bürkert
FLUID CONTROL SYSTEMS

# Type 3320, 3321,
# AE3320, AE3321

Electromotive 2/2-way valve



## Operating Instructions

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Operating Instructions 1810/03_EU-EN_00810525 / Original DE

# Electromotive 2/2-way valve

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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.

## 1.2 Definitions of terms

- The term "device" used in these instructions applies to all valve types described in these instructions:
  Type 3320, electromotive 2/2-way angle seat valve
  Type 3321, electromotive 2/2-way globe valve
- In these instructions, the abbreviation "Ex" stands for "explosion-risk".

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# 2 INTENDED USE

**Non-authorized use of the electromotive 2/2-way valve, Types 3320 and 3321, may be a hazard to people, nearby equipment and the environment.**

**The electromotive 2/2-way valve, Types 3320 and 3321, is designed to control the flow of liquid and gaseous media.**

- Standard devices must not be used in the potentially explosive area. They do not have a separate Ex type label which indicates approval for the explosion-proof area.
- 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.

**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 packing gland is worn.**

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

**Risk of crushing due to mechanically moving parts.**

- Perform installation work on the swivel plate, 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.

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**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.
- 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.
- Transport, install and dismantle a heavy device with the help of another person and with appropriate tools.
- Secure the system from unintentional actuation.
- Only trained technicians may perform installation and maintenance work.
- 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@buerkert.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 3320 and 3321 can be found on the Internet at:

www.buerkert.com

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# 5 PRODUCT DESCRIPTION

## 5.1 General description

The electromotive 2/2-way valve Type 3320 and 3321 is suitable for liquid and gaseous media.

This may be neutral gas, water, alcohol, oil, propellant, hydraulic fluid, saline solution, alkali, organic solvent and vapor.

The 2/2-way 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-energized 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 valves 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

- High leak-tightness by self-adjusting packing gland.
- Devices with PTFE and PEEK seal material are kept tight without the power supply.
- High flow values by the streamlined valve body made of stainless steel.
- 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.
- Simple and fast replacement of the pendulum disk.
- Valve actuator can be rotated through 360°.
- Integrated control.
- High seat tightness by pendulum disk.
- Non-contact, high-resolution and wear-free position sensor.
- The actuator housing consists of a robust and heat-dissipating aluminum 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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### 5.2.1 Versions (valve sizes and actuator sizes)

**Angle seat valve Type 3320 and globe valve Type 3321:**

| Available actuator size in nominal force [N] | | | | | | | |
|---|---|---|---|---|---|---|---|
| Orifice connection (valve body) | | Valve seat diameter [mm] | | | | | |
| [DN] | [inch] | 15 | 20 | 25 | 32 | 40 | 50 |
| 15 | 1/2" | 1300 | - | - | - | - | - |
| 20 | 3/4" | - | 1300 | - | - | - | - |
| 25 | 1" | - | - | 1300 | - | - | - |
| 32 | 1 1/4" | - | - | - | 1300 | - | - |
| 40 | 1 1/2" | - | - | - | - | 1300 | - |
| 50 | 2" | - | - | - | - | - | 1300 |

*Table 1: Variants for Types 3320 and 3321*

### 5.2.2 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 valve consists of an electromotively driven linear actuator, a swivel plate and a 2/2-way straight seat valve body or a 2/2-way angle seat 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.

Control is via binary signals (analog) or via fieldbus (digital).

The electromotive control valve is designed using three-wire technology. The valve is operated using 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 pendulum disk.

- 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.
- The flow-enhancing valve body made of stainless steel enables high flow values.
- The self-adjusting packing gland ensures high leak-tightness.
  The pendulum disk is coupled to the actuator spindle with a bolt and can therefore be quickly replaced.
- The actuator housing consists of a robust and heat-dissipating aluminum body which has a coating resistant to cleaning agents. The plastic materials used are also resistant to cleaning agents.

**Valve seat:**

As the valve seat is always closed against the medium flow, pay attention to the flow direction.

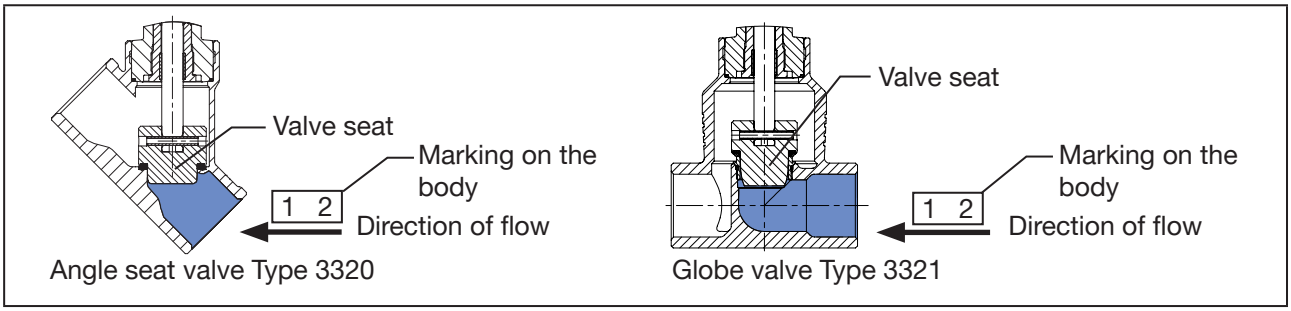



*Figure 1: Incoming flow under the seat, direction of flow*

**Fluid connections:**

- The socket connection or welded connection is the standard model for all valve bodies.
- For the globe valve Type 3321 there is also the valve body with a flanged connection.

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## 6.1 Diagram – structure of the electromotive valve

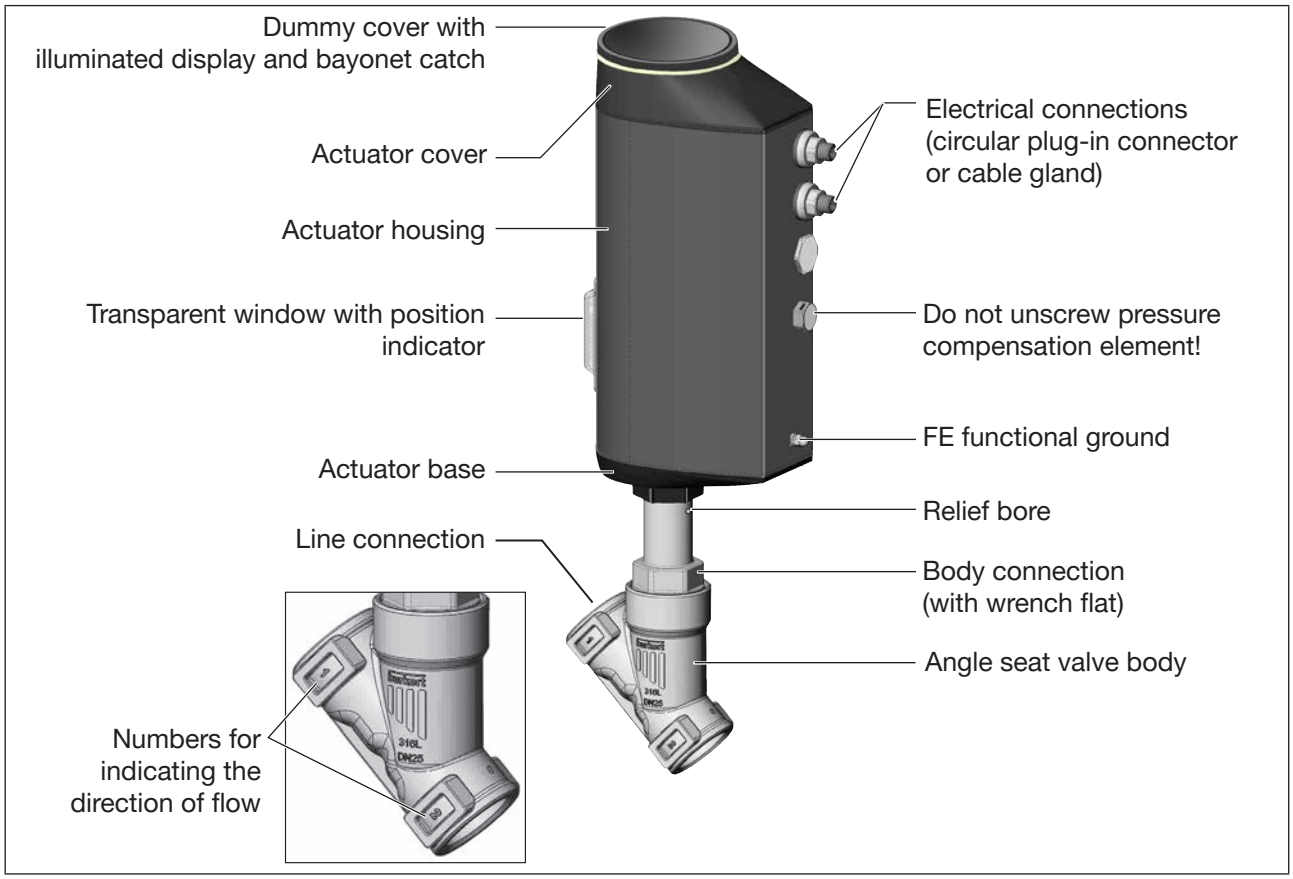



*Figure 2: Structure, electromotive angle seat control valve Type 3320*

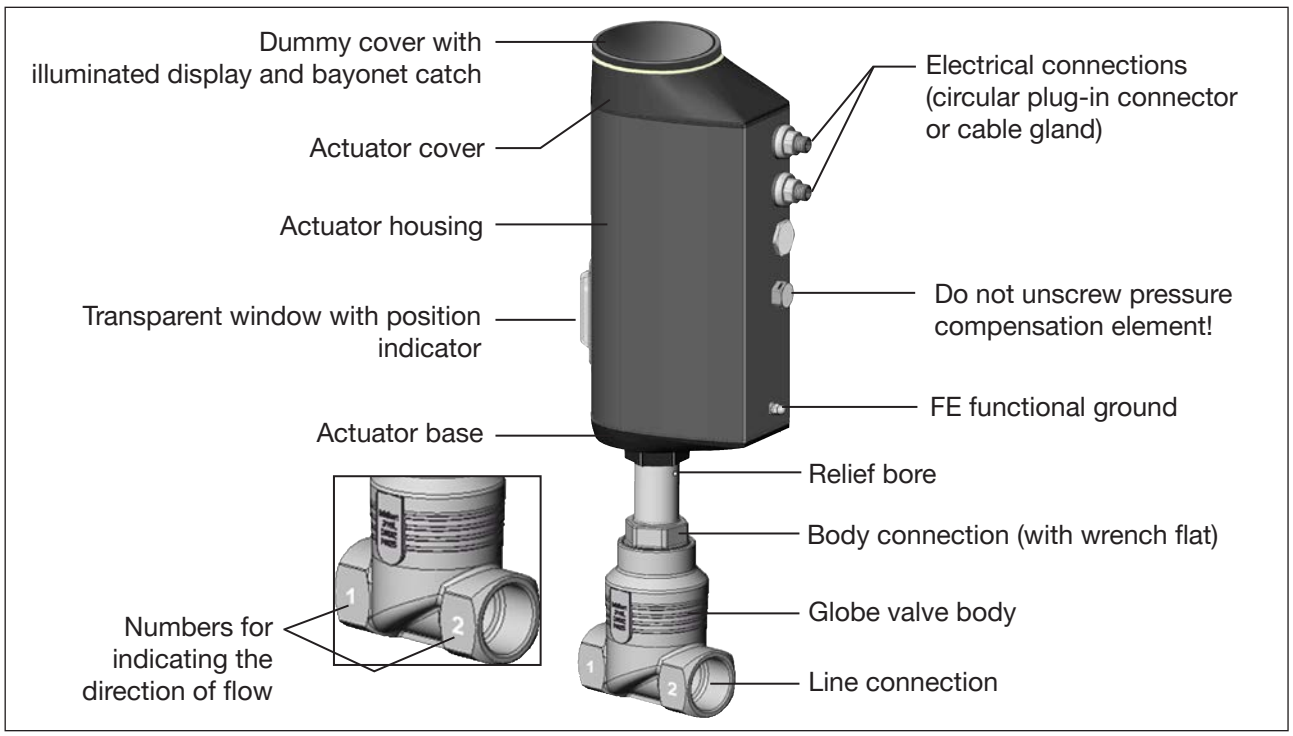



*Figure 3: Structure, electromotive globe valve Type 3321*

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## 6.2 Valve position after failure of the supply voltage

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.

Description of the SAFEPOS energy-pack see chapter "7.2 SAFEPOS energy-pack (option)" on page 21

## 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" on page 60.

### 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 colors for indicating the valve position".

**Displays in valve mode:**

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

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

*Table 2: 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 color of the valve position.
If device status deviates from "Normal": The colors 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 3: 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 color 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.<br>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.<br>→ Maintain device. |
| Green | 1 | Diagnostics active | Device is operating faultlessly. Status changes are shown in color.<br>Messages are transmitted via any connected fieldbus. |
| White | 0 | Diagnostics inactive | Device is switched on.<br>Status changes are not shown.<br>Messages are not transmitted via any connected field bus. |

*Table 4: Display of device status in NAMUR mode*

* A detailed fault description can be found in chapter "18.3 Troubleshooting" on page 85.

### 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 "18 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 |
| X.Tune active |
| Signal generator active |

*Table 5: 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 (analog) 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

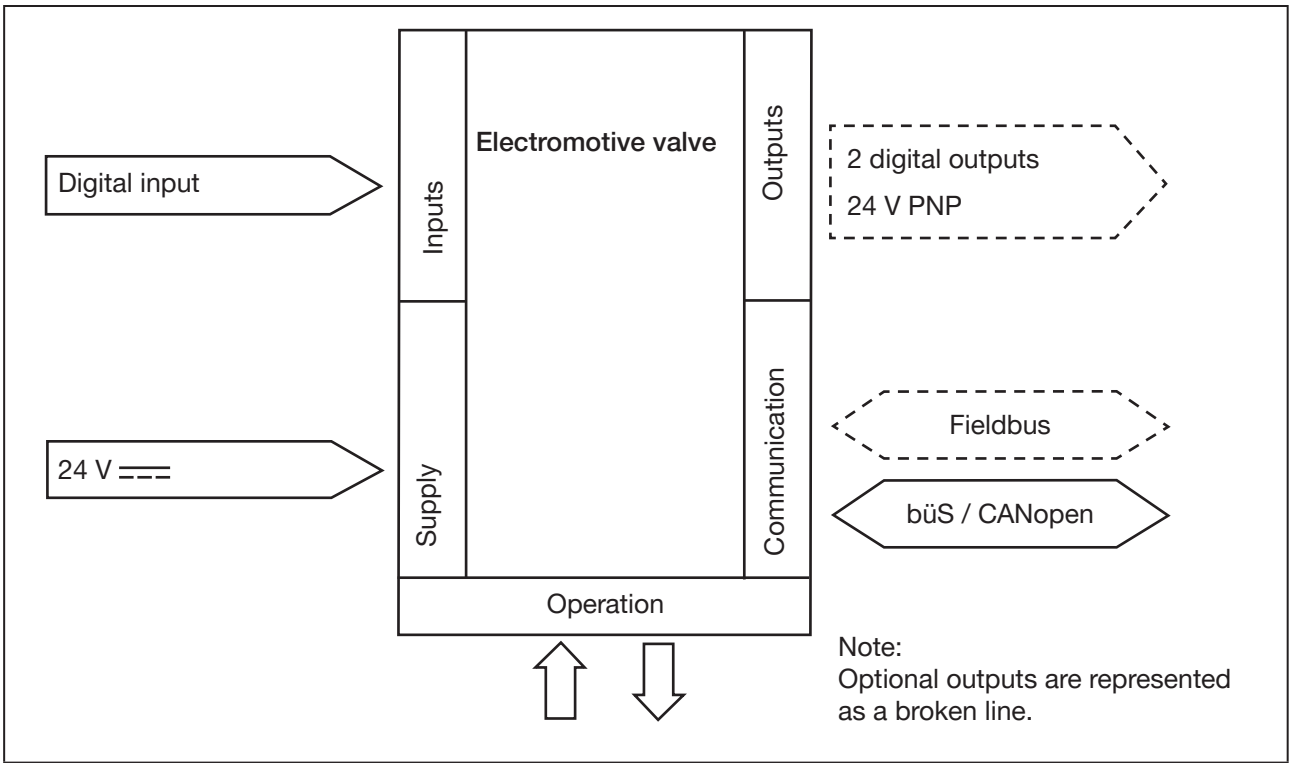



*Figure 4: Interfaces of the electromotive valve*

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

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### 7.1.2 Function diagram

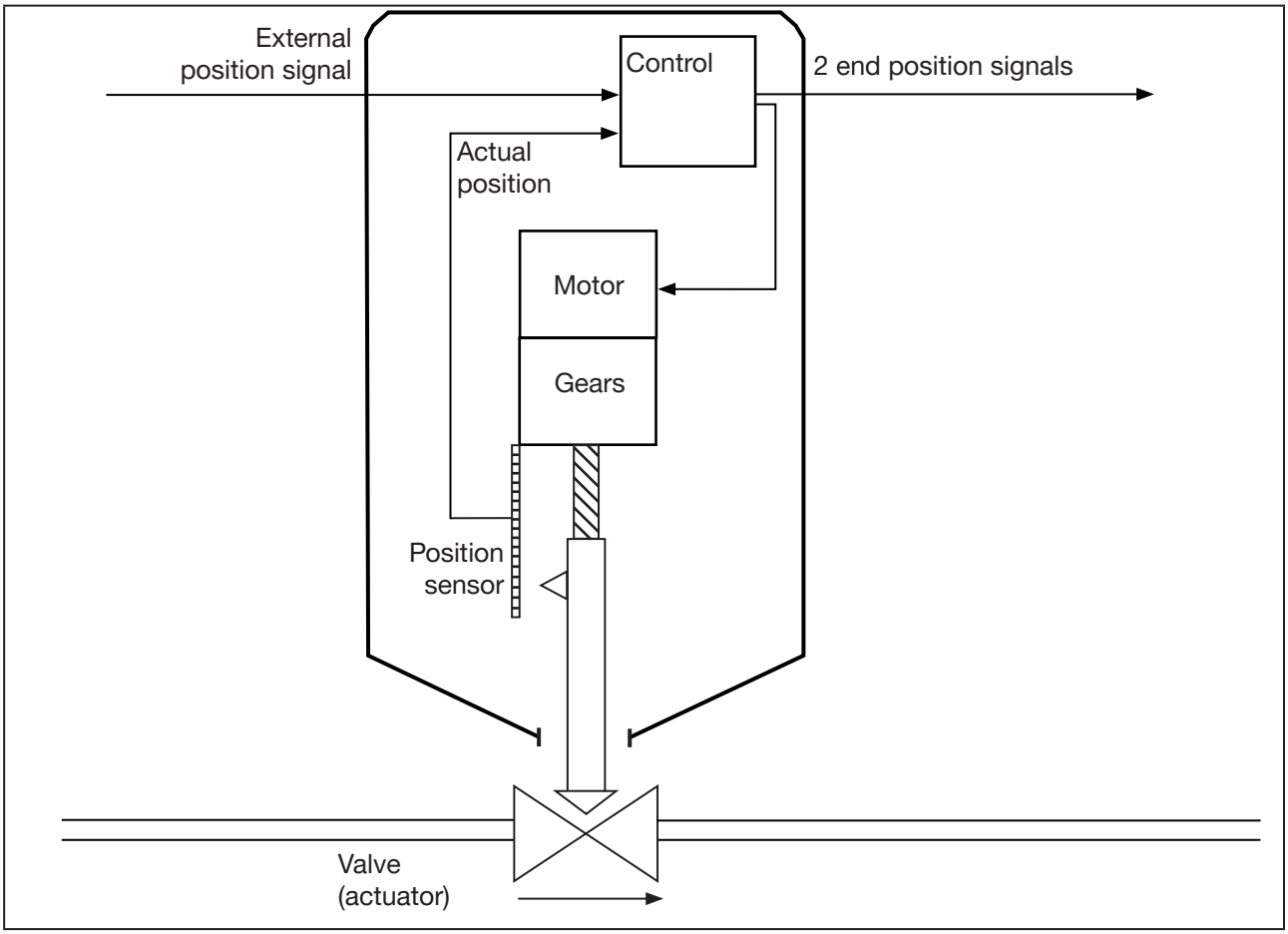



*Figure 5: Function diagram*

## 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 5 years was determined under the following conditions:

| | |
|---|---|
| Ambient temperature | 30 °C |
| Medium temperature | 165 °C |
| Duty cycle | 100 % |
| Medium pressure | 5 bar |
| Orifice | DN32 |

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**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.

### 7.2.3 Replacing SAFEPOS energy-pack

**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 LED illuminated ring goes out; the LED status must not be in LED off mode, see chapter "14.3 Setting LED mode".

The SAFEPOS energy-pack is housed in the actuator housing. To replace it, remove the following parts from the actuator:

**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.

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

The removal of these parts is described in detail in chapter "10.2.2 Access to the connection terminals" on page 40.

**Removing SAFEPOS energy-pack:**

→ Loosen the locking screw (hexagonal socket round screw T10).

