bürkert
FLUID CONTROL SYSTEMS

Typ 3320, 3321

Electromotive 2/2-way valve

Operating Instructions

MAN 1000295593 EN Version: - Status: RL (released | freigegeben) printed: 24.06.2016

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Operating Instructions 1606/00_DEde_00810525 / Original DE

Electromotive 2/2-way valve

Content

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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.

NOTE!

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-proof".

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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.

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 make allowance for any

- contingencies and events which may arise during the assembly, operation, and maintenance.
- local safety regulations – the operator is responsible for observing these regulations, also in relation to the installation personnel.

Risk of injury from high pressure!

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

Risk of burns or fire from hot device surface due to prolonged switch-on time

▸ Keep the device away from highly flammable substances and media and do not touch with bare hands.

Risk of crushing due to mechanically moving parts.

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

▸ Keep clear of the openings in the valve body.

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

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

▸ If the valve position is relevant as regards safety in the event of a power failure: Use only those devices which have the SAFEPOS energy-pack (optional energy pack).

▸ Using DIP switches, select a valve position which is safe for the process.

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.

▸ 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.

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NOTE!

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@de.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]							
Connection size (valve body)		Orifice DN (valve seat)					
[mm]	[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 pendulum disc 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.

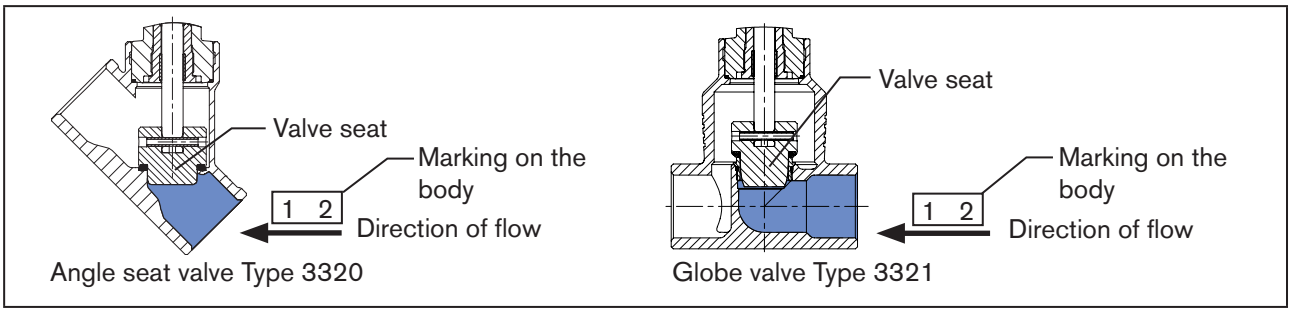

Figure 1: Incoming flow under the seat, direction of flow

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

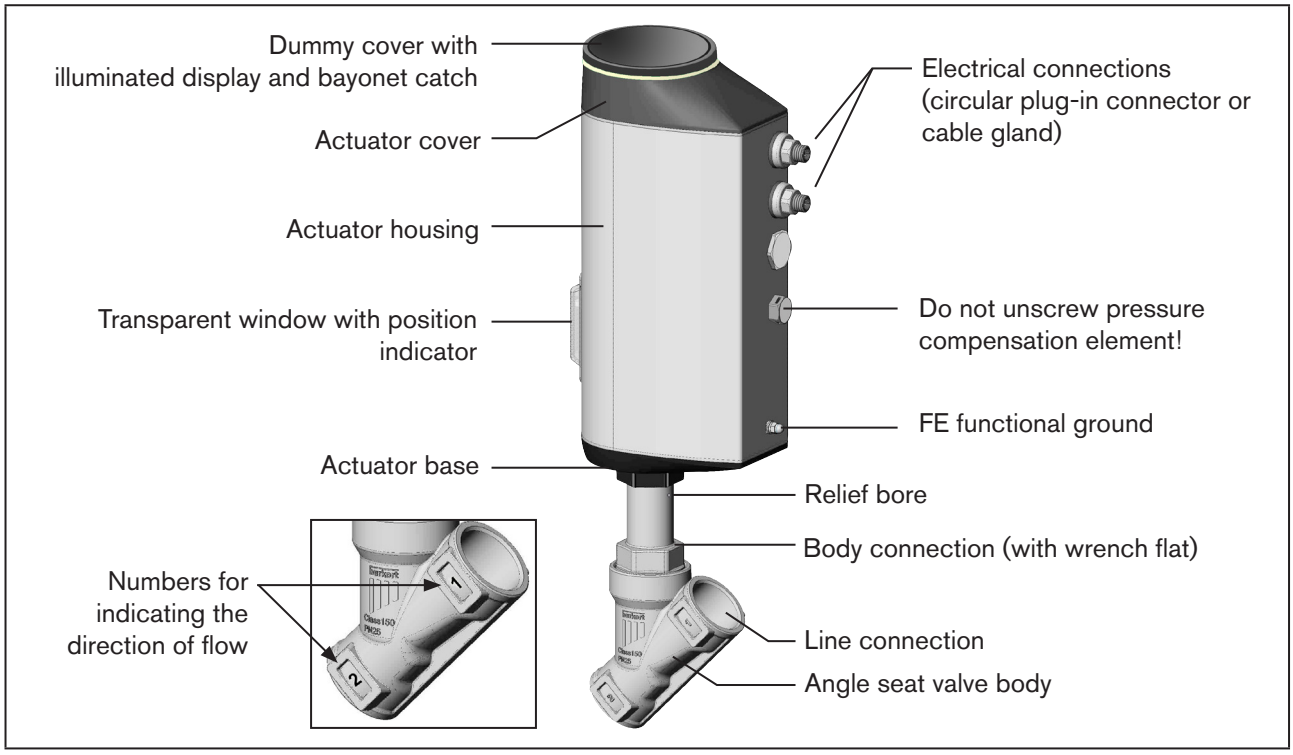

Figure 2: Structure, electromotive angle seat control valve Type 3320

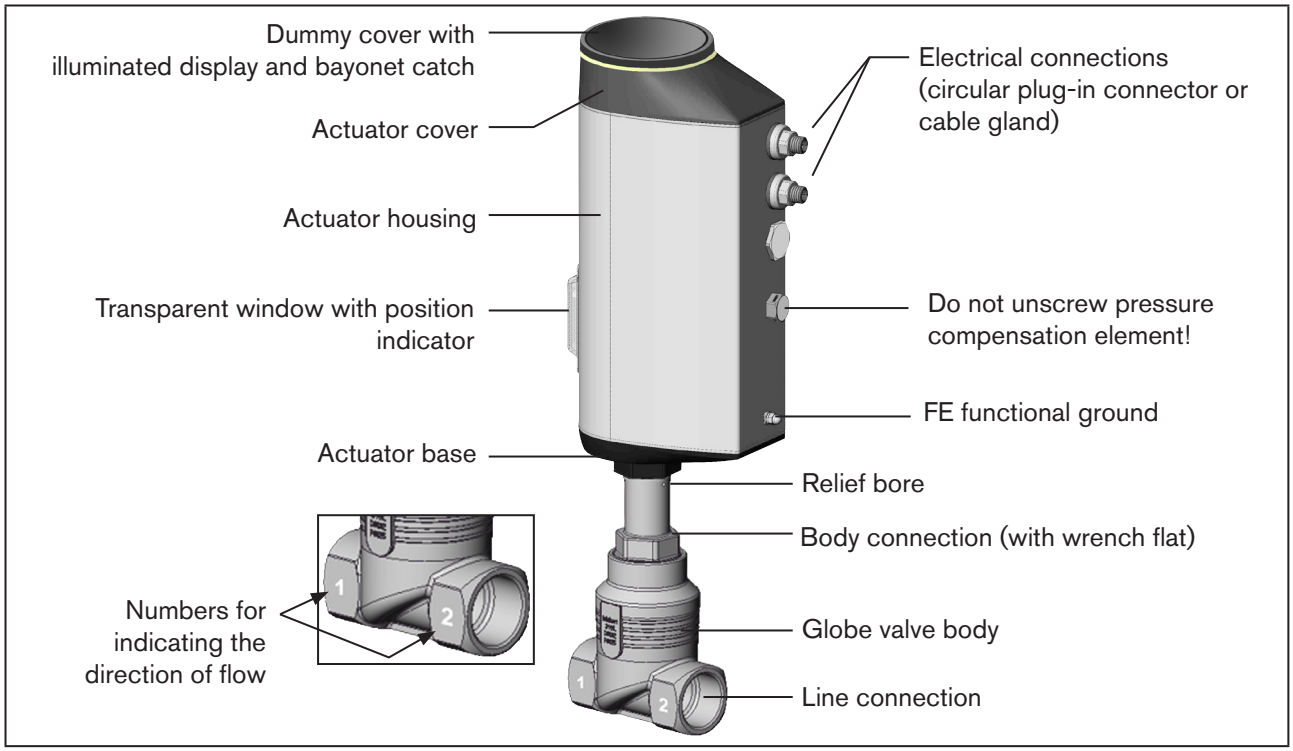

Figure 3: Structure, electromotive globe valve Type 3321

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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 20

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 "12.2.2 Setting LED mode" on page 48.

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.

Displays in valve mode:
The LED illuminated ring flashes alternately in different colors which indicate the valve position and the device status.

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:

Display in accordance with NE 107		Description	Meaning
Color	red	Failure, error or malfunction	Operation is not possible due to a malfunction in the device or on its peripheral equipment.
	orange	Function check	Work is being carried out on the device; operation is therefore not currently possible.
	yellow	Out of specification	Ambient conditions or process conditions for the device are outside the specified area. Internal device diagnostics point to problems in the device or the process properties.
	blue	Maintenance required	The device is operating, however a function is briefly restricted. → Service device.
	green	Diagnostics active	Device is operating perfectly. Status changes are indicated in different colors. Messages are transmitted via a possibly connected fieldbus.

Table 4: Display of device status in NAMUR mode

* A detailed fault description can be found in chapter "18.3 Troubleshooting" on page 77.

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, trouble-shooting" 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 and 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

