The messages are output when operation is interrupted by work on the device.

Messages for device status "Function check"
Manual control active
M.SERVICE active
M.CLEAN active
M.Q0.TUNE active
Signal generator active

Table 4: Messages for device status „Function check"

6.5 Factory settings

Operating state:
Devices are delivered with the MANUAL operating state preset.

The factory pre-settings can be found in chapter "16 Operating structure / factory setting"

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

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7 ELECTRICAL CONTROL

7.1 Function

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

The position sensor detects the actual position of the electrical linear actuator and generates an end position signal via the digital outputs.

Technical properties:

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

7.1.1 Interfaces

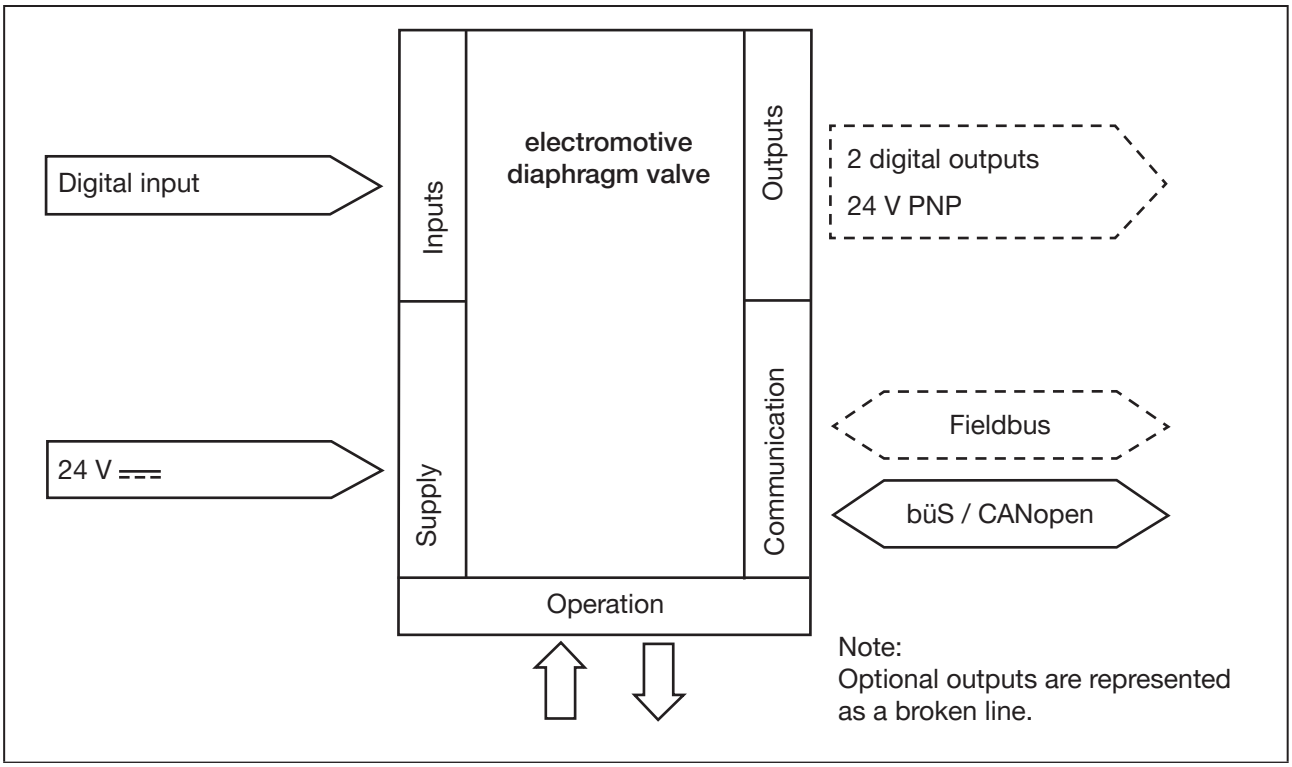

Figure 4: Interfaces of the electromotive diaphragm valve

The electromotive valve is designed using three-wire technology, i.e. the power (24 V DC) is supplied separately from the position signal of the digital input.

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7.1.2 Function diagram

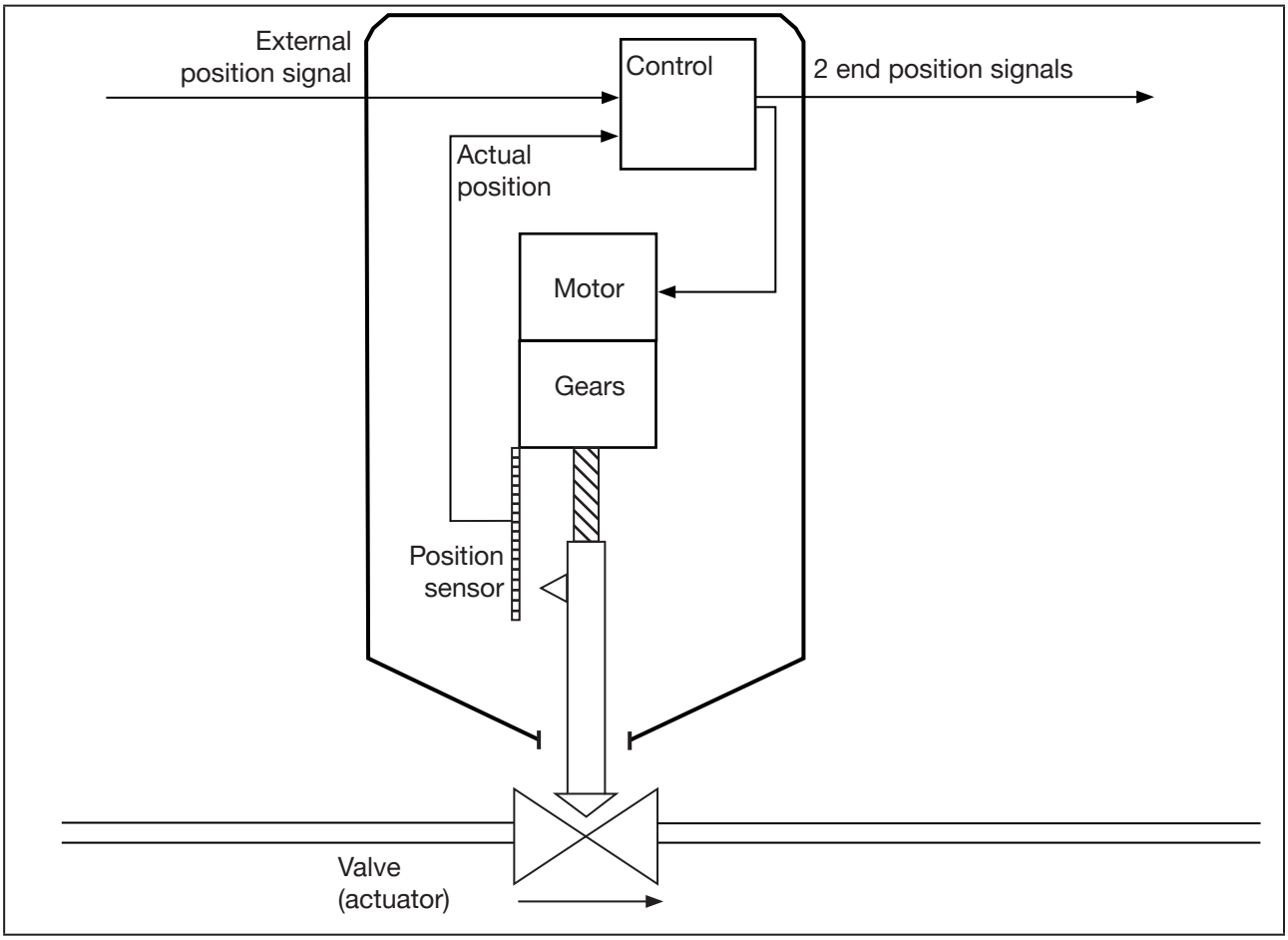

Figure 5: Function diagram

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7.2 SAFEPOS energy-pack (option)

Optionally there is the energy pack (SAFEPOS energy-pack) for the device. 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.

The energy pack is fully charged and ready for use after a maximum of 100 seconds (depending on the conditions of use).

7.2.1 Service life

Service life: up to 10 years (depending on the conditions of use).

The service life of 7.5 years was determined under the following conditions:

Ambient temperature	30 °C (+86 °F)
Medium temperature	80 °C (+176 °F)
Duty cycle	100 %
Medium pressure	6 bar
Diaphragm size	32

ATTENTION!

The SAFEPOS energy-pack is a wearing part. Information on the service life are guide values which are not guaranteed.

7.2.2 Messages on the state of the SAFEPOS energy-pack

The device issues a maintenance message:
The remaining service life of the energy storage is approx. 25 %! The energy storage must be changed soon.
⚠ Replace SAFEPOS energy-pack in good time before the service life ends.

The device issues an error message and moves to the safety position:
The SAFEPOS energy-pack was not replaced in good time after the warning was issued. The storage capacity is so low that there is no guarantee that the safety position can be approached.

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8 TECHNICAL DATA

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

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

8.1 Conformity

The electromotive valves, Types 3323, 3324 and 3325, are compliant with EU directives as stated in the EU Declaration of Conformity (if applicable).

8.2 Standards

The applied standards, which are used to demonstrate conformity with the EU Directives, are listed in the EU type examination certificate and/or the EU Declaration of Conformity (if applicable).

8.3 Licenses

The product is cULus approved. Instructions for use in the UL area see chapter “8.9 Electrical data”, page 28.

8.4 Type label

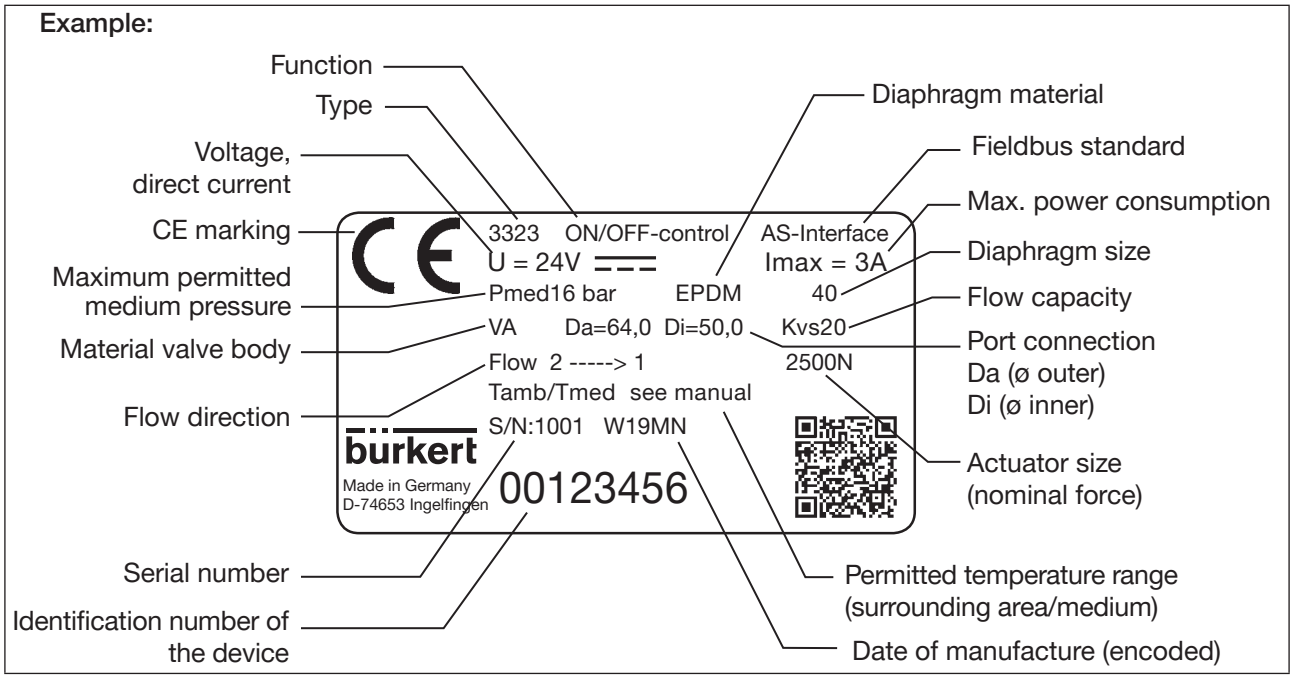

Figure 6: Description of the type label (example)

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8.4.1 UL additional label (example)

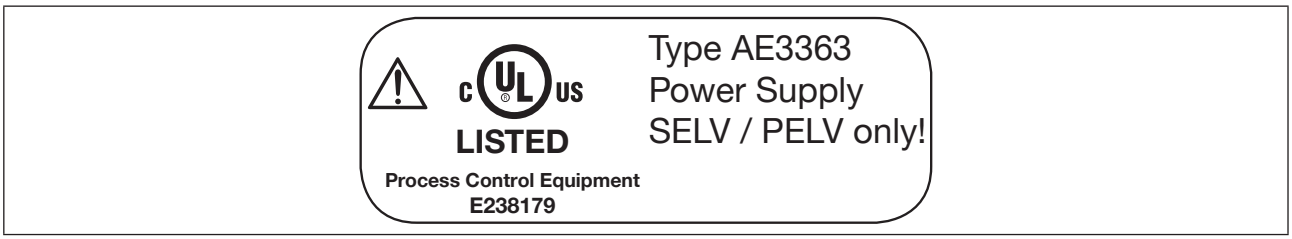

Figure 7: UL additional label (example)

8.5 Labelling of the forged steel valve bodies

Depending on the variant, the labelling may vary.

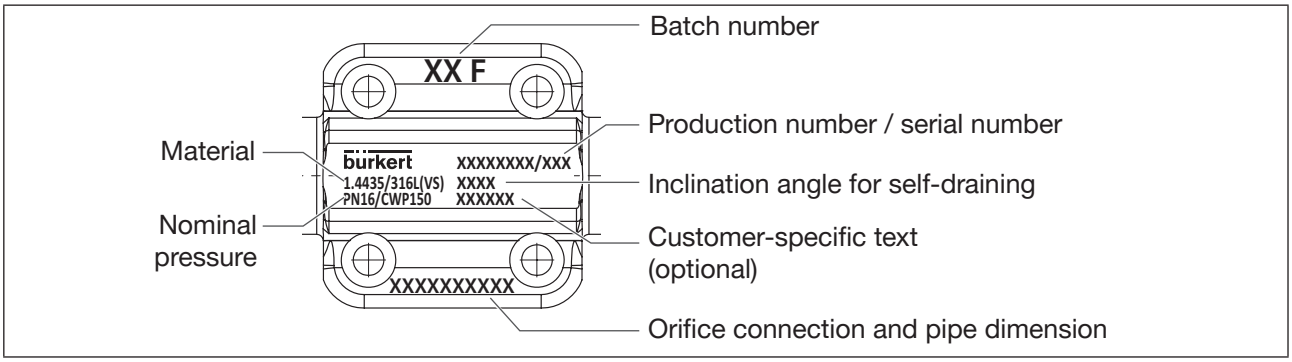

Figure 8: Labelling of the forged steel valve bodies (example)

8.6 Labelling of the tube valve bodies (VP)

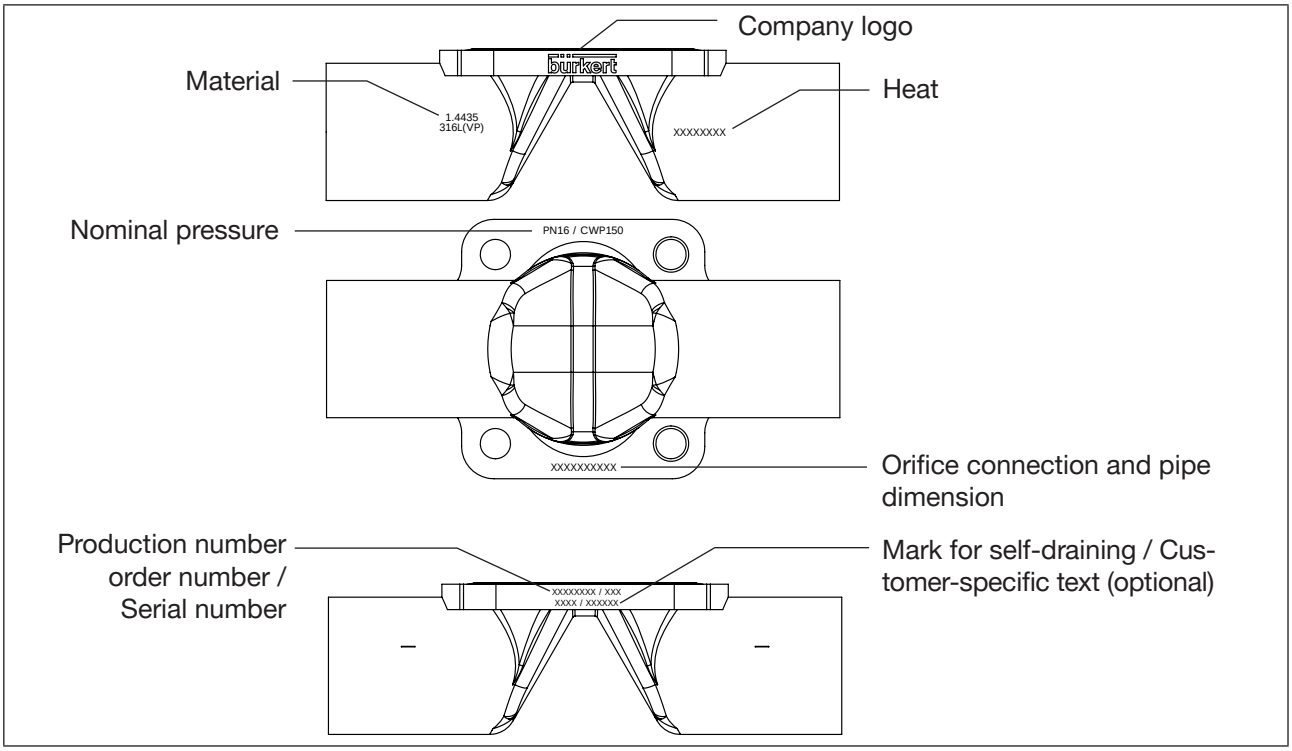

Figure 9: Labelling of the tube valve bodies (VP)

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8.7 Operating conditions

For operation of the device observe the product-specific information on the type label.

WARNING!

Malfunction if the temperature exceeds or drops below the permitted temperature range.

- Never expose the device outdoors to direct sunlight.
- The temperature must not exceed or drop below the permitted ambient temperature range.

Reduced sealing function if medium pressure too high.

As the valve seat is closed against the medium flow, the medium pressure may become too high and prevent the valve seat from closing tightly.

- The medium pressure must not be greater than the maximum value specified on the type label.

Danger due to escape of hot medium.

The diaphragm is not permanently temperature-resistant to hot medium.

- Do not use the diaphragm valve for steam shut-off.

Maximum permitted medium pressure: see type label

Media:	neutral, high-purity, sterile, contaminated, aggressive or abrasive media with high to semi-fluid viscosity.
Degree of protection:	(verified by Bürkert / not evaluated by UL) IP65/67 according to IEC 529, EN 60529, (IP67 on request). NEMA 250 4x (not guaranteed for installation location: actuator facing downward).
Altitude:	up to 2000 m above sea level.

8.7.1 Permitted temperature ranges

The permitted medium and ambient temperature ranges depend on various factors:

- **Medium temperature:** depends on the material of the valve body and diaphragm materials. See chapter “8.7.2 Permitted medium temperature”
- **Ambient temperature:** depends on the medium temperature. See “Figure 11: Temperature graph”.

To determine the permitted temperatures, all factors must be taken into account.

Minimum temperatures	Environment: –10 °C (14 °F) Medium: Observe dependence on material of the valve body and diaphragm materials. See chapter “8.7.2 Permitted medium temperature”
Maximum temperatures	Observe dependencies on ambient temperature and medium temperature. See chapter “8.7.3 Temperature graph for medium and ambient temperature”

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8.7.2 Permitted medium temperature

ATTENTION!

The behavior of the medium with respect to the diaphragm materials may change depending on the medium temperature.

- The indicated medium temperatures apply only to media which do not corrode or swell the diaphragm materials.
- The functional properties, and the service life of the diaphragm, may be impaired if the temperature rises or drops below the indicated medium temperature.

Permitted medium temperature for diaphragm materials

Diaphragm material	Permitted medium temperature range		
	minimal	maximal	Steam sterilisation
EPDM (AD)	-10 °C (14 °F)	+143 °C (289.4 °F)	+150 °C/60 min. (302 °F/60 min.)
PTFE/EPDM (EA)	-10 °C (14 °F)	+130 °C (266 °F)	+140 °C/60 min. (284 °F/60 min.)
Advanced PTFE/EPDM (EU)	-5 °C (23 °F)	+143 °C (289.4 °F)	+150 °C/60 min. (302 °F/60 min.)
GYLON / EPDM laminated (ER)	-5 °C (23 °F)	+130 °C (266 °F)	+140 °C/60 min. (284 °F/60 min.)
FKM (FF)	0 °C (32 °F)	+130 °C (266 °F)	No steam / dry heat up to +150 °C/60 min. (302 °F/60 min.)

Table 5: Permitted medium temperature depending on the diaphragm materials

Permitted medium temperature for valve bodies made of metal

Valve body material	Permitted temperature range
Stainless steel	-10...+150 °C (14...302 °F)

Table 6: Medium temperature for valve bodies of metal

Permitted medium temperature for plastic valve bodies

The permitted medium temperature for plastic valve bodies depends on the medium pressure.
See graph of pressure “Figure 10”.

Valve body material	Permitted temperature range (depends on the medium pressure)
PVC, see graph of pressure	-10...+60 °C (14 °F...140 °F)
PVDF, see graph of pressure	-10...+120 °C (14 °F...248 °F)
PP, see graph of pressure	-10...+80 °C (14 °F...176 °F)

Table 7: Medium temperature for plastic valve bodies

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Graph of pressure for orifices (DN) 15 to 40:

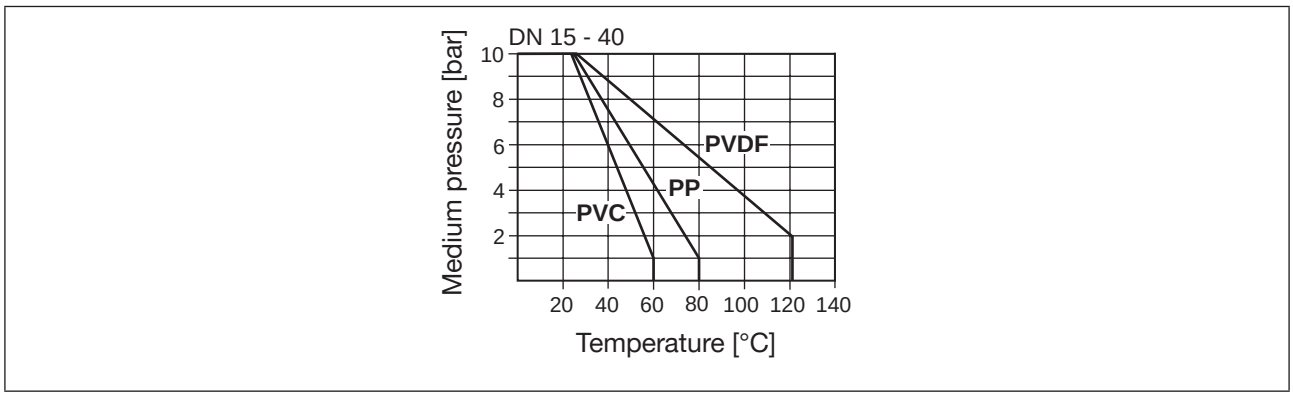

Figure 10: Graph: Dependence on medium temperature and medium pressure for valve bodies made of plastic

8.7.3 Temperature graph for medium and ambient temperature

The maximum permitted temperature for the ambient and the medium depend on each other. The permitted maximum temperatures must be determined using the temperature graph.

The values were determined under the following maximum operating conditions: Diaphragm size 25 when 100% duty cycle at 10 bar medium pressure.

For deviating operating conditions an individual verification can be performed. Please contact your Bürkert office for more information.

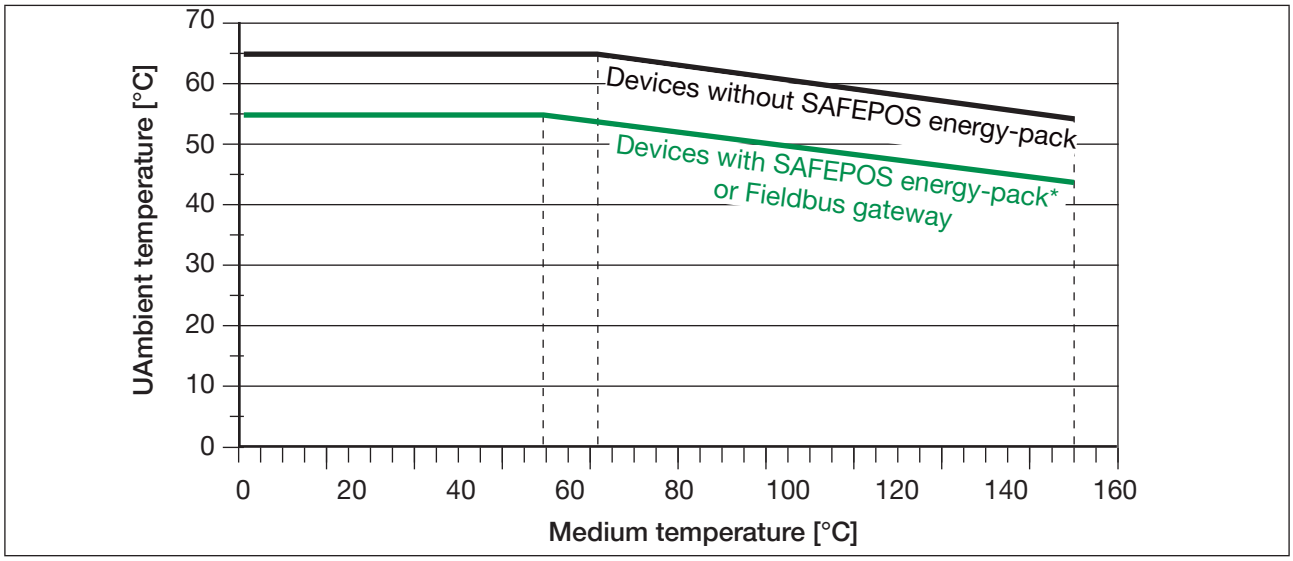

Figure 11: Temperature graph

* The service life of the SAFEPOS energy-pack depends on the medium temperature and the ambient temperature. For description see"7.2 SAFEPOS energy-pack (option)", page 22

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8.8 General technical data

Dimensions:	See data sheet	
Weight:	See data sheet	
Materials:	Actuator:	PPS and aluminium powder-coated
	Valve body:	Metal: stainless steel board material (Types 3324 and 3325), Investment casting (VG), forged steel (VS), tube valve body (VP), plastic: PP, PVC and PVDF
	Body connection:	CF-8 / 1.4308
	Spindle seal:	FKM
	Seal material:	sealing element actuator housing: EPDM
	Diaphragm:	EPDM, PTFE or FKM (see type label)
Port connection Connection types:	Welded connection according to:	DIN EN ISO 1127 / ISO 4200 / DIN11866 B DIN 11850 2 / DIN11866 A ASME BPE / DIN 11866 C BS4825 SMS 3008 DIN 11850 0“
	Clamp connection according to:	DIN 32676 B (ISO 4200) DIN 32676 A (DIN 11850 2) ASME BPE
	Socket connection, flanged connection and bonded connection. (Connection sizes on request).	
Electrical connection:	by connection terminals or circular plugs	
Installation position:	depends on the body model. See chapter “9.2 Installation position of the diaphragm valves”	
Sound pressure level:	<70 dB (A), may be higher depending on the usage conditions.	

8.9 Electrical data

WARNING!

Electric shock.

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

Protection class:	3 in accordance with DIN EN 61140
Electrical connections:	Cable gland, 2x M20 or 2 circular plug-in connectors M12.5-pin and 8-pin

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ATTENTION!

Consider voltage drop in supply line.
Example: with a cable cross-section of 0.34 mm2 a copper cable may have a maximum length of 8 meters.

Operating voltage:	24 V ⎓ ± 10 % max. residual ripple 10 %	
Operating current [A]*:	max. 3 A (at 25 °C / 77 °F), including actuator at max. load and charging current of the optional SAFEPOS energy-pack (charging current approx. 1 A) for the design of the power supply unit	
Standby consumption [W]*:	min. 2 W, max. 4.5 W	
Average consumption Electronics without actuator [W]*:	standard consumption	typically 3 W
	SAFEPOS energy-pack	0.5 W
	Fieldbus gateway	1 W
Energy consumption actuator for 1 cycle [Ws]*:	(see following graphs)	

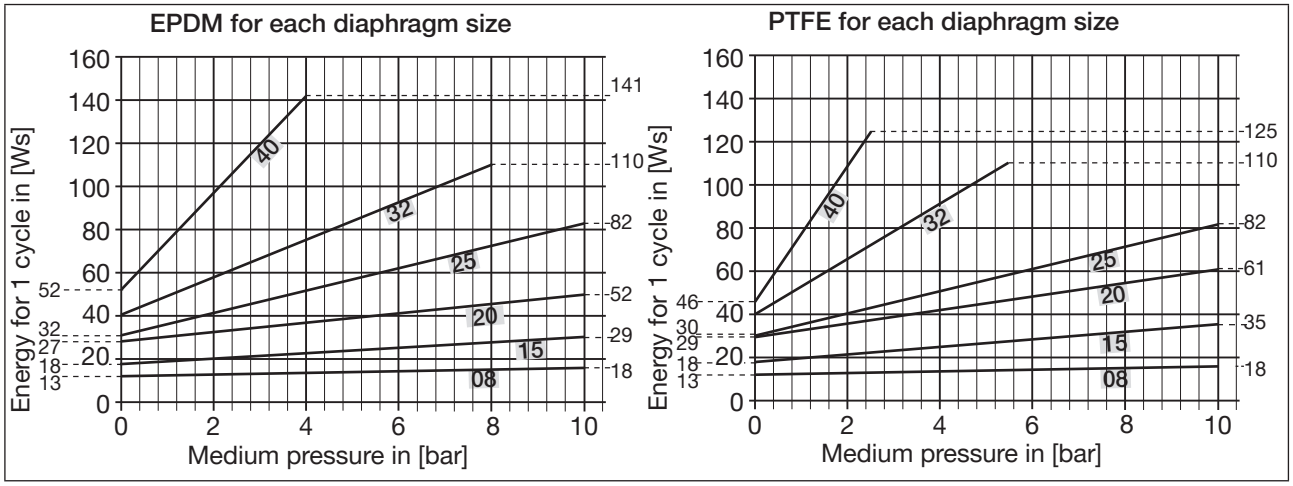

Figure 12: Energy consumption of actuator for each diaphragm size

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

1. For devices with the SAFEPOS energy-pack energy storage:
   Setting the function “Control if ready” reduces the max. operating current by 1 A.
   Setting in the configuration area **Position controller** → **Parameter** → **SAFEPOS** → **ENERGY-PACK** → **FUNCTION** → **Control if ready**.
2. Reducing the control speed X.TIME.
   Setting: Setting in the configuration area **Position controller** → **Parameter** → **ADD.FUNCTION** → activate **X.TIME** → **X.TIME** → **Opening time** → **Closing time**..