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

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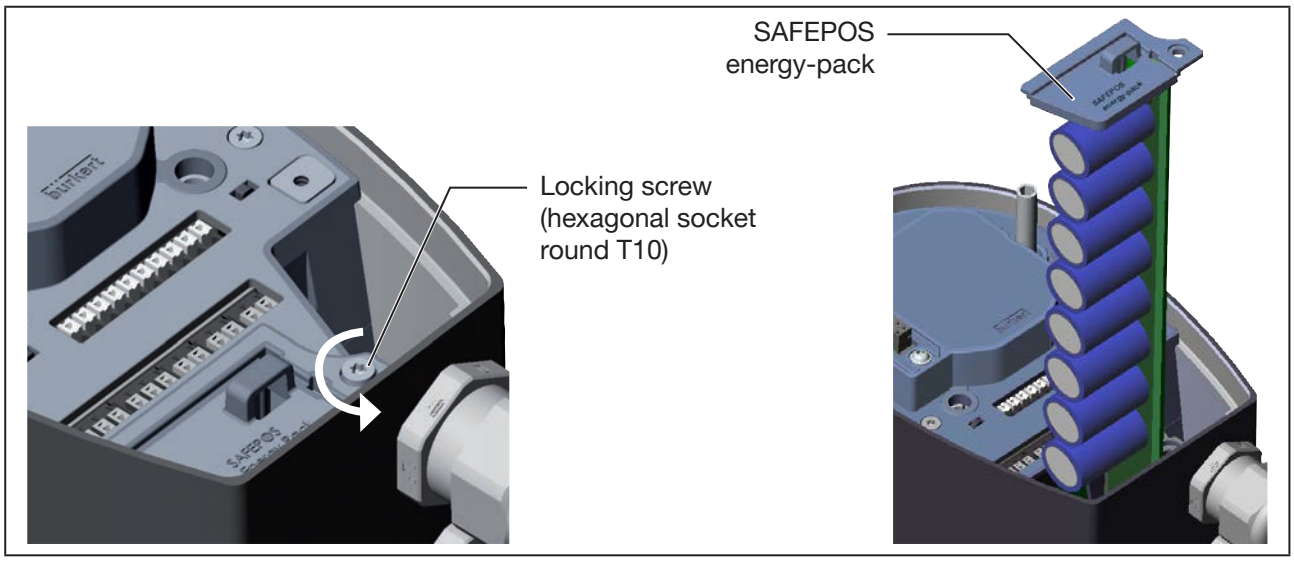



*Figure 6: Removing SAFEPOS energy-pack*

**Inserting new SAFEPOS energy-pack:**

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

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

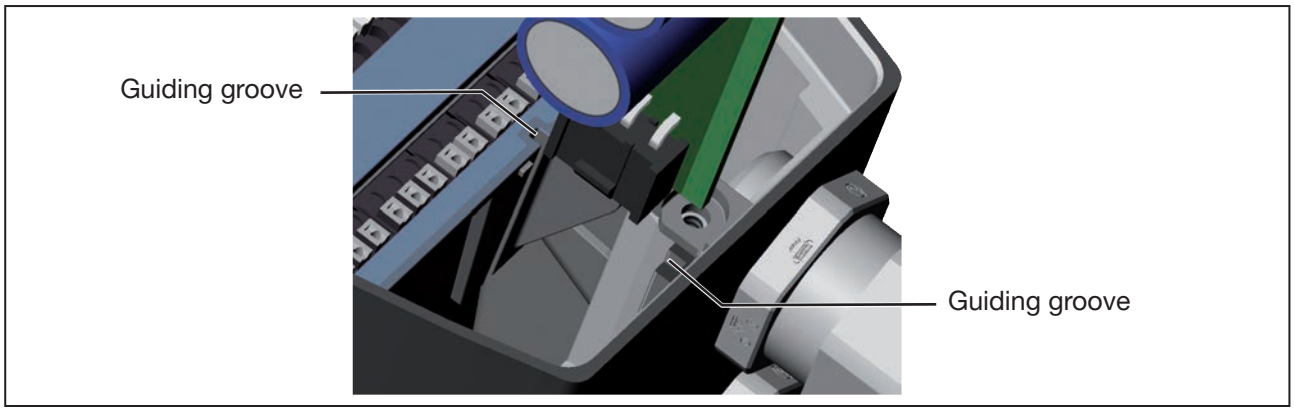



*Figure 7: Inserting SAFEPOS energy-pack*

→ Tighten the locking screw (hexagonal socket round screw T10).

→ Apply supply voltage.

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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
- Seal material and material of the valve body
- Fieldbus standard
- Orifice of the valve seat
- Flow capacity
- Actuator size
- Line connection
- Maximum permitted medium pressure
- Direction of flow

## 8.1 Conformity

The electromotive valves, Types 3320 and 3321, are compliant with EC directives as stated in the EC Declaration of Conformity (if applicable).

## 8.2 Standards

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

## 8.3 Licenses

The product is cULus approved. Instructions for use in the UL area see chapter "8.7 Electrical data".

## 8.4 Type label

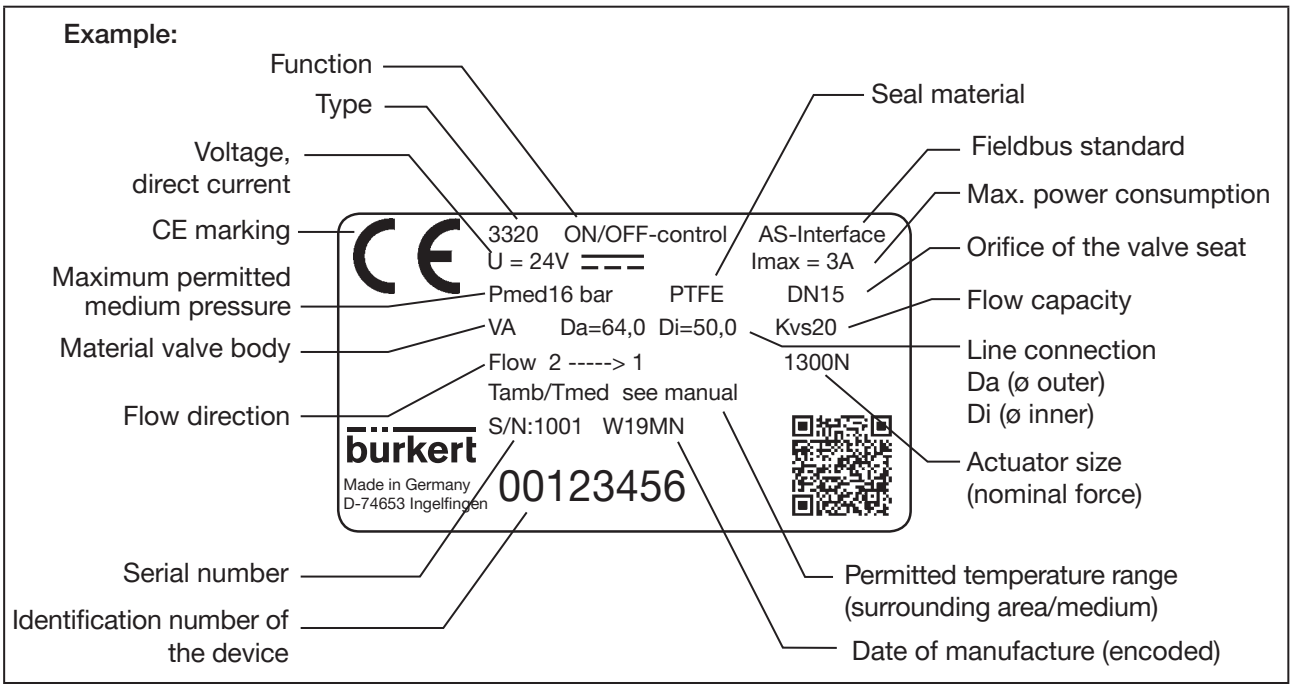



*Figure 8: Description of the type label (example)*

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### 8.4.1 Additional type label for UL approval (example)

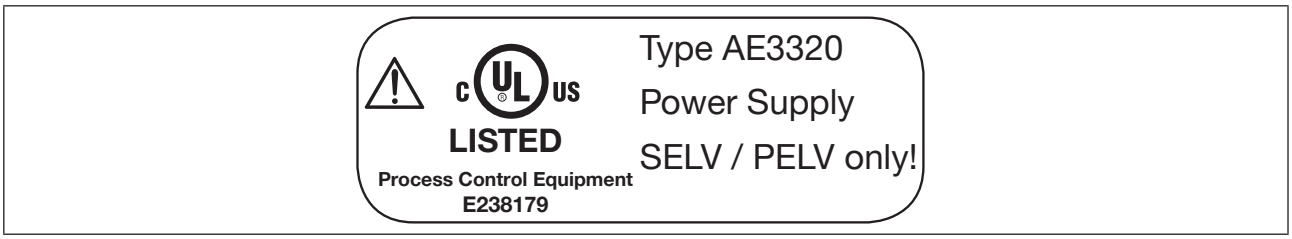



*Figure 9: Additional type label for UL approval (example)*

## 8.5 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.

**WARNING!**

**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.

| | |
|---|---|
| Maximum permitted medium pressure: | see type label |
| Media: | Neutral gases and vapor.<br>Liquid media: Water, alcohol, oil, propellant, hydraulic fluid, saline solution, alkali, organic solvent. |
| Degree of protection: | (verified by Bürkert / not evaluated by UL) IP65 as per IEC 529, EN 60529 (IP67 on request).<br>NEMA 250 4x (not guaranteed for installation location: actuator facing downward). |
| Direction of flow: | is specified on the rating plate by an arrow and the numbers 1 and 2.<br>The 1 and the 2 stand for identification also on the valve body.<br>The incoming flow is under the seat. |
| Altitude: | up to 2000m above sea level |

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## 8.5.1 Permitted temperature ranges

| | | |
|---|---|---|
| Minimum temperatures | Ambient: | -25 °C (-13 °F) |
| | Medium: | -10 °C (14°F) |
| Maximum temperatures | Ambient: | depending on the medium temperature; see temperature graph below. |
| | Medium: | depending on the ambient temperature; see temperature graph below.<br>On devices with seat seal PTFE/steel, max. +130 °C (266 °F) absolute.<br>On devices with seat seal PEEK/steel, max. + 185 °C (365 °F) absolute. |

### Temperature graph

The maximum permitted temperature for the environment and the medium depend on each other. The permitted maximum temperatures of the device versions can be determined from the characteristics of the temperature graph.

The values were determined under the following maximum operating conditions: Orifice DN32 when 100% duty cycle at 16 bar medium pressure.

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

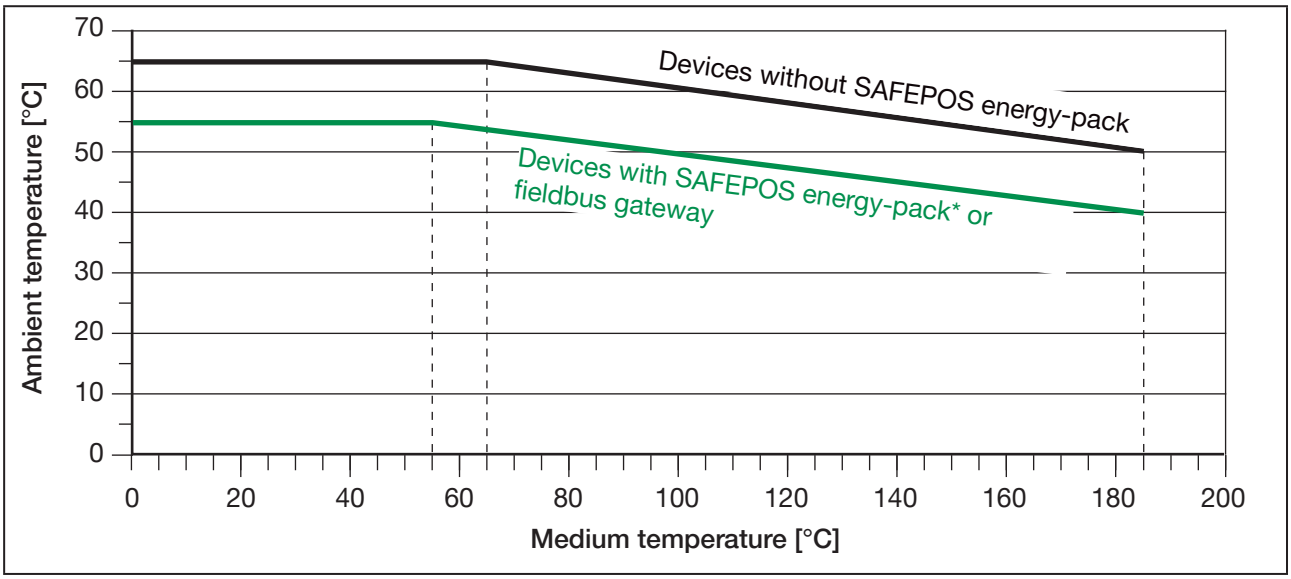



*Figure 10: Temperature graph*

* 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)"

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## 8.6 General technical data

| | | |
|---|---|---|
| Dimensions: | See data sheet | |
| Weight: | See data sheet | |
| Materials | Actuator: | PPS and aluminum powder-coated |
| | Valve body: | 316L |
| | Body connection: | 316L / 1.4401 |
| | Spindle: | 1.4401 / 1.4404 |
| | Spindle guide: | PEEK |
| | Packing gland | PTFE V-rings with spring compensation (carbon-filled PTFE) |
| Seal material | Sealing element actuator housing: | EPDM |
| | Valve seat seal: | See type label |
| Fluid connection<br>Possible connection types: | Socket connection G ½...G 2 (NPT, RC on request)<br>Welded connection according to EN ISO 1127 (ISO 4200), DIN 11850 Series 2<br><br>Also for globe valves of Type 3321:<br>Flanged connection in accordance with DIN 2634, ANSI B16.5 class 150, JIS 10K<br><br>Other connections on request | |
| Electrical connection: | By connection terminals or circular plugs | |
| Installation position: | Any position, preferably with actuator facing up | |

## 8.7 Electrical data

**WARNING!**

**Electric shock.**

Protection class III is only guaranteed if a SELV power supply unit or PELV power supply unit is used.

| | | |
|---|---|---|
| Protection class: | 3 according to DIN EN 61140 (VDE 0140) | |
| Electrical connections: | Cable gland, 2x M20 or<br>2 circular plug-in connectors M12, 5-pin and 8-pin | |
| Operating voltage: | 24 V ⎓ ± 10 % max. residual ripple 10 % | |
| Operating current [A]*: | max. 3 A<br>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 W | |
| Average consumption<br>Electronics without actuator [W]*: | standard consumption<br>SAFEPOS energy-pack | typically 3 W<br>0.5 W |

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Energy consumption actuator
for 1 cycle [Ws]*: (see following graphs)

* All values refer to a supply voltage of 24 V ⎓ at 25 °C.

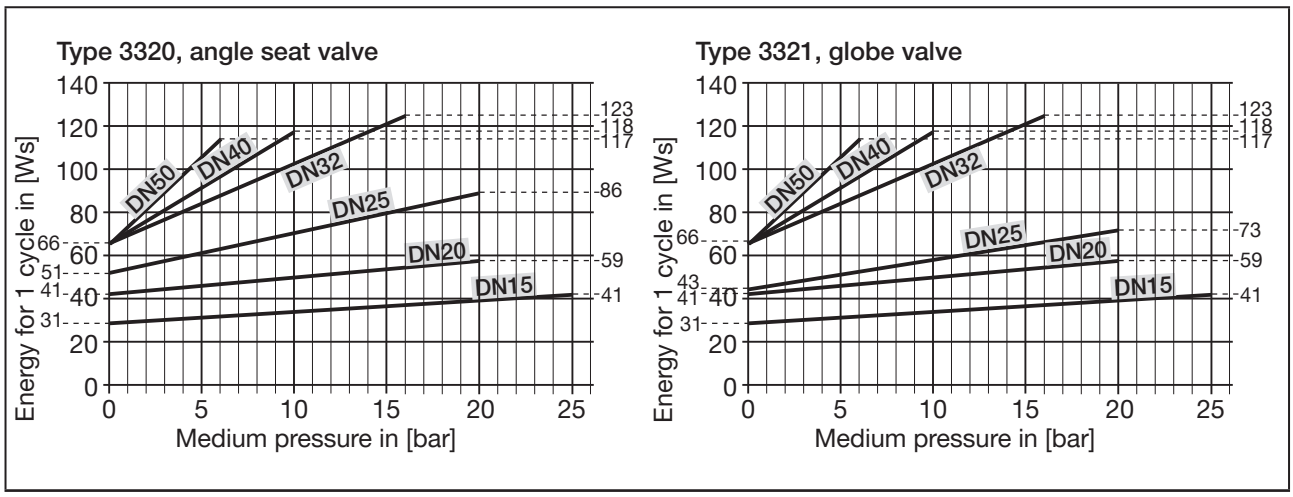



*Figure 11: Energy consumption of actuator*

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 5 years was determined under the following conditions:

| | |
|---|---|
| Ambient temperature | 30 °C |
| Medium temperature | 165 °C |
| Duty cycle | 100% |
| Medium pressure | 5 bar |
| Orifice | DN32 |

**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.

**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:** Connection to PC via USB büS interface set

**Communications software:** Bürkert Communicator

The digital outputs are not galvanically isolated for the operating voltage. They refer to the operating voltage GND.

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

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## 8.8 Kv values for Types 3320 and 3321

Kv value water [m³/h]
Flow-rate factor: Measurement at +20 °C, 1 bar pressure at valve input and free output.

| Seat diameter | Kv value water [m³/h] for underseat valve | Cv value (gal/min) for underseat valve |
|---|---|---|
| 15 | 5 | 5.8 |
| 20 | 11 | 12.7 |
| 25 | 18 | 20.8 |
| 32 | 31 | 35.8 |
| 40 | 42 | 48.6 |
| 50 | 62 | 71.7 |

*Table 6: Kv values for Type 3320*

| Seat diameter | Kv value water (m³/h) for underseat valve | Cv value (gal/min) for underseat valve |
|---|---|---|
| 15 | 4.7 | 5.4 |
| 20 | 8.1 | 9.4 |
| 25 | 13 | 15.0 |
| 32 | 18.1 | 20.9 |
| 40 | 31 | 35.8 |
| 50 | 45 | 52.0 |

*Table 7: Kv values for Type 3321*

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# 9 INSTALLATION OF THE VALVE

## 9.1 Safety instructions

**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 of devices with socket or flanged connection

**ATTENTION!**

**Damage to valve body, seat seal or diaphragm.**

- To prevent damage, the device must be in the MANUAL operating state during installation. Devices are delivered with the MANUAL operating state preset.

**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.

### 9.2.1 Installation requirements

**Installation position:** any position; preferably with actuator facing up.

**Direction of flow:** is specified on the rating plate by an arrow and the numbers 1 and 2.
The 1 and the 2 stand for identification also on the valve body.
The incoming flow is under the seat.

**Pipelines:** Ensure that the pipelines are aligned.

**Filter:** Required for devices with approval in accordance with EN 161.
In accordance with DIN EN 161 "Automatic Shut-off Valves for Gas Burners and Gas Appliances", a strainer must be installed upstream of the valve in the pipeline to prevent a 1 mm test pin from penetrating.

**Preparation:** Clean pipelines (sealing material, swarf, etc.).

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### 9.2.2 Installation

**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.

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

**Holding device**
To protect the valve actuator from damage due to forces and oscillations, a holding device is recommended. This is available as an accessory. See chapter "20 Accessories, spare parts".

## 9.3 Installation of devices with welded housing

**ATTENTION!**

**Damage to valve body, seat seal or diaphragm.**

▸ To prevent damage, the device must be in the MANUAL operating state during installation.
Devices are delivered with the MANUAL operating state preset.

**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.

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

1. Prepare removal of the actuator.
2. Remove the actuator.
3. Weld valve body into the pipeline.
4. Mount actuator on the valve body.

### 9.3.1 Preparing removal of the actuator

**ATTENTION!**

**Damage to valve body, seat seal or diaphragm.**

To prevent damage, the valve must be open when removing the actuator.

→ If the valve is closed: Open the valve using the mechanical manual control. See chapter "15.2 Actuating valve mechanically" on page 63.

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**WARNING!**

**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.
- Keep clear of the openings in the valve body.

## 9.3.2 Removing the actuator

→ Clamp the valve body into a holding fixture.

→ Place a suitable open-end wrench on the body connection.
⚠ Do not unscrew the body connection with a tool which could damage the body connection.

→ Unscrew the actuator off the valve body.

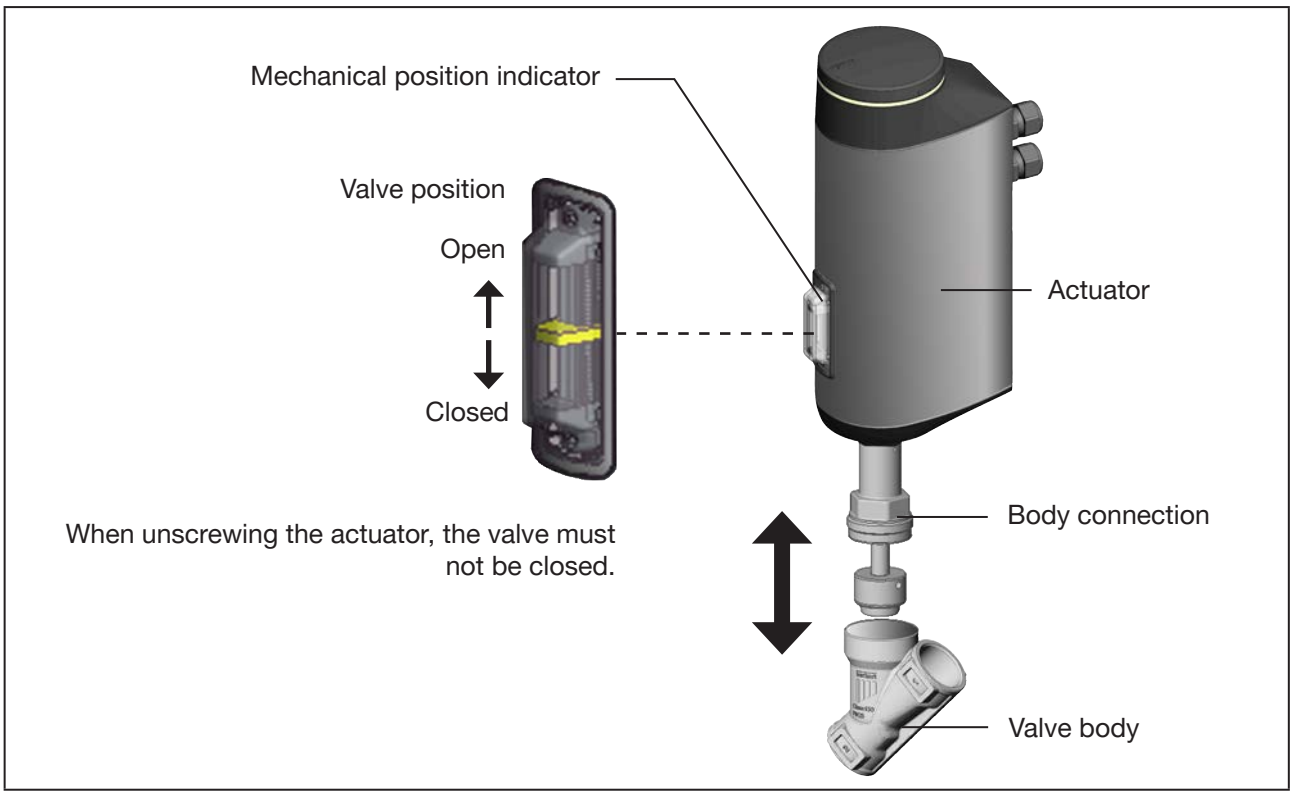



*Figure 12: Installation of electromotive actuator (angle seat valve shown in the example)*

## 9.3.3 Installation requirements

**Installation position:** Any position

**Direction of flow:** is specified on the rating plate by an arrow and the numbers 1 and 2.
The 1 and the 2 stand for identification also on the valve body.
The incoming flow is under the seat.