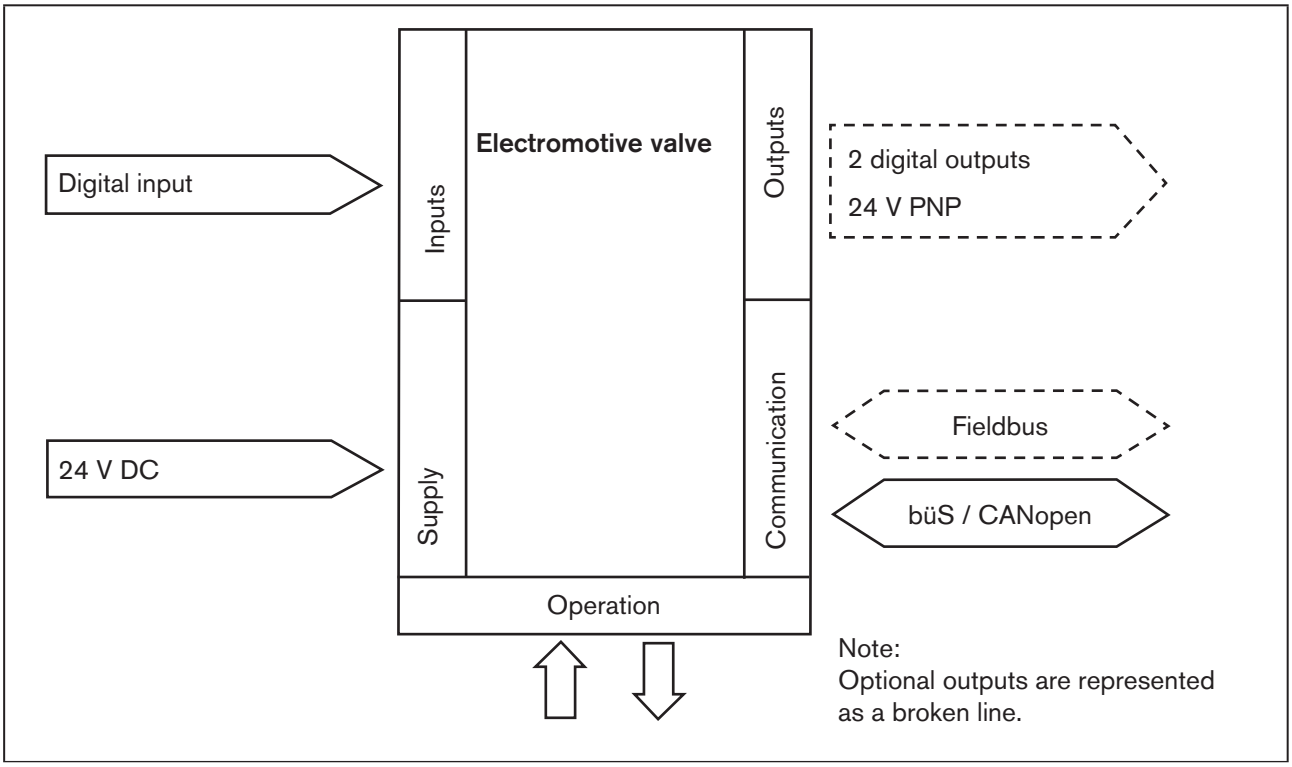

Figure 4: Interfaces of the electronic valve

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

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7.1.2 Function diagram

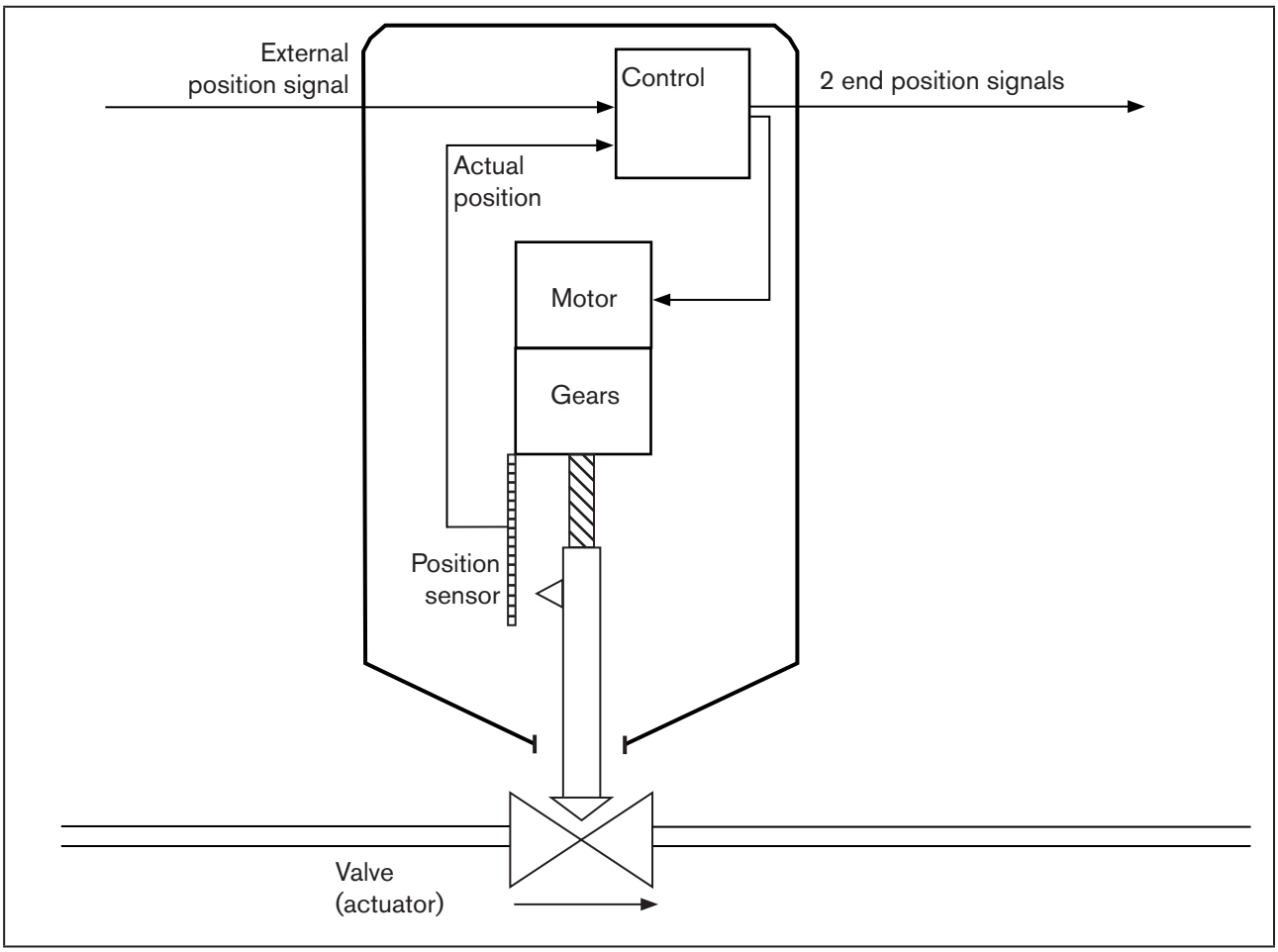

Figure 5: Function diagram

7.2 SAFEPOS energy-pack (option)

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

7.2.1 Life time

The life time is up to 10 years depending on the operating conditions.