* All values refer to a supply voltage of 24 V ⎓ at 25 °C (77 °F) ambient temperature and medium temperature.

Note: At minimum ambient and medium temperatures, the operating current can be up to 5 A (incl. 1 A charging current for the optional SAFEPOS energy-pack).

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Service life energy pack SAFEPOS energy-pack	Charging time: maximum 100 seconds (depending on the conditions of use) Service life: up to 10 years (depending on the conditions of use). The determined service life of 7.5 years was determined under the following conditions: Ambient temperature 30 °C (86 °F) Medium temperature 80 °C (176 °F) Duty cycle 100 % Medium pressure 6 bar (87.2 psi) Diaphragm size 32
Digital outputs (optional):	
Current limit	100 mA
Digital inputs for position signal:	0...5 V = log „0“, 10...30 V = log „1“ inverted input reversed accordingly (input current < 6 mA)
Communications interface to the PC:	büS service interface, connection is established using the USB-büS-Interface
Communications software for PC:	“Bürkert Communicator”

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

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

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8.10 Flow values for forged steel valve bodies VS

Kvs values for forged steel valve bodies VS							
Diaphragm size	Orifice connection (DN)	Seal material	Kvs value [m³/h]				
			DIN	ISO	ASME	BS	SMS
8	6	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	EPDM	34.0	-	-	-	-
		PTFE	34.0	-	-	-	-
	40 / 1 ½"	EPDM	40.0	41.0	37.0	-	38.0
		PTFE	40.0	40.0	37.5	-	38.0

Table 8: Kvs values for forged steel valve bodies VS

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8.11 Flow values for cast valve bodies and plastic valve bodies

Kvs values for cast valve bodies VG and plastic valve bodies PD, PP, PV				
Diaphragm size	Orifice connection (DN)	Seal material	Kv value [m³/h]	
			Cast valve bodies VG (all standards)	Plastic valve bodies (all materials)
8	8	EPDM	0.95	-
		PTFE	1.5	-
15	15	EPDM	5.6	3
		PTFE	5.3	3
20	20	EPDM	10.7	7
		PTFE	10.5	6.7
25	25	EPDM	14.6	11.4
		PTFE	13.6	10
32	32	EPDM	-	17.5
		PTFE	-	17.1
40	40	EPDM	35.0	24.5
		PTFE	35.0	24.0

Table 9: Kvs values for cast valve bodies VG and plastic valve bodies PD, PP, PV

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8.12 Flow values for tube valve bodies

Kvs values for 3G tube valve bodies VP (IHU2)					
Diaphragm size	Orifice connection (DN)	Seal material	Kv value [m³/h]		
			DIN	ISO	ASME
8	8 / 1/4"	EPDM	-	1.9	-
		PTFE	-	2.4	-
	10 / 3/8“	EPDM	1.9	-	-
		PTFE	2.4	-	-
	15 / 1/2“	EPDM	-	-	-
		PTFE	-	-	2.2
15	15 / 1/2“	EPDM	7.2	7	-
		PTFE	6.7	6.6	-
	20 / 3/4“	EPDM	6.9	-	-
		PTFE	5.5	-	6.5
20	20 / 3/4“	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

Table 10: Kvs values for 3G tube valve bodies VP

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9 INSTALLATION OF THE VALVE

9.1 Safety instructions for installation

WARNING!

Risk of injury from improper assembly.

- ▸ The assembly may be carried out only by trained technicians and with the appropriate tools.
- ▸ Secure system against unintentional activation.
- ▸ After installation, ensure that the process is restarted in a controlled manner. Observe sequence.
  1. Apply supply voltage.
  2. Charge the device with medium.

CAUTION!

Risk of injury due to a heavy device.

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

- ▸ Transport, install and dismantle a heavy device with the help of another person.
- ▸ Use appropriate tools.

9.2 Installation position of the diaphragm valves

The installation position of the diaphragm valve varies depending on the valve body.

One of the relief bores in the diaphragm socket, for monitoring leakage, must be at the lowest point.

9.2.1 Installation position of 2-way body

Installation position: any position, preferably with the actuator facing up.

Ensuring self-drainage:

It is the responsibility of the installer and operator to ensure self-drainage.

Self-draining must be considered during the installation:

- **Inclination angle of the pipeline.**
  Observe an inclination angle of 1°...5° for the pipeline.
- **Self-drainage-angle for valve body:**

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

  The self-drainage angle is specified as a value on forged steel valve bodies (VS) and tube valve bodies (VP). (See “Figure 8”, page 24 and “Figure 9”, page 24).

  The marking on the port connection of valve bodies serves as an orientation aid (see “Figure 13”). The marking must point upwards.

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

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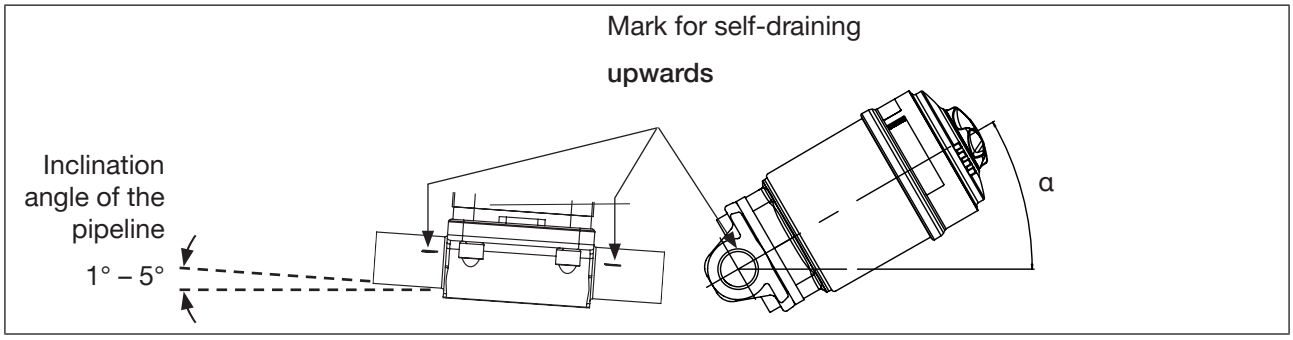

Figure 13: Installation position for self-drainage of the body

Information about self-draining 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.

It is the responsibility of the installer and operator to ensure self-draining.

www.Buerkert.com. Type / User Manuals / Additional manual „Angles for self-draining of diaphragm valves".

If you require clarification, contact your Bürkert sales department.

9.2.2 Installation position of T-valve body

Installation position:

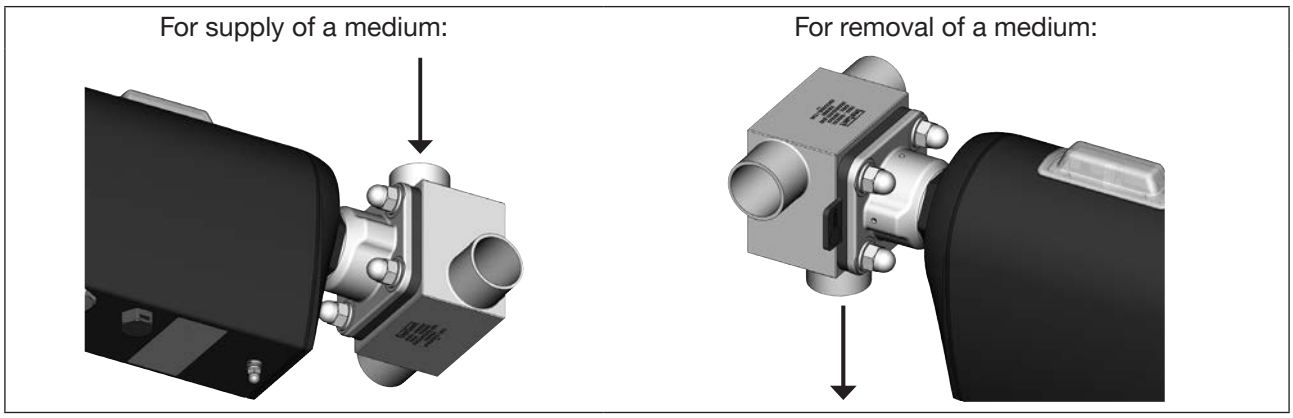

Figure 14: Installation position of T-valve body

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9.2.3 Installation position of tank bottom body

Recommended installation position: any, preferably with actuator face down.

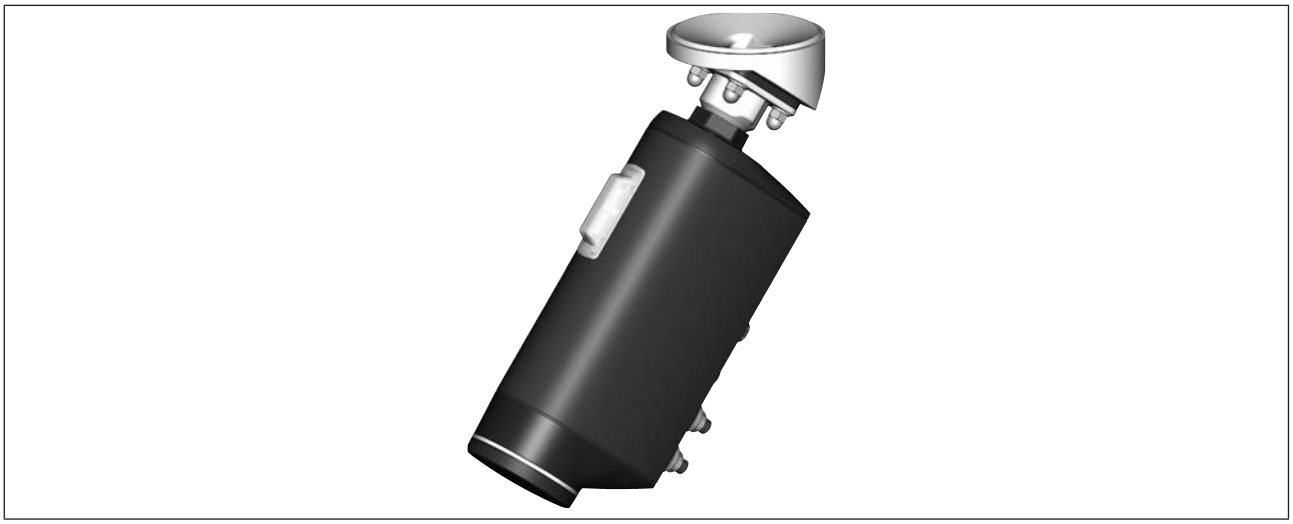

Figure 15: Installation position of tank bottom body, Type 3325

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9.3 Installation of devices with threaded socket connection, flange connection, clamp connection or bond connection

ATTENTION!

Damage to the diaphragm.

▸ To prevent damage, the valve must be in MANUAL operating state during installation.

Devices are delivered with the MANUAL operating state preset.

9.3.1 Required work steps

1. If not preset, set operating state MANUAL, chapter “13.1”, page 71.
2. If the device is already electrically connected, switch off the supply voltage. Wait until LED illuminated ring goes out.
3. Mount the device in the pipeline, chapter “9.3.3”, page 37.
4. Electrical installation, chapter “10”, page 50.
5. Apply supply voltage.
6. Execute function M.Q0.TUNE, chapter “11.3”, page 61.
7. Set operating state AUTOMATIK, chapter “13.1”, page 71.

9.3.2 Installation requirements

Pipelines: Ensure that the pipelines are aligned.

Preparation: Clean pipelines (sealing material, swarf, etc.).
Support and align pipelines. To ensure that the pipeline is self-draining, observe an inclination angle of 1° – 5°.

9.3.3 Mounting the device in the pipeline

Precondition: MANUAL operating state.

ATTENTION!

Note the following when installing the device in the plant.

The device and the relief bore must be accessible to allow inspection and maintenance work.

DANGER!

Risk of injury from high pressure.

▸ Before working on the system, switch off the pressure and vent or drain lines.

WARNING!

Risk of crushing due to mechanically moving parts.

▸ Keep clear of the openings in the valve body.

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→ Connect valve body to pipeline.
⚠ Ensure installation is de-energised and low-vibration.

Holding device
To protect the valve actuator from damage due to forces and vibrations, a holding device is recommended. This is available as an accessory. See chapter “23 Accessories, spare parts”.

Next steps:

- Electrical installation, chapter “10”, page 50.
- Apply supply voltage.
- To adjust the position control, running the M.Q0.TUNE function, chapter “11.3”, page 61.

ATTENTION!

Damage to the diaphragm.

▸ To prevent damage, first run the M.Q0.TUNE function after making the electrical connection. Only then set the operating state to AUTOMATIC.

- Set operating state AUTOMATIK, chapter “13.1”, page 71.

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9.4 Installation of devices with welded connection

ATTENTION!

Observe the national regulations for the qualification of welders and for performing welding work.

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

Note the following when installing the device in the plant.

The device and the relief bore must be accessible to allow inspection 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 the MANUAL operating state during installation and removal of the actuator and diaphragm.
- The actuator must be in the position “valve 100% open“.

Delivery condition for devices with welded connection
The devices are delivered in a disassembled state.
Operating state: MANUAL.
Position of the actuator: Valve open.

9.4.1 Required work steps

The device must not be welded with mounted actuator into the pipeline. Installation is divided into the following steps:

1. If not preset, set operating state MANUAL, chapter “13.1”, page 71.
2. If the valve is in the closed position, switch it to the position “valve 100% open”, chapter “15”, page 78.
3. If the device is already electrically connected, switch off the 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”, page 47.
5. Weld valve body into the pipeline.
   - 2-way body or T-body, chapter “9.4.3”, page 40.
   - Tank bottom body, chapter “9.4.4”, page 41.
6. Mount actuator on the valve body, chapter “9.5”, page 42.
7. Execute function M.Q0.TUNE, chapter “11.3”, page 61.
8. Set operating state AUTOMATIK, chapter “13.1”, page 71.

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9.4.2 Required tools and equipment

- 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

9.4.3 Welding 2-way body or T-valve body into the 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 drain lines.

Installation requirements:

Installation position:	2-way valve, see chapter “9.2.1”, page 34. T-valve, see chapter “9.2.2”, page 35.
Pipelines:	Ensure that the pipelines are aligned.
Preparation:	Clean pipelines (sealing material, swarf, etc.). Support and align pipelines. To ensure that the pipeline is self-draining, observe an inclination angle of 1° – 5°.

Welding valve body:

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.

Observe the applicable laws and regulations of the respective country with regard to the qualification of welders and the execution of welding work.

→ Weld valve body into the pipeline.
⚠ Ensure installation is de-energised and low-vibration.

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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 drain lines.

Recommendations

Observe sequence:

1. Weld the tank bottom body onto the base of the tank before installing the tank.
   Welding onto a tank which has already been installed is possible but more difficult.
   Note: Weld the tank bottom body in the middle of the tank base so that the tank can be optimally drained.
2. Construction of the tank.
3. Weld the tank bottom body into the pipeline.

Installation requirements:

Installation position:	See chapter “9.2.3”, page 36.
Tank preparation:	Clean the tank (sealing material, swarf, etc.).
Pipeline preparation:	Clean pipelines (sealing material, swarf, etc.). Support and align pipelines. To ensure that the pipeline is self-draining, observe an inclination angle of 1° – 5°.

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 tanks and instructions on welding observe the standard ASME VIII Division I.

Before you start welding, check the batch number indicated on the supplied manufacturer’s certificate 3.1.B.

Observe the applicable laws and regulations of the respective country with regard to the qualification of welders and the execution of welding work.

ATTENTION!

Note for welding:

- Use only welding material which is suitable for the tank bottom body.
- The tank bottom valve must not collide with any other installation part; the actuator must be easy to install and remove.

→ Weld the tank bottom body to the container.

→ Construct the tank.

→ Weld the tank bottom body into the pipeline.
⚠ Ensure installation is de-energised and low-vibration.

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Next steps:

- If the diaphragm is not mounted, mount it on the actuator, chapter “9.5.3”, page 42.
- Mount the actuator onto the valve body and connect the power, chapter “9.5.4”, page 44.
- To adjust the position control, running the M.Q0.TUNE function, chapter “11.3”, page 61.

ATTENTION!

Damage to the diaphragm.

▸ To prevent damage, first run the M.Q0.TUNE function after making the electrical connection. Only then set the operating state to AUTOMATIC.

- Set operating state AUTOMATIK, chapter “13.1”, page 71.

9.5 Mounting 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”, page 42.
2. Mounting actuator on the valve body and making the electrical connections, chapter “9.5.4”, page 44.
3. Execute function M.Q0.TUNE, chapter “11.3”, page 61.
4. Set operating state AUTOMATIK, chapter “13.1”, page 71.

9.5.2 Required tools

- 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

Depending on the size of the diaphragm, there are different fastening types for the diaphragm.

Diaphragm size	Fastening types for diaphragms	
	PTFE	EPDM / FKM / laminated PTFE
08	Diaphragm pressed in	Diaphragm pressed in
15, 20	Diaphragm with bayonet catch	Diaphragm with bayonet catch
25, 32, 40	Diaphragm with bayonet catch	Diaphragm screwed in

Table 11: Fastening types for diaphragms

Fastening the diaphragm with a bayonet catch:

→ Hook diaphragm into the pressure piece and secure by turning it 90°.

Fastening the diaphragm by screwing it in:

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→ If there is no insert in the pressure piece, fit the insert into the pressure piece as shown in the figure.

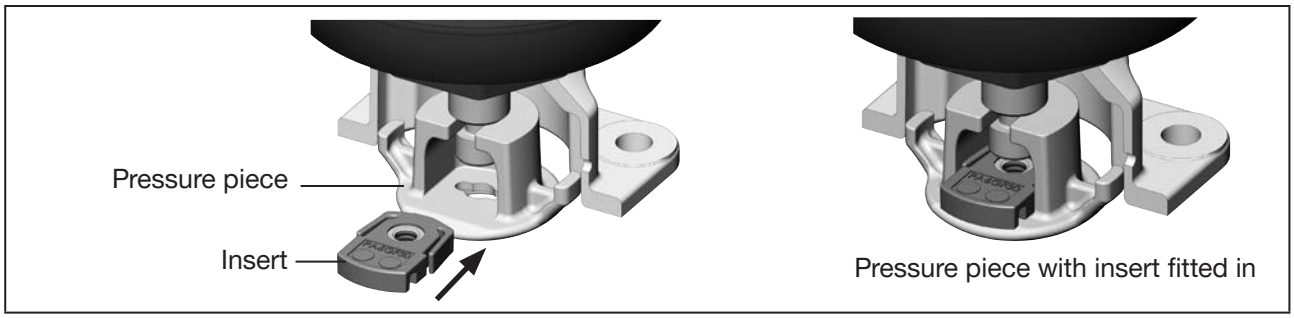

Figure 16: Fitting the insert into the pressure piece

→ Hand-tighten the diaphragm into the pressure piece.

→ Loosen by half a rotation.

→ Align diaphragm.
The identification tab on the diaphragm must protrude out of the valve body at right angles to the longitudinal axis of the pipeline (see “Figure 17”).

Fastening the diaphragm by pressing it in:

→ Press diaphragm into the pressure piece.

→ Align diaphragm. The identification tab on the diaphragm must protrude out of the valve body at right angles to the longitudinal axis of the pipeline (see “Figure 17”).

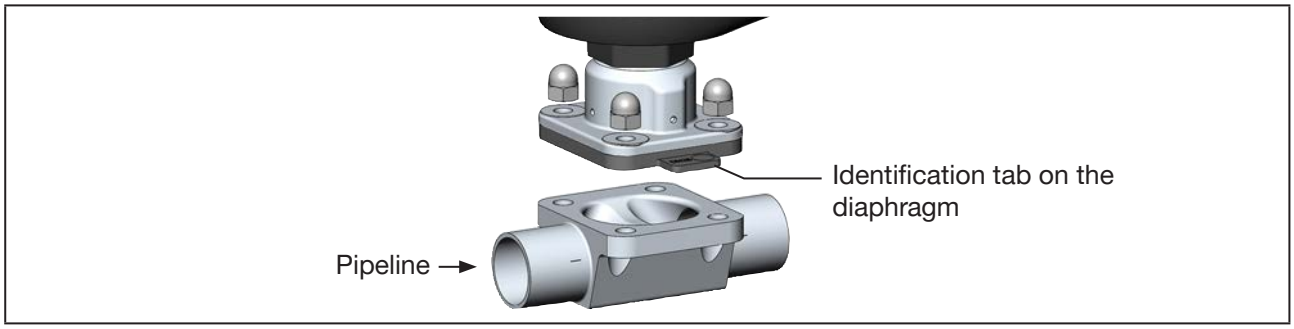

Figure 17: Aligning the diaphragm (example 2-way body)

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9.5.4 Mounting actuator on the valve body and making the electrical connections

WARNING!

Risk of injury due to electric shock.
Risk of crushing due to mechanically moving parts.

▸ Switch off 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 “Figure 17”).

→ Replace a damaged diaphragm.

→ Place actuator on the valve body.
Stud bolts have been pre-installed for T-body and tank bottom body.
Insert screws into the valve body for 2-way bodies.

→ Lightly tighten the nuts in a crosswise sequence until the diaphragm is positioned between the housing and actuator.
⚠ Do not fully tighten nuts yet.

→ Connect the device electrically.
The position of the connections can be aligned by rotating the actuator through 360°. See chapter “9.6 Rotating the actuator”.

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

→ Run M.SERVICE as described below.

Running M.SERVICE:

NOTE!

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 2 buttons for running the M.SERVICE are located under the dummy cover.

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

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

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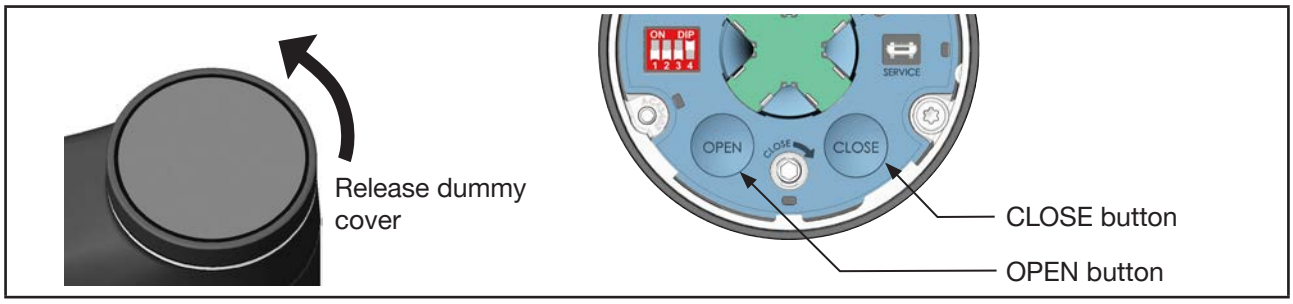

Figure 18: Running M.SERVICE

→ To release, rotate the dummy cover counter-clockwise and remove it.

→ Simultaneously hold down the OPEN and CLOSE buttons for 5 s.

✔ The M.SERVICE function has run.

→ Wait until the M.SERVICE function has ended and the actuator stops.

Tighten nuts gradually:

WARNING!

Risk of injury due to non-observance of the tightening torque.

Non-observance of the tightening torque is hazardous as the device may be damaged.

▸ Observe tightening torque.

→ Tighten the nuts crosswise to 1/3 of the tightening torque.

→ Then tighten the nuts crosswise to 2/3 of the tightening torque.

→ Tighten crosswise up to the permitted tightening torque.

Tightening torque for installation of the actuator

Diaphragm size	Tightening torques for diaphragm [Nm]*	
	EPDM/FKM	PTFE / advanced PTFE / laminated PTFE
08	2.5 +10 %	2.5 +10 %
15	3.5 +10 %	4 +10 %
20	4 +10 %	4.5 +10 %
25	5 +10 %	6 +10 %
32	8 +10 %	10 +10 %
40	8 +10 %	10 +10 %
* For all values, there is a tolerance of +10 % of the respective tightening torque.		

Table 12: Tightening torques for installation of the actuator

Holding device
To protect the valve actuator from damage due to forces and vibrations, a holding device is recommended. This is available as an accessory.See chpter “23 Accessories, spare parts”.

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Next steps:

- To adjust the position control, running the M.Q0.TUNE function, chapter “11.3”, page 61.

ATTENTION!

Damage to the diaphragm.

▸ To prevent damage, first run the M.Q0.TUNE function after making the electrical connection. Only then set the operating state to AUTOMATIC.

- Set operating state AUTOMATIC, chapter “13.1”, page 71.

9.6 Rotating the actuator

ATTENTION!

Damage to the diaphragm.

▸ To prevent damage to the diaphragm, the valve must be open when the actuator is rotated.

The position of the connections can be aligned by rotating the actuator through 360°.

→ In the case of devices which are not installed, clamp the valve body in a holding device.

→ Place an open-end wrench (width across flats M41) on the hexagon of the actuator.

→ Rotate the actuator and move it into the required position.

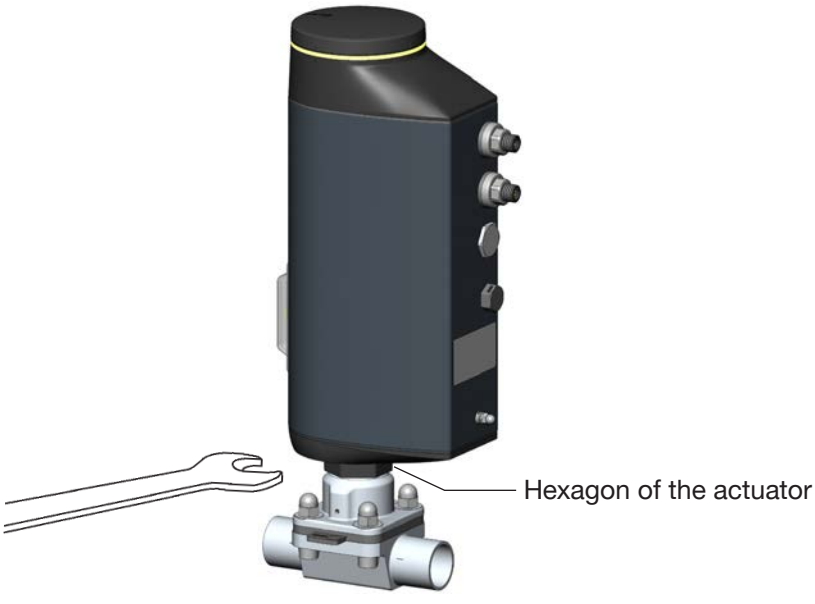

Figure 19: Rotating the actuator

The actuator cannot be rotated if devices are fitted with a holding device.

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9.7 Removing the actuator

DANGER!

Risk of injury from high pressure.

- Before working on the system or device, switch off the pressure and vent or drain 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 operating state MANUAL, chapter “13.1”, page 71.
2. Switch the valve to the position “valve 100% open“, chapter “15”, page 78.
3. Switch off the supply voltage. Wait until LED illuminated ring goes out.
4. Remove actuator from valve body, chapter “9.7.2”, page 47.

9.7.2 Remove actuator from valve body

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

WARNING!

Risk of injury due to electric shock.
Risk of crushing due to mechanically moving parts.

- Switch off supply voltage.
- Devices with SAFEPOS energy-pack: Completely drain SAFEPOS energy-pack. Wait until LED illuminated ring goes out; the LED status must not be in LED off mode.

ATTENTION!

Damage to the diaphragm.

- To prevent damage, the device must be in the MANUAL operating state 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 cross-wise.

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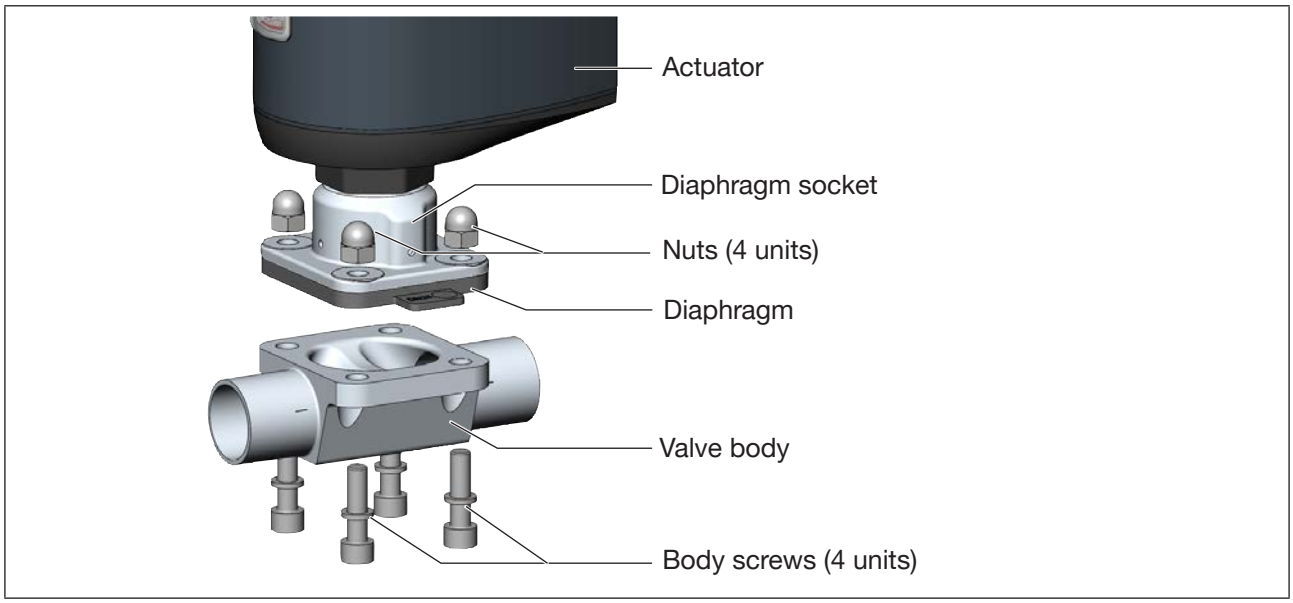

Figure 20: Disassembly of the diaphragm using the 2-way body as an example

→ Remove the body screws.