**Pipelines:** Ensure that the pipelines are aligned.

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**Filter:** Required for devices with approval in accordance with EN 161.
In accordance with DIN EN 161 "Automatic Shut-off Valves for Gas Burners and Gas Appliances", a strainer must be installed upstream of the valve in the pipeline to prevent a 1 mm test pin from penetrating.

**Preparation:** Clean pipelines (sealing material, swarf, etc.).

### 9.3.4 Welding valve body into the pipeline

**DANGER!**

**Risk of injury from high pressure!**

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

**ATTENTION!**

**Damage to the electronics of the actuator by the effect of heat.**

• Before welding in the valve body, remove the actuator.

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

### 9.3.5 Mounting actuator on the valve body

→ ⚠ Before mounting the actuator, check whether the graphite seal of the valve body is available and undamaged.

→ Replace damaged or missing graphite seal.

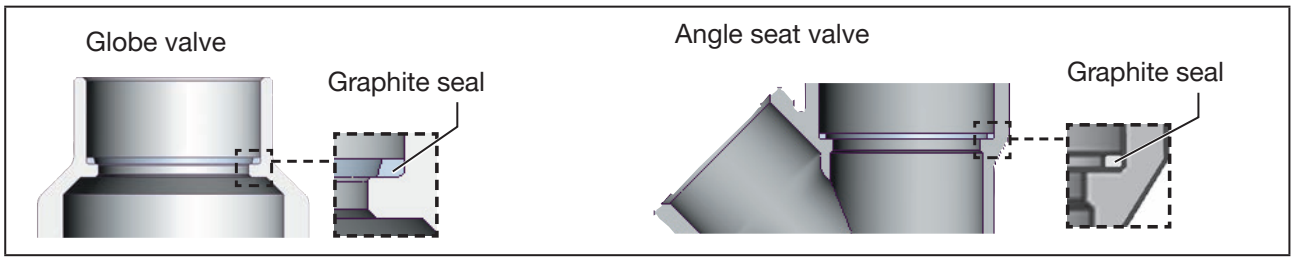



*Figure 13: Graphite seal of the valve body*

**DANGER!**

**Danger if incorrect lubricants used.**

Unsuitable lubricant may contaminate the medium. In oxygen applications there is a risk of an explosion.

▸ Only use approved lubricants for specific applications, such as oxygen or analytical applications.

→ If required, grease the external thread of the body connection (e.g. with Klüber paste UH1 96-402 from Klüber).

→ Place the external thread on the internal thread of the body connection. See "Figure 12: Installation of electromotive actuator (angle seat valve shown in the example)".



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→ Place a suitable open-end wrench on the body connection.
⚠ Do not screw on the body connection with a tool which could damage the body connection (e.g. pipe wrench).

**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.

→ Screw actuator onto the valve body.

| Orifice connection (valve body) [DN] | Tightening torque for body connection | |
|---|---|---|
| | [Nm] | [lbf ft] |
| 10/15 | 45 ±3 | 33 ±2 |
| 20 | 50 ±3 | 37 ±2 |
| 25 | 60 ±3 | 44 ±2 |
| 32 | 65 ±3 | 48 ±2 |
| 40 | | |
| 50 | 70 ±3 | 52 ±2 |
| 65 | 100 ±3 | 74 ±2 |
| 80 | 120 ±5 | 89 ±2 |
| 100 | 150 ±5 | 111 ±2 |

*Table 8: Tightening torques for body connection*

**Holding device**
To protect the valve actuator from damage due to forces and oscillations, a holding device is recommended. This is available as an accessory. See chapter "20 Accessories, spare parts".

## 9.3.6 After installation

→ Connect the device electrically.

The position of the connections can be aligned by rotating the actuator through 360°. For description see chapter "9.4 Rotating the actuator".

A description of the electrical connection can be found in chapter "10 Electrical installation".

**ATTENTION!**

**Damage to valve body, seat seal or diaphragm.**

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

→ Run X.TUNE function to adjust the end position. See chapter "11.4 Adjusting the position control – running the X.TUNE" on page 46.

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## 9.4 Rotating the actuator

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

**ATTENTION!**

**Damage to the seat seal and seat contour when valve is closed.**

If the valve is closed when the actuator is rotated, the seat seal and the seat contour may be damaged.

- If the valve is closed: Before rotating the actuator, open the valve using the mechanical manual control. For description see "15.2 Actuating valve mechanically".

→ 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 clockwise and move it into the required position.

If the actuator can be rotated only counter-clockwise for installation reasons, observe the following safety warning:

**WARNING!**

**Risk of injury due to discharge of medium and pressure release.**

If the actuator is rotated counter-clockwise, the body connection may become detached.

- ▸ When rotating the actuator counter-clockwise, counter with a 2nd open-end wrench on the hexagon of the body connection.

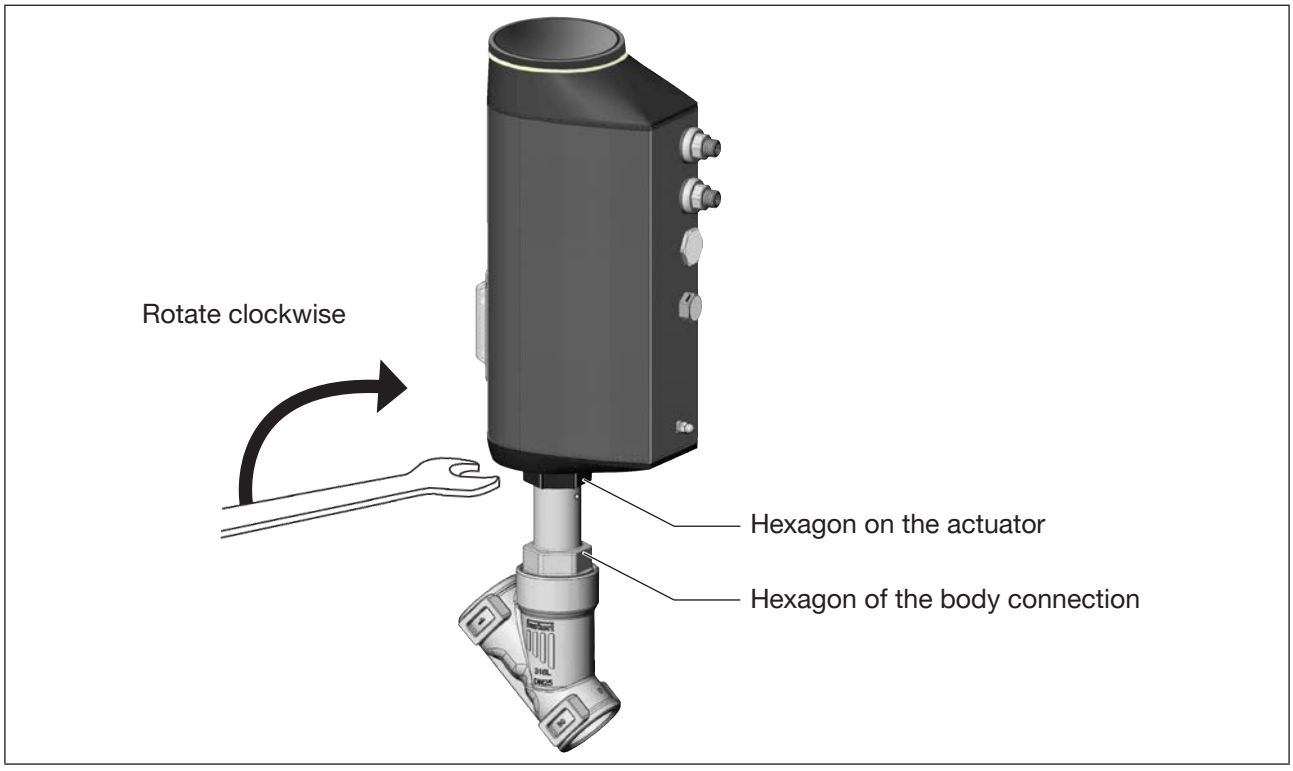



*Figure 14: Rotating the actuator*

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## 9.5 Holding device

The holding device is used to protect the valve actuator from damage due to forces and oscillations. The holding device is available as an accessory in 2 sizes.
See chapter "20 Accessories, spare parts".

### 9.5.1 Attaching the holding device

→ Attach holding device to the pipe between valve body and actuator as shown in the diagram.

If there is a relief bore:

**ATTENTION!**

Ensure that the relief bore, which is used to detect leaks, is not covered.

→ Fix the holding device in place using suitable means.

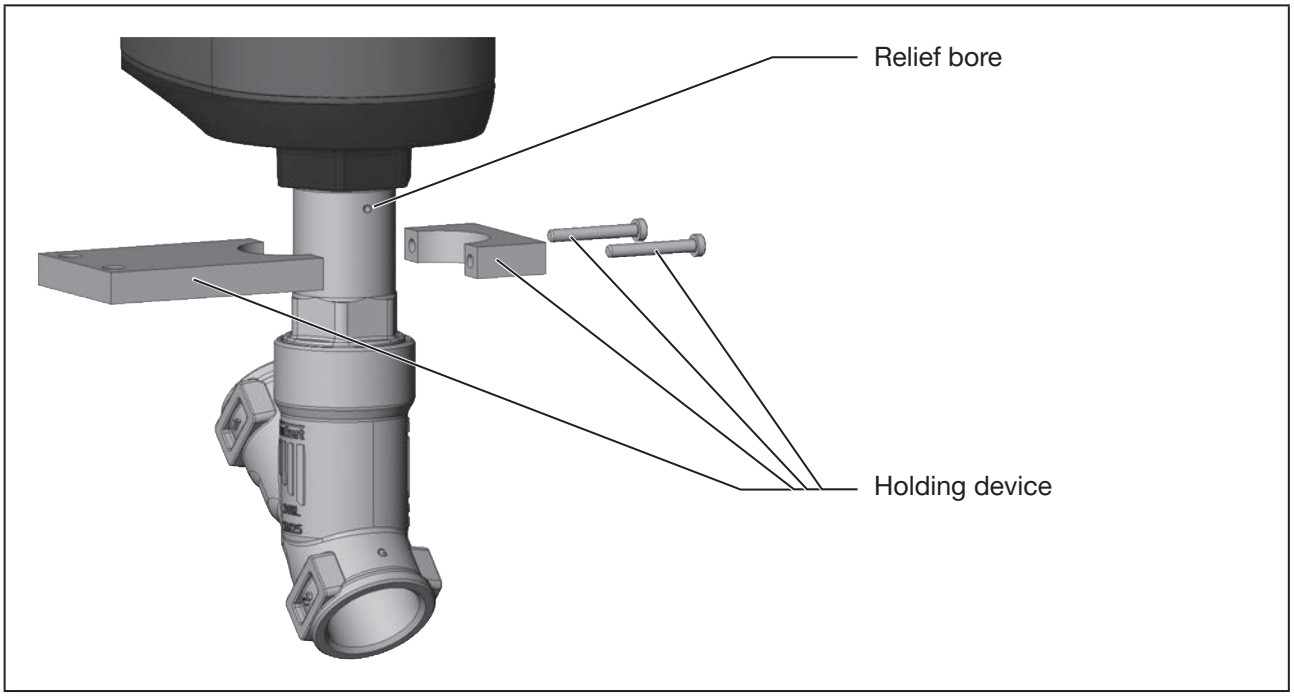



*Figure 15: Attaching the holding device*

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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

### 10.1.1 Safety instructions

**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 Starting up".

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## 10.1.2 Description of the circular plug-in connectors

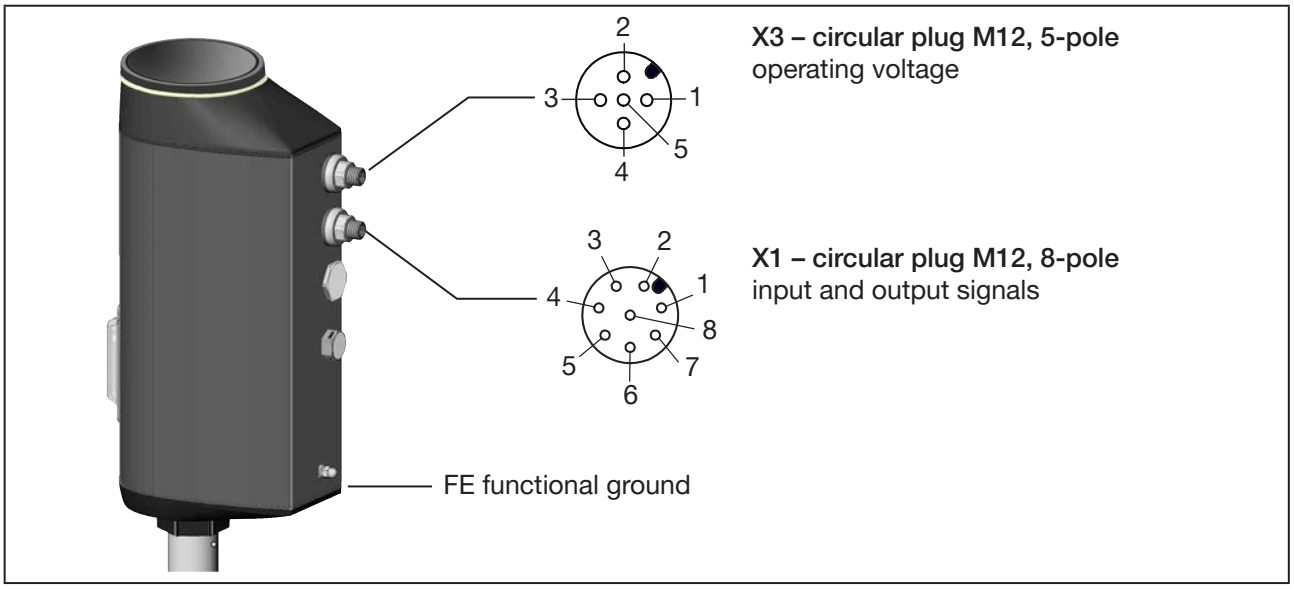



*Figure 16: Description of the circular plug-in connectors*

## 10.1.3 X1 – M12 circular plug, 8-pole

| 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 9: X1 – M12 circular plug, 8-pole*

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### 10.1.4 X3 – M12 circular plug, 4-pole or 5-pole, operating voltage

| Pin | Wire color | | Assignment (from point of view of the device) |
|---|---|---|---|
| | without büS network 4-pole connection* | with büS network | |
| 1 | - | CAN shield | |
| 2 | white | red | 24 V ⎓ ± 10 %<br>max. residual ripple 10 % |
| 3 | blue | black | GND / CAN_GND |
| 4 | - | white | CAN_H |
| 5 | - | blue | CAN_L |
| * *The indicated wire colors refer to the M12 connection cable, 4-pole, part no. 918038, available as an accessory.* | | | |

*Table 10: X3 – M12 circular plug, 4-pole or 5-pole, operating voltage*

**Electrical installation with or without büS network:**
To be able to use the büS network (CAN interface), a 5-pole circular plug and a shielded 5-wire cable must be used.

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

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## 10.2 Electrical installation with cable gland

### 10.2.1 Safety instructions

**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.

### 10.2.2 Access to the connection terminals

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

**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.

**1. Removing dummy cover:**

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

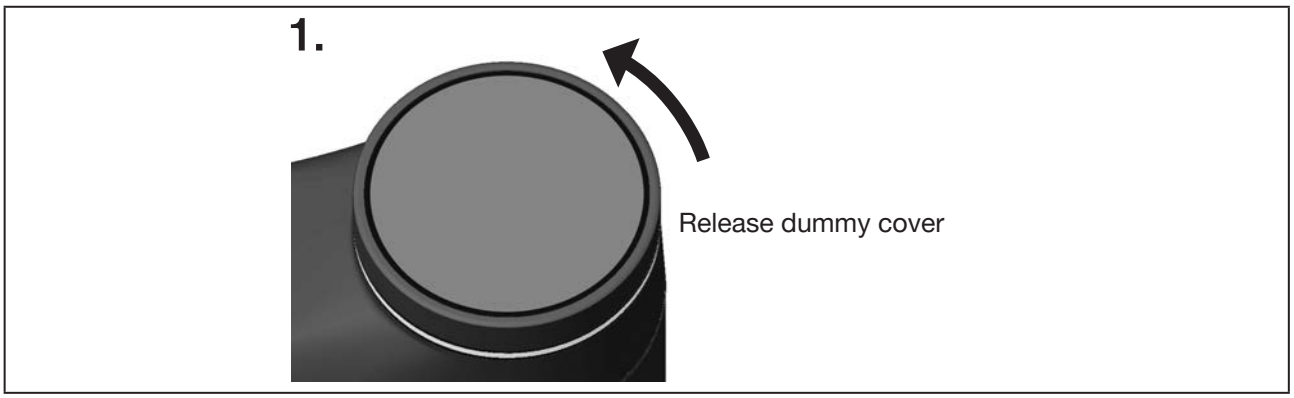



*Figure 17: Removing dummy cover*

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**2. Removing LED and storage module:**

→ Remove the 2 fastening screws (hexagon head key, width across flats 3 mm).

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

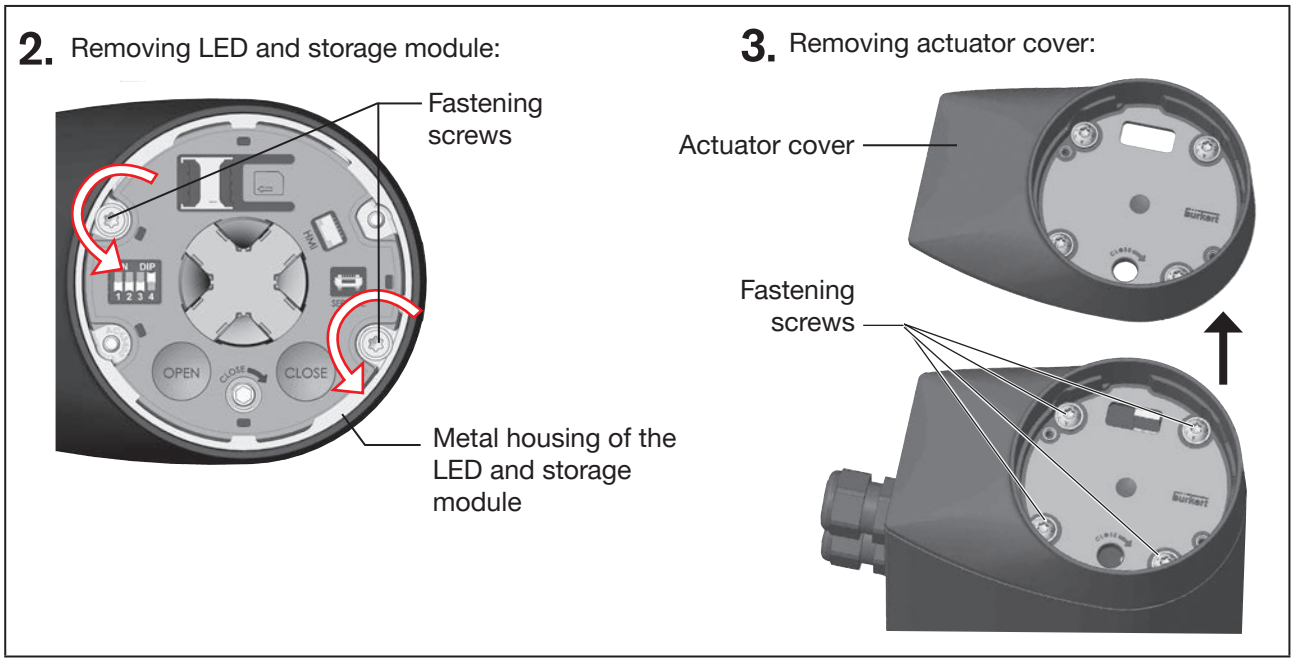



*Figure 18: Remove LED and storage module and remove actuator cover*

**3. Removing actuator cover:**

→ Loosen the 4 fastening screws (T25 hexagonal 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.

## 10.2.3 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 43.

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

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**ATTENTION!**

**Damage or malfunction due to ingress of dirt and moisture.**

To comply with the degree of protection IP65:

- 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).

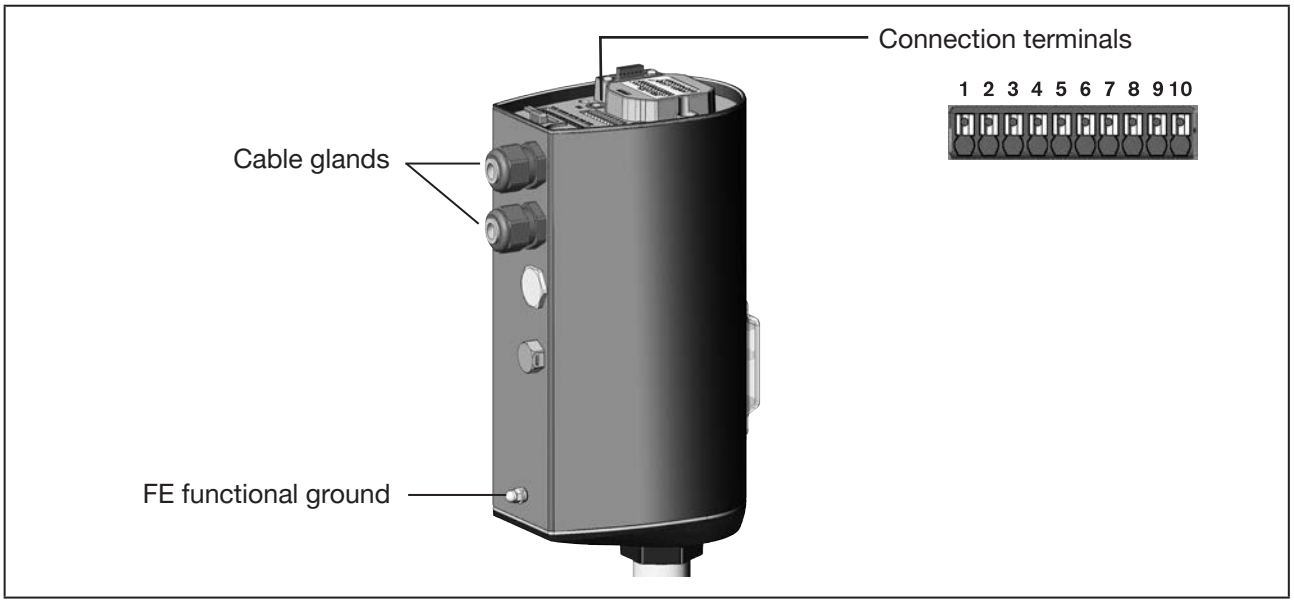



*Figure 19: Connecting the cables*

→ Connect the device according to the tables.

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### 10.2.4 Terminal assignment – input signal from the control center (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 11: Terminal assignment – input signal from the control center (e.g. PLC)*

### 10.2.5 Terminal assignment – operating voltage and büS network

| Terminal | Assignment (from point of view of the device) |
|---|---|
| | CAN shield |
| 10 | 24 V ⎓ ± 10 %<br>max. residual ripple 10 % |
| 9 | GND |
| 1* | CAN_GND<br>⚠ Do not connect unless a separate line is used for CAN. |
| 2* | CAN_H |
| 3* | CAN_L |

*Table 12: Terminal assignment – operating voltage and büS network*

*** Electrical installation of büS network:**
Terminals 1, 2 and 3 (CAN interface) are for the connection of the büS network.
Terminal 1 is bridged internally with terminal 9, but is not designed for the operating voltage.

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## 10.2.6 Closing the device

**ATTENTION!**

**Damage or malfunction due to ingress of dirt and moisture.**

Before closing the device, comply with the degree of protection IP65 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.

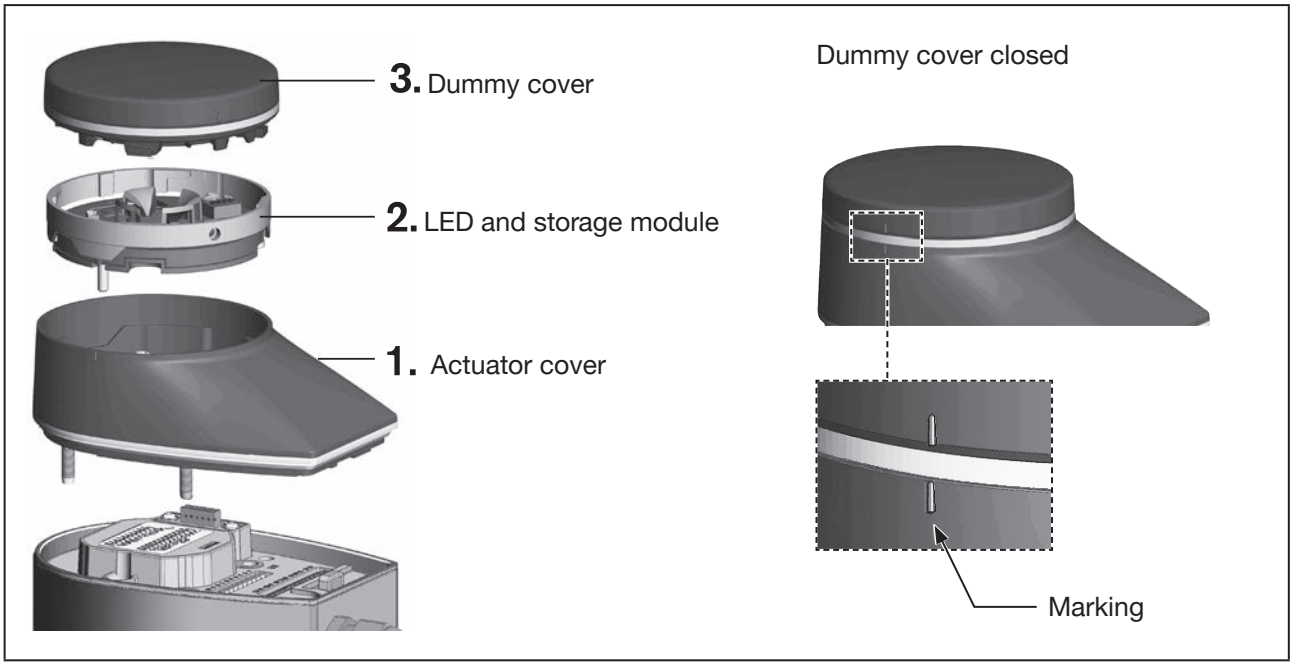



*Figure 20: Closing the device*

**1. Attaching the actuator cover**

→ Place actuator cover on the actuator housing.

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

**2. Inserting LED and storage module**

→ Insert LED and storage module and fix with the 2 fastening screws (tightening torque: 1.1 Nm (0.8 lbf ft)).

**3. Closing device with dummy cover**

→ Fit the dummy cover and turn clockwise until the marking at the edge is directly over the marking for the drive cover.

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

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# 11 STARTING UP

## 11.1 Safety instructions

**WARNING!**

**Risk of injury from improper operation!**

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

- 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/the device.

## 11.2 Basic settings

| Type of base setting (observe sequence) | | Factory presetting |
|---|---|---|
| 1. | Setting effective direction | NC (normally closed) |
| | Activate or deactivate safety position | activated |
| 2. | Adjusting the position control (X.TUNE function) | executed |
| 3. | Set operating state to AUTOMATIC | MANUAL |

*Table 13: Overview: Basic settings of the electromotive 2/2-way valve*

**ATTENTION!**

**Observe for devices which were removed for installation.**

If the actuator was removed, the X.TUNE function must be run again before starting up. See chapter "11.4 Adjusting the position control – running the X.TUNE"

- The device must be in the MANUAL operating state.

## 11.3 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 14: Setting effective direction and safety position*

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## 11.4 Adjusting the position control – running the X.TUNE

When the X.TUNE function is running, the electromotive actuator is adjusted to the physical stroke of the actuator used.

**Devices are delivered with the X.TUNE function run at the factory.**

**ATTENTION!**

**Do not run X.TUNE without a mandatory requirement.**

The X.TUNE function is necessary when changing the valve body or removing the actuator for installation.

**WARNING!**

**Danger due to uncontrolled process after running the X.TUNE function.**

When the X.TUNE is running under medium pressure, the actuator will be incorrectly adjusted. This will result in an uncontrolled process.

- Never run the X.TUNE under medium pressure.
- Secure system against unintentional activation.

### 11.4.1 Adjustment using the buttons in the device

The 2 buttons for running the X.TUNE are located under the dummy cover.

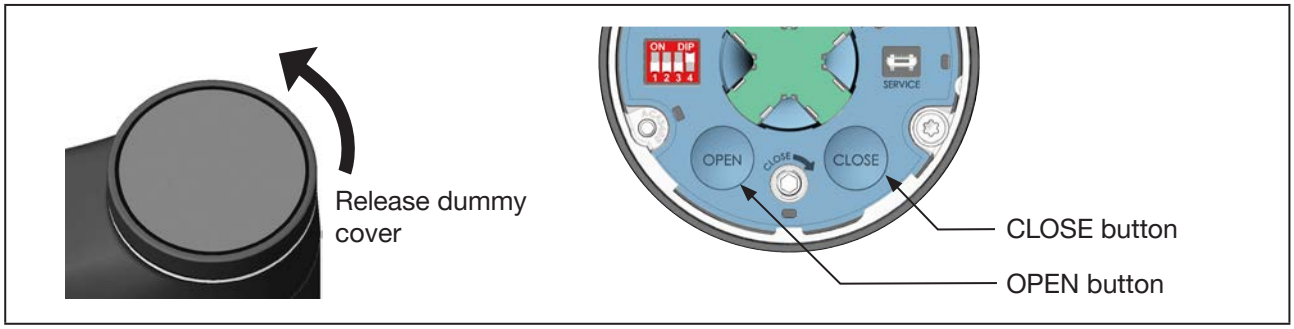



*Figure 21: Adjusting the position control using the buttons in the device*

**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.

**Running the X.TUNE function:**

⚠ Ensure that no medium pressure is applied.
Do not run the X.TUNE unless it is absolutely essential.

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

When the X.TUNE is running, the LED illuminated ring is lit orange.

When the X.TUNE ends, the LED illuminated ring is reset to its previous status.

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### 11.4.2 Adjustment of the position control on the PC

The setting is made on the PC via the büS service interface and by using the "Bürkert Communicator" PC software. To do this, the USB büS interface set, available as an accessory, is required.

To run the X.TUNE function, you must change to the detailed view maintenance for position controller.

**Switch to the detailed view as follows:**

→ Select **Position controller**.

→ Switch to **MAINTENANCE**.

✓ You are in the detailed view maintenance.

**Running the X.TUNE function:**

⚠ Ensure that no medium pressure is applied.

→ Select **CALIBRATION**.

→ Select **X.TUNE**.

The following text appears: "Choose seal material (see type label)!"

→ Choose seal material.

The following question appears: "Do you really want to start the X.TUNE?"
⚠ Do not confirm the question unless it is absolutely essential to run the X.TUNE.

→ Start X.TUNE.

✓ The X.TUNE function is running.

If the X.TUNE is canceled due to an error, a message appears (see table below).

| Possible messages when X.TUNE is canceled | Description |
|---|---|
| There are device errors. | There is an error which is preventing X.TUNE from running. |
| Time limit exceeded. | The X.TUNE could not be run within the time limit due to an error. |
| Motor current is too high. | The motor current is too large for running the X.TUNE function. |
| Lower end position of the valve is not detected. | The lower end position of the valve cannot be detected by the position sensor. |

*Table 15: Possible error message following cancellation of the X.TUNE function*

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## 11.5 Setting AUTOMATIC operating state

Setting AUTOMATIC operating state:

→ Set DIP switch 4 to AUTOMATIC.

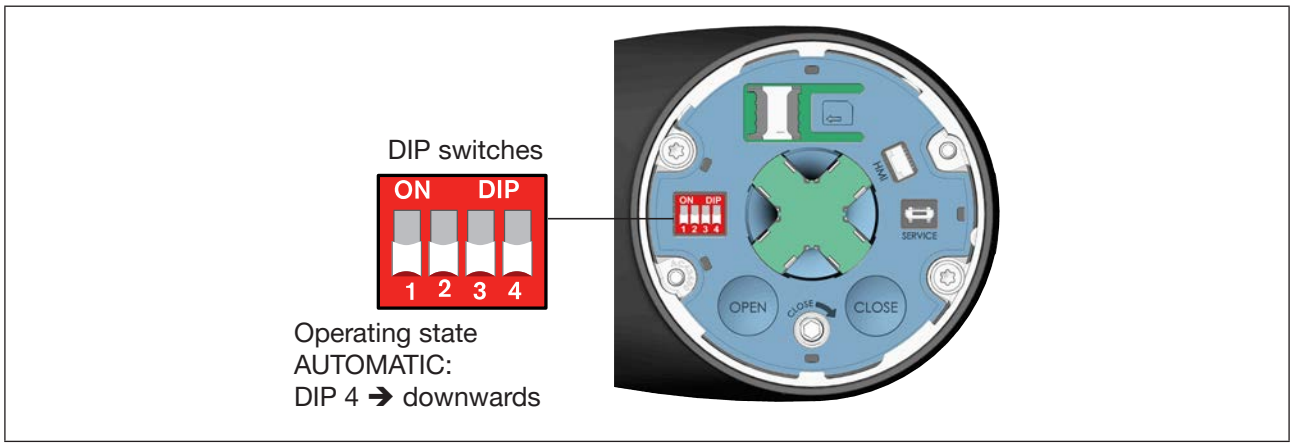



*Figure 22: Setting AUTOMATIC operating state*

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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 its environment.

- ▸ 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/the device.

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

- **Standard devices**
  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" PC 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 16: Operating options*

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## 12.2 Display elements

**Representation of the display elements:**

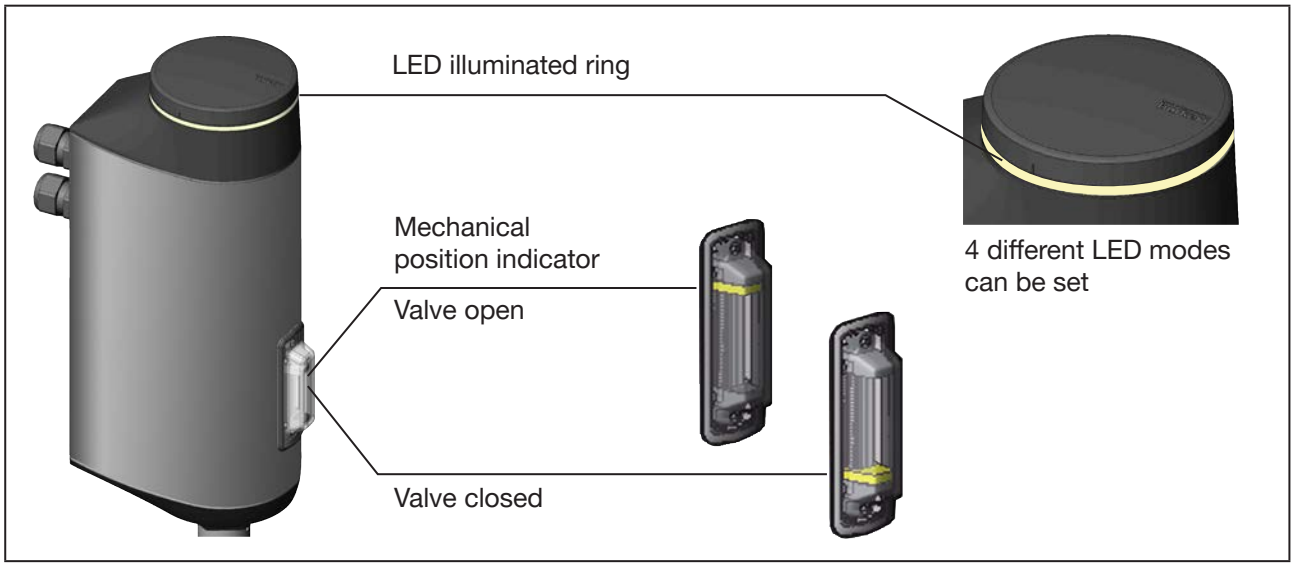



*Figure 23: Display elements*

### 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 color or in alternating colors.

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

The LED modes are set using the Bürkert Communicator PC software . For a description, see chapter "14.3 Setting LED mode" on page 60.

* A complete description of the device statuses, errors and warnings, which are displayed in LED mode, can be found in chapter "6.4 Display of the device status".

### 12.2.2 Mechanical position indicator

The valve position can be read off on the mechanical position indicator even if the supply voltage fails (see "Figure 23: Display elements")

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## 12.3 Operating elements

**Representation of the operating elements:**

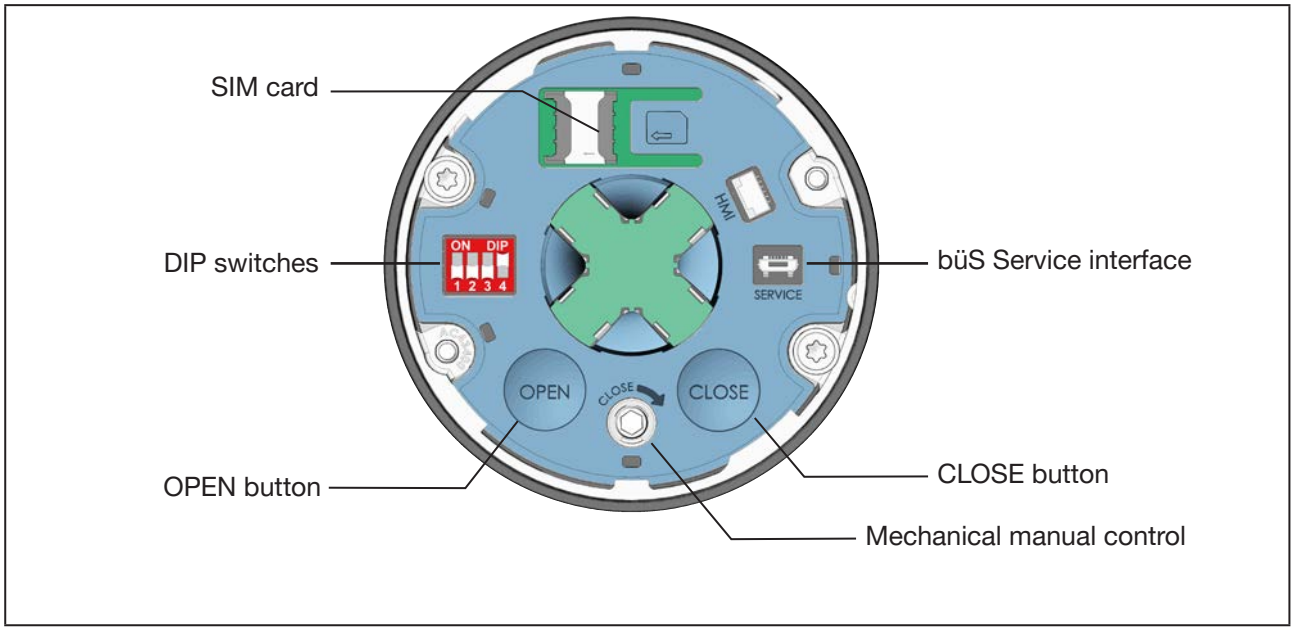



*Figure 24: Operating elements*

### 12.3.1 DIP switches

**Settings**

Switch 1: Activate or deactivate safety position, see chapter "13.2" on page 57.

Switch 2: Select safety position between NO and NC, see chapter "13.2" on page 57.

Switch 3: Not used.

Switch 4: For switching between AUTOMATIC mode and MANUAL mode.
See chapter "13.1" on page 56.

### 12.3.2 OPEN button and CLOSE button

Electrical manual control: Open valve: Press OPEN button
Close valve: Press CLOSE button

Running X.TUNE (Autotune): For description see chapter "11.4 Adjusting the position control – running the X.TUNE".

### 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".

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## 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.
- Parameterizing 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 1: Variants for Types 3320 and 3321" on page 13).

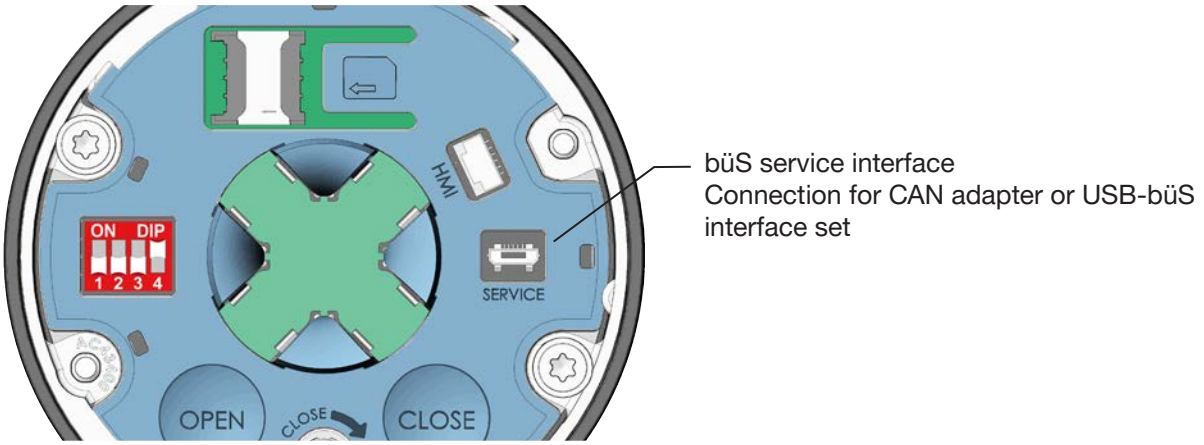



*Figure 25: büS service interface*

For devices with EtherNet/IP the büS Service interface is inside of the fieldbus gateway (see chapter "17.4 Access to the büS service interface" on page 75).

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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 "20 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.