→ Remove valve body.

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9.8 Holding device

The holding device is used to protect the valve actuator and the body from damage due to forces and oscillations. The holding device is available as an accessory. See chapter “23 Accessories, spare parts”

9.8.1 Attaching the holding device

→ Attach holding device to the hexagon of the actuator as shown in the diagram.

ATTENTION!

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

→ Fix the holding device in place using suitable means.

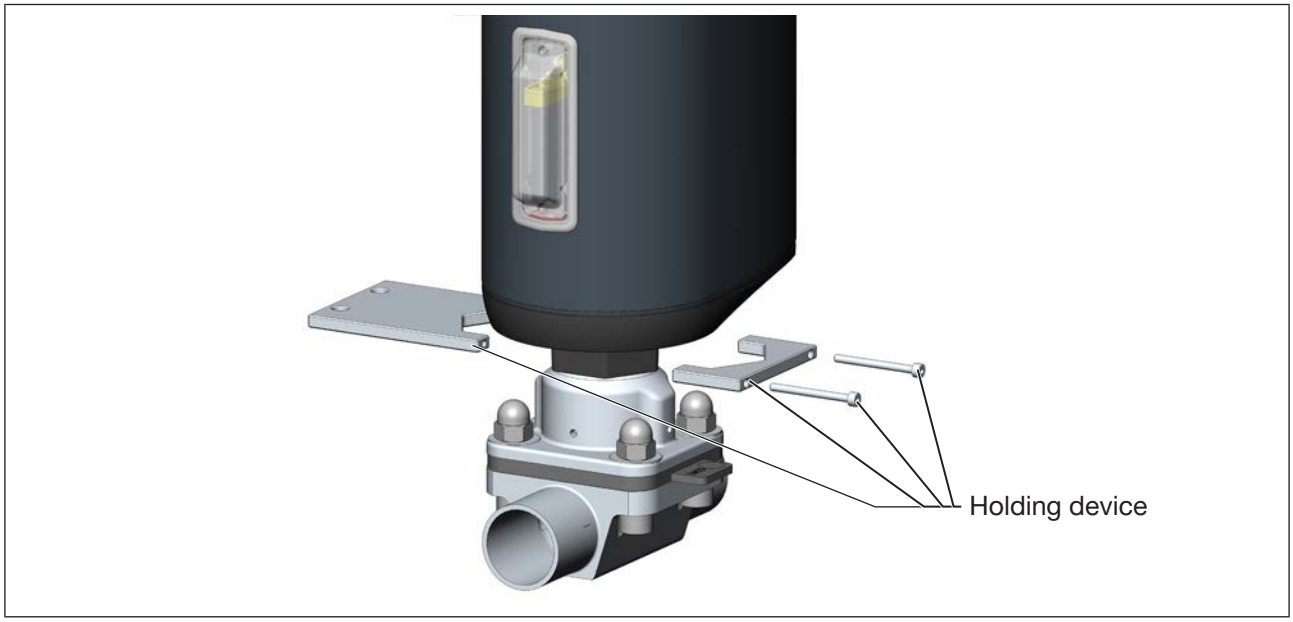

Figure 21: Attaching the holding device

The actuator cannot be rotated if devices are fitted with a holding device.

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10 ELECTRICAL INSTALLATION

The electromotive valve is available with one of 2 different connection variants:

- With circular plug-in connector (multipole version)
- Cable gland with connection terminals

Signal values

Operating voltage: 24 V ⎓

Digital input for control signal: 0...5 V = log „0“; 10...30 V = log „1“

10.1 Electrical installation with circular plug-in connector

WARNING!

Risk of injury from improper installation.

- ▸ Installation may be carried out by authorized technicians only and with the appropriate tools.
- ▸ Observe the general rules of technology during installation.

Risk of injury from unintentional activation of the system and uncontrolled restart.

- ▸ Secure system against unintentional activation.
- ▸ Following installation, ensure a controlled restart.

ATTENTION!

To ensure electromagnetic compatibility (EMC), the functional ground must be grounded with a short cable (max. 1m). The functional ground must have a cross-section of at least 1.5 mm².

Selection of the connection line:
When selecting the length and cross-section of the individual wires, consider the voltage drop with reference to the maximum supply current.

→ Connect the device according to the tables.

→ When the operating voltage has been applied, make the required basic settings and adjustments for the electromotive valve. For description see chapter “11 Start-up”.

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10.1.1 Description of the circular plug-in connectors

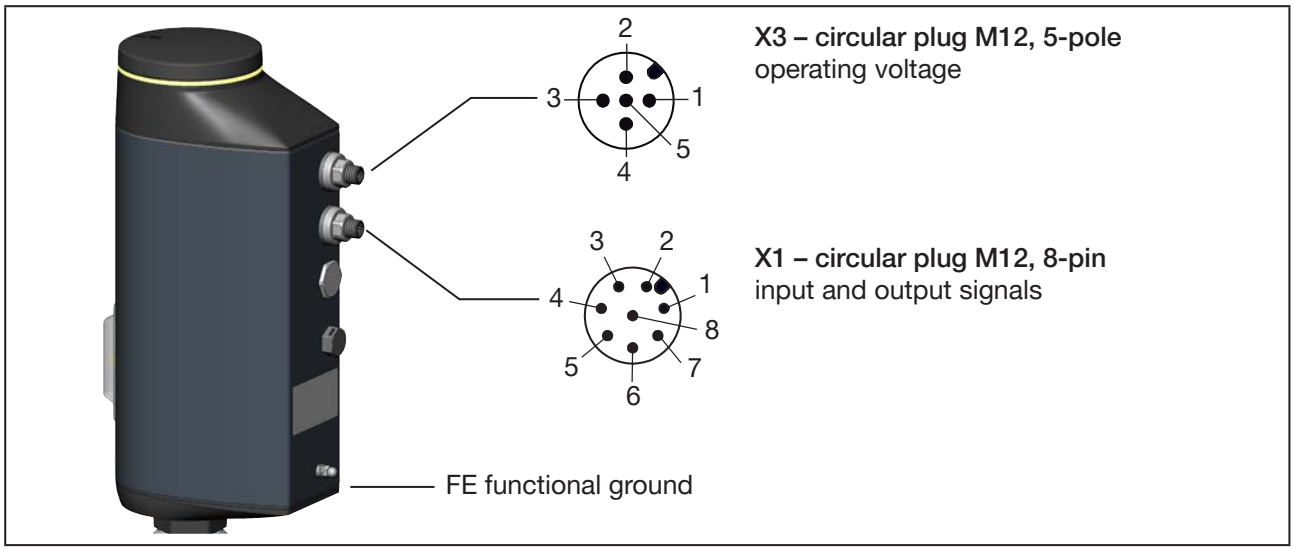

Figure 22: Description of the circular plug-in connectors

10.1.2 X1 – M12 circular plug, 8-pin

Pin	Wire color*	Assignment (from point of view of the device)
Input signals from the control center (e.g. PLC)		
1	white	Digital input + 0...5 V (log. 0) / 10...30 V (log. 1)
Output signals to the control center (e.g. PLC) – (required for analog output and/or digital output option only)		
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 indicated wire colors refer to the connection cable, part no. 919061, available as an accessory.*		

Table 13: X1 – M12 circular plug, 8-pin

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10.1.3 X3 – M12 circular plug, 5-pole, operating voltage (Devices without büS/CANopen network)

A 4-pin female connector can be used as a counterpart.

Pin	Wire color*	Assignment
1	-	do not connect
2	white	+24 V ⎓ ± 10 %, max. residual ripple 10 %
3	blue	GND
4	-	do not connect
5	-	do not connect (not available on the 4-pin female connector)
* *The indicated wire colours refer to the M12 connection cable, 4-pin, part no. 918038, available as an accessory.*		

Table 14: X3 – M12 circular plug, 5-pole, operating voltage

→ When the operating voltage is applied make the required base settings and adjustments for the electromotive diaphragm valve. For a description, see chapter "11.1 Basic settings".

10.2 Electrical connection büS/CANopen

10.2.1 X3 – M12 circular plug, 5-pole, büS/CANopen network and operating voltage

Pin	Wire color*	Assignment
1	CAN shield	
2	red	+24 V ⎓ ± 10 %, max. residual ripple 10 %
3	black	GND / CAN_GND
4	white	CAN_H
5	blue	CAN_L
* *The specified wire colours refer to the büS cable, which is available as an accessory. See the cabling guideline,* **link:** Guide for planning of büS networks		

Table 15: X3 – M12 circular plug, 5-pole, büS/CANopen network and operating voltage

NOTE!

A shielded 5-wire cable must be used for the electrical connection of the büS/CANopen network.

Further information on cabling büS networks can be found under the following link:
Guide for planning of büS networks

→ When the operating voltage is applied make the required base settings and adjustments for the electromotive diaphragm valve. For a description, see chapter "11.1 Basic settings".

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10.3 Electrical connection fieldbus gateway

Figure 23: Electrical connection fieldbus gateway

The fieldbus gateway is connected with a circular plug-in connector M12, 4-pin.

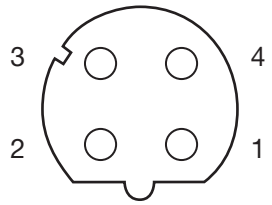
Circuit diagram	Pin	Assignment
	1	Transmit +
	2	Receive +
	3	Transmit –
	4	Receive –

Table 16: Electrical assignment fieldbus gateway

NOTE!

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

As the metal housing of the M12 circular plug-in connector is connected to the actuator housing, the functional ground must be grounded on the actuator housing. For the grounding use a short line (max. 1m) with a cross-section of at least 1.5 mm^2.

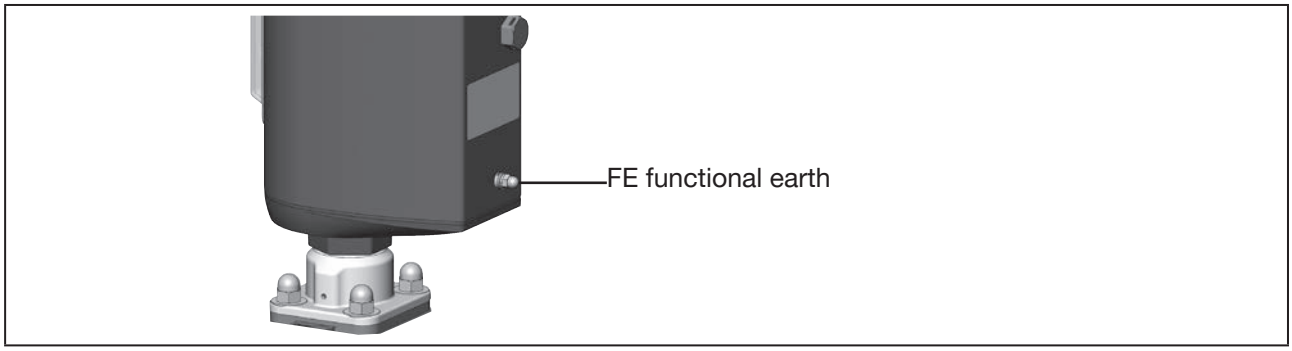


Figure 24: Functional earth

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10.4 Electrical installation with cable gland

WARNING!

Risk of injury from improper installation.

- Installation may be carried out by authorized technicians only and with the appropriate tools.
- Observe the general rules of technology during installation.

Risk of injury from unintentional activation of the system and uncontrolled restart.

- Secure system against unintentional activation.
- Following installation, ensure a controlled restart.

ATTENTION!

To ensure electromagnetic compatibility (EMC), the functional ground must be grounded with a short cable (max. 1m). The functional ground must have a cross-section of at least 1.5 mm².

10.4.1 Access to the connection terminals

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

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

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

1. Removing dummy cover:

→ To release, rotate the dummy cover counter-clockwise and remove it.

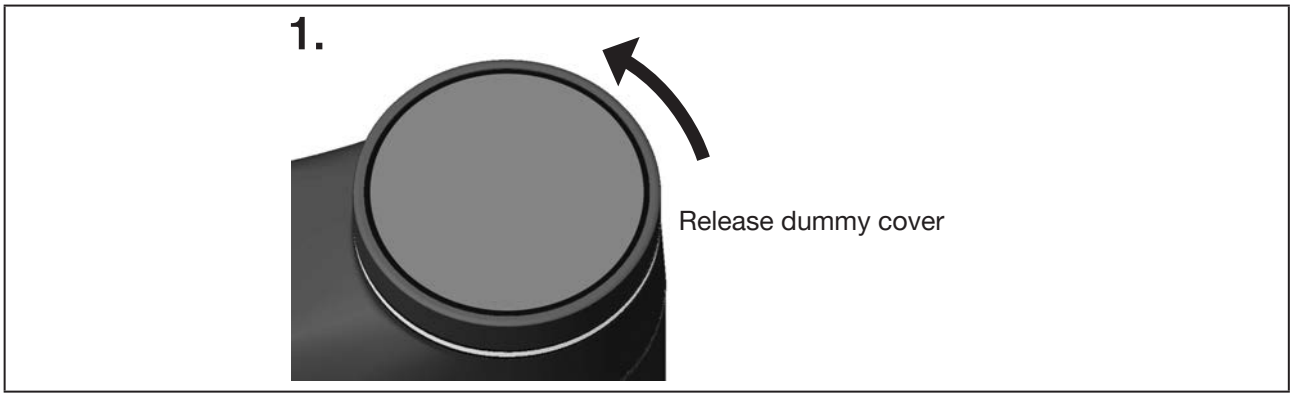

Figure 25: Removing dummy cover

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2. Removing the LED and storage module:

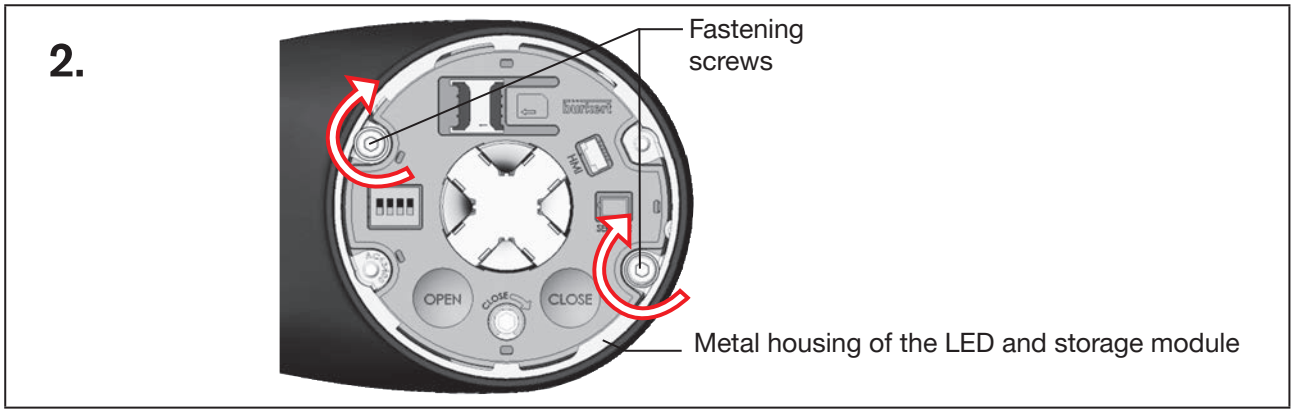

Figure 26: Removing the LED and storage module

→ Remove the 2 fastening screws (hexalobular-internal screws T20).

→ Take hold of the LED and storage module on both sides of the metal housing and lift out.

3. Removing actuator cover:

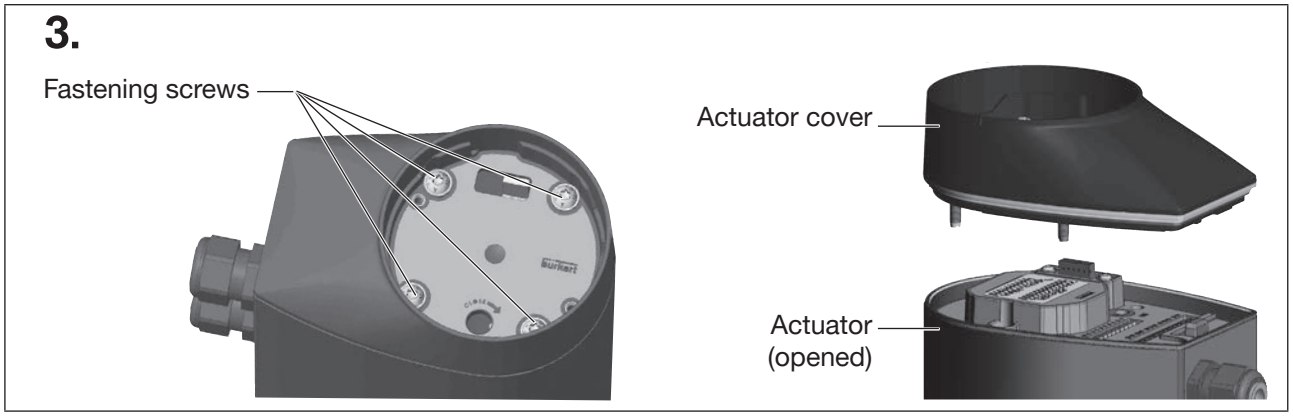

Figure 27: Removing actuator cover

→ Loosen the 4 fastening screws (T25 hexagon socket round screws).
The screws are integrated in the actuator cover to prevent them from falling out.

→ Remove the actuator cover.

The connection terminals are now accessible.

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10.4.2 Connecting the cables

→ Push the cables through the cable gland.

ATTENTION!

Allow for connection to spring-type terminals.

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

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

→ Connect the wires. The terminal assignment can be found in the tables below, starting on page 57.

→ Tighten the union nut of the cable gland (tightening torque approx. 1.5 Nm (1.1 lbf ft)).

ATTENTION!

Damage or malfunction due to ingress of dirt and moisture.

To comply with the degree of protection IP65 and IP67:

- Close all unused cable glands with dummy plugs.
- Tighten the union nuts on the cable glands. Tightening torque depends on cable size or dummy plug approx. 1.5 Nm (1.1 lbf ft).

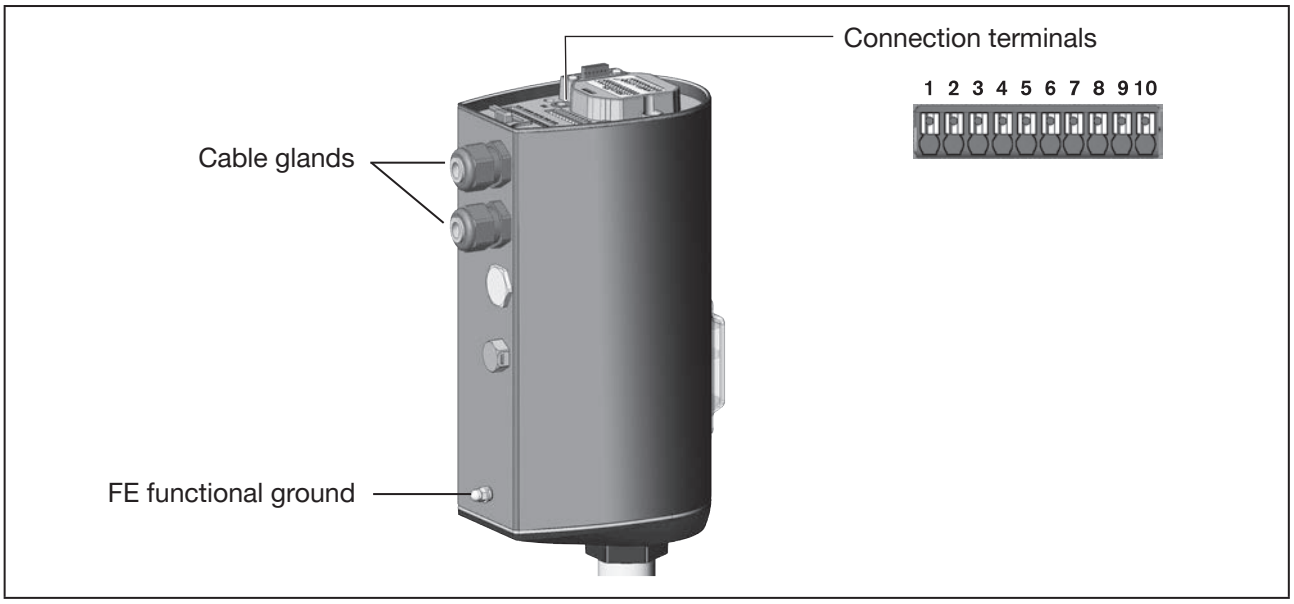

Figure 28: Connecting the cables

→ Connect the device according to the tables.

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10.4.3 Terminal assignment – input signal from the control centre (e.g. PLC)

Terminal	Assignment (from point of view of the device)	
5	Digital input +	+ 0...5 V (log. 0) / 10...30 V (log. 1)
4	Digital input GND	specific to operating voltage GND (terminal GND)
8	Digital output 1	24 V / 0 V
6	Digital output 2	24 V / 0 V
7	Digital output GND	

Table 17: Terminal assignment – input signal from the control center (e.g. PLC)

10.4.4 Terminal assignment – operating voltage

Terminal	Assignment
10	+24 V ⎓ ±10 % max. residual ripple 10 %
9	GND

Table 18: Terminal assignment – operating voltage

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10.4.5 Closing the actuator housing

ATTENTION!

Damage or malfunction due to ingress of dirt and moisture.

Before closing the device, comply with the degree of protection IP65 and IP67 by ensuring that:

- The seal must be inserted in the actuator housing/actuator cover and must not be damaged.
- The sealing surfaces must be clean and dry.

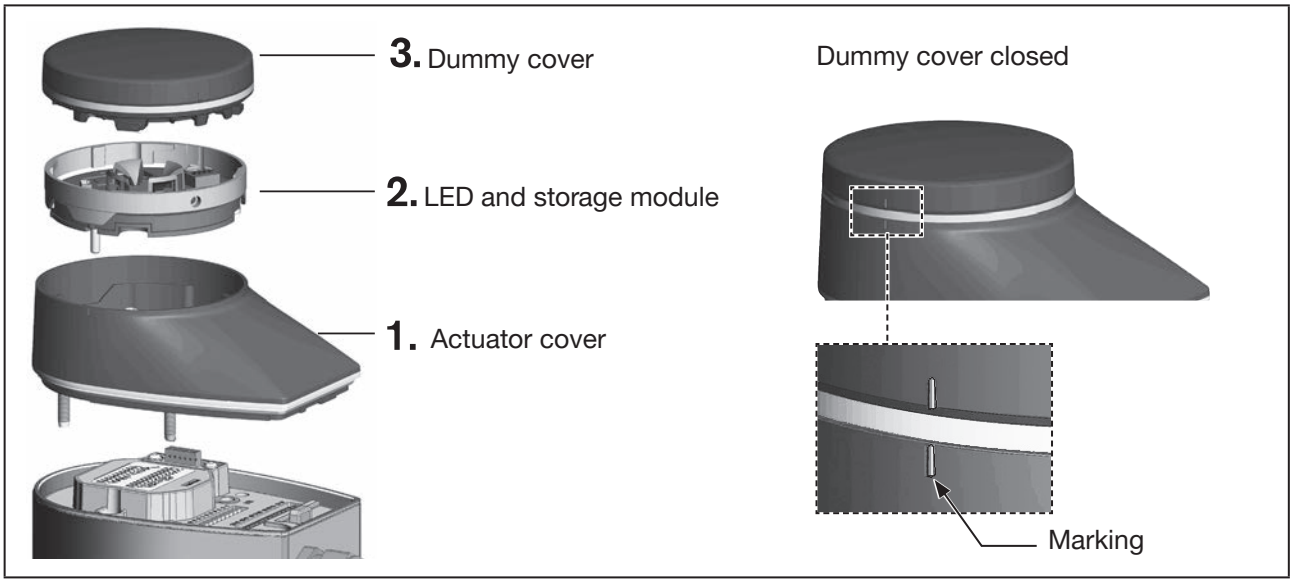

Figure 29: Closing the actuator housing

1. Attaching the actuator cover

→ Place actuator cover on the actuator housing.

→ Slightly screw in the 4 fastening screws (T25 hexagon socket round screws) crosswise, firstly by hand and then tighten (tightening torque: 5.0 Nm (3.7 lbf ft)).

2. Mount LED and storage module:

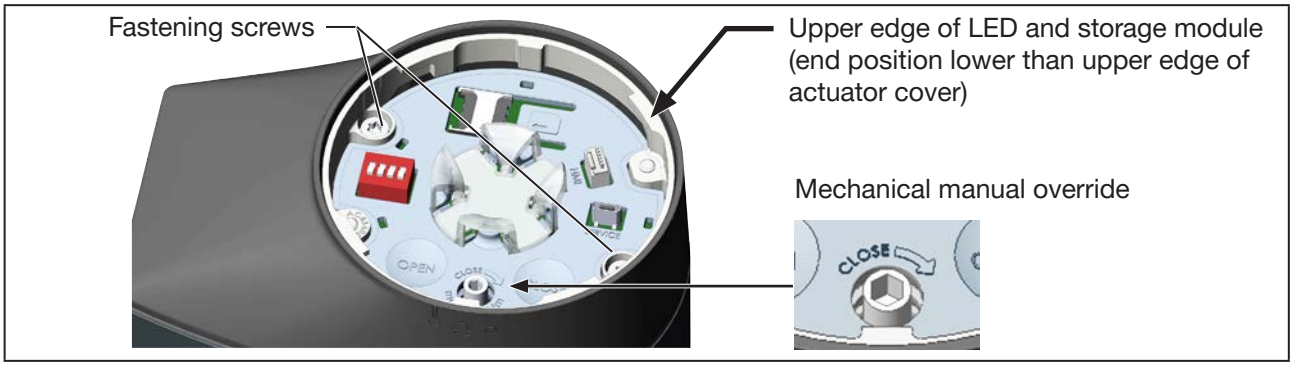

Figure 30: Mount LED and storage module:

→ 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.

NOTE!

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 the tightening torque of 1.1 Nm!

3. Closing dummy cover

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

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

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

When the operating voltage has been applied, make the required basic settings and adjustments for the electromotive valve. For description see chapter “11 Start-up”.

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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 have understood the contents of the operating instructions.
- ▸ Observe the safety instructions and intended use.
- ▸ Only adequately trained personnel may start up the equipment and the device.

11.1 Basic settings

Type of base setting (observe sequence)		Factory presetting
1.	Setting effective direction	NC (normally closed)
	Activate or deactivate safety position	activated
2.	Adjustment of position control (MQ.0.TUNE function)	–
3.	Set operating state to AUTOMATIC	MANUAL

Table 19: Overview: Basic settings of the diaphragm valve

11.2 Setting safety position and effective direction

The effective direction and the 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 activated / deactivated))	**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)

Table 20: Setting effective direction and safety position

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11.3 Adjusting the position control - running M.Q0.TUNE

When the M.Q0.TUNE function is running, the position control is adjusted to the actual stroke of the actuator used and the required sealing force is determined.

In doing so, the sealing point must be manually approached. It is important that the valve is not completely closed.

Based on this position, the device uses an algorithm to calculate the optimum sealing force. This ensures that the diaphragm is sealed under the given conditions and that the service life of the diaphragm is optimised.

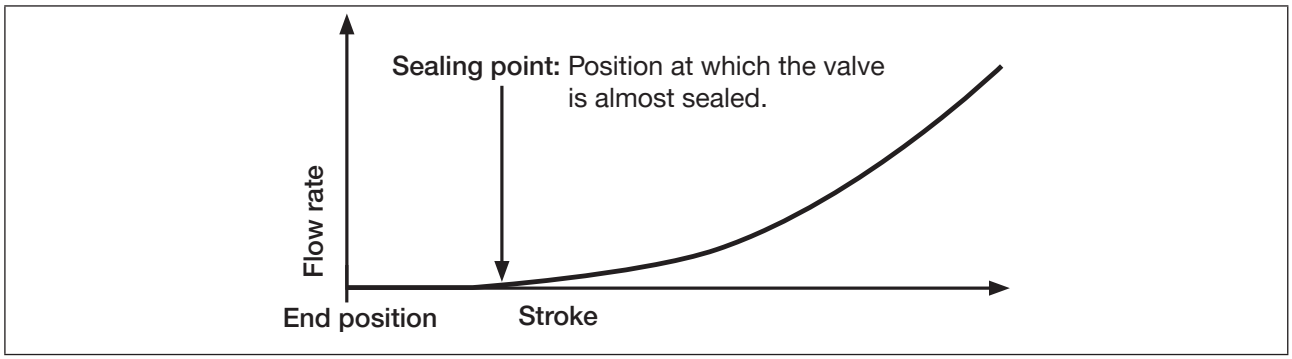

Table 21: Sealing point

ATTENTION!

Run M.Q0.TUNE.

- Run M.Q0.TUNE to ensure that the diaphragm is sealed under the given conditions and that the service life of the diaphragm is optimized.
- After changing the actuator or valve body, or if the operating conditions are changed, the M.Q0.TUNE must be run again.
- Run the M.Q0.TUNE function in the MANUAL operating state.

WARNING!

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

If the M.Q0.TUNE is running without medium pressure, the actuator will be incorrectly adjusted.
This will cause an uncontrolled process due to a leaking actuator or damage to the diaphragm.

- Run M.Q0.TUNE under medium pressure only.

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11.3.1 Triggering the M. Q0.TUNE function

The 2 buttons for approaching the sealing point and for running the M.Q0.TUNE are under the dummy cover.