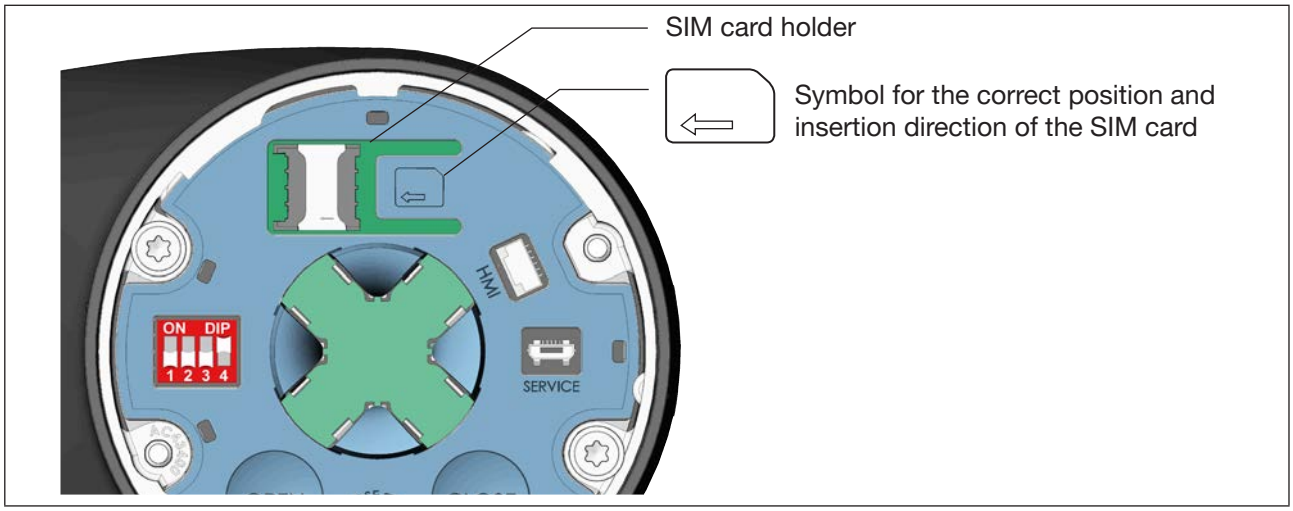



*Figure 26: Inserting the SIM card*

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## 12.6 User interface of the Bürkert Communicator PC software

**View of configuration area:**

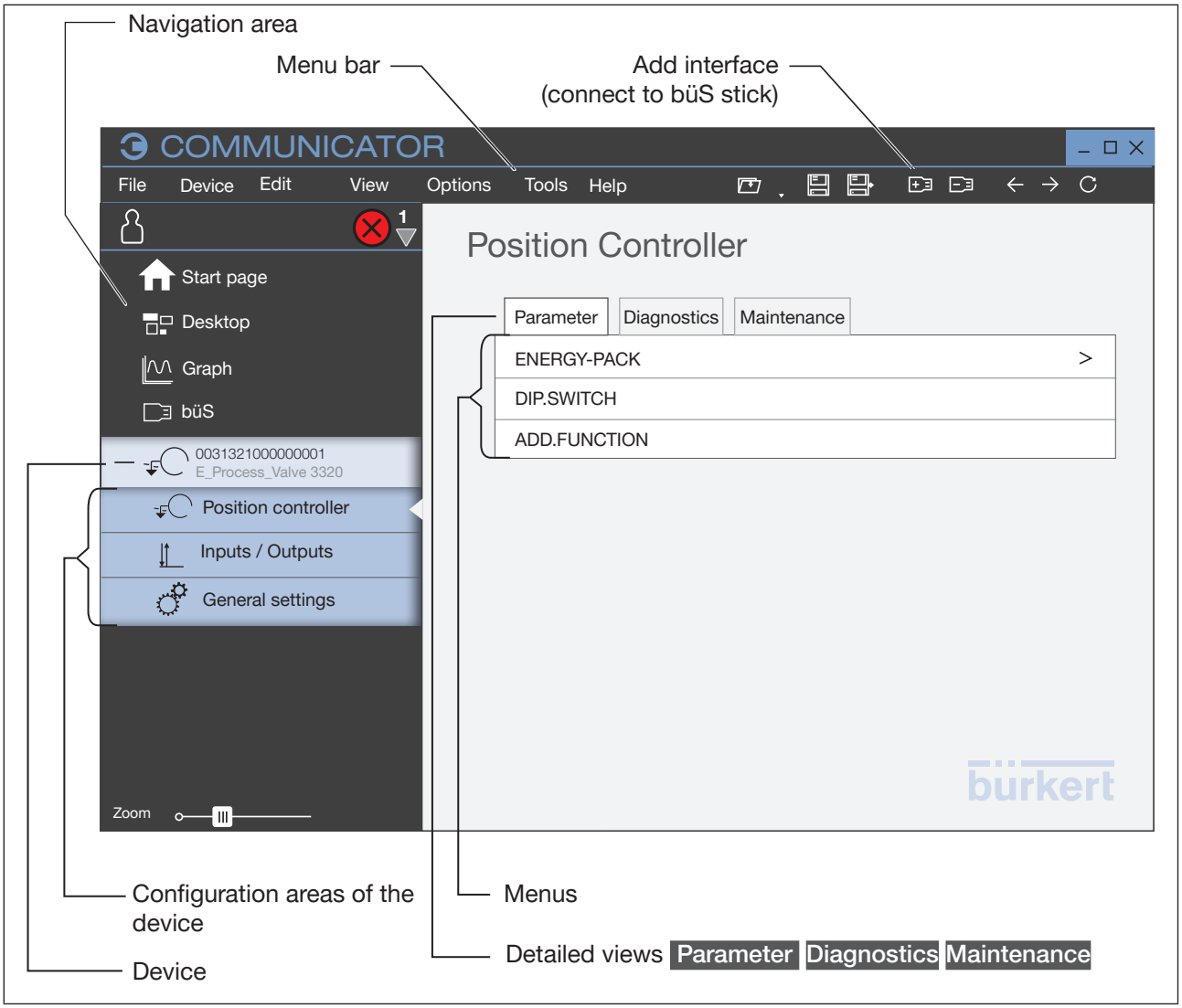



*Figure 27: Bürkert Communicator, view of configuration area*

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View of application area:

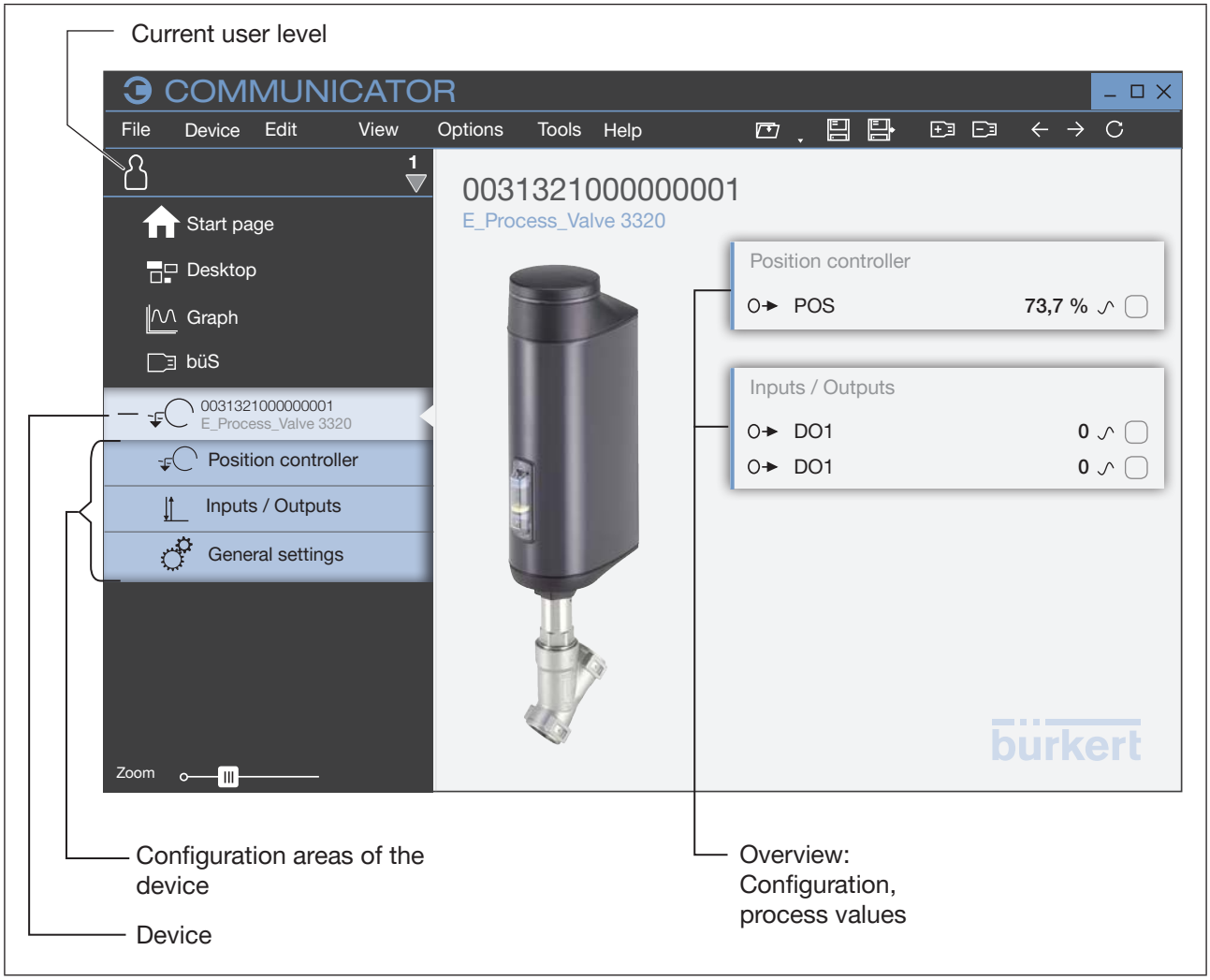



*Figure 28: Bürkert Communicator, view of application area*

## 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 by 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. |

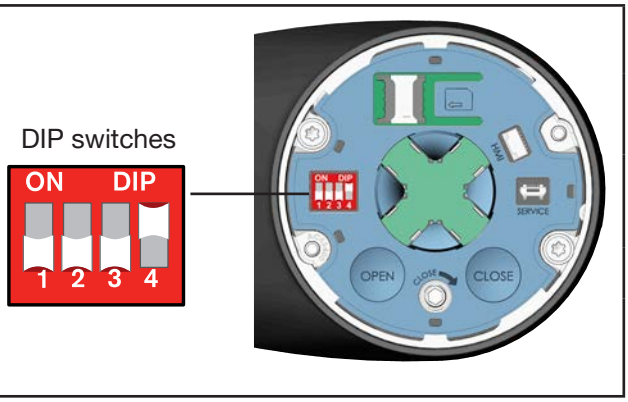



*Table 17: Overview of basic functions*

## 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.

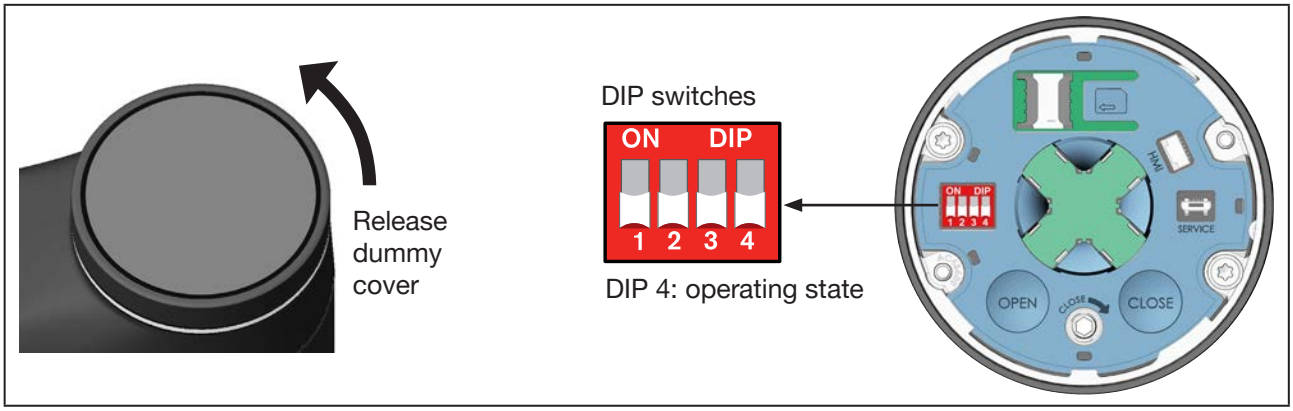
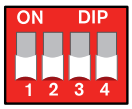



*Figure 29: Setting operating state*

→ Set operating state on DIP switch 4.

|  | Operating state | |
|---|---|---|
| | AUTOMATIC:<br>DIP 4 ➔ downwards | MANUAL:<br>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 | | Schalterstellung (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 18: 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 *X.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 *X.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 *X.TUNE* and 60 s.

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

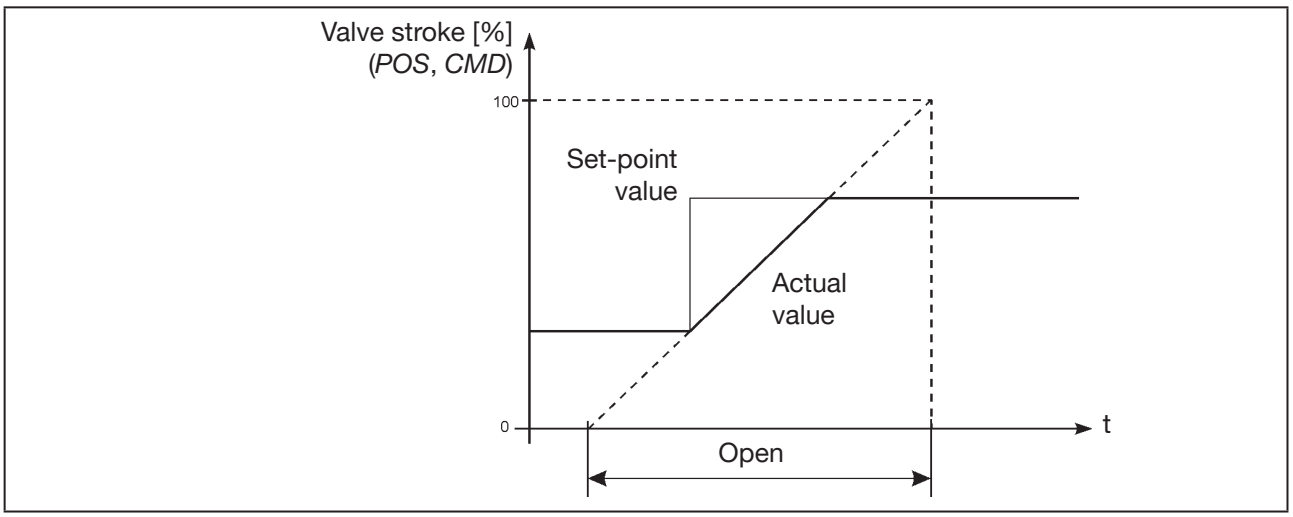



*Figure 30: X.TIME graph*

**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.

**Activating the limit actuating time:**

→ Select **Position controller**.

→ Select **ADD.FUNCTION**.

→ Select **X.TIME**.

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

**Configuring the limit actuating time:**

→ In the detailed view parameter select **X.TIME**.

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→ 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.

## 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 %*

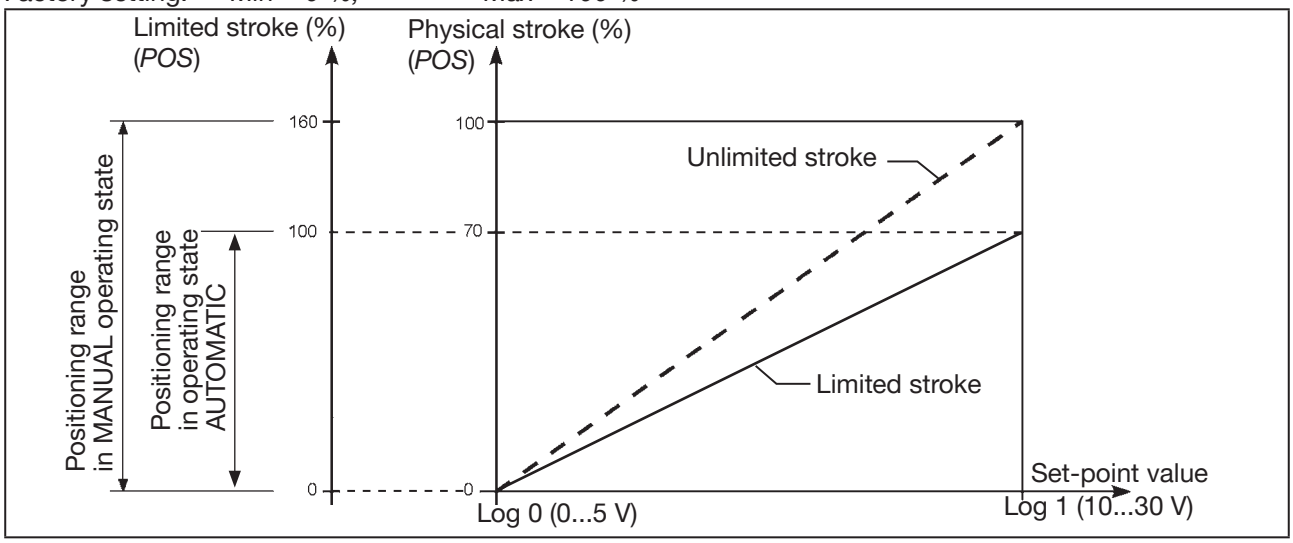



*Figure 31: X.LIMIT graph*

**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.

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

**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.

**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 detailed view parameters for general settings.

**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 colors 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 detailed view parameters for general settings.

**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 is usually used to open and close the valve manually.

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

## 15.1 Actuating valve electrically

The valve is manually and electrically actuated by pressing 2 buttons which are located on the LED and storage module under the dummy cover.

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.

**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.

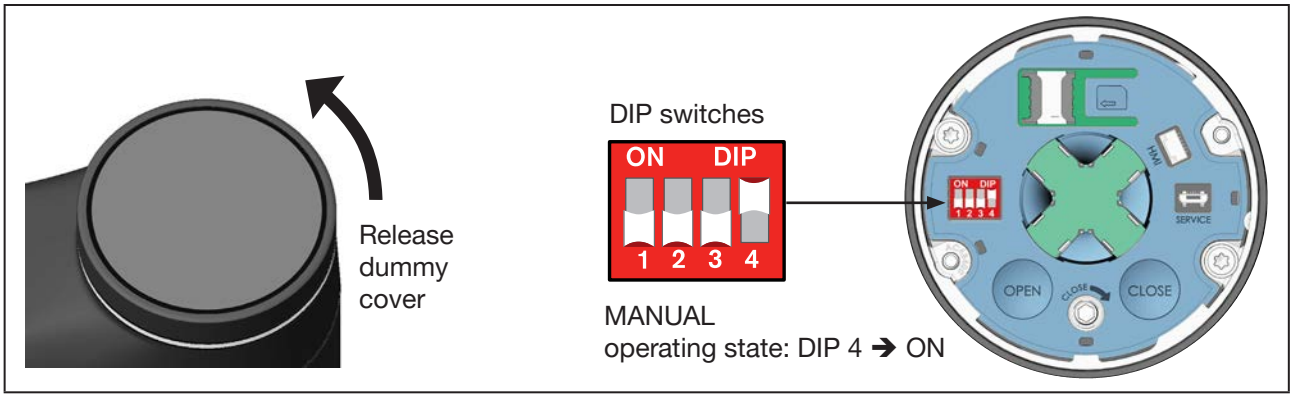



*Figure 32: Setting MANUAL operating state*

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

→ Set DIP switch 4 to ON. The device is now in MANUAL operating state (see "Figure 32").

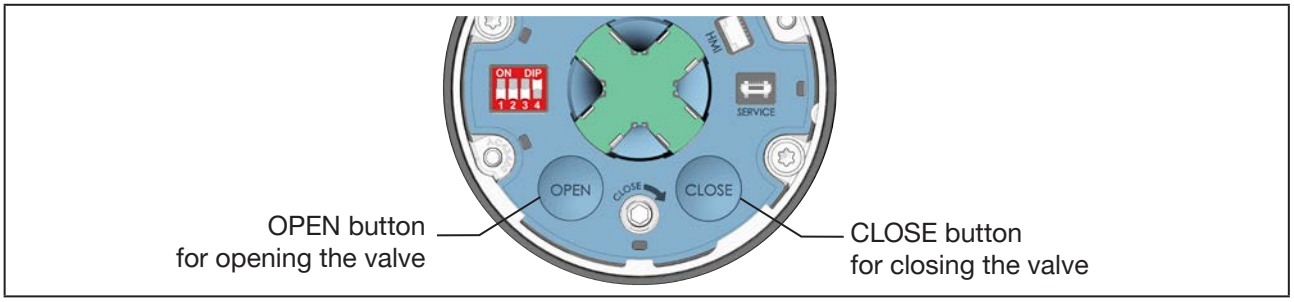



*Figure 33: Electrical manual actuation of devices*

→ Using the OPEN button and CLOSE button, open or close the valve (see "Figure 33").

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

→ Close the dummy cover.

## 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!**

The mechanical manual control may be used in a de-energized state only, otherwise the device may be damaged.

**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.

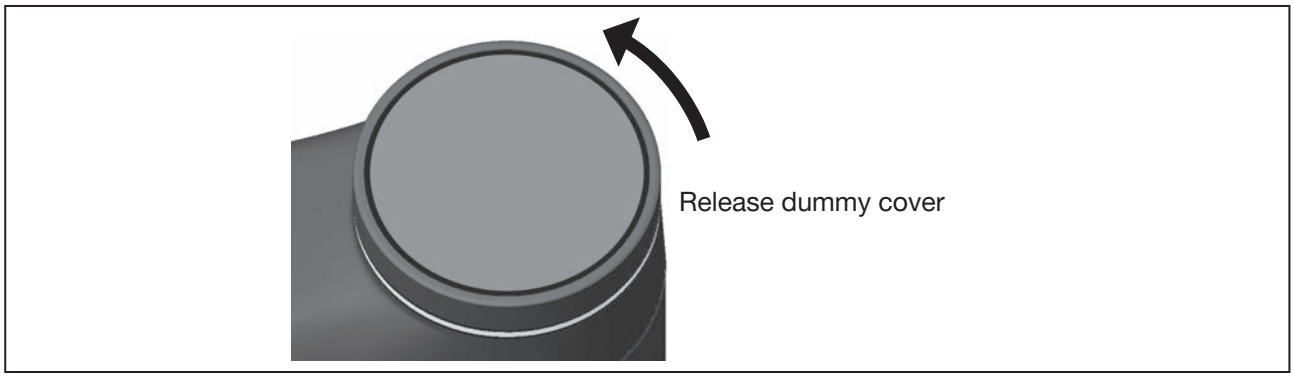



*Figure 34: Removing dummy cover*

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

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

**ATTENTION!**

**Maximum torque 2 Nm (1.5 lbf ft).**
If the torque is exceeded on reaching the valve end position, the mechanical manual control will be damaged.

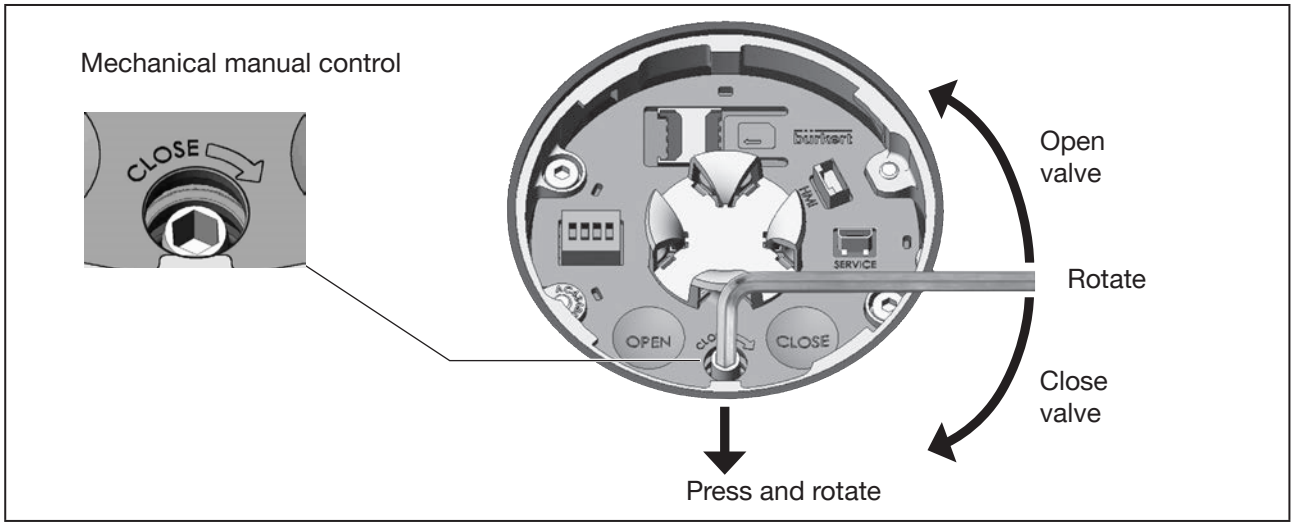



*Figure 35: Mechanical manual control*

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→ Applying a gentle pressure, couple the mechanical manual control and simultaneously turn the Allen key (see "Figure 35").