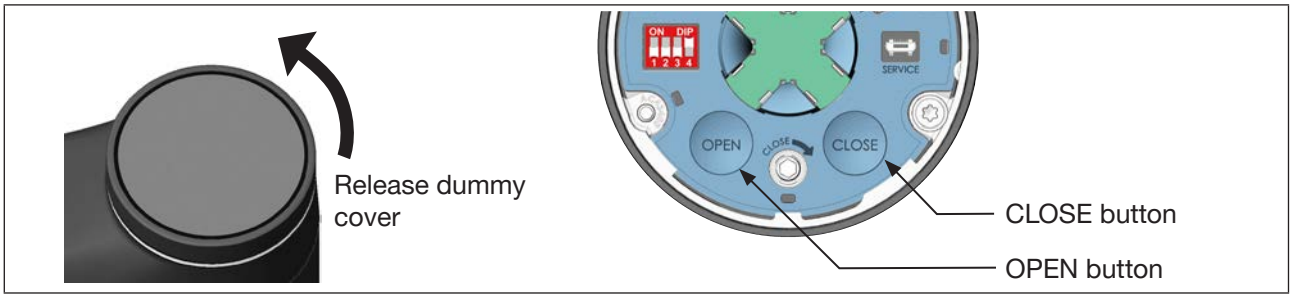

Figure 31: Adjustment of the position control using the buttons in the device

→ To release, rotate the dummy cover counter-clockwise and remove it.

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

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

Running the M.Q0.TUNE function:

⚠ Ensure that medium pressure is applied and that the MANUAL operating state has been set.

→ Establish operating conditions (medium pressure and temperature)

→ Using the CLOSE button, approach the sealing point.

→ Simultaneously hold down the OPEN button and CLOSE button for 5 seconds.

✔ The M.Q0.TUNE function is running.
The device now calculates the optimum force for sealing the valve.

When the M.Q0.TUNE is running, the LED illuminated ring is lit orange.
When the M.Q0.TUNE ends, the LED illuminated ring is reset to its previous status.

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11.4 Setting AUTOMATIC operating state

Factory settings: Devices are delivered with the MANUAL operating state preset.

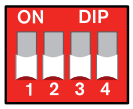
The operating state is switched with DIP switch 4 which is located under the dummy cover.

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

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

→ To release, rotate the dummy cover counter-clockwise and remove it.

→ Set operating state AUTOMATIC on DIP switch 4.

	Operating state	
	AUTOMATIC: DIP 4 ➔ downwards	MANUAL: DIP 4 ➔ upwards (ON)

→ Close the dummy cover.

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12 OPERATION

WARNING!

Danger due to improper operation.

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

- ▸ The operating personnel must know and have understood the contents of the operating instructions.
- ▸ Observe the safety instructions and intended use.
- ▸ Only adequately trained personnel may operate the equipment and the device.

There are different control elements available for operation of the device.

- **Standard version**
  The device is operated using 2 capacitive buttons and 4 DIP switches.
- **Additional operating option**
  Extended functions can be set on a PC or tablet. The setting is made by the büS service interface and by using the “Bürkert Communicator” software.
  To do this, the USB-büS-interface set, available as an accessory, is required.

12.1 Overview: Availability of the operating elements

Control element	Function
4 DIP switches	Activate safety position
	Select safety position
	Not used
	Switching MANUAL, AUTOMATIC operating state
OPEN button	Opening the valve
CLOSE button	Closing the valve
Mechanical manual control	Opening or closing valve mechanically
SIM card holder	Holder for insertion of the SIM card available as an accessory
büS Service interface	For connection of a CAN adapter or the USB-büS-interface set available as an accessory
"Bürkert Communicator" PC software	Software for configuring and setting the device on the PC or tablet

Table 22: Operating options

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12.2 Display elements

Representation of the display elements:

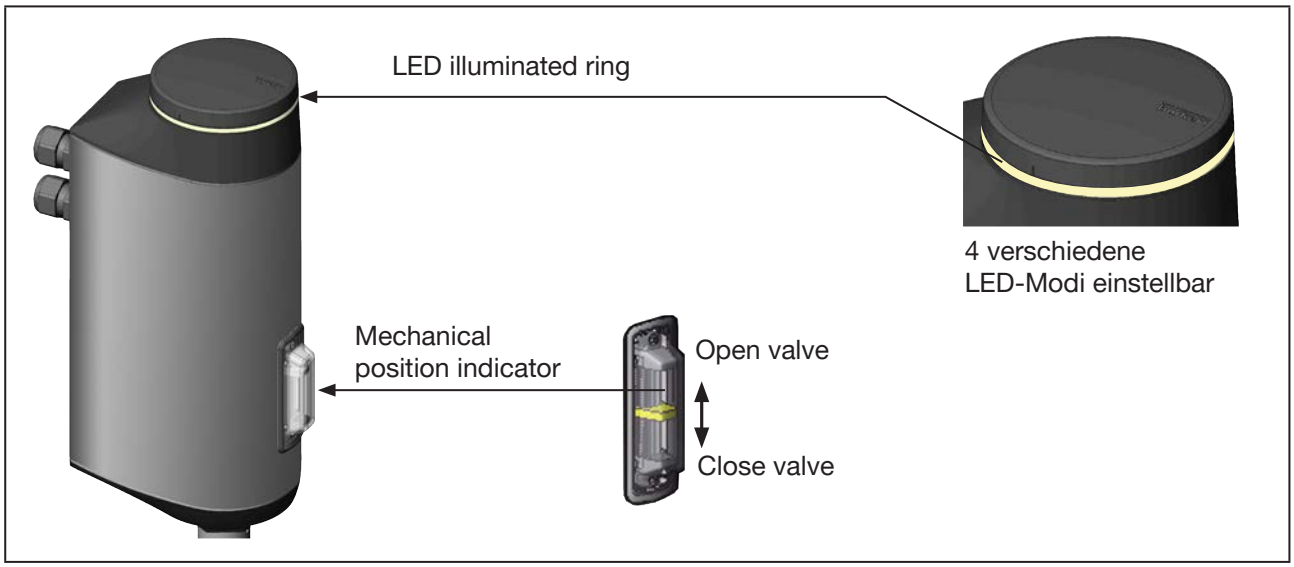

Figure 32: Display elements

12.2.1 LED illuminated ring

The transparent LED illuminated ring, which transmits the light of the LEDs outwards, is attached to the dummy cover.

The device status is indicated by a lit, flashing or rapidly flashing LED illuminated ring in one colour or in alternating colours.

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

- NAMUR mode*
- Valve mode*
- Valve mode + warnings* – mode set in the factory
- LED off

Setting LED mode:

The LED modes are set using the Bürkert Communicator PC software . For a description, see chapter “14.3 Setting LED mode”.

* A complete description of the device statuses, errors and warnings, which are displayed in LED mode, see 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 “Figure 32: Display elements”)

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12.3 Control elements

Representation of the control elements:

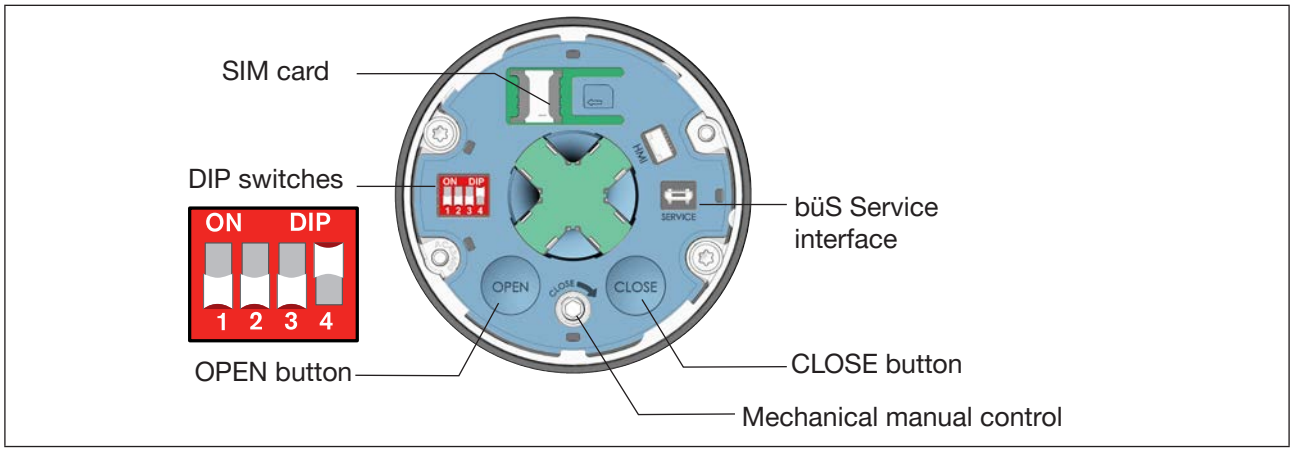

Figure 33: Control elements

12.3.1 DIP switches

Settings

Switch 1: Activate or deactivate safety position. See chapter "13.2 Setting safety position and effective direction".

Switch 2: Select safety position between NO and NC. See chapter"13.2 Setting safety position and effective direction".

Switch 3: Not used.

Switch 4: For switching between AUTOMATIC mode and MANUAL mode.
See chapter"13.1", page 71.

12.3.2 OPEN button and CLOSE button

Electrical manual control:	Open valve: Press OPEN button Close valve: Press CLOSE button ⚠ When closing the valve: Carefully close the valve at low force to prevent damaging the diaphragm. Do not press the CLOSE button again when the valve is closed.
M.Q0.TUNE:	For description see chapter "11.3 Adjusting the position control - running M.Q0.TUNE".
Running M.SERVICE	See chapter "9.5.4 Mounting actuator on the valve body and making the electrical connections"

12.3.3 Mechanical Manual Control

When the supply voltage is not applied, e.g. during installation or in the event of a power failure, the valve can be opened or closed with the mechanical manual control.

For description see chapter "15.2 Actuating valve mechanically".

12.4 büS service interface

The büS service interface can be used for a short-term service.

- Configuration of the device, e.g. the basic setting for starting up using the „Bürkert Communicator“ PC software. To do this, the USB-büS-interface set, available as an accessory, is required.
- Configuration of the büS network.
  The büS service interface is internally connected directly to the büS network.
- Parameterising the operating parameters
- Fault diagnostics
- Software update

Connect only the applicable CAN adapter to the büS service interface. This CAN adapter is a component of the USB-büS-interface set available as an accessory (see “Table 32: Accessories”, page 125).

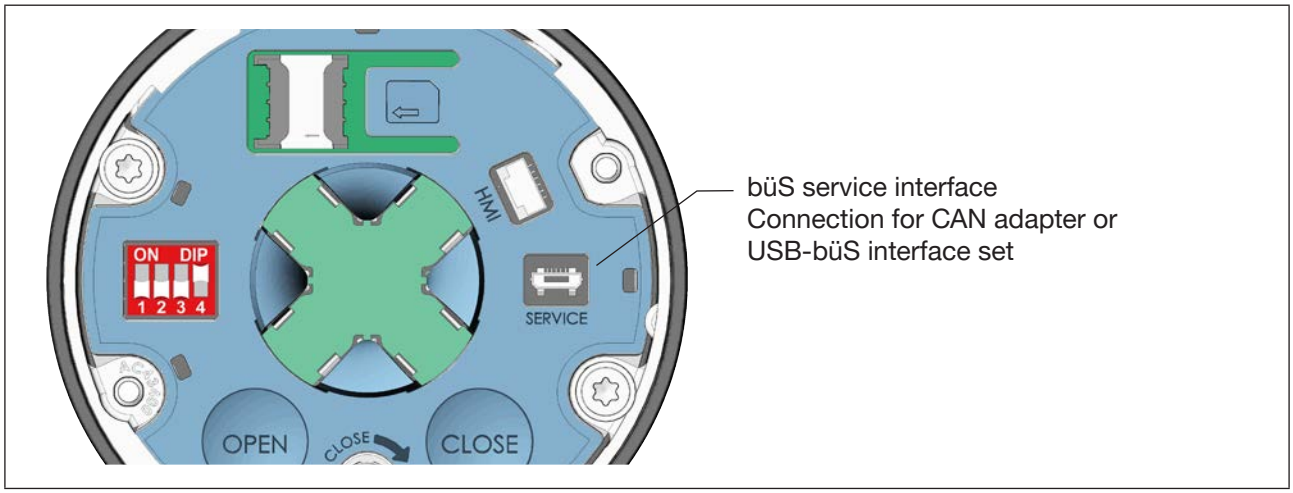

Figure 34: büS service interface

On devices with a fieldbus gateway, the büS service interface is inside the fieldbus gateway (see chapter “17.1.1 Access to the büS service interface”

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12.5 Accepting and saving SIM card data (option)

The optionally available SIM card can be used to save and transfer device-specific values and user settings to a different device.

The SIM card is detected when the device starts and is checked for available data. If applicable, this data is accepted or overwritten:

- The SIM card does not contain any data.
  The existing device-specific values and user settings are saved on the SIM card.
- The SIM card contains data which is compatible with the device.
  The SIM card data is accepted by the device. The existing device-specific values and user settings are overwritten.
- The SIM card contains data which is 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 any commercially available SIM cards for the device.
The inserted SIM card is a special industrial version which is particularly durable and temperature-resistant.
Purchase the SIM card for the electromotive valves via your Bürkert sales department only. See chapter "23 Accessories, spare 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 SIM card in the area with the SIM card symbol. The position must correspond with the symbol.

→ Applying gentle pressure, push the SIM card all the way to the left into the holder.

→ Restart the device. The new data are transferred.

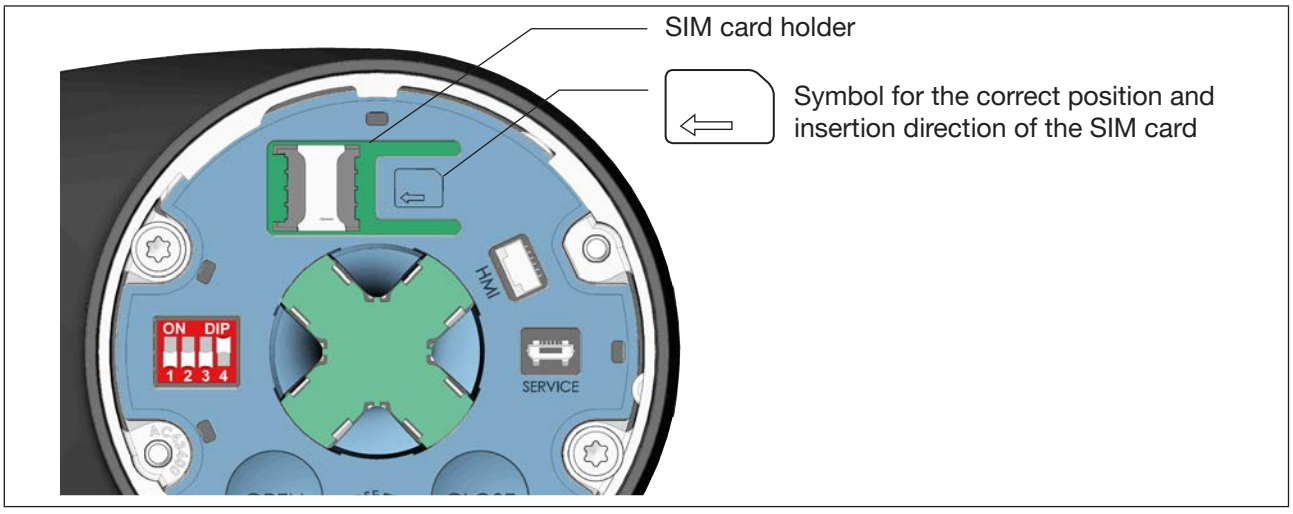

Figure 35: Inserting the SIM card

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12.6 User interface of the Bürkert Communicator PC software

View of configuration area:

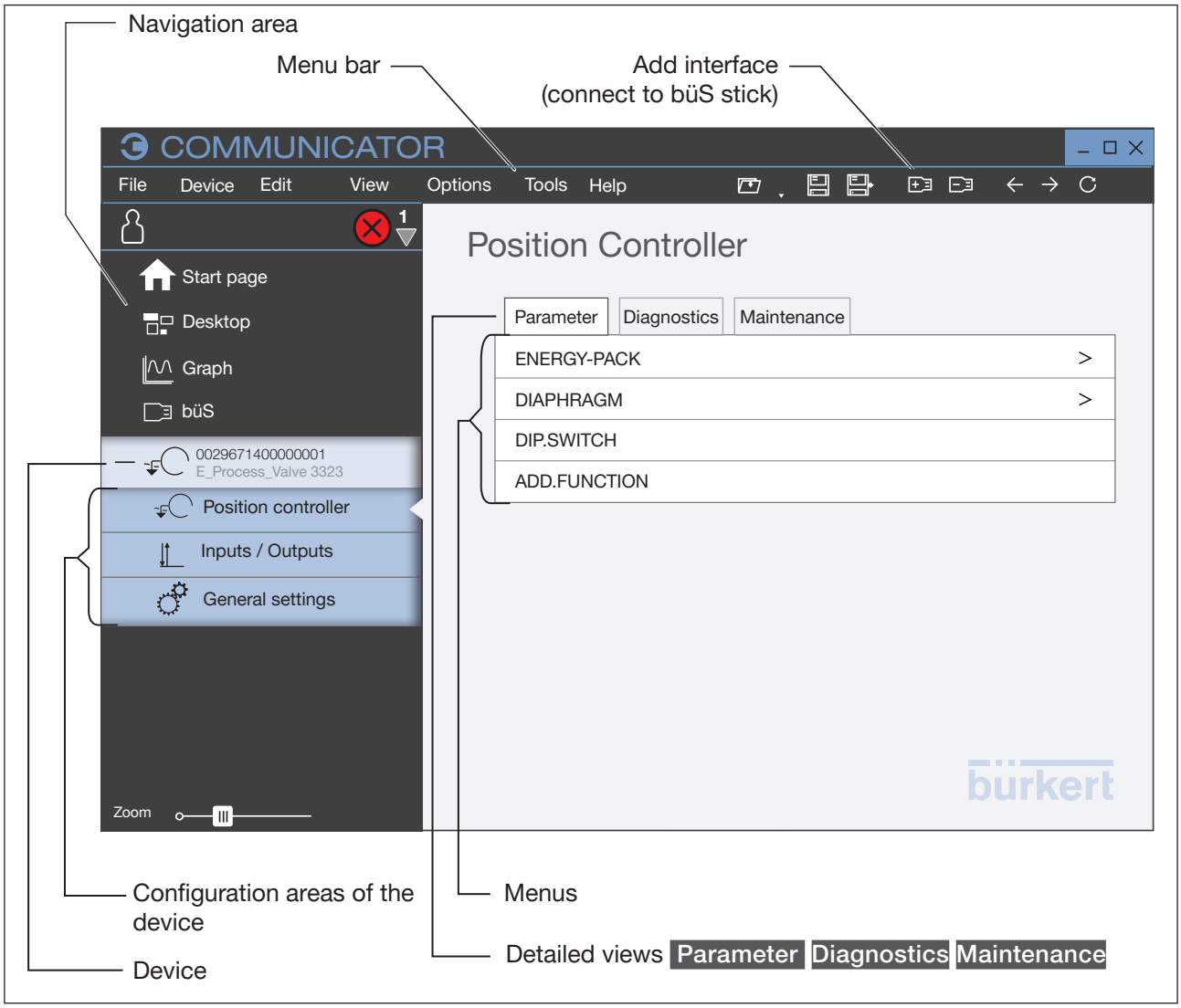

Figure 36: Bürkert Communicator, view of configuration area

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View of application area:

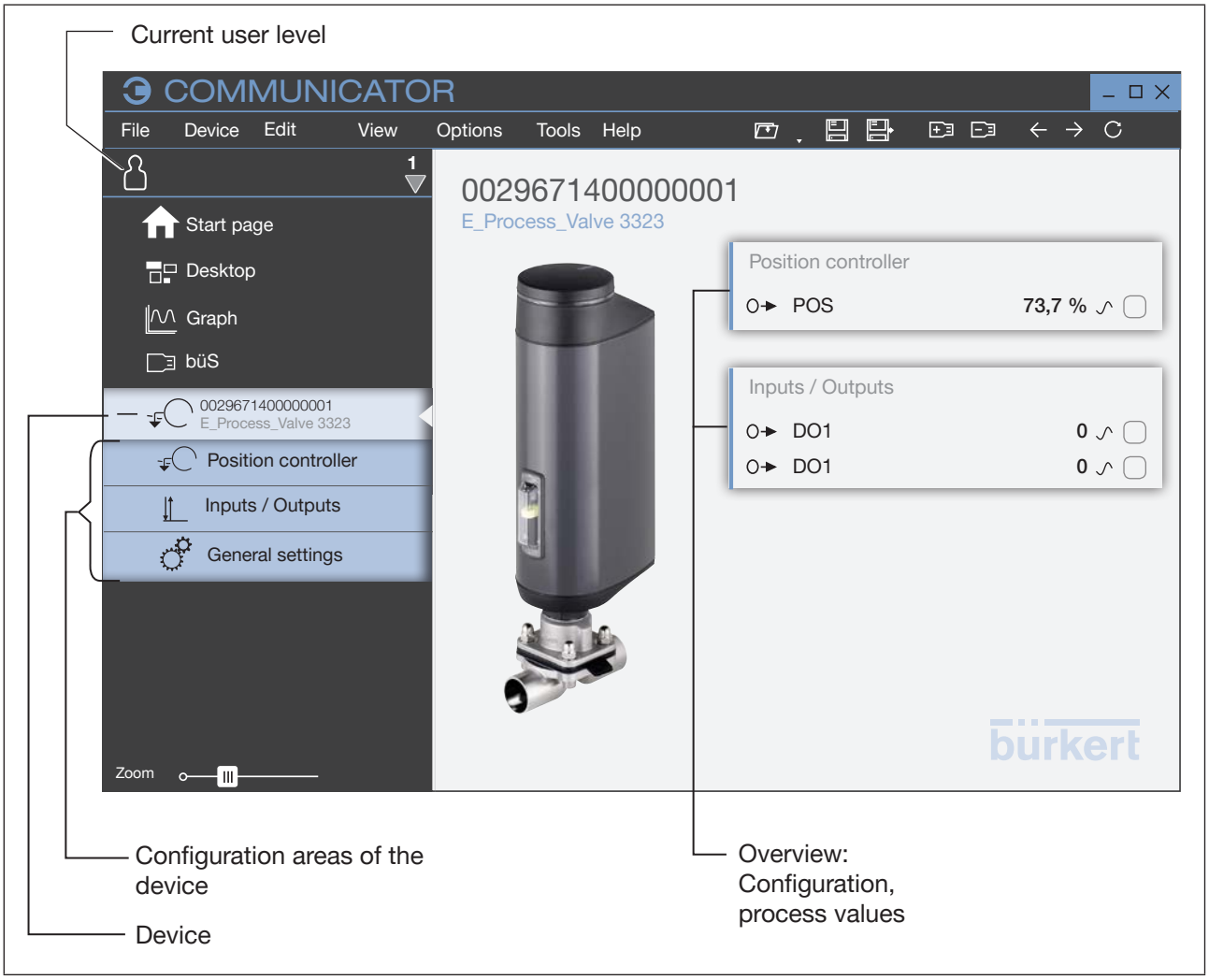

Figure 37: Bürkert Communicator, view of application area

12.7 Establishing a connection between the device and Bürkert Communicator

→ Install the Bürkert Communicator software on the PC.

→ Use the büS stick to establish a connection between the device and the PC.

→ Open the Bürkert Communicator.

→ In the menu bar, click the symbol for Add interface.

→ Select büS stick or büS over network.

✓ You have established a connection between the device or network and the Bürkert Communicator. The device or devices in the network are displayed in the navigation area.

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13 BASIC FUNCTIONS

The basic functions are set via the DIP switch position.

DIP switches	Basic function
1	Activate or deactivate safety position
2	Set safety position and effective direction (NC and NO)
3	Not used
4	For switching between AUTOMATIC mode and MANUAL mode.

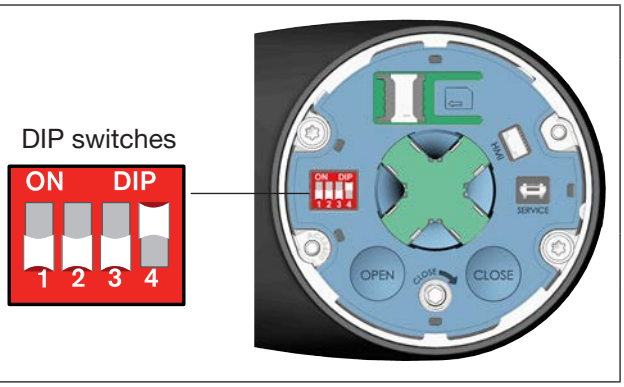


Table 23: Overview of basic functions

13.1 Switching operating state, AUTOMATIC – MANUAL

Factory setting: Devices are delivered with the MANUAL operating state preset.

The operating state is switched with DIP switch 4 which is located under the dummy cover.

→ To release, rotate the dummy cover counter-clockwise and remove it.

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

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

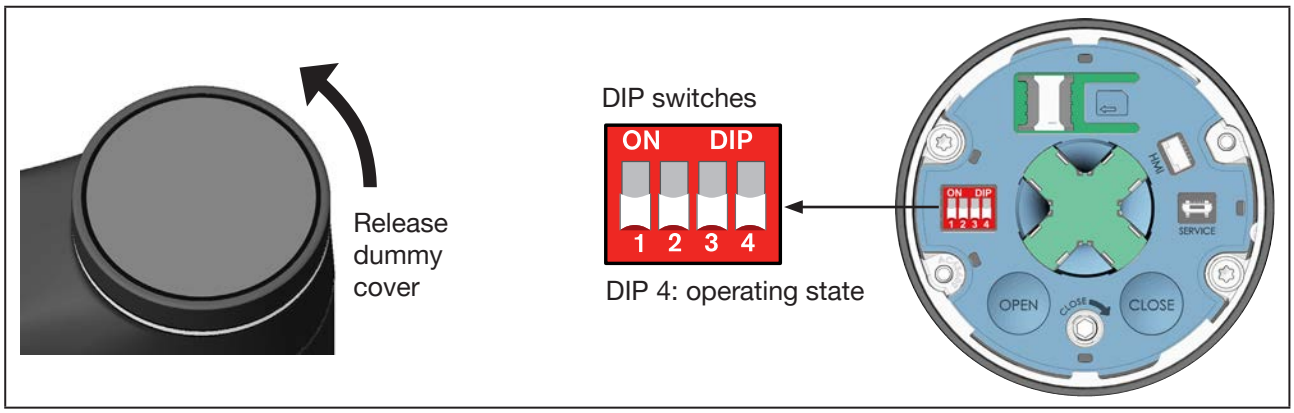
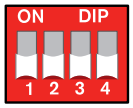


Figure 38: Setting operating state

→ Set operating state on DIP switch 4.

	Operating state	
	AUTOMATIC: DIP 4 ➔ downwards	MANUAL: DIP 4 ➔ upwards (ON)

→ Close the dummy cover.

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13.2 Setting safety position and effective direction

The effective direction and the 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 activated / deactivated))	**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)

Table 24: Setting effective direction and safety position

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14 EXTENDED FUNCTIONS

14.1 X.TIME – Limiting the control speed

Use this auxiliary function to specify the opening and closing times for the entire stroke and limit the control speeds.

When the M.Q0.TUNE function is running, the minimum opening and closing time for the entire stroke is automatically entered for Open and Close. Therefore, movement can be at maximum speed.

Factory setting: values determined at the factory by the M.Q0.TUNE function

If the control speed is limited, values can be input for Open and Close which are between the minimum values determined by the M.Q0.TUNE and 60 s.

Effect of limiting the opening speed when there is a jump in the set-point value

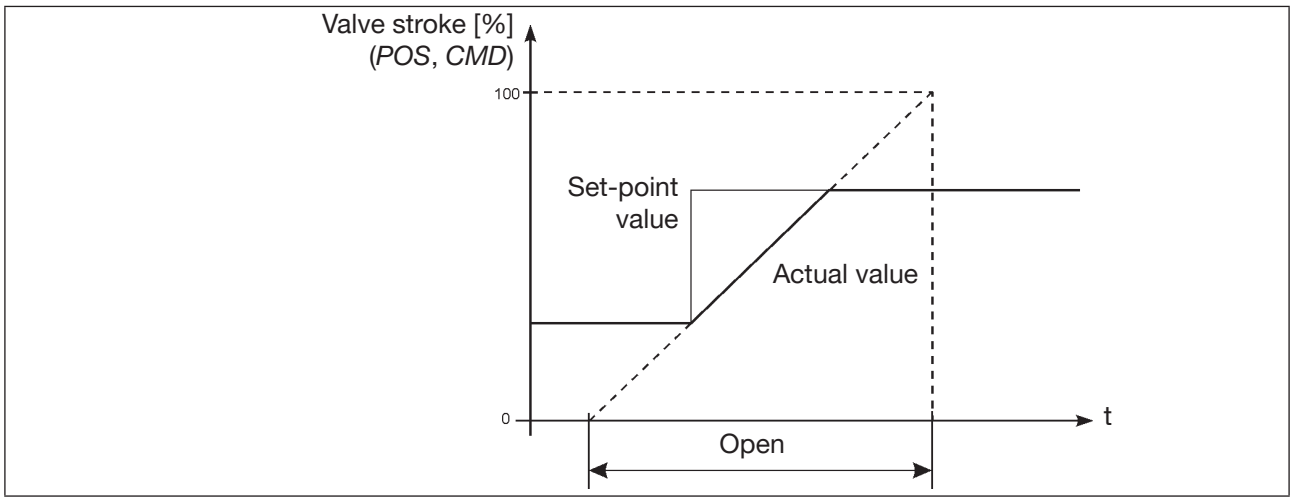

Figure 39: X.TIME graph

Setting with the PC software Bürkert Communicator on the PC:

The PC software Bürkert Communicator can be downloaded free of charge from the Bürkert homepage.
To do this, the USB-büS-interface set, available as an accessory, is required.
Communication is established by the büS service interface of the device.

The setting is made in the detailed view parameters for position controller.

Changing to the detailed view:

→ Select **Position controller** in the navigation area.

✓ You are in the detailed view parameter.

Activating the limit actuating time:

→ Select **ADD.FUNCTION**.

→ Select **X.TIME**.

✓ The limit actuating time is activated and the menu **X.TIME** for configuration is now available.

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Configuring the limit actuating time:

→ In the detailed view parameter select X.TIME.

→ Select Opening time.

→ Input and confirm lower limit value.

→ Select Closing time.

→ Input and confirm upper limit value.

✓ You have activated and configured the limit actuating time.

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14.2 X.LIMIT – Limiting the mechanical stroke range

This auxiliary function limits the (physical) stroke to specified percentage values (minimum and maximum). In doing so, the stroke range of the limited stroke is set equal to 100 %.