→ Move valve to the required position.
⚠ Maximum torque 2 Nm (1.5 lbf ft).
Open (rotate counter-clockwise), close (rotate clockwise).

The position indicator indicates when the valve has reached its end positions (see "Figure 36").

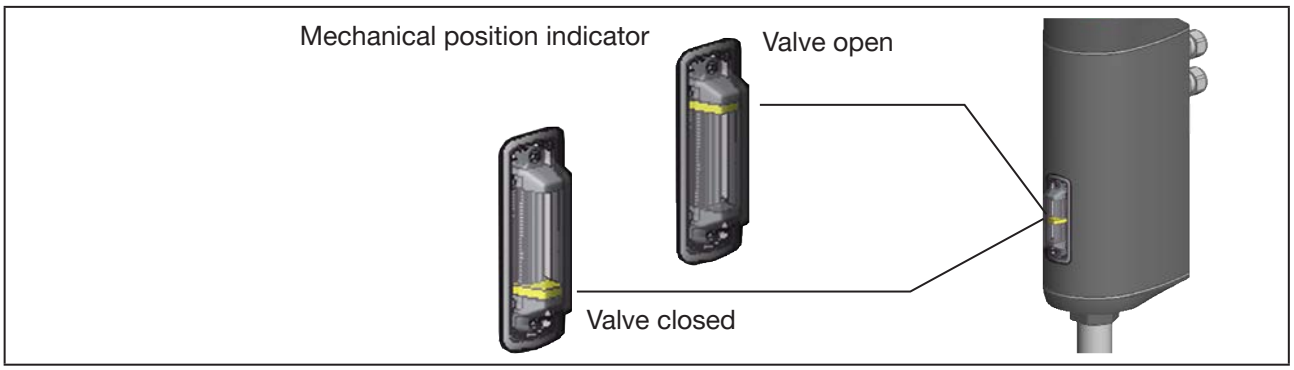



*Figure 36: Mechanical position indicator*

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

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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

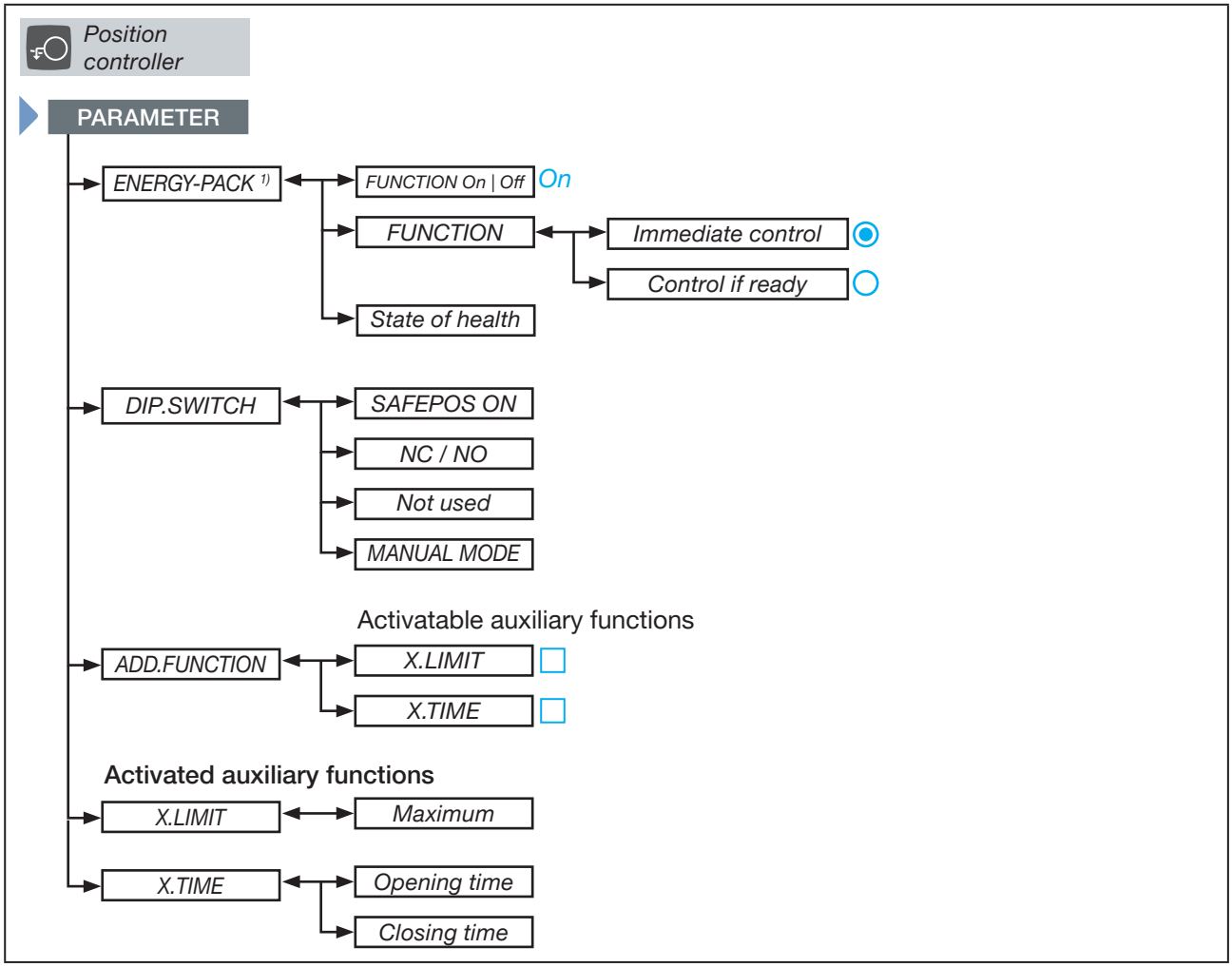



*Figure 37: Operating structure - 1-a, Configuration area position controller*

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

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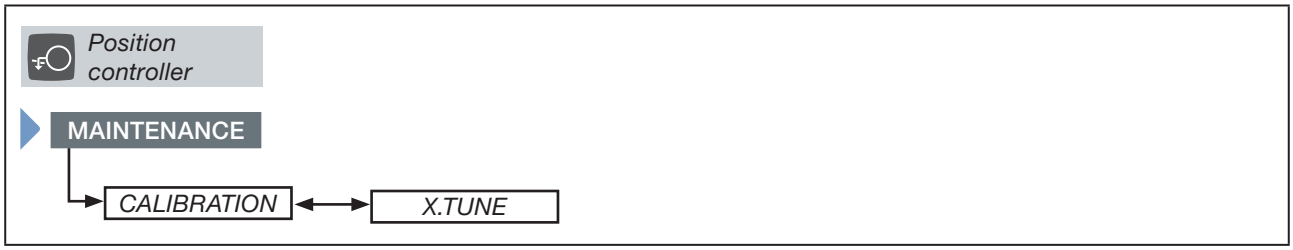



*Figure 38: Operating structure - 1-b, Maintenance position controller*

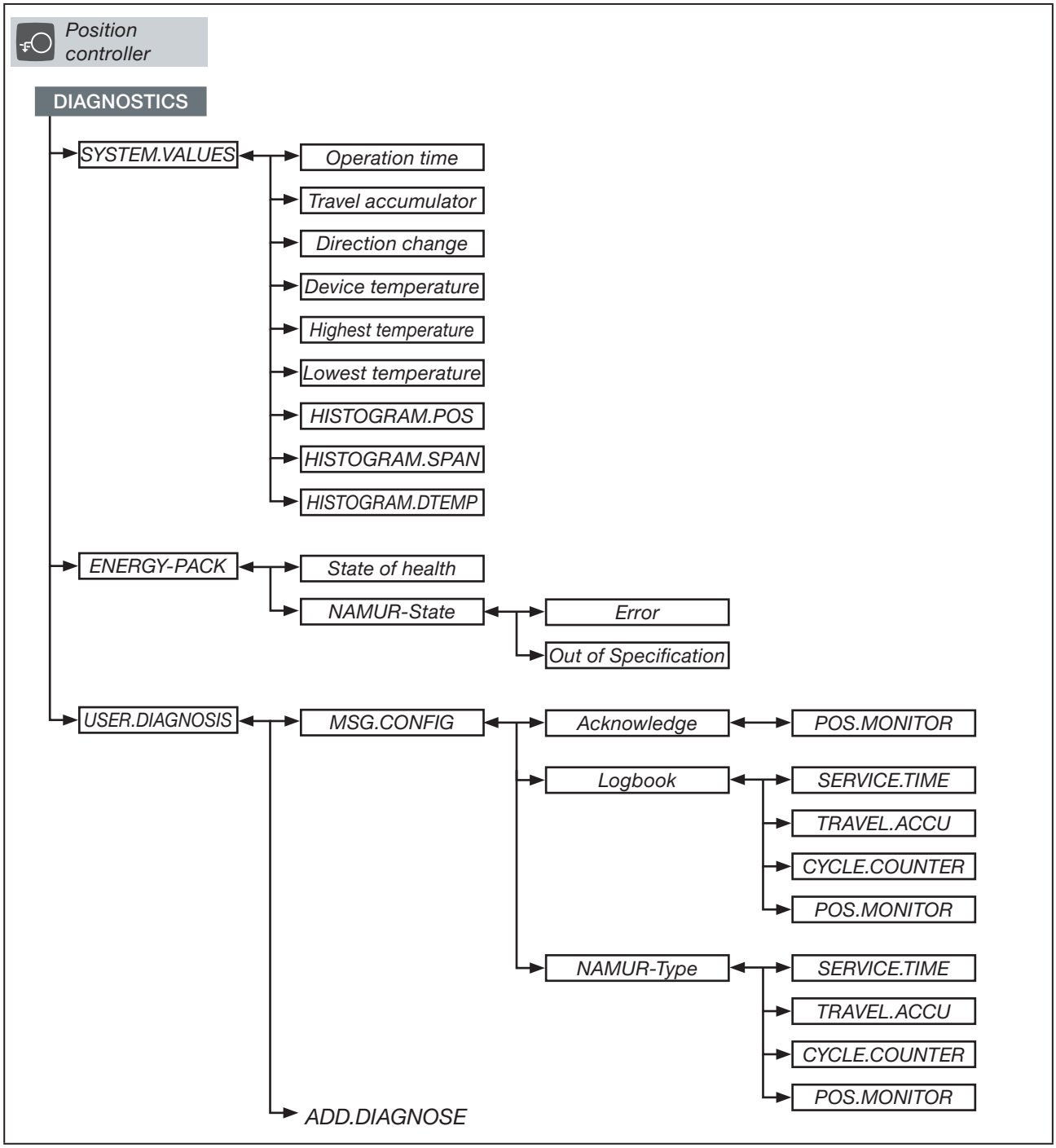



*Figure 39: Operating structure - 1-c, Diagnostics position controller*

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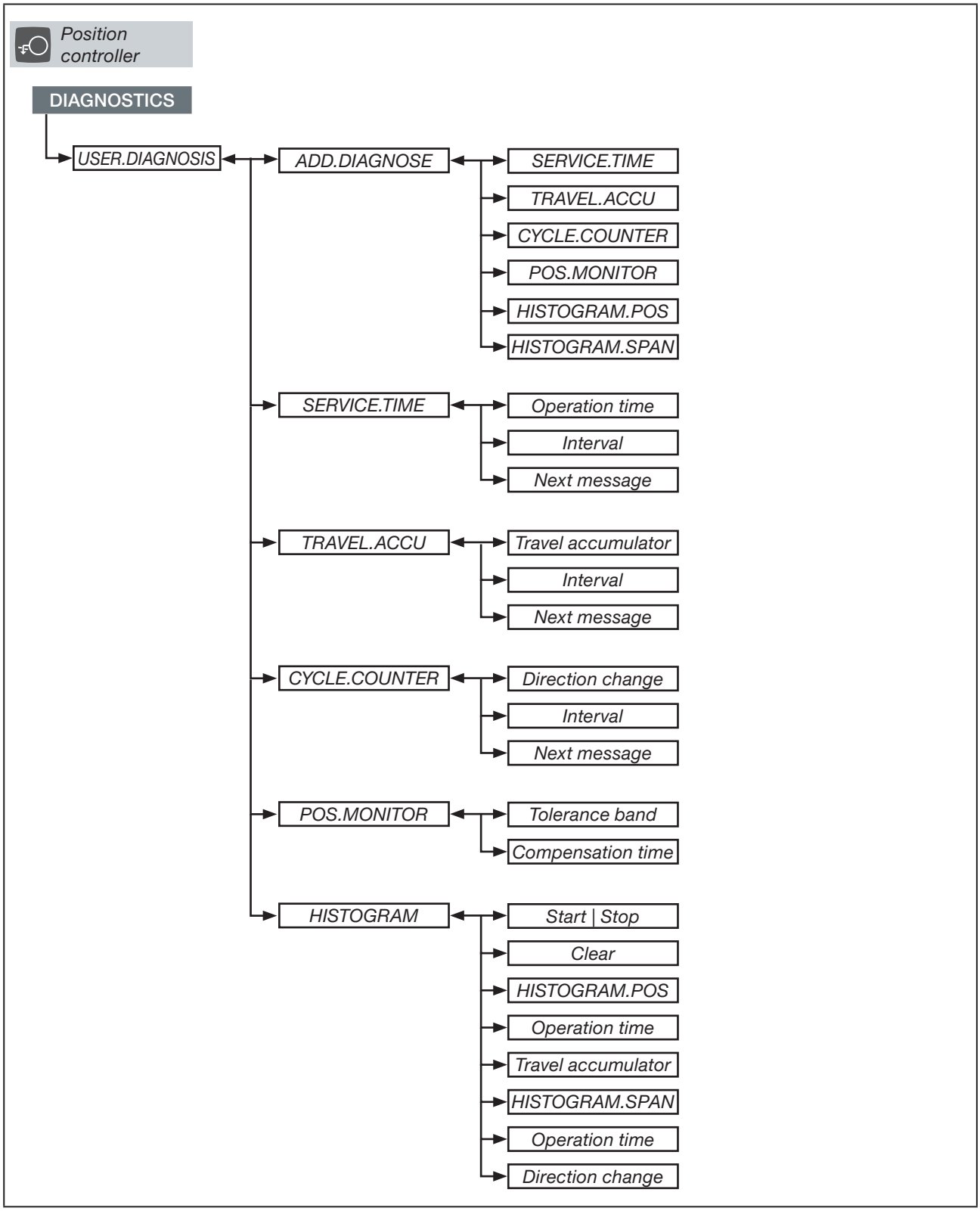



*Figure 40: Operating structure - 1-d, Diagnostics position controller*

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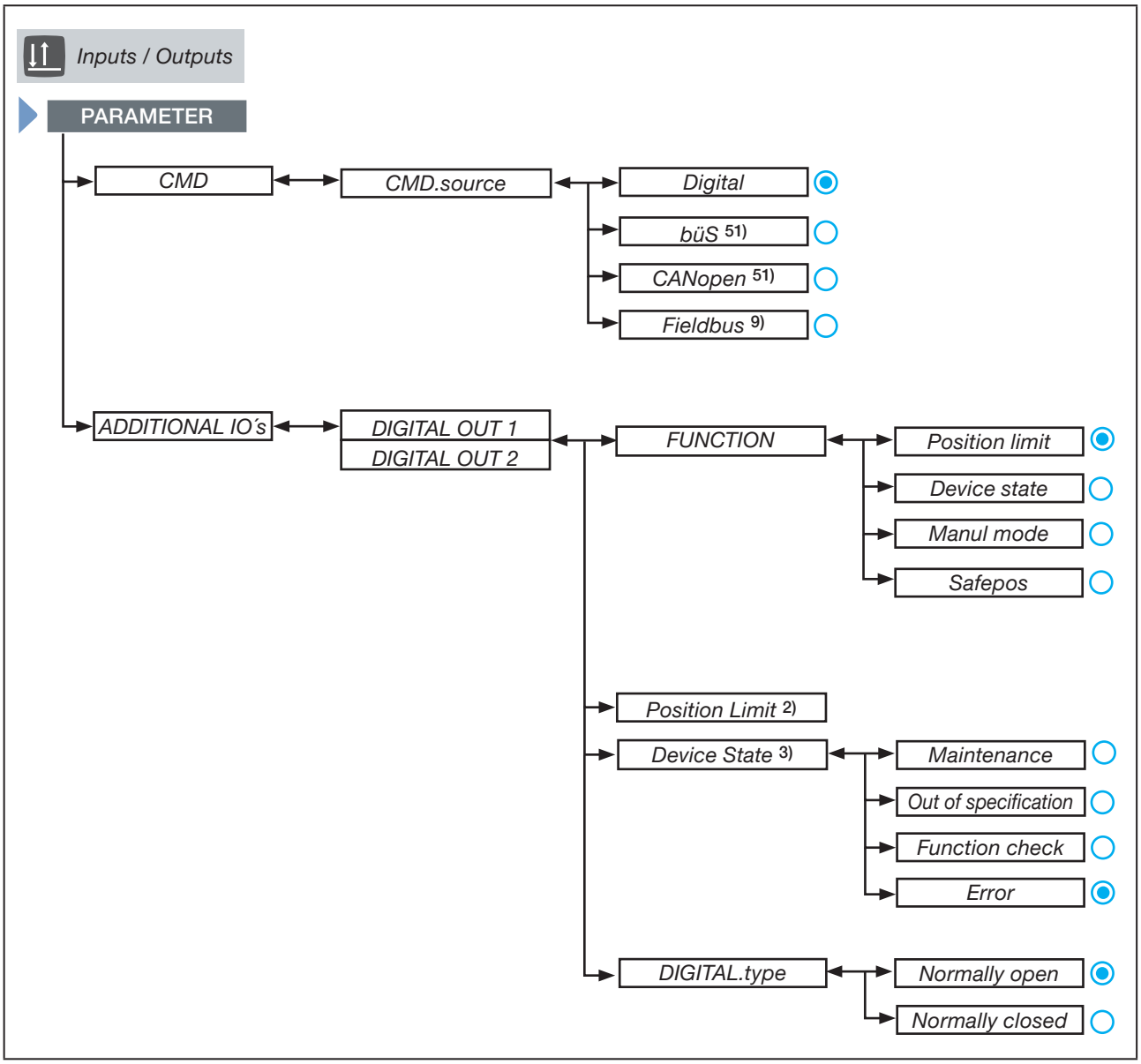



*Figure 41: Operating structure - 2-a, Configuration area inputs / outputs*

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

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

9) Only available for devices with Gateway option.

51) Only available for devices with the according communication protocol.

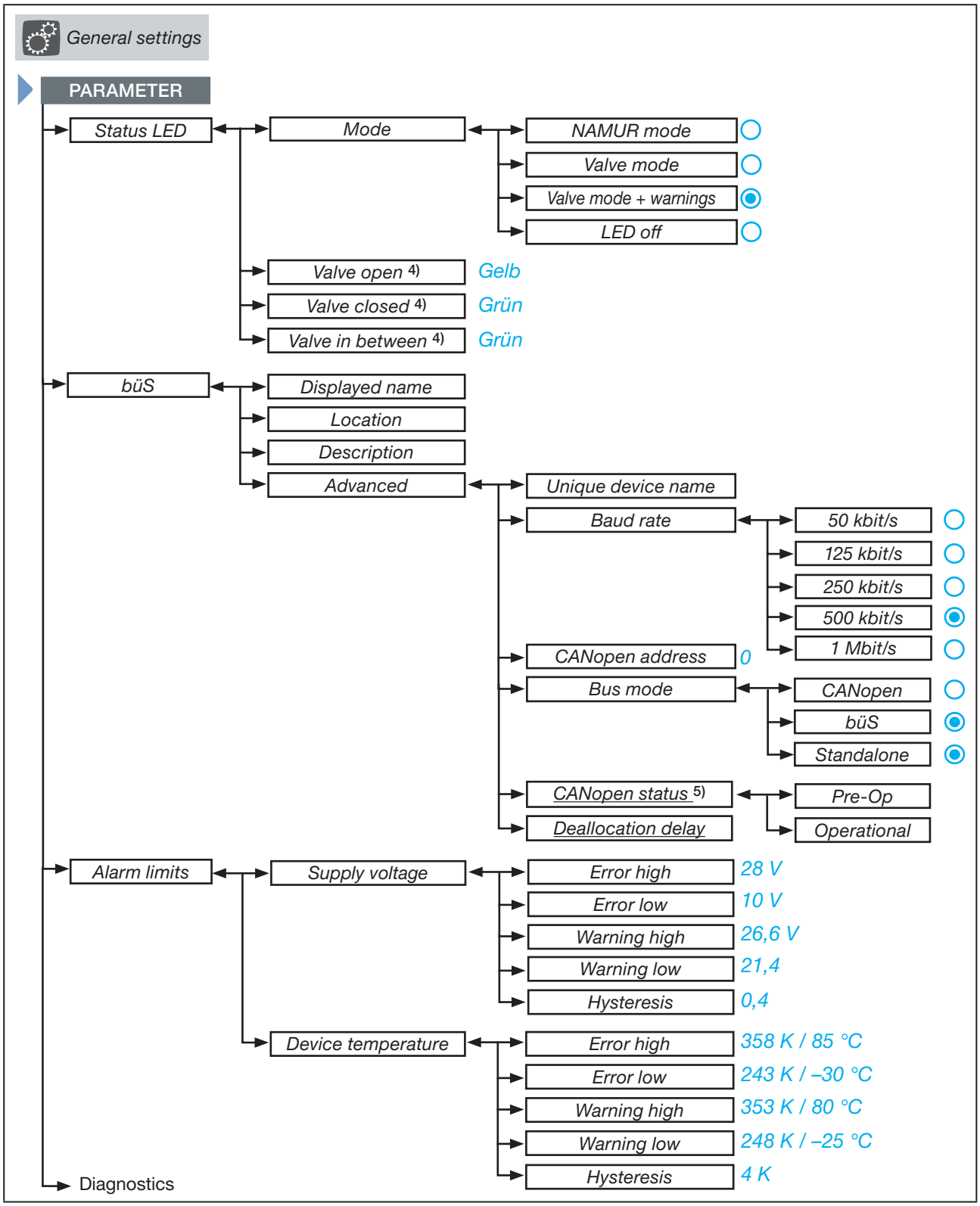



*Figure 42: Operating structure - 3-a, Configuration area general settings*

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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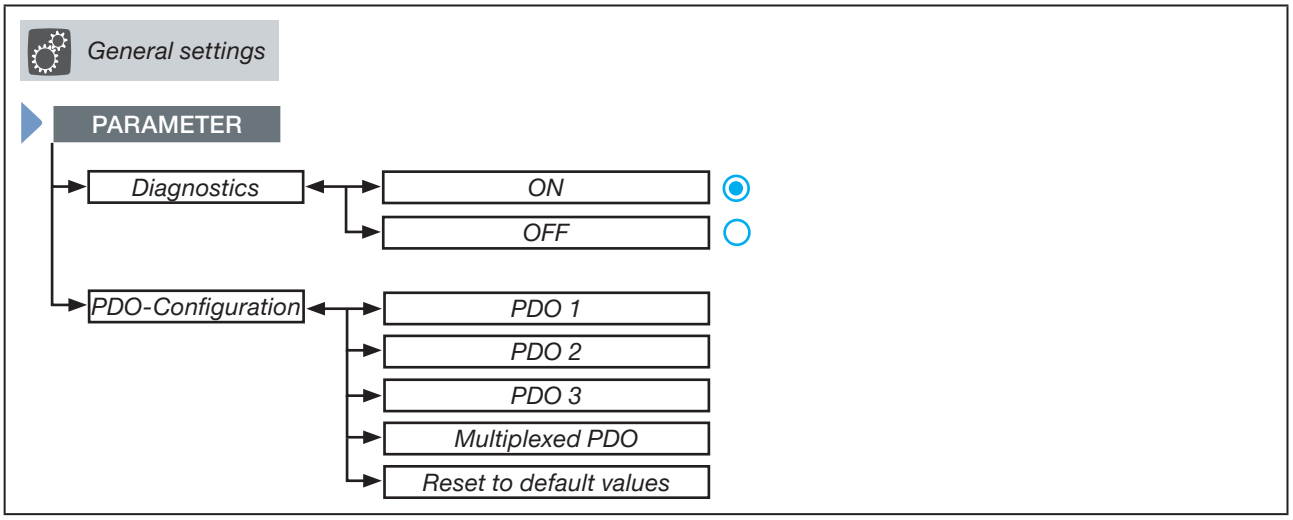



*Figure 43: Operating structure - 3-b, Configuration area general settings*

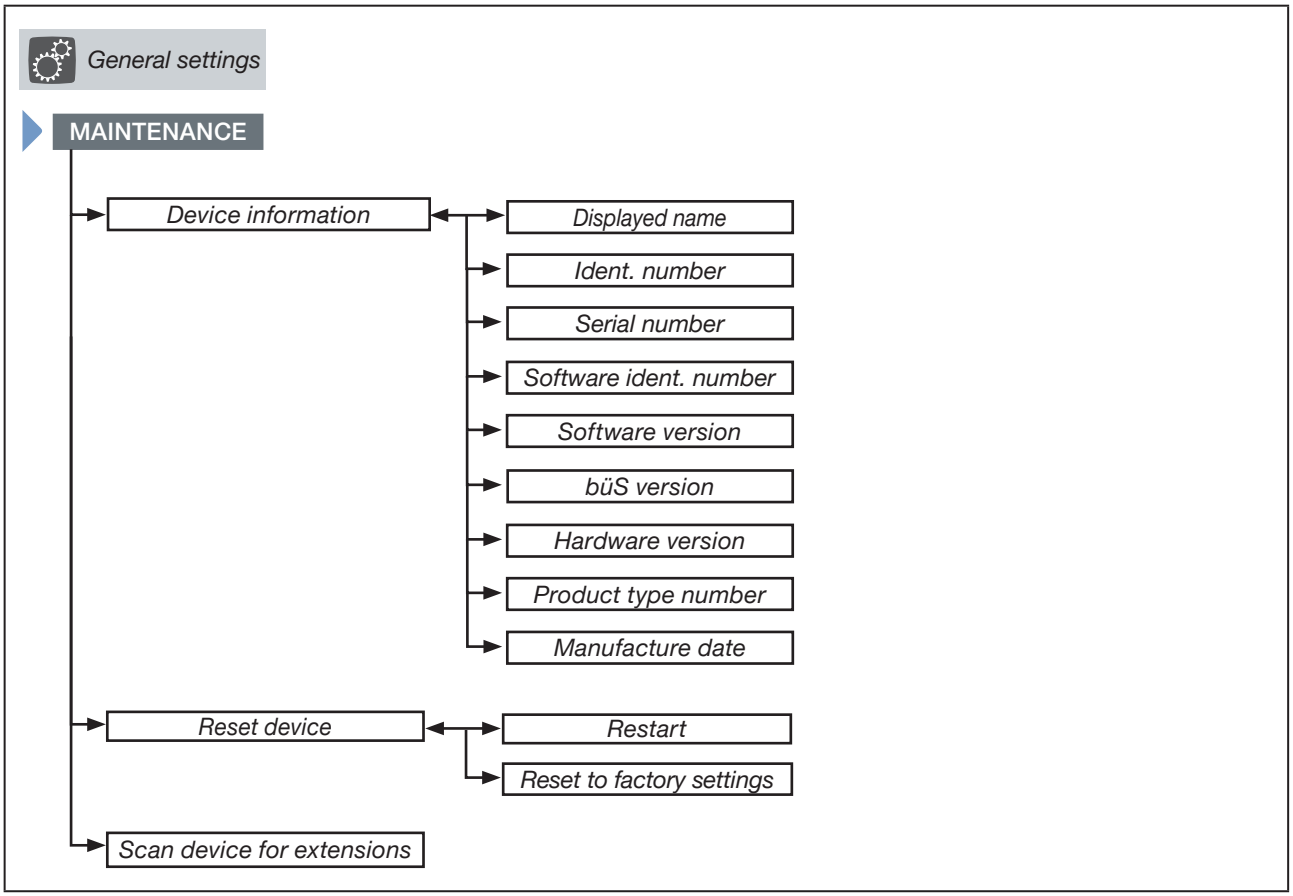



*Figure 44: Operating structure - 3-c, Maintenance general settings*

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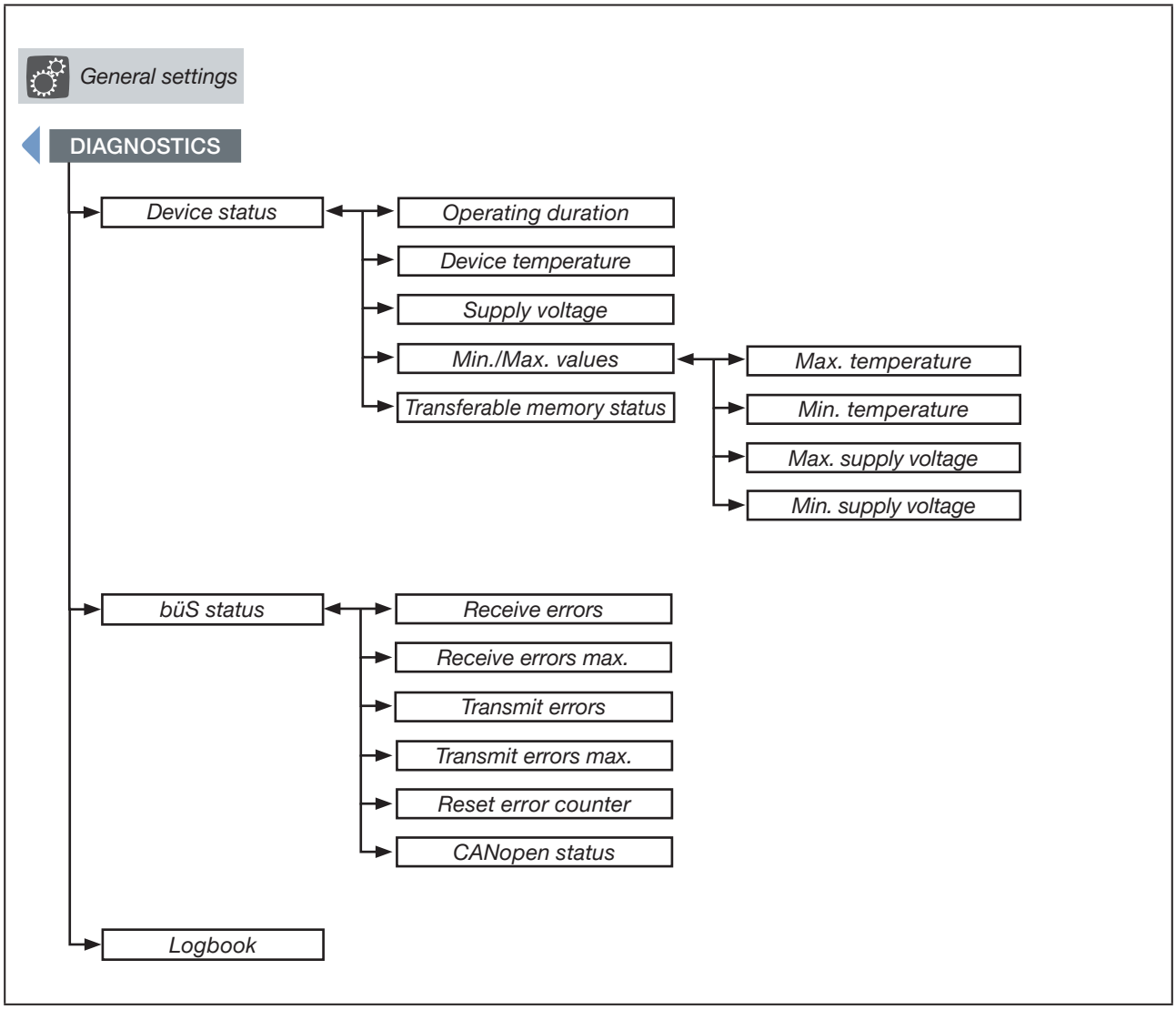



*Figure 45: Operating structure - 3-d, Diagnostics general settings*

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# 17 FIELDBUS GATEWAY
## EtherNet/IP, PROFINET and Modbus TCP

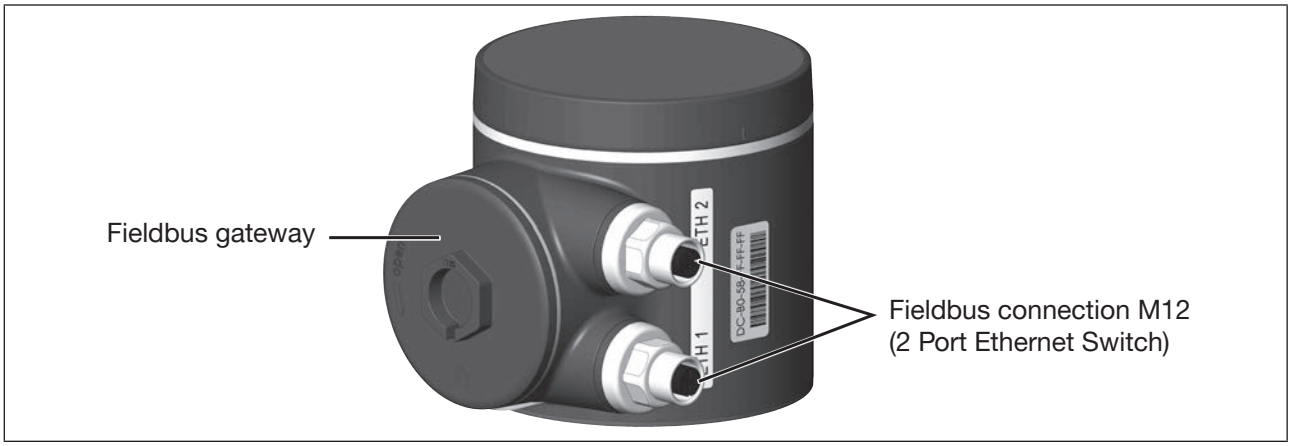



*Figure 46: Fieldbus gateway*

## 17.1 Technical data

| | |
|---|---|
| Network speed | 10/100 mbps |
| Auto negotiation | Yes |
| Network diagnostics | Yes, via error telegram |
| MAC-ID | Individual identification number, stored in the module and on the outside of the device (see type label) |
| Device name Ethernet (factory settings) | XXX (name can be changed) |
| Interface for service and system update | Internal mini USB (may be used only by technicians who have been trained for this task) |

## 17.2 Industrial Ethernet

**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. |

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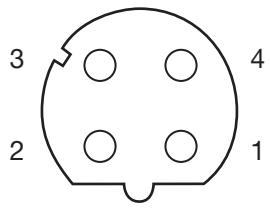
**EtherNet/IP specifications**

| | |
|---|---|
| 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 |

| | |
|---|---|
| Modbus TCP specifications | |
| Modbus Function Codes | 1, 2, 3, 4, 6, 15, 16, 23 |
| Mode | Message Mode: Server |
| Transmission speed | 10 and 100 Mbit/s |
| Data transport layer | Ethernet II, IEEE 802.3 |

## 17.3 Electrical connection

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




| | |
|---|---|
| Pin 1 | Transmit + |
| Pin 2 | Receive + |
| Pin 3 | Transmit – |
| Pin 4 | Receive – |

*Table 19: Electrical assignment*

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**ATTENTION!**

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 mm².

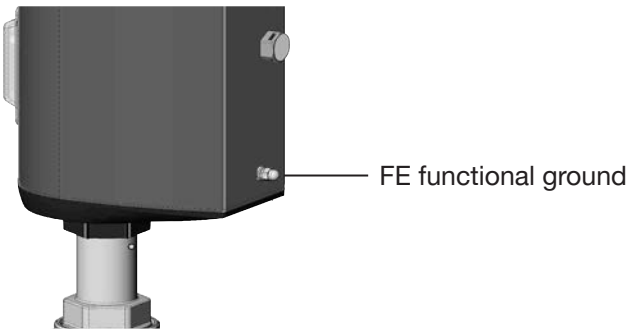



*Figure 47: Functional earth*

### 17.3.1 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.

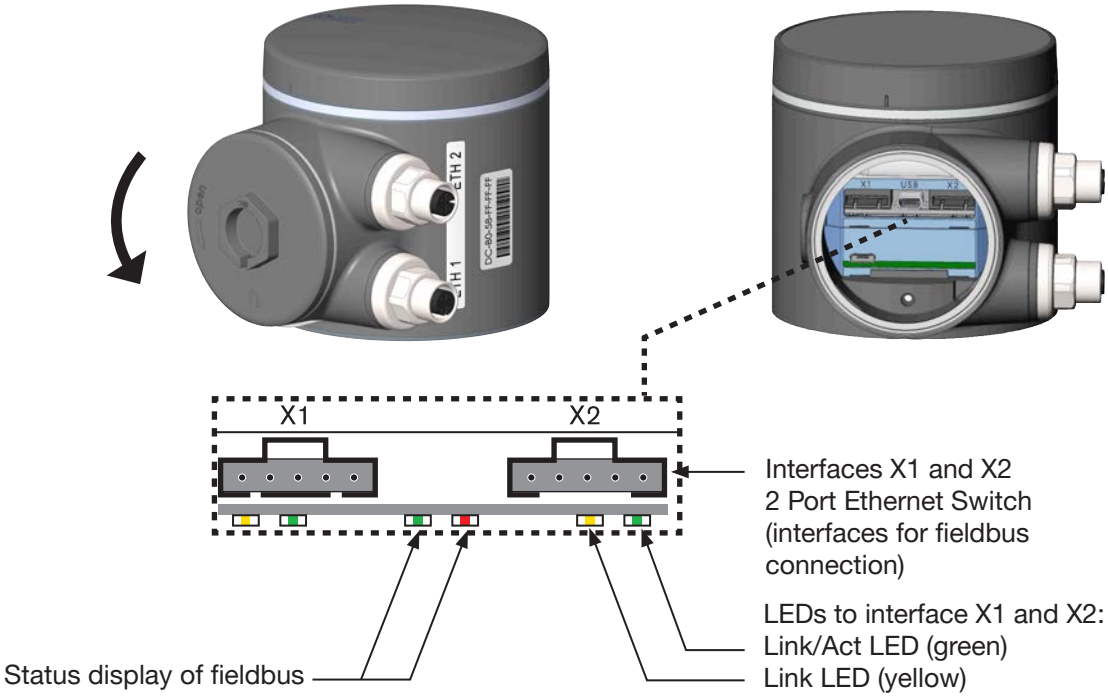



*Figure 48: LEDs for status display of the network connection*

| 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.<br>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 | No connection to the network available. | - |
| | Not active | No connection to the network available. | Check cables. |

*Table 20: LED status displays of the interfaces X1 and X2 (fieldbus connection)*

## 17.4 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.

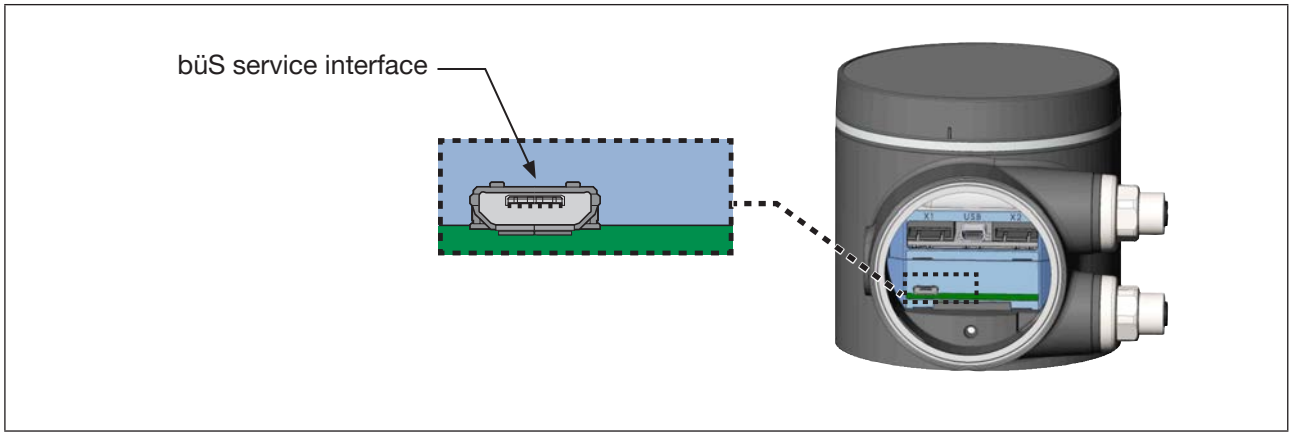



*Figure 49: büS service interface for Fieldbus Gateway version*

## 17.5 Web server

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

### 17.5.1 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.

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### 17.5.2 Access to the web server

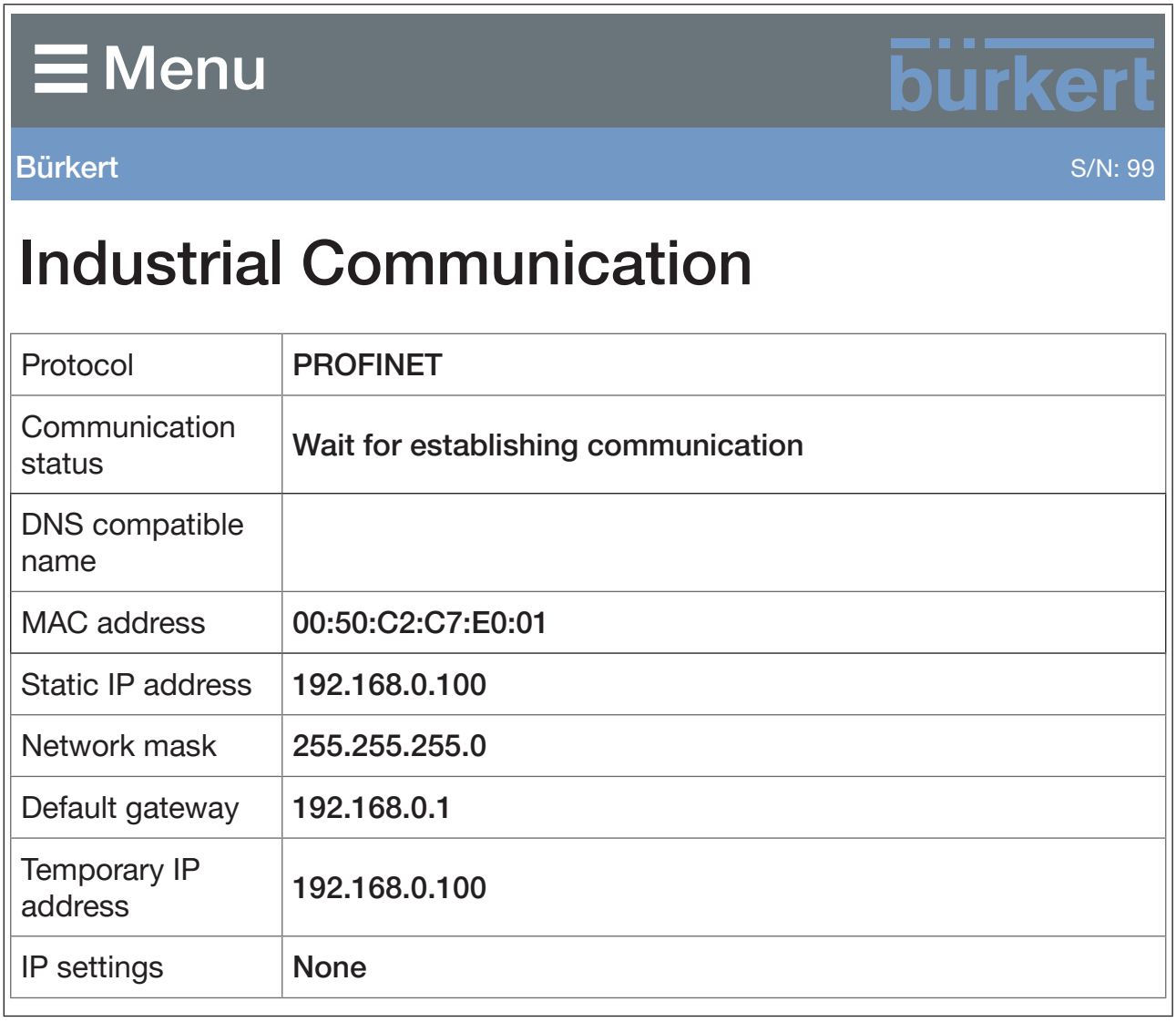



*Figure 50: Access to the web server via the Default IP*

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.