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

Factory setting: *Min = 0 %, Max = 100 %*

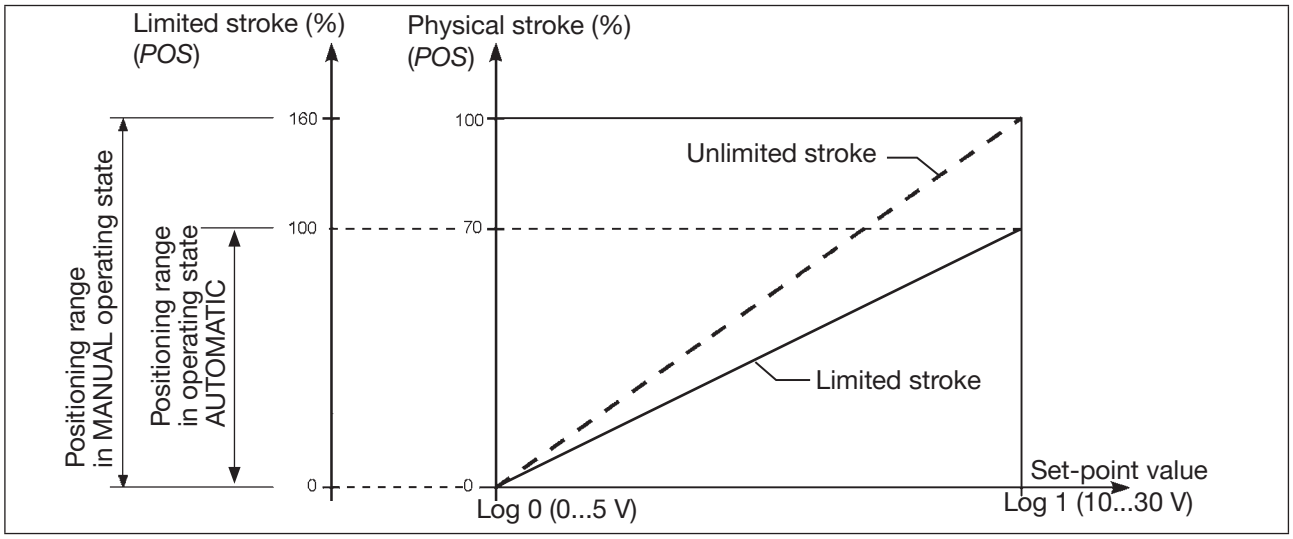

Figure 40: X.LIMIT graph

ATTENTION!

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

Setting with the PC software Bürkert Communicator on the PC:

The PC software Bürkert Communicator can be downloaded free of charge from the Bürkert homepage.

To do this, the USB-büS-interface set, available as an accessory, is required. Communication is established by the büS service interface of the device.

Parameter

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

Switch to the detailed view as follows:

→ Select Position controller.

✓ You are in the detailed view Parameter.

Activating the mechanical stroke limit:

→ Select ADD.FUNCTION.

→ Select X.LIMIT.

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

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Configuring the mechanical stroke limit:

→ In the detailed view parameter select X.LIMIT.

→ Select Maximum.

→ Input and confirm upper limit value.

✓ You have activated and configured the mechanical stroke limit.

14.3 Setting LED mode

Setting with the PC software Bürkert Communicator on the PC:

The PC software Bürkert Communicator can be downloaded free of charge from the Bürkert homepage.

To do this, the USB-büS-interface set, available as an accessory, is required. Communication is established by the büS service interface of the device.

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

Switch to the detailed view as follows:

→ Select General settings. .

✓ You are in the detailed view Parameter.

Setting the LED mode:

→ Select Status LED.

→ Select Mode.

The following LED modes can be selected:
NAMUR mode

Valve mode

Valve mode + warnings

LED off

✓ You have set LED mode.

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14.4 Setting the colours for indicating the valve position

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

Setting with the PC software Bürkert Communicator on the PC:

The PC software Bürkert Communicator can be downloaded free of charge from the Bürkert homepage.

To do this, the USB-büS-interface set, available as an accessory, is required.
Communication is established by the büS service interface of the device.

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

Switch to the detailed view as follows:

→ Select General settings.

✓ You are in the detailed view Parameter.

How to set the colour for the valve position.

→ Select Status LED.

→ Select Valve mode or Valve mode + warnings.

→ In the submenus Valve mode and Valve mode + warnings, 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.

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15 MANUAL ACTUATION OF THE VALVE

The valve can be manually actuated in 2 ways: electrically or mechanically. Electrical manual control should usually be used to open and close the valve manually.

Mechanical manual control is used only to open and close the valve in the event of a power failure. Mechanical manual control may be used in a de-energised state only.

15.1 Actuating valve electrically

ATTENTION!

Damage to the diaphragm by electrical manual control.

▸ Do not press the CLOSE button when the valve is closed, otherwise the diaphragm may be damaged.

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

The 2 buttons for opening and closing the valve are located under the dummy cover.

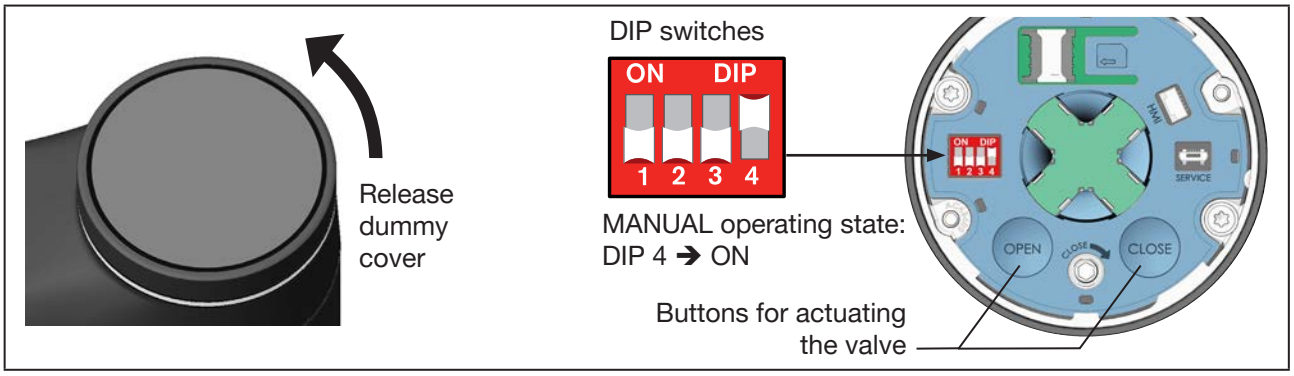

Figure 41: Setting MANUAL operating state and actuating the valve

Remove dummy cover:

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

→ To release, rotate the dummy cover counter-clockwise and remove.

Changing to the operating state MANUAL:

→ Set DIP switch 4 to ON.
The device is the MANUAL operating state.

Change valve position:

→ To open press the OPEN button.

→ To close press the CLOSE button.
NOTE!
Do not press the CLOSE button when the valve is closed, otherwise the diaphragm may be damaged.

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Changing to the operating state AUTOMATIC:

→ Reset DIP switch 4 downwards.
The device is back in the AUTOMATIC operating state.

Closing dummy cover:

→ Mount the dummy cover and turn it clockwise until the 2 marks (one vertical line on the dummy cover and on the fieldbus gateway) are vertically aligned.

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15.2 Actuating valve mechanically

When the supply voltage is not applied, e.g. during installation or in the event of a power failure, the valve can be opened or closed with the mechanical manual control.

ATTENTION!

Damage to the device or diaphragm by mechanical manual control.

- ▸ Use mechanical manual control in a de-energized state only.
- ▸ Carefully close the valve at low force to prevent damaging the diaphragm.

15.2.1 Required work steps

Devices without fieldbus gateway:

1. Switch off the supply voltage. Wait until LED illuminated ring goes out.
2. Removing dummy cover, see chapter “15.2.3”, page 81.
3. Actuating valve mechanically, see chapter “15.2.5”, page 82 .
4. Closing the dummy cover, see chapter “15.2.7”, page 83.
5. Apply supply voltage.

Devices with fieldbus gateway:

1. Switch off the supply voltage. Wait until LED illuminated ring goes out.
2. Removing dummy cover, see chapter “15.2.3”, page 81.
3. Removing the fieldbus gateway from the actuator, see chapter “15.2.4”, page 81.
4. Actuating valve mechanically, see chapter “15.2.5”, page 82 .
5. Mounting the fieldbus gateway on the actuator, see chapter “15.2.6”, page 83.
6. Closing the dummy cover, see chapter “15.2.7”, page 83.
7. Apply supply voltage.

15.2.2 Required tool

- Allen key, width across flats 3 mm

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15.2.3 Removing dummy cover

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

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

Figure 42: Removing dummy cover or display module

→ To release the dummy cover, rotate counter-clockwise and remove.

15.2.4 Removing the fieldbus gateway from the actuator

Preconditions: Supply voltage switched off, dummy cover removed.

NOTE!

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

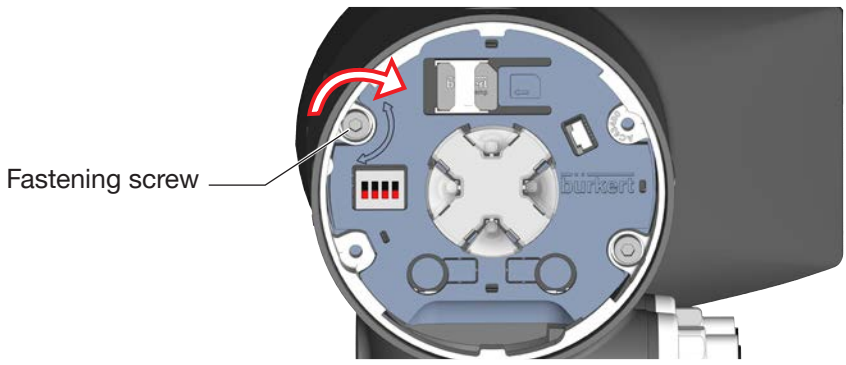

Figure 43: Remove fieldbus gateway

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

NOTE!

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 anticlockwise and carefully remove it.

→ Disconnect connection cable from the fieldbus gateway.

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15.2.5 Actuating valve mechanically

NOTE!

The mechanical manual override may be used only when it is deenergised, otherwise the device may be damaged.

→ To mechanically actuate the valve, use an Allen key with width across flats 3 mm.

NOTE!

Maximum torque 2 Nm.
If the torque is exceeded on reaching the valve end position, the mechanical manual control will be damaged.

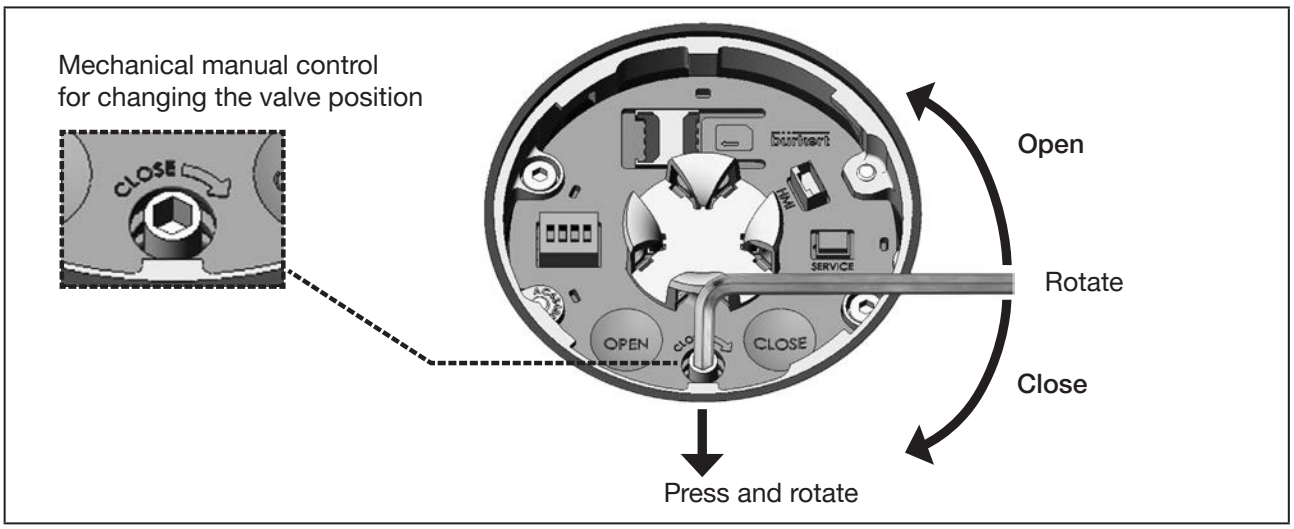

Figure 44: Mechanical manual control

→ Applying a gentle pressure, couple the mechanical manual control and simultaneously turn the Allen key counter-clockwise (see "Figure 44").
⚠ When closing the valve:
Carefully close the valve at low force to prevent damaging the diaphragm.

→ Move valve to the required position.
⚠ Maximum torque 2 Nm (1.5 lbf ft).
- To open, turn it anticlockwise.
- To close, turn it clockwise

→ After reaching the required valve position, remove the Allen key.
The mechanical manual control automatically decouples.

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15.2.6 Mounting the fieldbus gateway on the actuator

Preconditions: Supply voltage switched off.

NOTE!

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

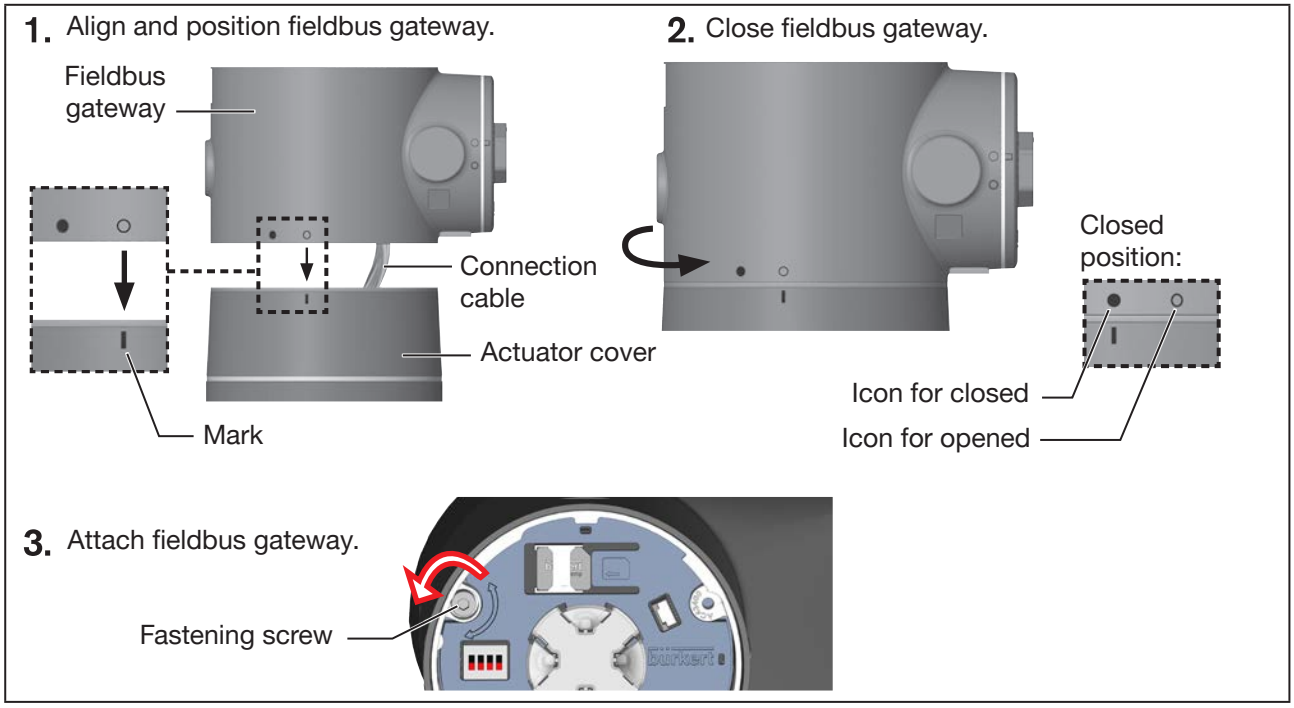

Figure 45: Mount fieldbus gateway.

→ 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 tightening torque 1.1 Nm!

15.2.7 Closing the dummy cover

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

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

→ Mount the dummy cover and turn it clockwise until the 2 marks (one vertical line on the dummy cover and on the fieldbus gateway) are vertically aligned.

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16 OPERATING STRUCTURE / FACTORY SETTING

The factory presets are highlighted in blue to the right of the menu in the operating structure.

Examples: ◉ / ☒ Menu options activated or selected at the factory

○ / ☐ Menu options not activated or selected at the factory

2 %, *10 sec*, ... Values set at the factory

16.1 Operating structure of the configuration area

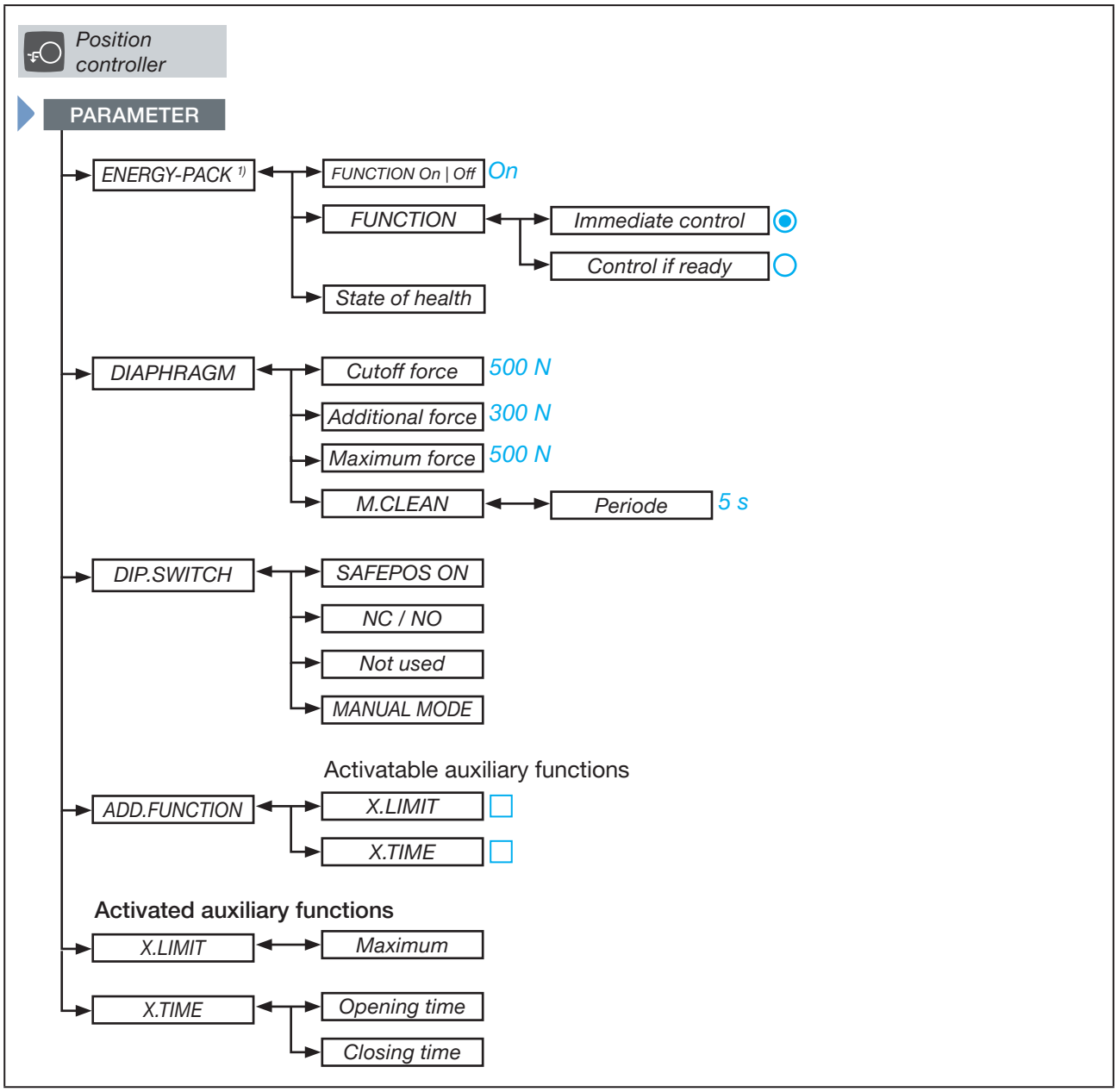

Figure 46: Operating structure - 1-a, Configuration area position controller

1) Only available for devices with SAFEPOS energy pack (optional).

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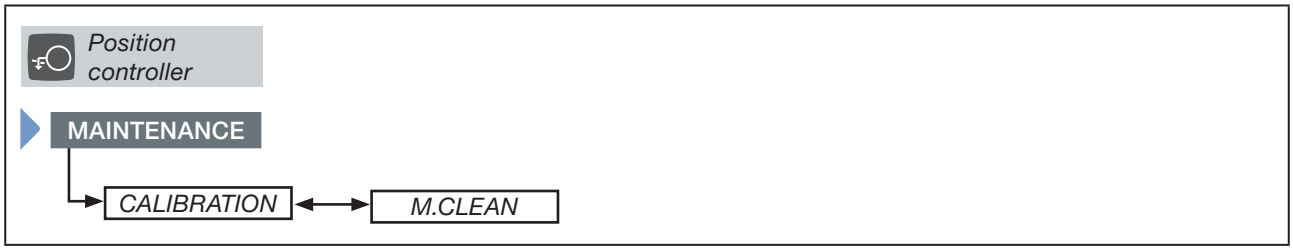

Figure 47: Operating structure - 1-b, Maintenance position controller

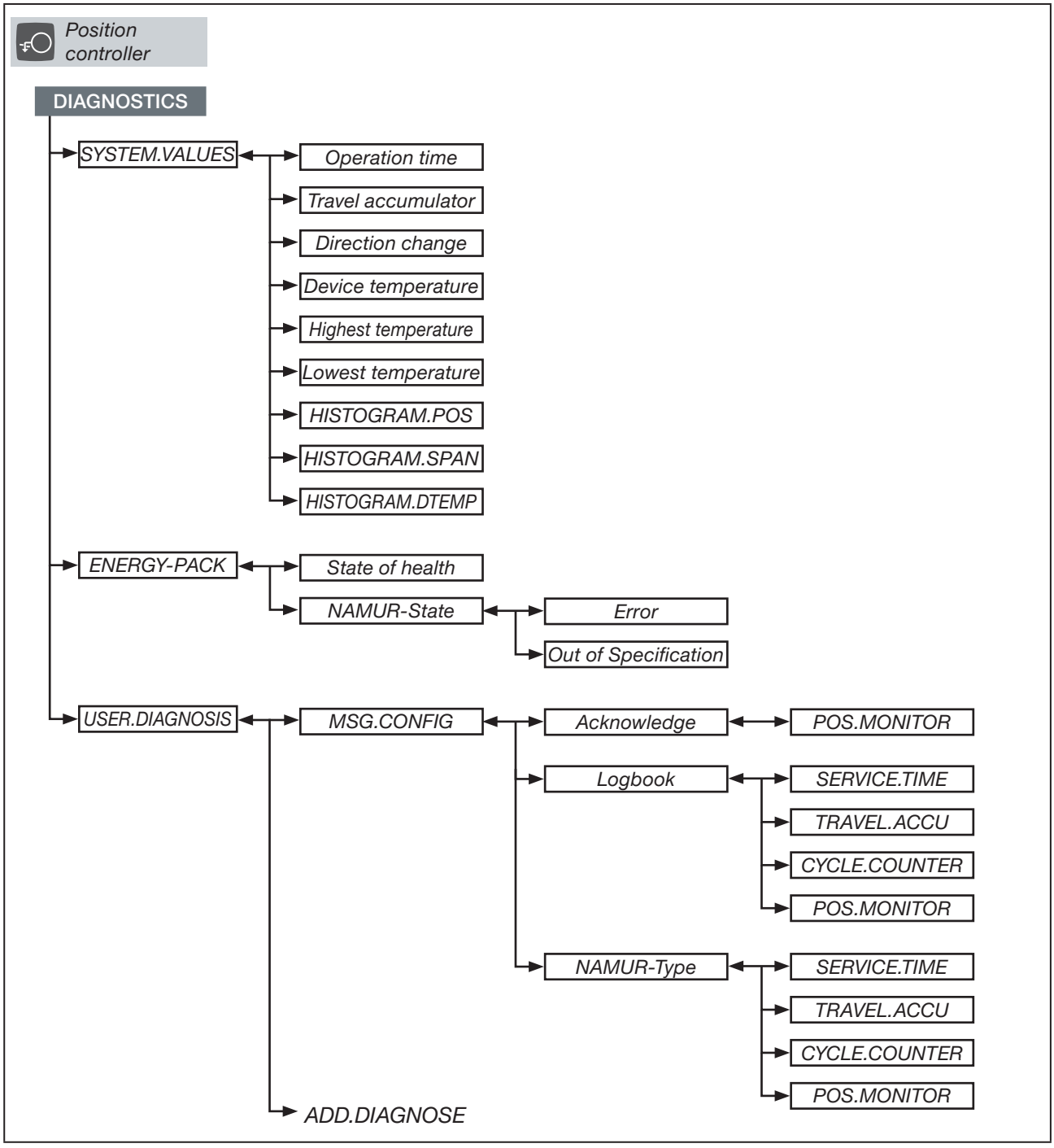

Figure 48: Operating structure - 1-c, Diagnostics position controller

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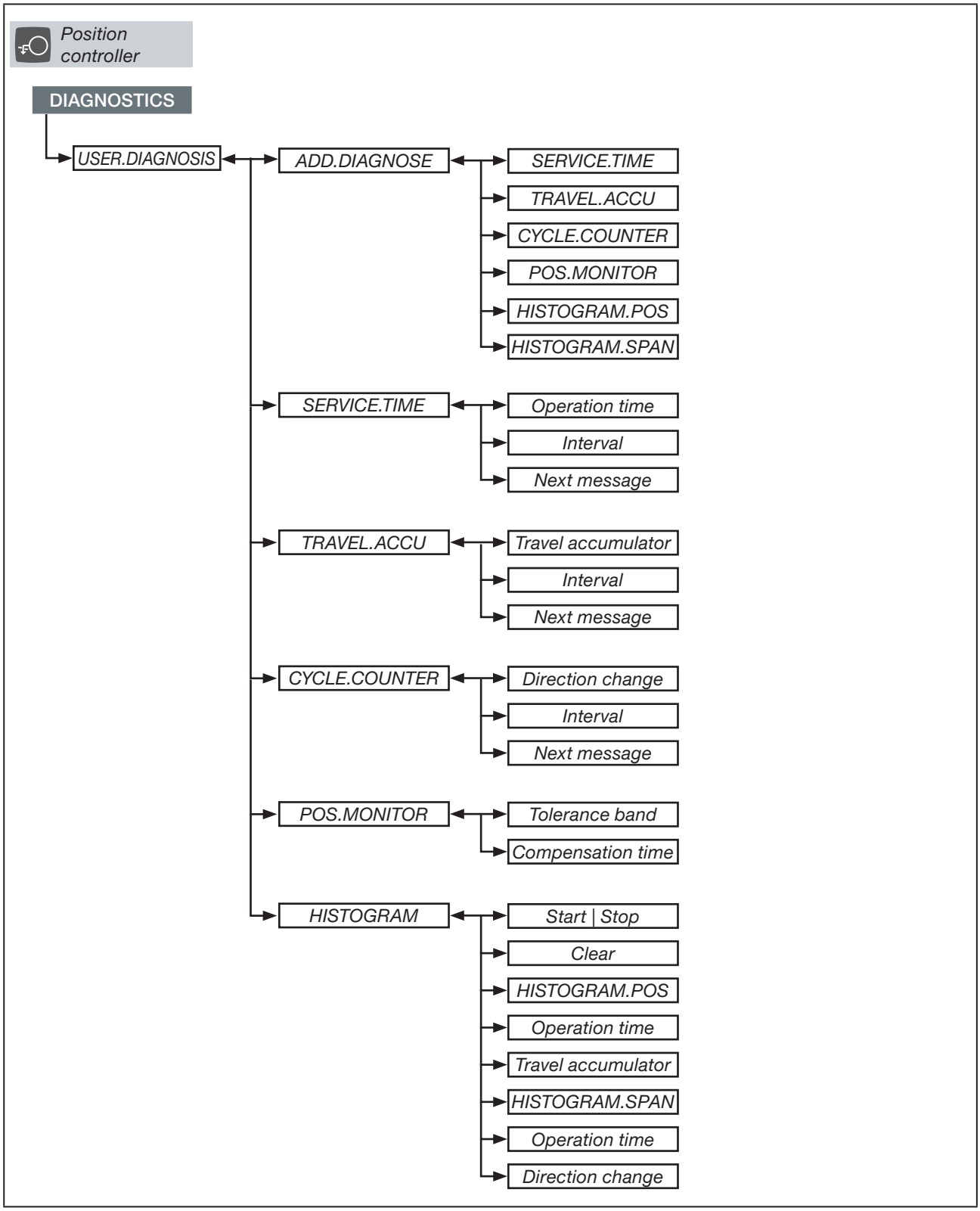