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### 17.5.3 Configuring EtherNet device

Logging into the system:

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

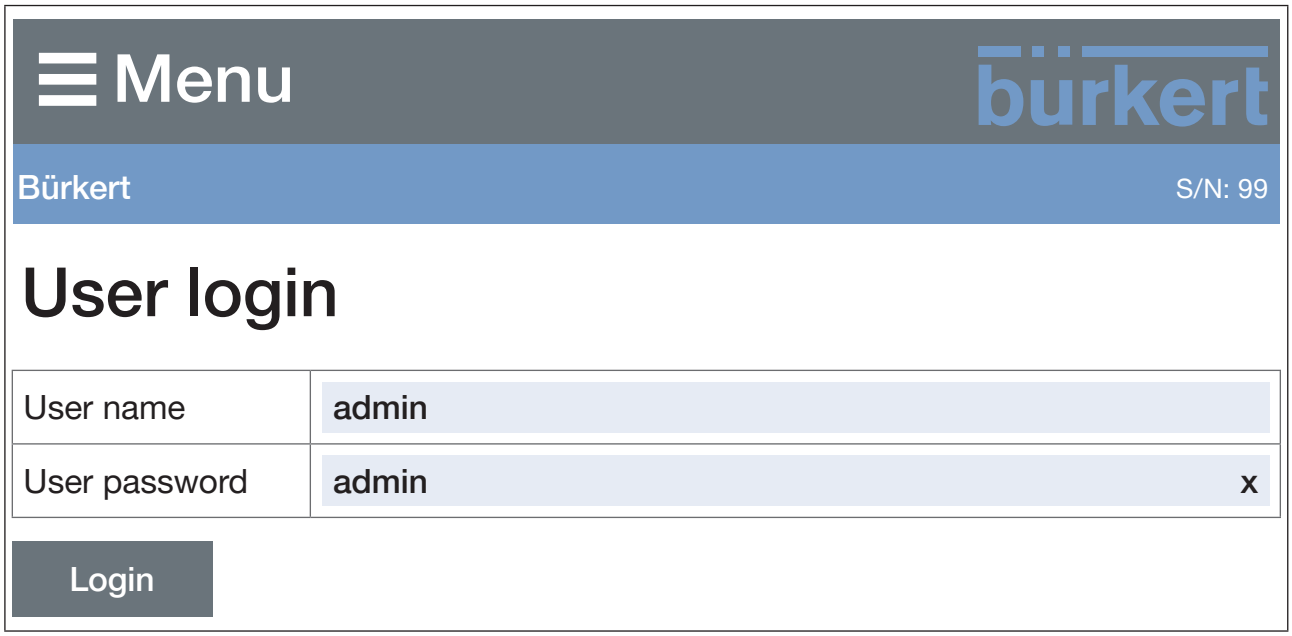



*Figure 51: Logging into the system*

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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.

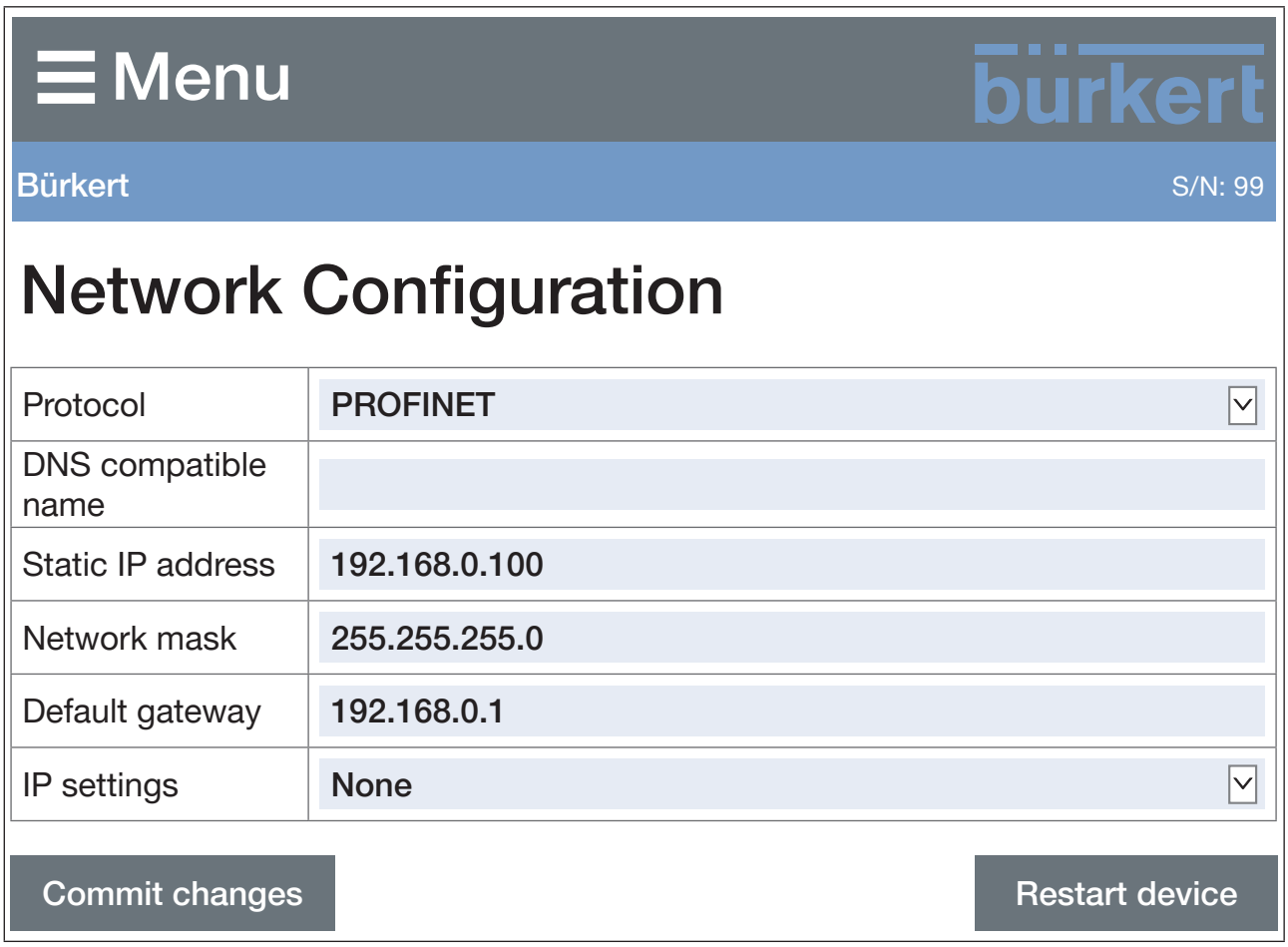



*Figure 52: Configuring Ethernet device*

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## 17.6 Configuration and parameterization of EtherNet/IP

The data exchange between EtherNet/IP master and the device (EtherNet device) is object-oriented. Each node in the network is represented as a collection of objects.

The assembly object specifies the structure of the objects for data transfer. The assembly object can be used to combine (map) data (e.g. I/O data) into blocks and transmit them via a single communication link. This mapping means that fewer accesses to the network are required.

It distinguishes between input and output assemblies. An input assembly reads in data from the application via the network or produces data on the network.

An output assembly writes data to the application or consumes data from the network.

Different assembly instances have already been permanently programmed in the fieldbus coupler or fieldbus controller (static assembly). After switching on the supply voltage, data from the process map is combined by the assembly object. As soon as a connection has been established, the master can address the data with "Class", "Instance" and "Attribute" and access it or read and/or write it via I/O connections.

The mapping of the data depends on the selected assembly instance of the static assembly.

### 17.6.1 Addressing

The IP address is assigned – as is usual with Ethernet/IP – via a DHCP server. If no assignment occurs within 1 minute via DHCP, the device uses the Default IP 192.168.0.100.

### 17.6.2 EDS file

The EDS file (Electronic Data Sheets file) includes the characteristic data of the fieldbus coupler or fieldbus controller and information on its communication abilities.

The EDS file required for EtherNet/IP operation is read in from the respective project planning software or installed.

**Download the EDS file**
from:www.buerkert.com→ Type 3320 or 3321

Instructions on installing the EDS file can be found in the documentation of the project planning software which you are using.

## 17.7 Object route function

The object route function allows access to all objects in the system. The interface is described in the table. For access the object must be described with index and subindex as well as the address of the device/module. When this has been done, the value can be read back.

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| Name | Description | Access type | ProfiNet | | | EtherNet/IP | | | Modbus TCP | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slot | Subslot | Index | Class | Instance | Attributes | Function code (FC) | Start address | Number of elements |
| Address | (UNIT32)<br>Specified address (node D) and object<br>→ Observe byte sequence: Little Endian.<br>• Byte 3: Device address (NODE ID)<br>• Byte 2: Sub index<br>• Byte 1: Index (low byte)<br>• Byte 0: Index (high byte) | RW | 0 | 1 | 1 | 0xc7 | 1 | 1 | FC16 | 1000 | 2 |
| Data length | (UNIT32)<br>Reserved | RW | 0 | 1 | 2 | c7 | 2 | 1 | FC16 | 1002 | 2 |
| Value in UNIT32 | (UNIT32)<br>Value of the required object | RO | 0 | 1 | 3 | c7 | 3 | 1 | FC16 | 1004 | 2 |
| Value as string | (C_String)<br>Value if greater than 4 bytes | RO | 0 | 1 | 4 | c7 | 4 | 1 | FC16 | 1006 | 10 |
| Result | (UNIT32)<br>0x00000000 finished<br>0xFFFFFFFF running | RO | 0 | 1 | 5 | c7 | 5 | 1 | FC4 | 1016 | 2 |
| Start/Cancel | (UNIT8)<br>Start or cancel the function | RW | 0 | 1 | 6 | c7 | 6 | 1 | FC6 | 1018 | 2 |

*Table 21: Object route function*

### 17.7.1 Examples of use

1. Protocol-specific access to the object route function:

| ProfiNet | | |
|---|---|---|
| Slot | Subslot | Index |
| 0 | 1 | 1 |

| EtherNet/IP | | |
|---|---|---|
| Class | Instance | Attributes |
| 0xc7 | 0x01 | 0x03 |
| | | |
| **Modbus TCP** | | |
| Function code (FC) | Start address | Number of elements |
| FC16 | 1000 | 2 |

*Table 22: Example of use 1*

Example of reading the device status object (0x2004 sub 0x01) from the device with address 0x28:

→ 0x28012004

2. Running the route function by writing 0x01 to the following index/attribute:

| ProfiNet | | |
|---|---|---|
| Slot | Subslot | Index |
| 0 | 1 | 6 |

| EtherNet/IP | | |
|---|---|---|
| Class | Instance | Attributes |
| 0xc7 | 0x06 | 0x03 |
| | | |
| **Modbus TCP** | | |
| Function code (FC) | Start address | Number of elements |
| FC6 | 1018 | 2 |

*Table 23: Example of use 2*

→ Writing 0x01

3. Reading the queried value:

| ProfiNet | | |
|---|---|---|
| Slot | Subslot | Index |
| 0 | 1 | 3 |

| EtherNet/IP | | |
|---|---|---|
| Class | Instance | Attributes |
| 0xc7 | 0x03 | 0x03 |
| | | |
| **Modbus TCP** | | |
| Function code (FC) | Start address | Number of elements |
| FC16 | 1004 | 2 |

*Table 24: Example of use 3*

→ Read

Example:
The device status is 0x05 (error).

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## 17.8 Objects

The following objects allow additional control and monitoring.

### 17.8.1 Device status NAMUR NE 107

| Name | Description | Access type |
|---|---|---|
| Device state<br>NAMUR NE 107 | Corresponds to the device status of type 3323, 3324 and 3325 | RO |

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|
| reserved | reserved | NAMUR mode:<br>0 – Automatic mode<br>1 – Manual mode<br>2 – Flashing | | NAMUR status:<br>0 – Normal<br>1 – Diagnostics active<br>2 – Maintenance required<br>3 – Device out of specification<br>4 – Warning<br>5 – Error | | | |

*Table 25: Device status NAMUR NE 107*

### 17.8.2 büS control object

| Name | Description | Access type |
|---|---|---|
| Control mode* | Byte 0: defines the device behavior and communication with the connected devices. It can therefore be defined when the device starts transferring process data.<br>Byte 1: defines the device behavior if a device fails. | RW |
| Control word** | Byte 0: Address of the device to be controlled.<br>Byte 1: Node (device) management according to CANopen specification. | RW |

*

| Byte 1 | Byte 0 |
|---|---|
| 0: reserved<br>1: Do not cancel allocation to missing device | 0: Automatic mode (büS standard)<br>1: Input for operation with COM<br>2: Input for operation with PLC |
| **Byte 3** | **Byte 2** |
| Reserved | Reserved |

**

| Byte 1 | Byte 0 |
|---|---|
| 0x81: Reset node (device restart) | 0xFF: All devices |
| **Byte 3** | **Byte 2** |
| Reserved | Reserved |

*Table 26: büS control object*

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# 18 MAINTENANCE, TROUBLESHOOTING

## 18.1 Safety instructions

**DANGER!**

**Risk of injury from high pressure in the system or device.**

- Before working on the system or device, switch off the pressure. Vent or drain lines.

**Risk of injury due to electric shock.**

- Before working on the system or device, switch off the power supply. Secure against reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

**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.

## 18.2 Maintenance

Maintenance work is described in the separate service manual. Find these instructions on our homepage at: www.buerkert.com → Type 3320, 3321.

### 18.2.1 Actuator

Provided the valve is operated according to these operating instructions, the electromotive actuator is maintenance-free.

### 18.2.2 Wearing parts of the valve

Parts which are subject to natural wear:

- Seals
- Swivel plate
- Valve seat

→ If a wearing part is leaking, replace the particular wearing part with an appropriate spare part. (Spare parts sets and installation tools see chapter "20.2 Spare parts".

How to change wearing parts is described in the separate service manual.
You can find these instructions on our homepage at: www.burkert.com → Type 3320, 3321.

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### 18.2.3 Visual inspection

Perform regular visual inspections according to the conditions of use:

→ Check medium connections for leak-tightness.

→ Check the relief bore on the pipe for leaking medium.

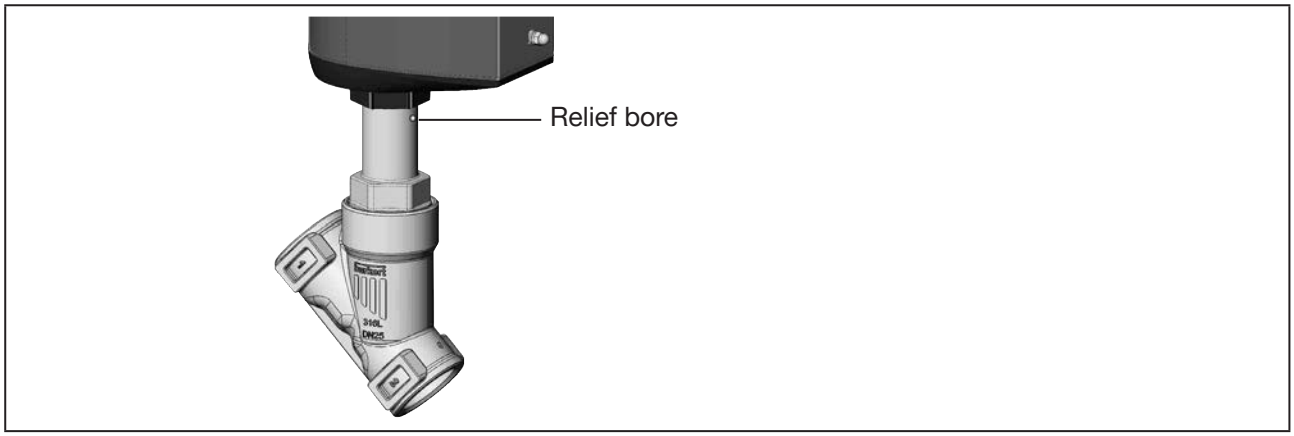



*Figure 53: Relief bore*

### 18.2.4 Replacing the SAFEPOS energy pack

The replacement of the SAFEPOS energy pack is described in chapter "18.2.4 Replacing the SAFEPOS energy pack".

### 18.2.5 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 color 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 %!<br>The energy storage must be changed soon. | Maintenance message. | Replace SAFEPOS energy pack soon, or in good time before the service life ends. |

*Table 27: Maintenance messages*

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## 18.3 Troubleshooting

### 18.3.1 Messages for device status "Out of specification"

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

- Valve mode + warnings (mode set in the factory).
  The LED illuminated ring flashes yellow alternately with the color 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 28: Messages for device status "Out of specification"*

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### 18.3.2 Error messages

The error messages of the device are displayed as follows:

- Valve mode
  The LED illuminated ring flashes red alternately with the color of the valve position.
- Valve mode + warnings (mode set in the factory).
  The LED illuminated ring flashes red alternately with the color 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. | Failure of the 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 X.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 path sensor. | Error message. Actuator moves to the safety position. Manual control not possible. | Contact your Bürkert Service Center. |
| Internal error: … | Internal error of the device. | Error message. Actuator moves to the safety position. | Contact your Bürkert Service Center. |

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| Message | Description | Device behavior | Procedure |
|---|---|---|---|
| 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. |
| External CMD not assigned. | "EXTERNAL" has been set as the source for the input signal.<br>Assignment of the external büS partner missing. | Error message. Actuator moves to the safety position. | Assign external büS partner or set "Internal" or "Gateway" as the source for the input signal.<br>Setting the input signal: In the configuration area "Inputs / Outputs". |
| External ExtError not assigned. | | | |
| External DigitalOut1 not assigned. | | | |
| External DigitalOut2 not assigned. | | | |
| 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*

# 19 CLEANING

Do not use alkaline cleaning agents to clean the surfaces of the device.

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# 20 ACCESSORIES, SPARE PARTS

**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 its environment

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

| Accessories | Order number |
|---|---|
| Connection cable with M12 socket, 4-pole, (length 5 m) for operating voltage | 918038 |
| Connection cable with M12 socket, 8-pole, (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.de |
| SIM card | 291773 |
| Holding device for line connection DN15...DN20 | 693770 |
| Holding device for line connection DN25...DN50 | 693771 |

*Table 30: Accessories*

## 20.1 Communications software

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

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

Download the software from: www.buerkert.com

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### 20.1.1 USB interface

To communicate with the devices, the PC requires a USB interface and the USB büS interface set available as an accessory. (see "Table 30: Accessories").

## 20.2 Spare parts

### 20.2.1 Spare parts for valves of Types 3320 and 3321

| Spare parts for Types 3320 and 3321 | | Order number |
|---|---|---|
| SAFEPOS energy-pack | | 285834 |
| Seal set for packing gland | Spindle ø10 mm, DN15...DN40 | 309618 |
| | Spindle ø14 mm, DN50 | 309621 |

*Table 31: Spare parts for Types 3320 and 3321*

### 20.2.2 Spare parts for angle seat valve of Type 3320

| Swivel plate set for Type 3320<br>includes: swivel plate, dowel pin, graphite seal | | |
|---|---|---|
| DN | Order number | |
| | PEEK/steel | PTFE/steel |
| 13/15 | On request | 011134 |
| 20 | On request | 011171 |
| 25 | On request | 160737 |
| 32 | On request | 011208 |
| 40 | On request | 011209 |
| 50 | On request | 216431 |

*Table 32: Swivel plate set for Type 3320*

### 20.2.3 Spare parts for globe valve of Type 3321

| Swivel plate set for Type 3321<br>includes: swivel plate, dowel pin, graphite seal | | |
|---|---|---|
| DN | Order number | |
| | PEEK/steel | PTFE/steel |
| 13/15 | On request | 149606 |
| 20 | On request | 011171 |
| 25 | On request | 160737 |
| 32 | On request | 011208 |
| 40 | On request | 011209 |
| 50 | On request | 216431 |

*Table 33: Swivel plate set for Type 3321*

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### 20.2.4 Spare parts for valve seat set Type 3321

| Valve seat set for Type 3321<br>includes: graphite seal, valve seat | |
|---|---|
| **DN** | **Order number** |
| 15 | 262152 |
| 20 | 262157 |
| 25 | 262170 |
| 32 | 262174 |
| 40 | 262177 |
| 50 | 262179 |

*Table 34: Valve seat set for Type 3321*

## 20.3 Installation tools

### 20.3.1 Installation tools for valves of Types 3320 and 3321

| Modified socket wrench for packing gland<br>(series-production status from April 2012) | | | |
|---|---|---|---|
| **Spindle ø [mm]** | **Housing DN** | **Wrench size** | **Order number** |
| 10 | 15...40 | SW16 | 683221 |
| 14 | 50 | SW24 | 683223 |

*Table 35: Installation tools for Types 3320 and 3321*

### 20.3.2 Accessories Type 3321

| Installation tool for replacing valve seat Type 3321 | |
|---|---|
| **DN** | **Bestellnummer** |
| 15 | 652604 |
| 20 | 652605 |
| 25 | 652606 |
| 32 | 652607 |
| 40 | 652608 |
| 50 | 652609 |

*Table 36: Accessories Type 3321*

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# 21 DISASSEMBLY

## 21.1 Safety instructions

**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.

→ Disconnect the electrical connection.

→ Remove device.

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# 22 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.
- Prevent the temperature from exceeding or dropping below the permitted storage temperature.

# 23 STORAGE

**ATTENTION!**

**Incorrect storage may damage the device.**

- Store the device in a dry and dust-free location.
- Storage temperature -40...+70 °C.

# 24 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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