Figure 49: Operating structure - 1-d, Diagnostics position controller

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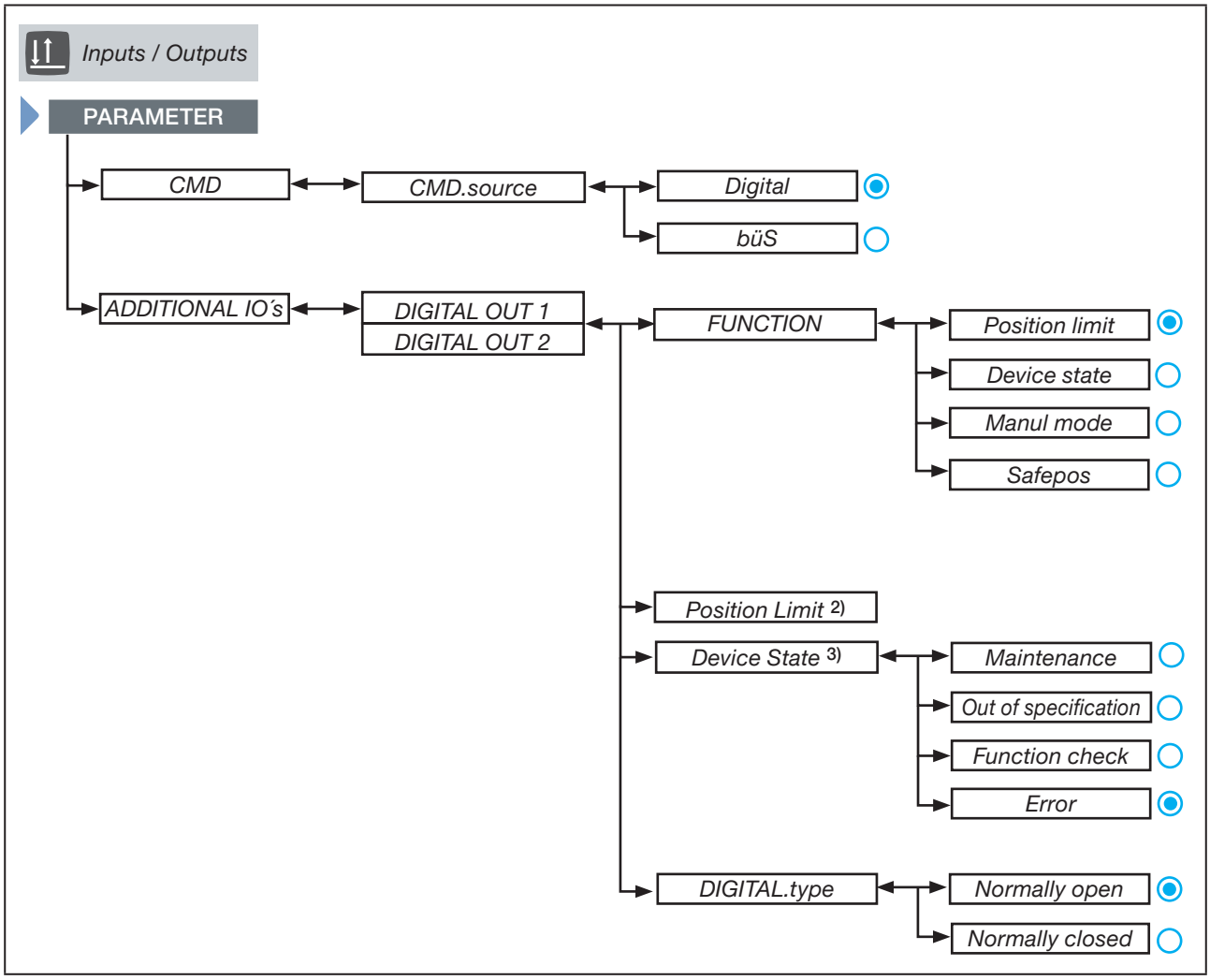

Figure 50: Operating structure - 2-a, Configuration area inputs / outputs

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

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

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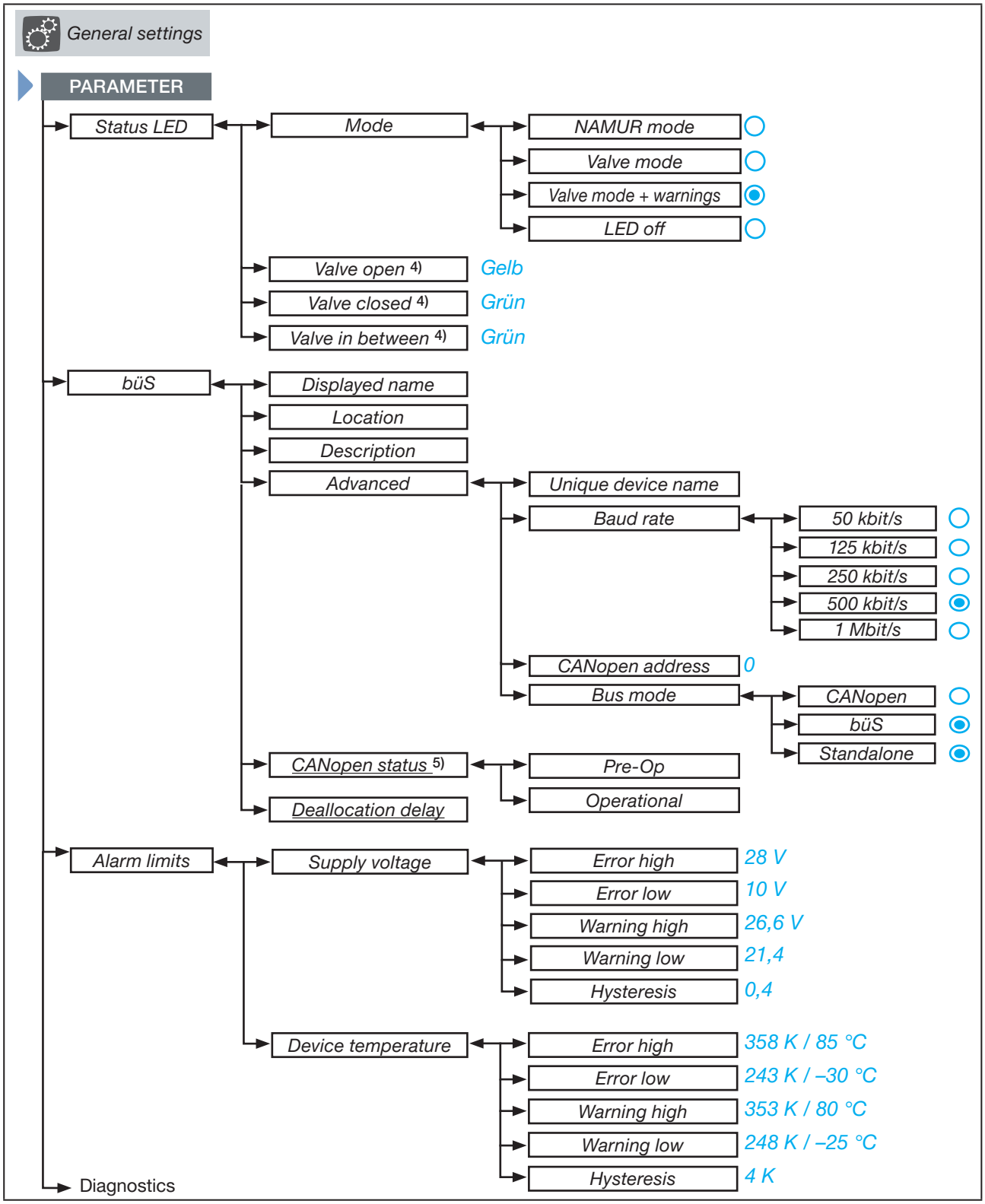

Figure 51: Operating structure - 3-a, Configuration area general settings

4) Only available if in the menu **Mode** → **Valve mode** or **Valve mode w/ Warnings** has been selected.

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

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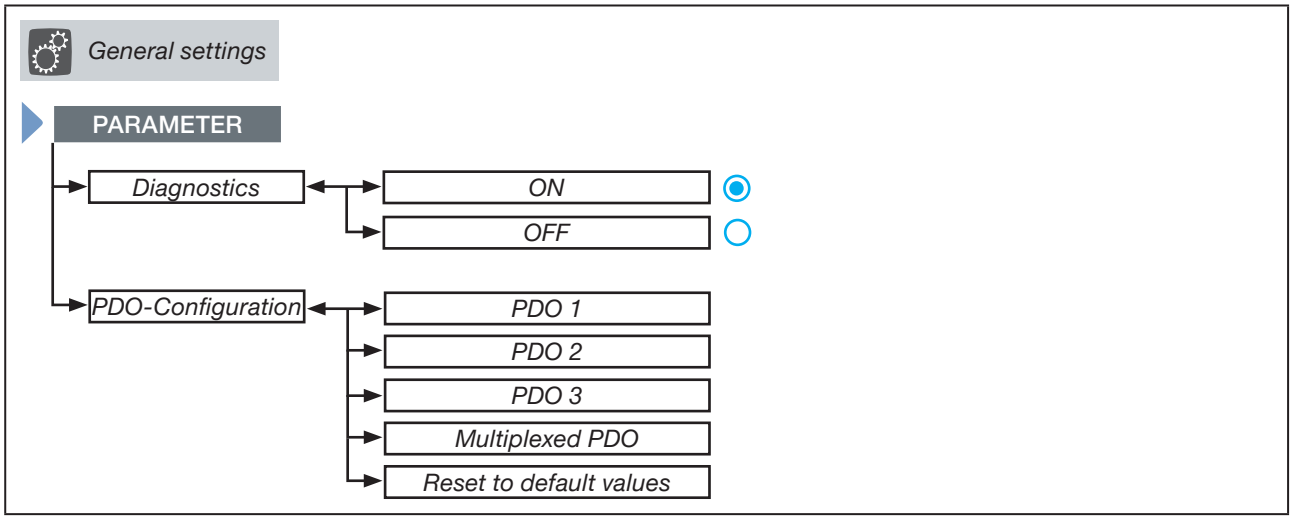

Figure 52: Operating structure - 3-b, Configuration area general settings

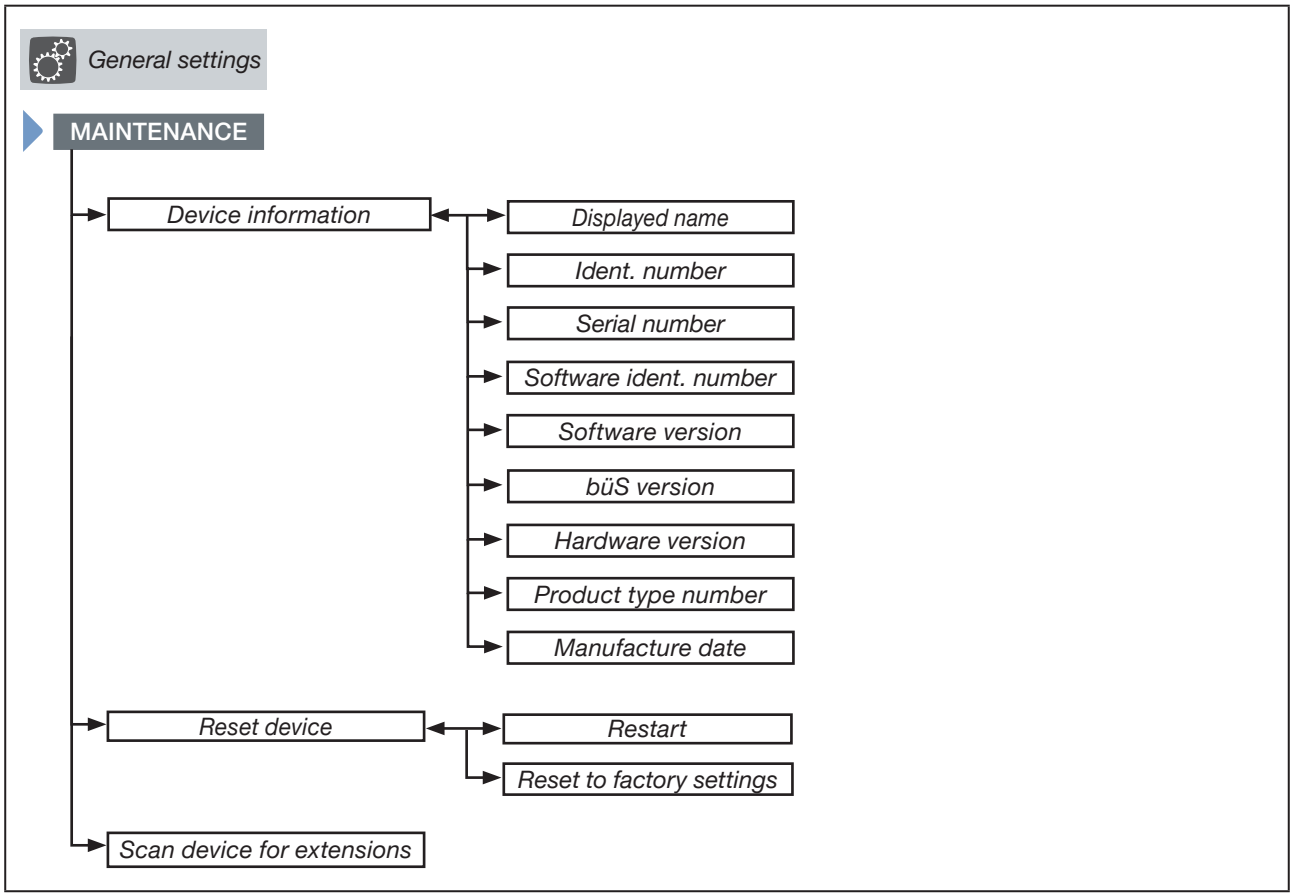

Figure 53: Operating structure - 3-c, Maintenance general settings

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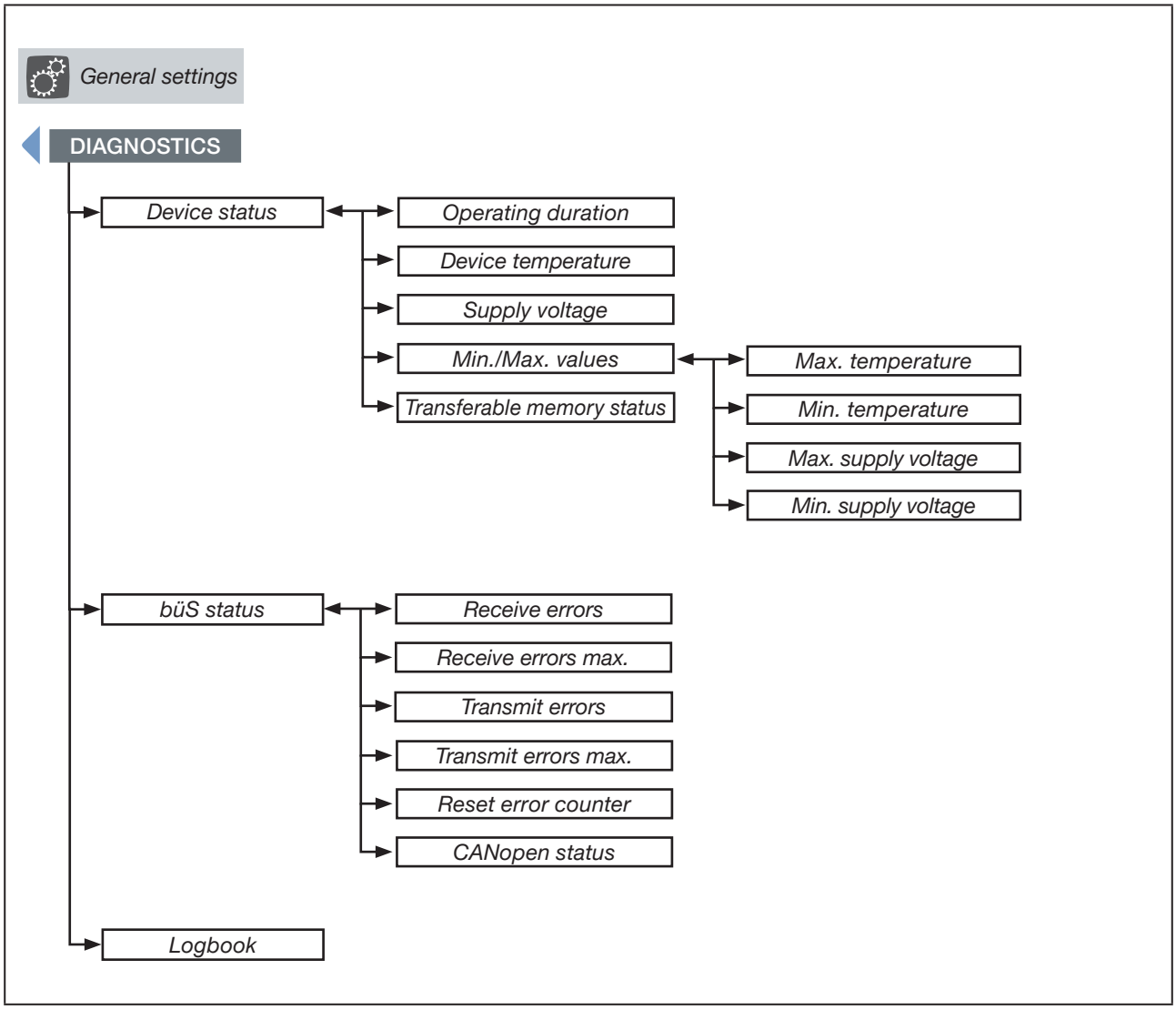

Figure 54: Operating structure - 3-d, Diagnostics general settings

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17 INDUSTRIAL ETHERNET

For integration into an Ethernet network, the electromotive diaphragm valve with integrated fieldbus gateway is available as an option.

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

17.1 Description fieldbus gateway

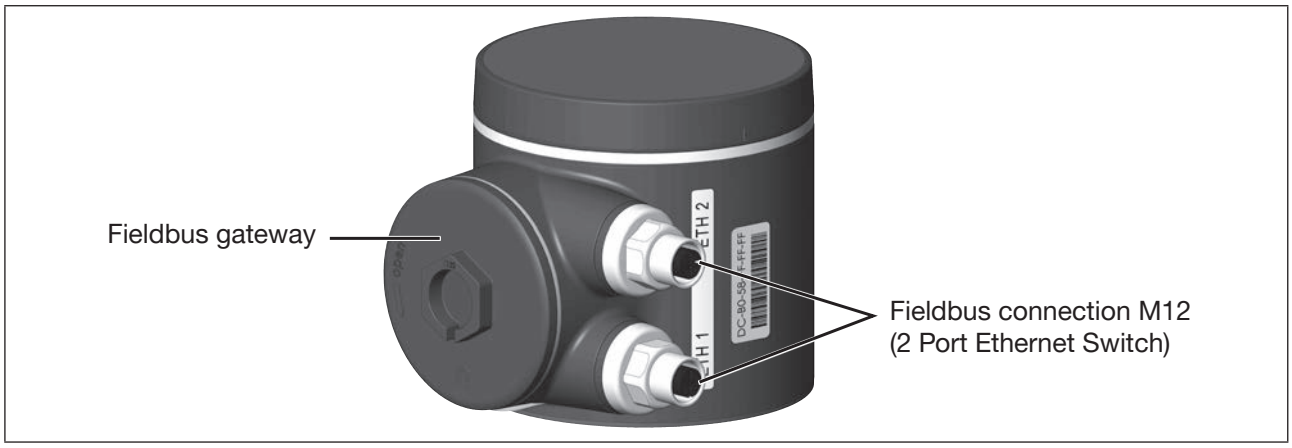

Figure 55: Fieldbus gateway

17.1.1 Access to the büS service interface

The büS service interface is located inside the fieldbus gateway.

To gain access, open the cover by turning it anticlockwise.

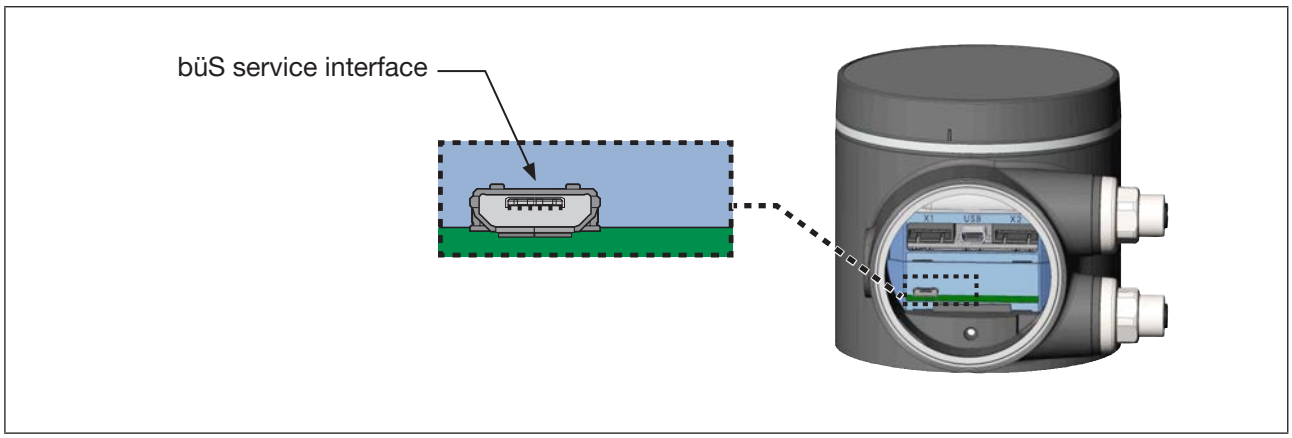

Figure 56: büS service interface for Fieldbus Gateway version

Electrical connection of the fieldbus gateway:
see chapter “10.3 Electrical connection fieldbus gateway”, page 53.

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17.1.2 LEDs for status display of the network connection

The LEDs for status display of the network connection are inside the fieldbus gateway.

To gain access, open the cover by turning it anticlockwise.

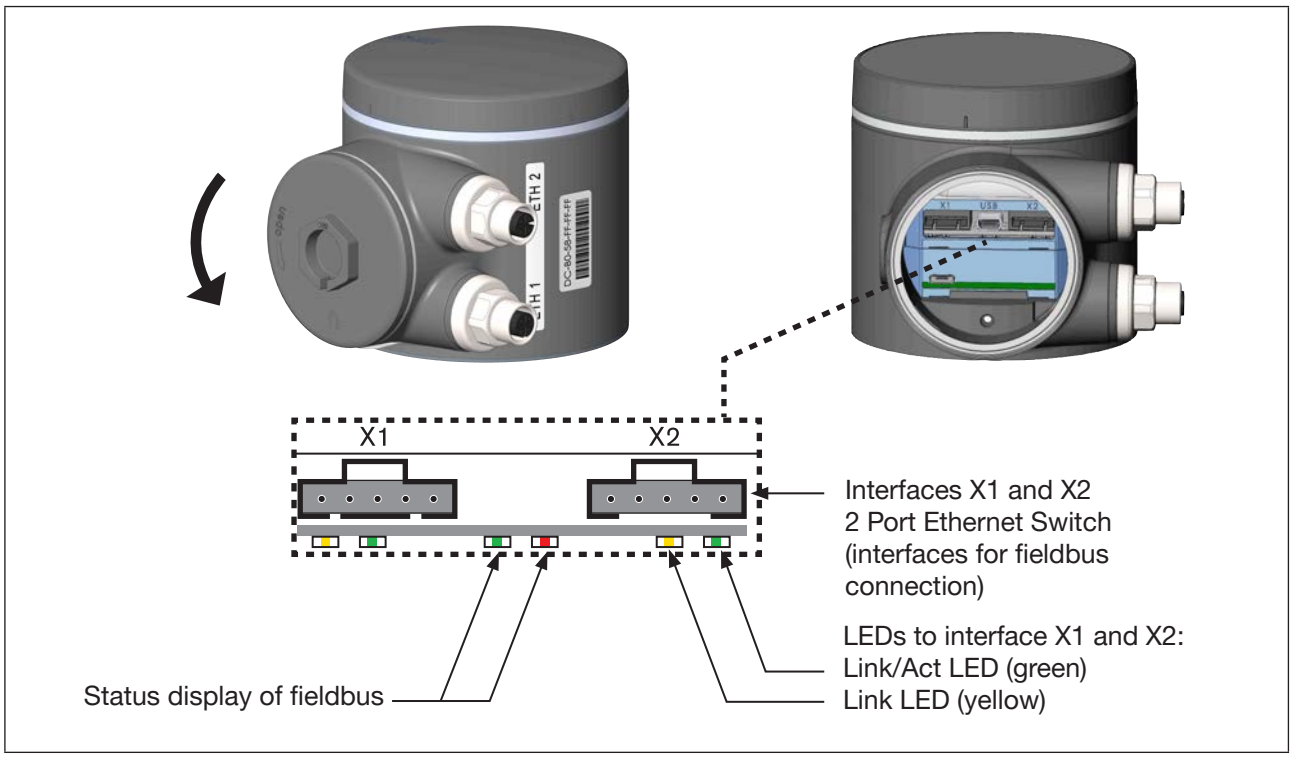

Figure 57: LEDs for status display of the network connection

LED status		Description / cause of error	Procedure
Link/Act LED (green)	Active	Rapid flashing: Connection to the higher-level protocol layer EtherNet/IP has been established. Data is being transmitted. Slow flashing: There is no connection to the protocol layer. This is usually the case for approx. 20 seconds following a restart.	
	Not active	No connection to the network available.	Check cables.
Link LED (yellow)	Active	Connection to the network available.	-
	Not active	No connection to the network available.	Check cables.

Table 25: LED status displays of the interfaces X1 and X2 (fieldbus connection)

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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.
Data transport layer	Ethernet II, IEEE 802.3

17.2.2 EtherNet/IP specifications

Predefined 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 transmission	Half Duplex, full Duplex, autonegotiation
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 services	Identity Object Reset Service of Type 0 and 1
Data transport layer	Ethernet II, IEEE 802.3

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

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17.3 Designing 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:
www.burkert.com / Type 3323 / Downloads „Software“ / Device Description Files

For instructions on installation of the start-up files, please refer to the documentation of the design software being used.

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

The Ethernet parameters must be set for Modbus TCP.

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. To do this, you need the USB-büS-Interface, which is available as an accessory.

Display operation: Key functions

select, activate	confirm	back

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

Switch to the detailed view as follows:

→ When setting with “Bürkert Communicator” in the navigation area, select Industrial communication.

→ When setting on the display switch from home screen to CONFIGURATION and select Industrial communication.

You are in the detailed view Parameter.

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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 required fieldbus protocol.

Settings:

→ Select IP settings and create settings.

- DNS compatible name can be set for PROFINET only.
- Static IP address factory default setting: 192.168.0.100
- Network mask factory default setting: 255.255.255.0
- Default gateway factory default setting: 192.168.0.1.

Setting for EtherNet/IP fieldbus protocol:

→ Select IP settings.

→ Select IP-Mode and set the required operation mode. Factory default setting: Static IP address.

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

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17.4 Web server

The configuration of the EtherNet device required for integration in the network can be implemented via a web server.

17.4.1 Connection to the web server

→ Setting IP address in the network card of the PC.

IP address: **192.168.0.xxx**

For xxx enter any numerical value except 100
(EtherNet device is delivered with 100 occupied by IP address).

→ Using a network cable, connect the PC to the EtherNet device.

17.4.2 Access to the web server

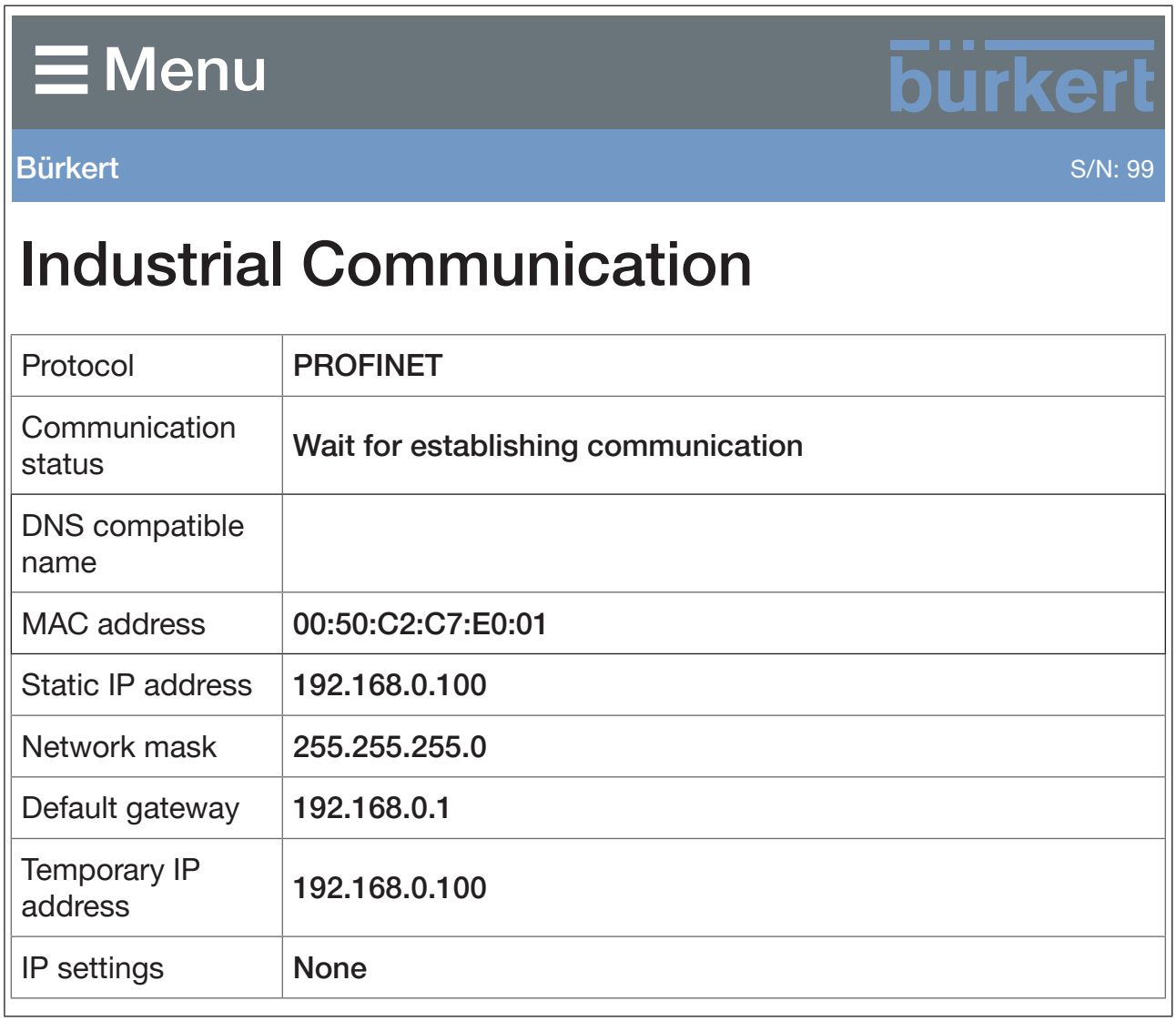

Figure 58: Access to the web server via the Default IP

With EtherNet/IP, it is also possible to set DHCP or BOOTP (NOT standard).
The IP address is acquired from a DHCP server.

→ Open an Internet browser.

→ Input Default IP **192.168.0.100**.
(For Ethernet/IP devices the IP address is assigned via a DHCP server. If no assignment occurs within 1 minute via DHCP, the device uses the Default IP 192.168.0.100.)

The software for configuration of the EtherNet device is now available on the PC.

Configuration of several devices:

All devices are delivered with the same IP address (192.168.0.100). To ensure that the device can be identified for the configuration, the network may contain only 1 device which has not yet been configured.

▸ Connect the devices (EtherNet device) in succession, individually to the network and configure.

17.4.3 Configuring EtherNet device

Logging into the system:

→ Input user name and password. Username: **admin**
Password: **admin**

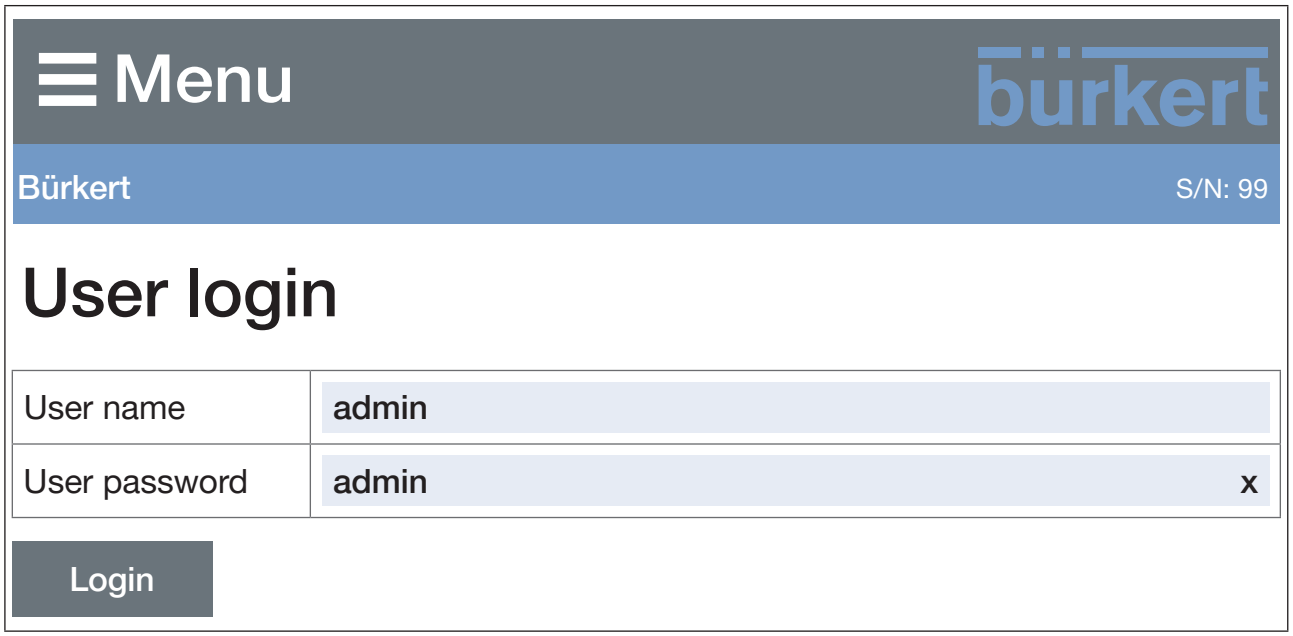

Figure 59: Logging into the system

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Configuration:

→ Input device name and IP address for the Ethernet device.
The device name will be used later for project planning (e.g. in STEP 7).

→ Activate with **Commit changes**.

→ To accept the changed parameters, reset the voltage in the Ethernet device.

→ Restart device with **Restart device**.

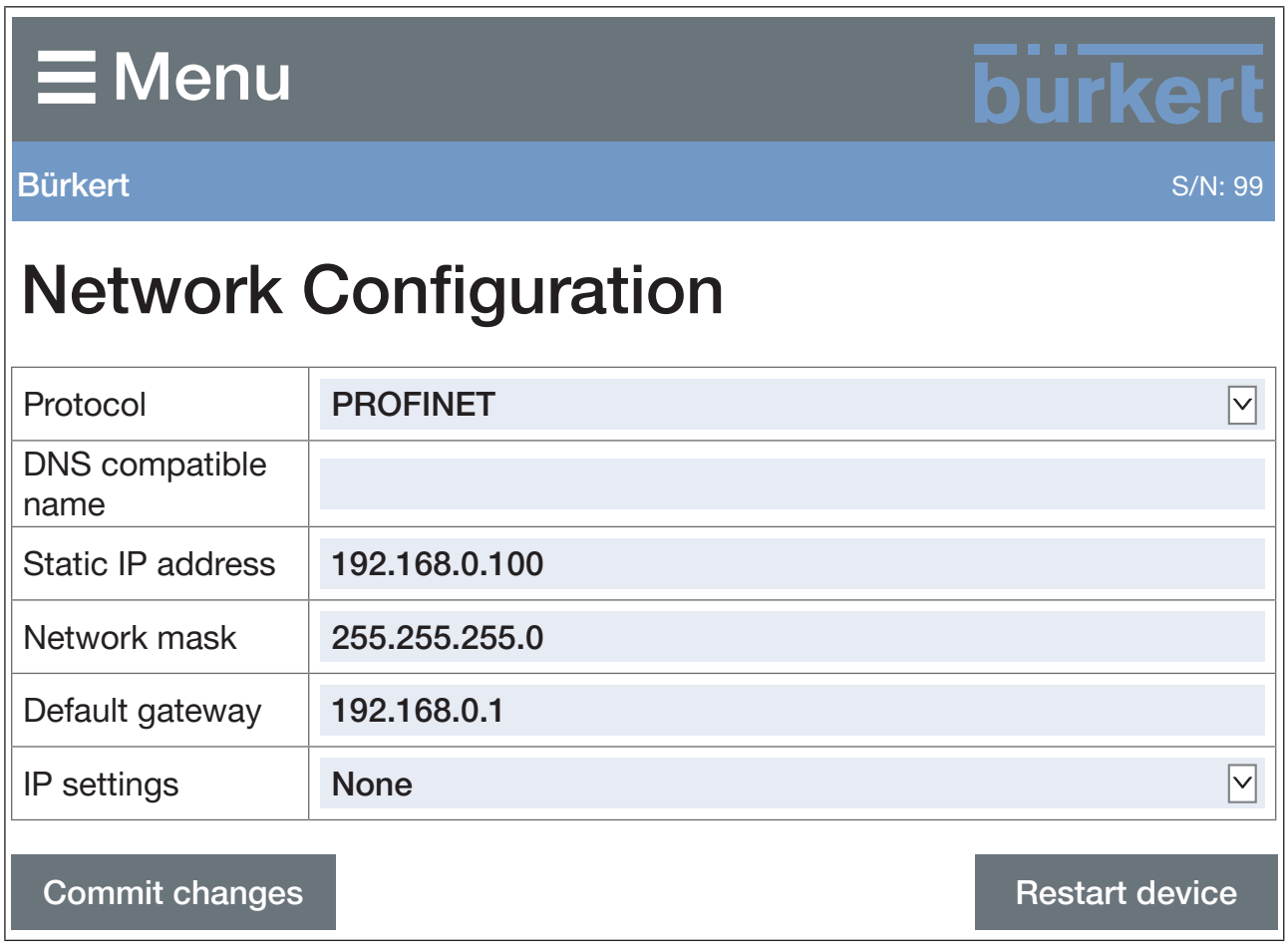

Figure 60: Configuring Ethernet device

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18 CANopen

Electrical installation of devices with CANopen network:
see chapter “10.2 Electrical connection büS/CANopen”, page 52.

18.1 Designing 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:
www.burkert.com / Type 3323 / Downloads „Software“ / Device Description Files

For instructions on installation of the start-up files, please refer to the documentation of the design software being used.

18.2 CANopen network configuration

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

Download:
www.burkert.com / Type 3323 / Downloads „User Manuals“ /
"Software manual | CANopen Network configuration"

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19 büS

The term “büS” (Bürkert system bus) used in this manual stands for the communication bus developed by Bürkert, based on the CANopen protocol.

EElectrical installation of devices with büS network:
see chapter “10.2 Electrical connection büS/CANopen”, page 52.

19.1 Cabling of büS networks

Further information on cabling büS networks can be found under the following link:

Guide for planning of büS networks

19.2 Configuration of büS networks

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

Download :
www.burkert.com / Type 8922 / Downloads / User manuals / Software manual Type 8922, MExx | Software of f(x) configuration

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20 MAINTENANCE, TROUBLESHOOTING

WARNING!

Risk of injury from improper maintenance work.

- ▸ Maintenance may be carried out only by trained technicians and with the appropriate tools.
- ▸ Secure system against unintentional activation.
- ▸ Following maintenance, ensure a controlled restart.

The following maintenance work is required for the diaphragm valve.

- After the first steam sterilisation or when required
  →Retighten body screws crosswise.
- After maximum 10^5 switching cycles
  →Check the diaphragm for wear and replace if required.

Muddy and abrasive media require correspondingly shorter inspection intervals.

- Replacing the SAFEPOS energy pack
  The device outputs a maintenance message as soon as the SAFEPOS energy pack is to be replaced.
  Message: The remaining service life of the energy pack is approx. 25 %.
  Energy pack must be changed soon.

20.1 Visual inspection

Perform regular visual inspections according to the conditions of use:

→ Check medium connections for leak-tightness.

→ Check the relief bore for leaking medium.

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20.2 Replacing the diaphragm

DANGER!

Risk of injury from high pressure.

▸ Before working on the system or device, switch off the pressure and vent or drain 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 operating state MANUAL, chapter “13.1”, page 71.
2. Switch the valve to the position “valve 100% open“, chapter “15”, page 78.
3. Switch off the supply voltage. Wait until LED illuminated ring goes out.
4. Remove actuator from valve body, chapter .“20.2.3”, page 103.
5. Replace diaphragm, chapter “20.2.4”, page 104.
6. Mounting actuator on the valve body and making the electrical connections, chapter “20.2.5”, page 106.
7 Execute function M.Q0.TUNE, chapter “11.3”, page 61.
8. Set operating state AUTOMATIK, chapter “13.1”, page 71.

20.2.2 Required tools

- Open-end wrench

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20.2.3 Remove actuator from valve body

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

WARNING!

Risk of injury due to electric shock.
Risk of crushing due to mechanically moving parts.

- Switch off supply voltage.
- Devices with SAFEPOS energy-pack: Completely drain SAFEPOS energy-pack. Wait until LED illuminated ring goes out; the LED status must not be in LED off mode.

ATTENTION!

Damage to the diaphragm.

- To prevent damage, the device must be in the MANUAL operating state 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 cross-wise.

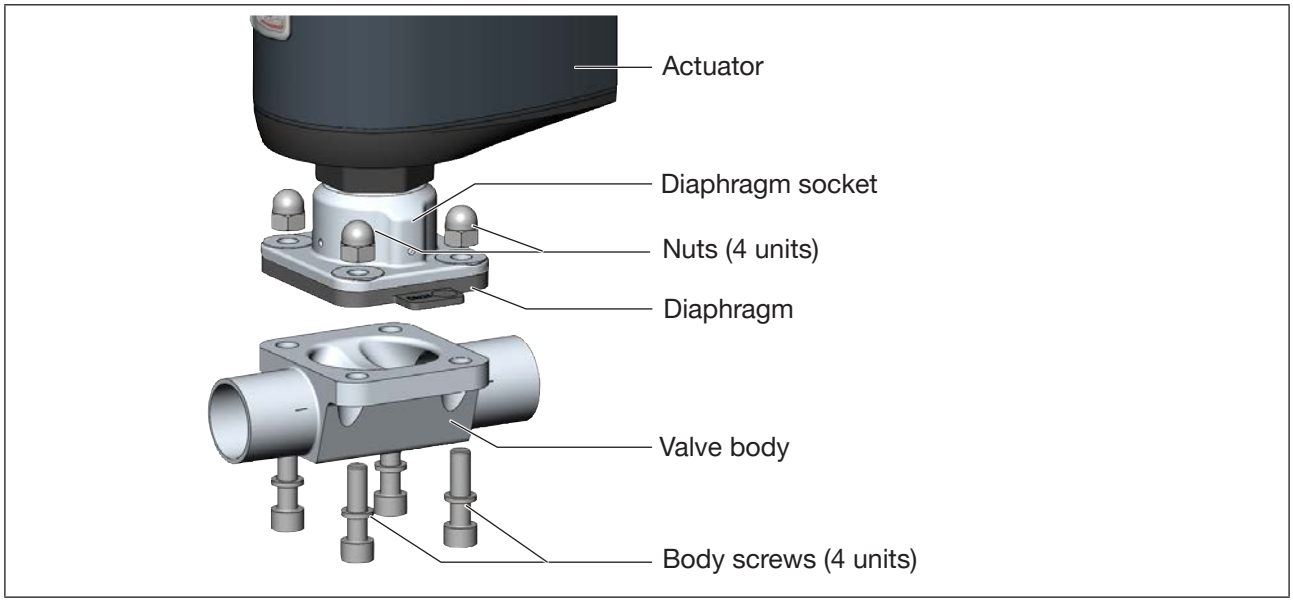

Figure 61: Disassembly of the diaphragm using the 2-way body as an example

→ Remove the body screws.

→ Remove valve body.

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20.2.4 Replacing the diaphragm

→ Unbutton or unscrew the old diaphragm (see “Table 26: Fastening types for diaphragms”).
Diaphragm with bayonet catch: → Loosen and remove diaphragm by turning it 90°.

Mount the new diaphragm:

Depending on the size of the diaphragm, there are different fastening types for the diaphragm.

Diaphragm size	Fastening types for diaphragms	
	PTFE	EPDM / FKM / laminated PTFE
08	Diaphragm pressed in	Diaphragm pressed in
15, 20	Diaphragm with bayonet catch	Diaphragm with bayonet catch
25, 32, 40	Diaphragm with bayonet catch	Diaphragm screwed in

Table 26: Fastening types for diaphragms

Fastening the diaphragm with a bayonet catch:

→ Hook diaphragm into the pressure piece and secure by turning it 90°.

Fastening the diaphragm by screwing it in:

→ If there is no insert in the pressure piece, fit the insert into the pressure piece as shown in the figure.

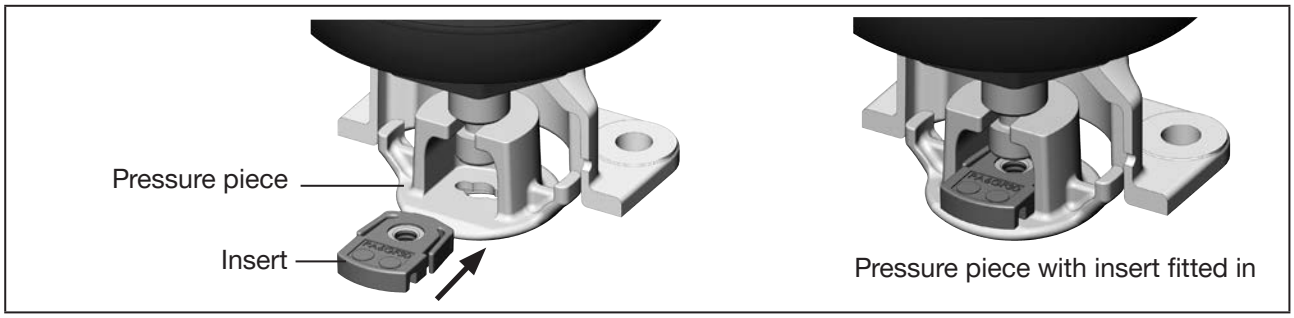

Figure 62: Fitting the insert into the pressure piece

→ Hand-tighten the diaphragm into the pressure piece.

→ Loosen by half a rotation.

→ Align diaphragm.
The identification tab on the diaphragm must protrude out of the valve body at right angles to the longitudinal axis of the pipeline (see “Figure 63”).

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Fastening the diaphragm by pressing it in:

→ Press diaphragm into the pressure piece.

→ Align diaphragm. The identification tab on the diaphragm must protrude out of the valve body at right angles to the longitudinal axis of the pipeline (see “Figure 63”).

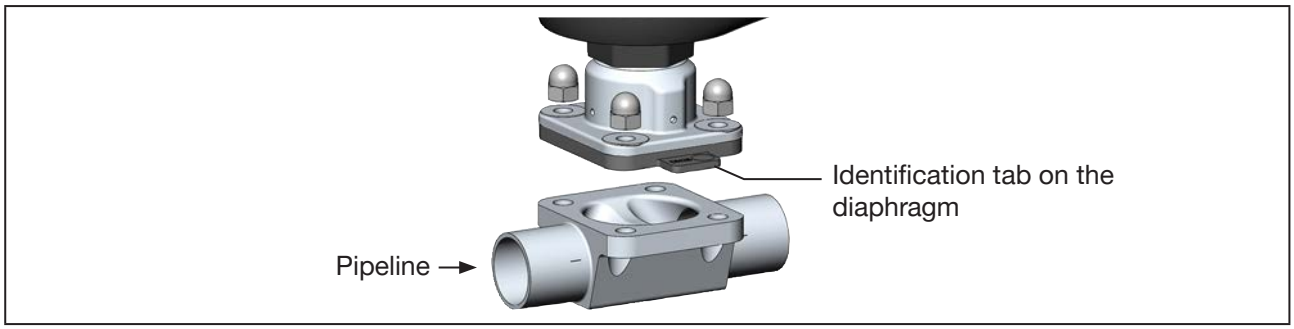

Figure 63: Aligning the diaphragm (example 2-way body)

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20.2.5 Mounting actuator on the valve body and making the electrical connections

WARNING!

Risk of injury due to electric shock.
Risk of crushing due to mechanically moving parts.

▸ Switch off 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“Figure 63”).

→ Replace a damaged diaphragm.

→ Place actuator on the valve body.
Stud bolts have been pre-installed for T-body and tank bottom body.
Insert screws into the valve body for 2-way bodies.

→ Lightly tighten the nuts in a crosswise sequence until the diaphragm is positioned between the housing and actuator.
⚠ Do not fully tighten nuts yet.

→ Apply supply voltage.

→ Run M.SERVICE as described below.

Running M.SERVICE using buttons in the device:

NOTE!

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 2 buttons for running the M.SERVICE are located under the dummy cover.

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

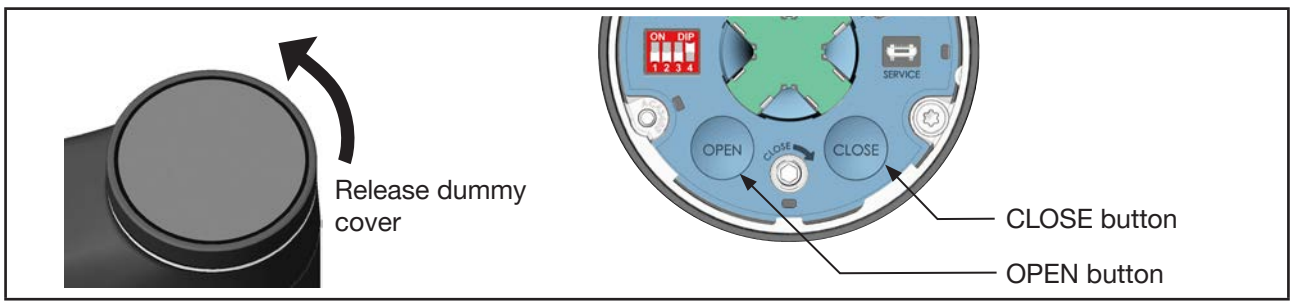

Figure 64: Running M.SERVICE

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→ To release, rotate the dummy cover counter-clockwise and remove it.

→ Simultaneously hold down the OPEN button and CLOSE button for 5 seconds.

✔ The M.SERVICE function has run.

→ Wait until the M.SERVICE function has ended and the actuator stops.

Tighten nuts gradually:

WARNING!

Risk of injury due to non-observance of the tightening torque.

Non-observance of the tightening torque is hazardous as the device may be damaged.

▸ Observe tightening torque.

→ Tighten the nuts crosswise to 1/3 of the tightening torque.

→ Then tighten the nuts crosswise to 2/3 of the tightening torque.

→ Tighten crosswise up to the permitted tightening torque.

Tightening torque for installation of the actuator

Diaphragm size	Tightening torques for diaphragm [Nm]	
	EPDM/FKM	PTFE / advanced PTFE / laminated PTFE
08	2.5 +10 %	2.5 +10 %
15	3.5 +10 %	4 +10 %
20	4 +10 %	4.5 +10 %
25	5 +10 %	6 +10 %
32	8 +10 %	10 +10 %
40	8 +10 %	10 +10 %
* For all values, there is a tolerance of +10 % of the respective tightening torque		

Table 27: Tightening torques for installation of the actuator

Next steps:

- To adjust the position control, running the M.Q0.TUNE function, chapter “11.3”, page 61.

ATTENTION!

Damage to the diaphragm.

▸ To prevent damage, first run the M.Q0.TUNE function after making the electrical connection. Only then set the operating state to AUTOMATIC.

- Set operating state AUTOMATIK, chapter “13.1”, page 71.

→

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20.3 Replacing the SAFEPOS energy pack

WARNING!

Risk of injury due to improper replacement of spare parts.

- Spare parts may be changed only by trained technicians and with the appropriate tools.

CAUTION!

Risk of injury due to electric shock.

- Before removing the SAFEPOS energy-pack, switch off the supply voltage.
- Completely drain SAFEPOS energy-pack. Wait until the LED illuminated ring goes out; the LED status must not be in LED off mode.

Setting the LED mode, see chapter “14.3 Setting LED mode”, page 76.

20.3.1 Required work steps

The SAFEPOS energy-pack is located in the actuator housing. The following steps are required to replace the SAFEPOS energy pack:

1. Switch off the supply voltage. Wait until LED illuminated ring goes out.
2. Open the actuator housing
   Devices without fieldbus gateway, chapter “20.3.3”, page 109.
   Device with fieldbus gateway, chapter “20.3.4”, page 111.
3. Replacing the SAFEPOS energy-pack, chapter “20.3.5”, page 113:
4. Close the actuator housing
   Devices without fieldbus gateway, chapter “20.3.6”, page 115.
   Device with fieldbus gateway,, chapter “20.3.7”, page 117.
5. Apply supply voltage.

20.3.2 Required tools and equipment

- Key for hexalobular-internal screw T10, T20 and T25
- Allen key, width across flats 3 mm

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20.3.3 Opening the actuator housing for device without fieldbus gateway

Precondition: Supply voltage switched off.

WARNING!

Risk of injury due to improper installation work.

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

Removing dummy cover:

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

Figure 65: Removing dummy cover

→ To release the dummy cover, rotate counter-clockwise and remove.

Removing LED and storage module:

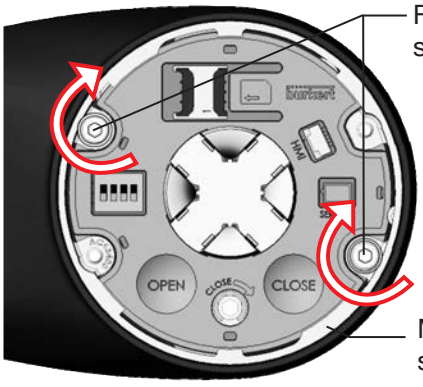

Figure 66: Removing LED and storage module

→ Remove the 2 fastening screws (hexalobular-internal screws T20).

→ Take hold of the LED and storage module on both sides of the metal housing and lift out.

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Removing actuator cover:

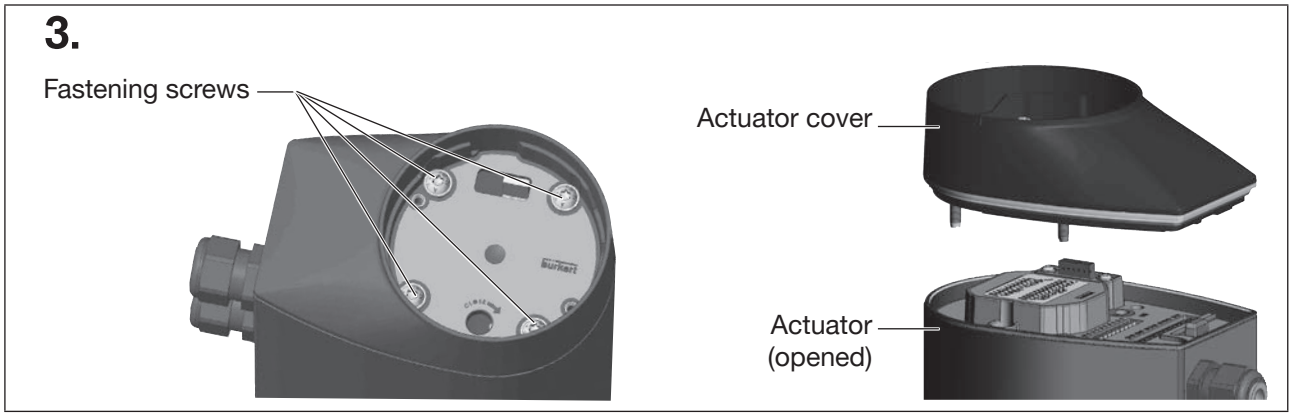

Figure 67: Removing actuator cover

→ Loosen the 4 fastening screws (hexalobular-internal screws T25).
The screws are integrated in the actuator cover to prevent them from falling out.

→ Remove actuator cover.

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20.3.4 Opening the actuator housing for device with fieldbus gateway

Precondition: Supply voltage switched off.

WARNING!

Risk of injury due to improper installation work.

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

Removing dummy cover:

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

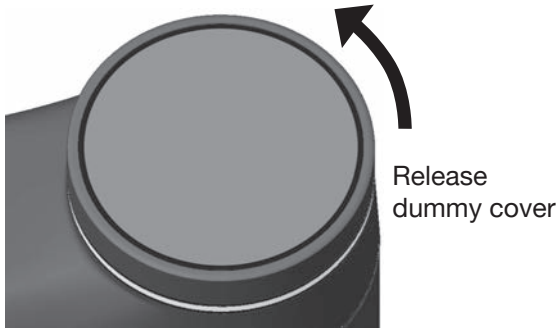

Figure 68: Removing dummy cover

→ To release the display module or the dummy cover, rotate counter-clockwise and remove.

Removing fieldbus gateway:

NOTE!

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

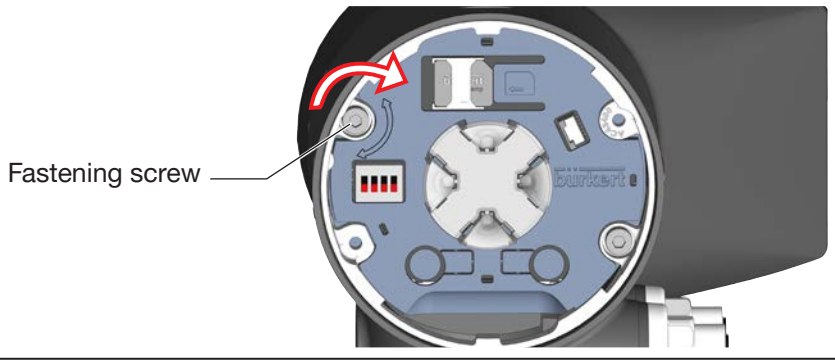

Figure 69: Removing fieldbus gateway

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

NOTE!

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

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→ To release the fieldbus gateway, turn it anticlockwise and carefully remove it.

→ Disconnect connection cable from the fieldbus gateway.

Removing bayonet adapter:

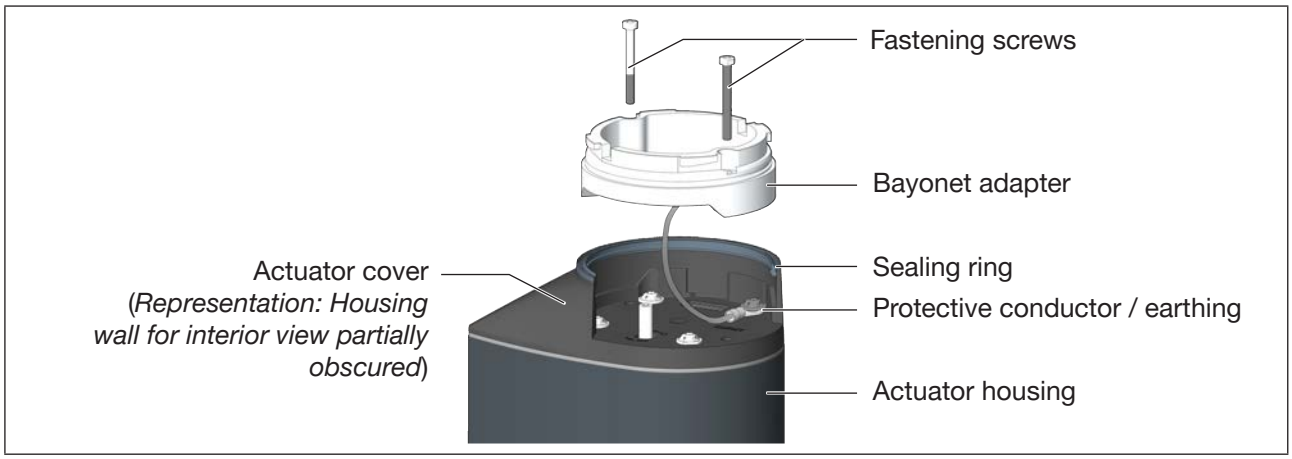

Figure 70: Removing bayonet adapter

→ Remove 2 fastening screws (hexalobular-internal screws T20).

→ Lift out bayonet adapter.
NOTE! The bayonet adapter is connected to the actuator cover by the earthing cable.
Bayonet adapter and actuator cover are removed together from the actuator.

Removing actuator cover:

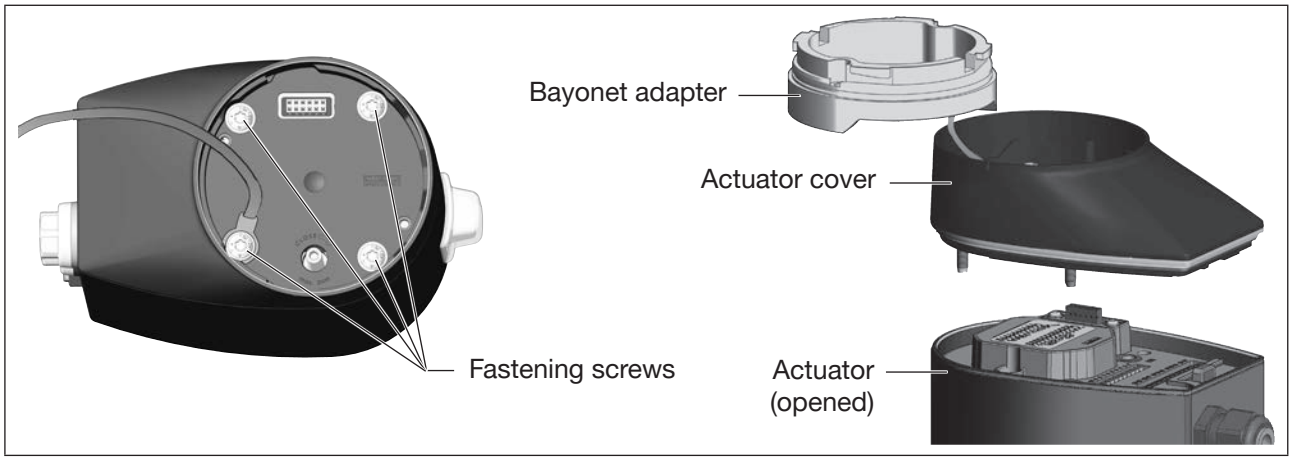

Figure 71: Removing actuator cover

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

→ Remove actuator cover and bayonet adapter.

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20.3.5 Replacing the SAFEPOS energy-pack

Precondition: Actuator housing opened, power supply switched off.

Removing SAFEPOS energy pack:

NOTE!

Removal while the supply voltage is applied may result in data loss.

▸ Remove SAFEPOS energy pack only when the power supply is switched off.

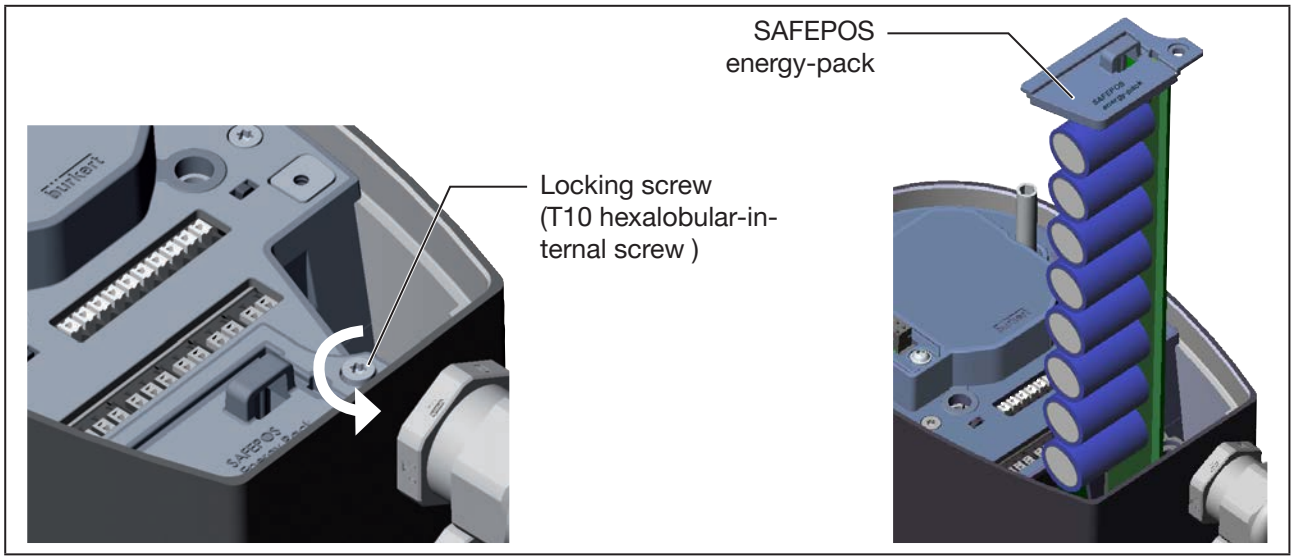

Figure 72: Removing the SAFEPOS energy-pack

→ Loosen locking screw (T10 hexalobular-internal screw).

→ Completely pull out SAFEPOS energy-pack on the bracket.

Inserting new SAFEPOS energy pack:

→ Take SAFEPOS energy-pack out of the transport packaging.

→ Insert SAFEPOS energy-pack into the two guiding grooves and push in all the way.

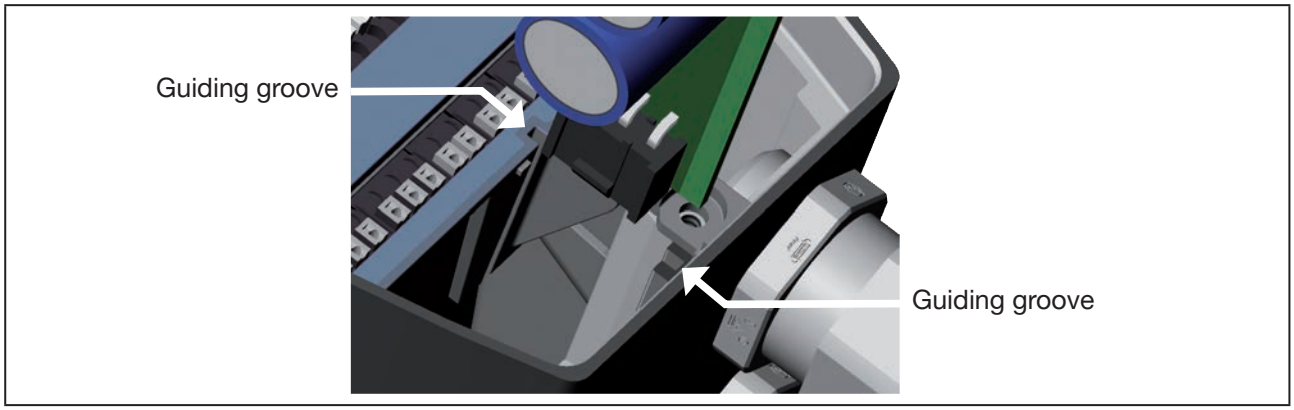

Figure 73: Inserting the SAFEPOS energy-pack

→ Tighten locking screw (T10 hexalobular-internal screw).
Observe tightening torque 1.1 Nm!

Next steps:

- Close the actuator housing,
  Devices without fieldbus gateway, chapter “20.3.6”, page 115.
  Device with fieldbus gateway, chapter “20.3.7”, page 117.
- Apply supply voltage.

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20.3.6 Closing the actuator housing for device without fieldbus gateway

ATTENTION!

Damage or malfunction due to ingress of dirt and moisture.

Before closing the device, comply with the degree of protection IP65 and IP67 by ensuring that:

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

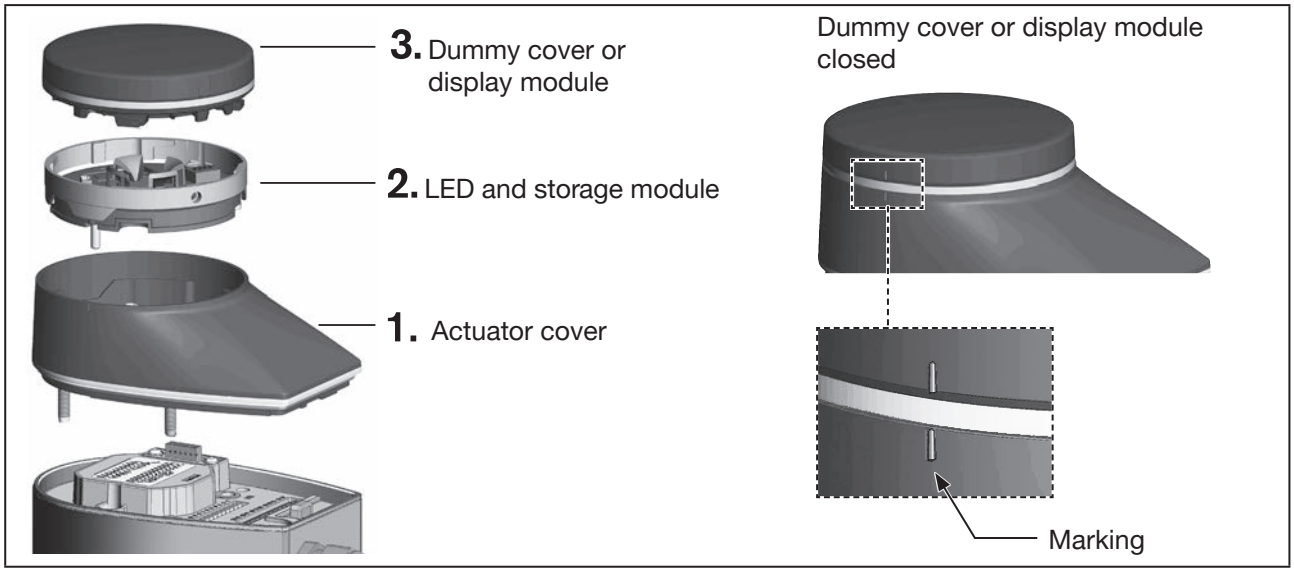

Figure 74: Closing the actuator housing

1. Mounting the actuator cover

→ Place actuator cover on the actuator housing.

→ Slightly screw in the 4 fastening screws (T25 hexagon socket round screws) crosswise, firstly by hand and then tighten (tightening torque: 5.0 Nm).

2. Mount LED and storage module:

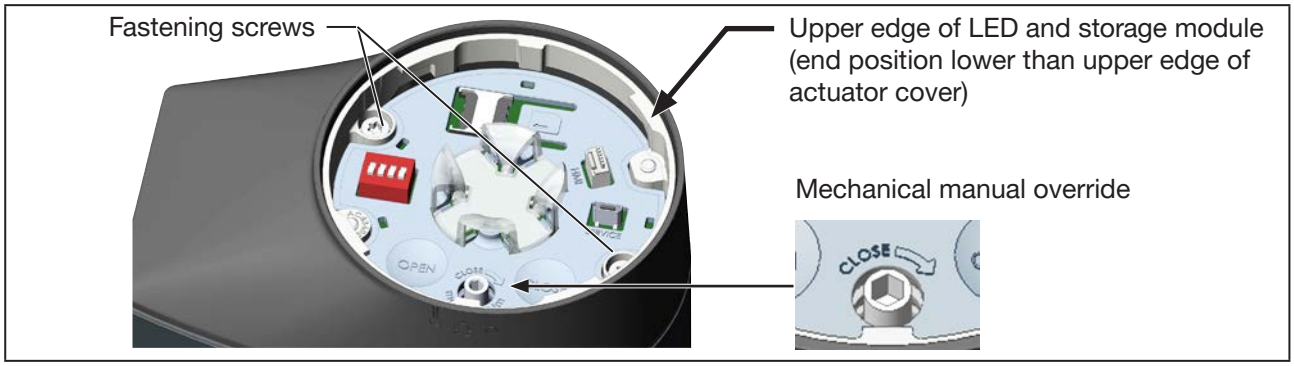

Figure 75: Mount LED and storage module:

→ 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.

NOTE!

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 the tightening torque of 1.1 Nm!

Closing dummy 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.

→ Mount the dummy cover and turn it clockwise until the 2 marks (one vertical line on the dummy cover and on the fieldbus gateway) are vertically aligned.

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20.3.7 Closing the actuator housing for device with fieldbus gateway

Precondition: Supply voltage switched off.

Mounting actuator cover:

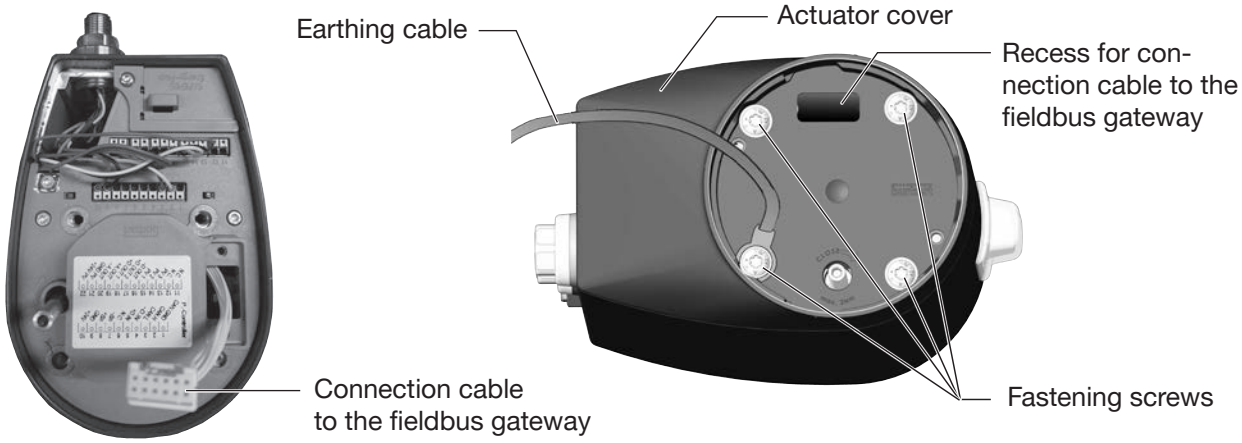

Figure 76: **Mounting actuator cover**

→ Feed connection cable to the fieldbus gateway through the recess in the actuator cover.

→ Position actuator cover on the actuator housing.
NOTE: The earthing cable, which is attached to the bayonet adapter, must be connected to one of the fastening screws in the actuator cover.

→ Tighten 4 fastening screws (hexalobular-internal screws T25).
Observe tightening torque 5 Nm!

Mounting bayonet adapter:

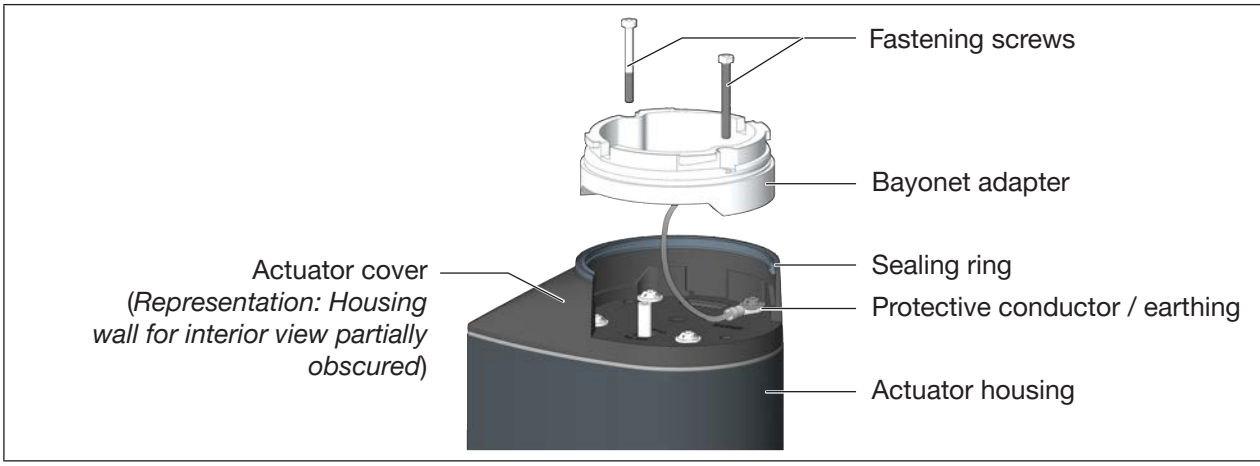

Figure 77: Mounting bayonet adapter

→ Position bayonet adapter on the actuator cover
NOTE! The sealing ring in the actuator housing must be close-fitting.

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

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Mounting fieldbus gateway:

NOTE!

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

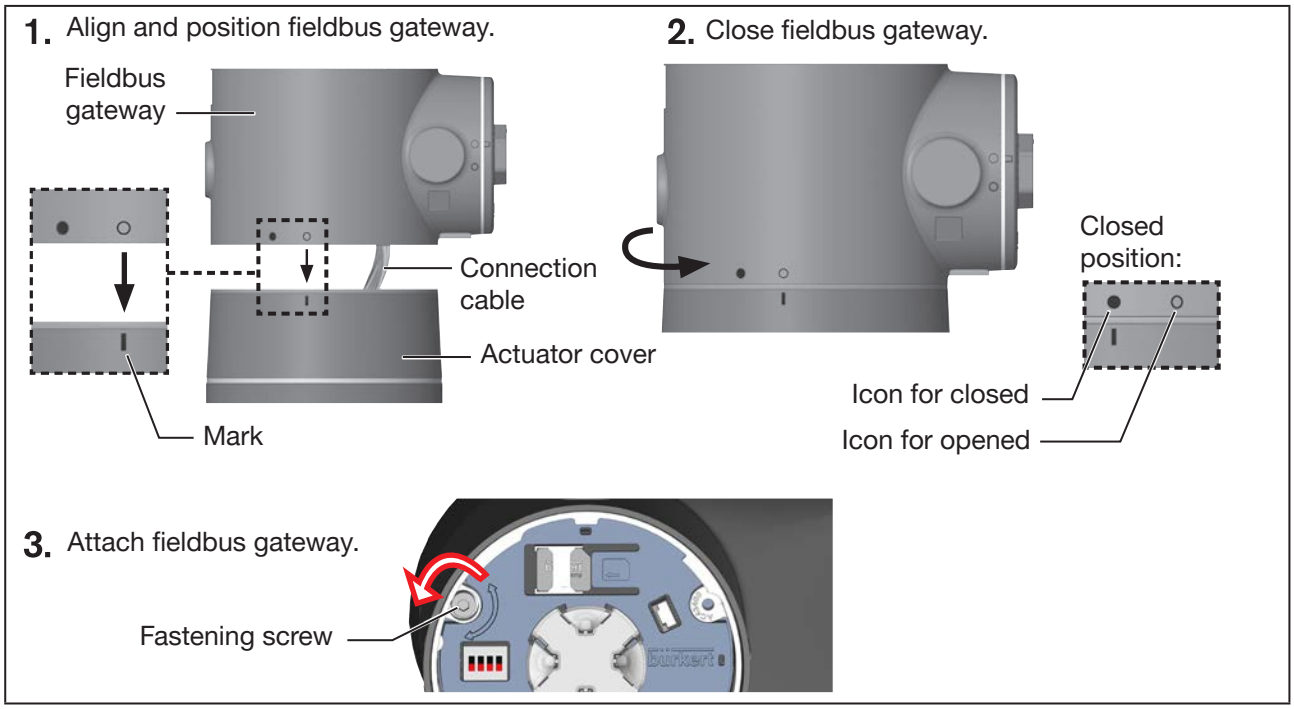

Figure 78: Mount fieldbus gateway.

→ 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 tightening torque 1.1 Nm!

Closing dummy 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.

→ Mount the dummy cover and turn it clockwise until the 2 marks (one vertical line on the dummy cover and on the fieldbus gateway) are vertically aligned.

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20.4 Maintenance messages

Maintenance messages are displayed in the following LED modes:

- Valve mode + warnings (mode set in the factory).
  The LED illuminated ring flashes blue alternately with the colour of the valve position.
- NAMUR mode.
  The LED illuminated ring is lit blue.

If „Valve mode“ is set as the LED mode, maintenance messages are not displayed.

Message	Device behavior	Procedure
The remaining service life of the energy storage is approx. 25 %! The energy storage must be changed soon.	Maintenance message.	Replace SAFEPOS energy pack soon, or in good time before the service life ends.

Table 28: Maintenance messages

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21 TROUBLESHOOTING AND MESSAGES

21.1 Error messages

The error messages of the device are displayed as follows:

- Valve mode
  The LED illuminated ring flashes red alternately with the colour of the valve position.
- Valve mode w/ warnings (mode set in the factory).
  The LED illuminated ring flashes red alternately with the colour of the valve position.
- NAMUR mode.
  The LED illuminated ring is lit red.

Message	Description	Device behavior	Procedure
Motor temperature is too high. Motor moves to the safety position.	Friction in the drive train is too high for operation.	Error message. Actuator moves to the safety position.	Contact your Bürkert Service Center.
Motor temperature is too high. Motor stops to avoid thermal damage.	Friction in the drive train is too high for operation.	Error message. Motor switches off. Actuator stops. Manual control not possible.	Contact your Bürkert Service Center.
Excess temperature detected.	Device temperature is too high for operation.	Error message. Actuator moves to the safety position. Manual control possible.	Reduce ambient temperature. If problems continue, contact your Bürkert Service Center.
Insufficient temperature detected.	Device temperature is too low for operation.	Error message. Actuator moves to the safety position. Manual control possible.	Increase ambient temperature.
Excess voltage detected.	Supply voltage is too high for operation.	Error message. Actuator moves to the safety position. Manual control possible.	Check supply voltage.
Insufficient voltage detected.	No supply voltage or supply voltage is too low for operation.	Error message. Actuator moves to the safety position. Manual control not possible.	Check supply voltage. If problems continue, contact your Bürkert Service Center.
Motor current is too high.	Increased friction in the drive train or end position detection incorrect.	Error message. Motor switches off. Actuator stops. Manual control not possible.	Run the M.Q0.TUNE function. If problems continue, contact your Bürkert Service Center.
Motor peak current is too high.	Increased friction in the drive train or end position detection incorrect.		
Internal error: Hall sensor signal error.	Signal error of the measurement sensor.	Error message. Actuator moves to the safety position. Manual control not possible.	Contact your Bürkert Service Center.

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Message	Description	Device behavior	Procedure
Internal error: …	Internal error of the device.	Error message. Actuator moves to the safety position.	Contact your Bürkert Service Center.
Persistent memory cannot be used: Defective or not available.	Writing or reading error of the internal data storage EEPROM.	Error message. Actuator moves to the safety position.	Restart device. If problems continue, contact your Bürkert Service Center.
BueS event: Producer(s) not found.	Assigned external büS producer cannot be found.	Error message. Actuator moves to the safety position.	Check signal to büS partner.
BueS event: Bus connection lost / not available.	büS network cannot be found.	Error message. Actuator moves to the safety position.	Check büS network.
BueS event: Producer is not operational.	Producer is not operational in the status.	Error message. Actuator moves 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 message. Actuator moves to the safety position.	Assign device and büS participant a unique address.
No correct connection to the process control system.	No connection available to the process control system.	Error message. Actuator moves to the safety position.	Check connection to the process control system.
Energy pack must be replaced.	Storage capacity of the energy pack is too low. Approach of the safety position cannot be guaranteed.	Error message. Actuator moves to the safety position.	Replace SAFEPOS energy pack.
No energy pack available.	SAFEPOS energy pack is not detected.	Error message. Actuator moves to the safety position.	Check that SAFEPOS energy pack has been installed correctly.

Table 29: Error messages

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21.2 Messages for device status “Out of specification”

Messages for device status “Out of specification” are displayed in the following LED modes:

- Valve mode w/ warnings (mode set in the factory).
  The LED illuminated ring flashes yellow alternately with the colour of the valve position.
- NAMUR mode.
  The LED illuminated ring is lit yellow.

Messages for device status "Out of specification" are not displayed in the LED mode "Valve mode".

Message	Description	Device behavior	Procedure
Motor temperature is high.	Increased friction in the drive train.	Message "Out of specification".	If problems continue, contact your Bürkert Service Center.
Temperature limit exceeded.	Ambient temperature is too high or increased friction in the drive train.	Message "Out of specification".	Reduce ambient temperature. If problems continue, contact your Bürkert Service Center.
Temperature limit not achieved.	Ambient temperature is too low.	Message "Out of specification".	Increase ambient temperature
Voltage limit exceeded.	Supply voltage is too high.	Message "Out of specification".	Check supply voltage.
Voltage limit not achieved.	Supply voltage is too low.		

Table 30: Messages for device status “Out of specification”

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21.3 Messages for device status “Function check”

Messages for device status “Function check” are displayed in the following LED modes:

- Valve mode w/ warnings (mode set in the factory).
  The LED illuminated ring flashes orange alternately with the colour of the valve position.
- NAMUR mode.
  The LED illuminated ring is lit orange.

Messages for device status "Function check" are not displayed in the LED mode "Valve mode".

Message	Description	Device behavior	Procedure
MANUAL operating state active .	Device is in the MANUAL operating state.	Message "Function check".	Switch to AUTOMATIC operating state.
Signal generator active	Device is in simulation mode: Input signals are simulated.	Message "Function check".	Switch off signal generator.
M.Q0.TUNE active	M.Q0.TUNE function is run (adaption of position control).	Message "Function check".	Wait until the M.Q0. TUNE function is exited.
External CMD not assigned.	"büS" has been set as the source for the input signal. Assignment of the external büS/CANopen partner missing.	Message "Function check".	Assign an external büS/CANopen fieldbus consumer or set a different source. Setting the input signal: In the configuration area "Inputs / Outputs".

Table 31: Messages for device status “Out of specification””

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22 CLEANING

ATTENTION!

The surfaces of the device must not be cleaned with alkaline cleaning agents.

22.1 Flushing the valve body

The device has the M.CLEAN function to remove residue from the parts which come into contact with media.

When the M.CLEAN function is running, the valve changes continuously between the 80 % and 100 % open positions. As a result, all parts which come into contact with media are accessible for cleaning during the flushing process.

22.1.1 Running M.CLEAN

Run the M.CLEAN function to remove residue from the parts which come into contact with media during the flushing process.

Setting with the PC software Bürkert Communicator on the PC:

The PC software Bürkert Communicator can be downloaded free of charge from the Bürkert homepage.

To do this, the USB-büS-interface set, available as an accessory, is required.
Communication is established by the büS service interface of the device.

To start the M.CLEAN function, you must change to the detailed view maintenance for position controller.

Switch to the detailed view as follows:

→ Select Position controller in the navigation area and switch to MAINTENANCE.

✓ You are in the detailed view maintenance.

Running the M.CLEAN function:

→ Select CALIBRATION.

→ Select M.CLEAN.

The following question appears: „Do you really want to start the M.CLEAN?“

→ Start M.CLEAN.

The M.CLEAN function is run. The valve now continuously changes its position between 80 % and 100 % open. The following text appears: „ --RUNNING --
End M.CLEAN by acknowledgement“

→ End M.CLEAN.

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23 ACCESSORIES, SPARE PARTS

23.1 Accessories

CAUTION!

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

Incorrect accessories and unsuitable spare parts may cause injuries and damage the device and the surrounding area.

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

Accessories	Order number
Connection cable with M12 socket, 4-pin, (length 5 m) for operating voltage	918038
Connection cable with M12 socket, 8-pin, (length 2 m) for input and output signals	919061
USB-büS-interface set:	
büS stick set 1 (including power supply unit, bus-stick, terminating resistor, Y-distributor, 0.7 m cable with M12 connector)	772426
büS stick set 2 (including bus-stick, terminating resistor, Y-distributor, 0.7 m cable with M12 connector)	772551
büS adapter for büS Service interface (M12 to büS Service interface micro USB)	773254
büS cable extensions from M12 plug to M12 socket	
Connection cable, length 1 m	772404
Connection cable, length 3 m	772405
Connection cable, length 5 m	772406
Connection cable, length 10 m	772407
Bürkert Communicator	Information at www.buerkert.com
SIM card	291773
Holding device for diaphragm size 08* to 40	693771
Dummy cover made of plastic	277881
* For diaphragm size 08 the holding device is included in the scope of delivery.	

Table 32: Accessories

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23.1.1 Communications software

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

A detailed description for installing and operating the PC software can be found in the associated operating instructions.

Download the software from: www.burkert.com.

23.1.2 büS service interface

The device is equipped with the büS service interface for communicating with the PC. Communication takes place via a USB interface on the PC and the USB-büS-Interface, which is available as an accessory. (See “Table 32: Accessories”).

23.2 Spare parts

23.2.1 Spare parts for valves of Types 3323, 3324, 3325

Spare parts for Types 3323, 3324, 3325	Order number
SAFEPOS energy-pack	285 834

Table 33: Spare parts for Types 3323, 3324, 3325

23.2.2 Replacement part sets for replacing the diaphragm

Diaphragm size	Order numbers of diaphragms					
	EPDM (AB*)		EPDM (AD*)		FKM (FF*)	
08	677 663	E02**	688 421	E03/E04**	677 684	F01**
15 BC**	693 162	E02**	693 163	E03/E04**	693 164	F01**
20 BC**	693 165	E02**	693 166	E03/E04**	693 167	F01**
25	677 667	E01**	688 424	E03/E04**	677 687	F01**
32	677 668	E01**	688 425	E03/E04**	677 688	F01**
40	677 669	E01**	688 426	E03/E04**	677 689	F01**
	PTFE (EA*)		Advanced PTFE (EU*)		Gylon laminated (ER*)	
08	677 674	L04/L10**	679 540	L05/L09**	693 175	L06/L08**
15	677 675	E02/E04- PTFE**	679 541	E02/E04- PTFE+ Hole**	693 176	L06/L08**
20	677 676	E02/E04- PTFE**	679 542	E02/E04- PTFE+ Hole**	693 177	L06/L08**
25	677 677	E02/E04- PTFE**	679 543	E02/E04- PTFE+ Hole**	693 178	L06/L08**
32	677 678	E02/E04- PTFE**	679 544	E02/E04- PTFE+ Hole**	693 179	L06/L08**
40	584 378	E02/E04- PTFE**	584 379	E02/E04- PTFE+ Hole**	693 180	L06/L08**

Table 34: Replacement part sets for replacing the diaphragm

* *SAP Code*

** *Identification on the diaphragm*

If you have any queries, please contact your Bürkert sales office.

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24 DISASSEMBLY

DANGER!

Risk of injury from high pressure and discharge of medium.

If the device is under pressure when removed, there is a risk of injury due to sudden pressure release and discharge of medium.

▸ Before removing the device, switch off the pressure. Vent or drain the lines.

CAUTION!

Risk of injury due to a heavy device.

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

▸ Transport, install and dismantle a heavy device with the help of another person.

▸ Use appropriate tools.

NOTE!

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.

→ Remove device.

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25 PACKAGING, TRANSPORT

CAUTION!

Risk of injury due to a heavy device.

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

- ▸ Transport, install and dismantle a heavy device with the help of another person.
- ▸ Use appropriate tools.

ATTENTION!

Transport damage!

Inadequately protected devices may be damaged during transportation.

- Protect the device against moisture and dirt in shock-resistant packaging during transportation.

26 STORAGE

ATTENTION!

Incorrect storage may damage the device.

- Store the device in a dry and dust-free location.
- Prevent the temperature from exceeding or dropping below the permitted storage temperature.

Devices with diaphragm:

- Storage temperature -20…+70 °C (-4...158 °F)
  (The higher the storage temperatures, the quicker the elastomers age).
- For storage, slacken the fastening screws on the diaphragm.
- Store device only with the valve open.

Devices without diaphragm:

- Storage temperature -40…+70 °C (-40...158 °F)

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27 DISPOSAL

ATTENTION!

Damage to the environment caused by parts contaminated with media.

- Dispose of the device and packaging in an environmentally friendly manner.
- Observe applicable disposal and environmental regulations.

Observe the national waste disposal regulations.

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