The life time 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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NOTE!

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

7.2.2 Messages on the state of the SAFEPOS energy-pack

The device issues a warning:
The remaining life time of the energy pack is approx. 25 %

▸ ⚠ Replace SAFEPOS energy-pack in good time before the life time 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 "12.2.2 Setting LED mode".

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

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 38.

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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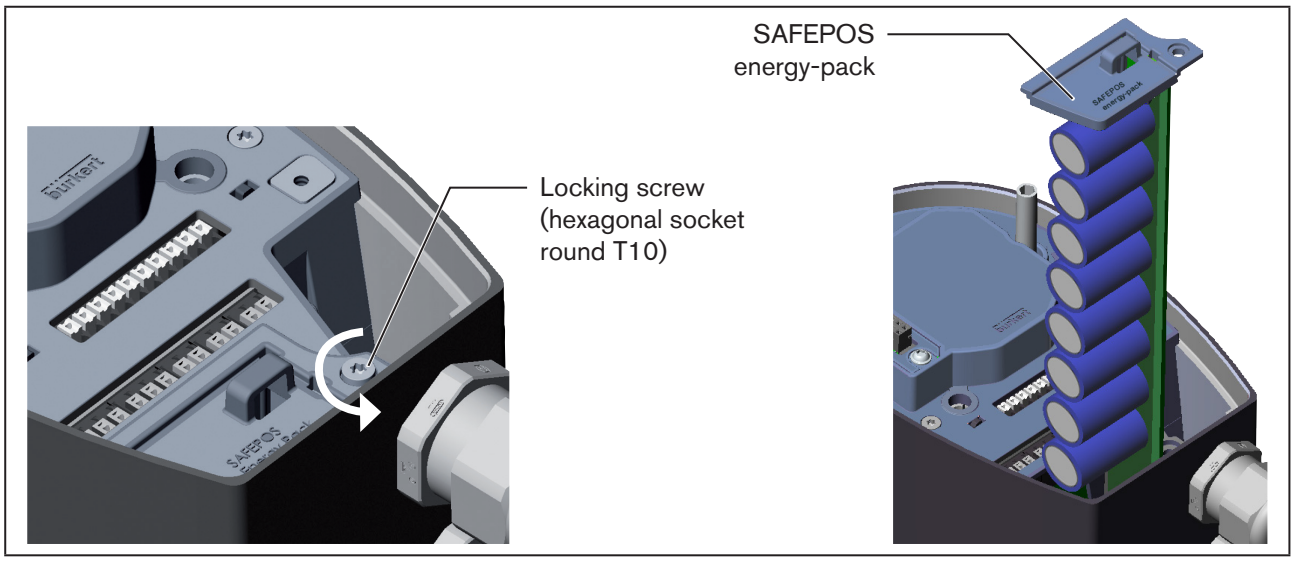

Figure 6: Removing SAFEPOS energy-pack

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.

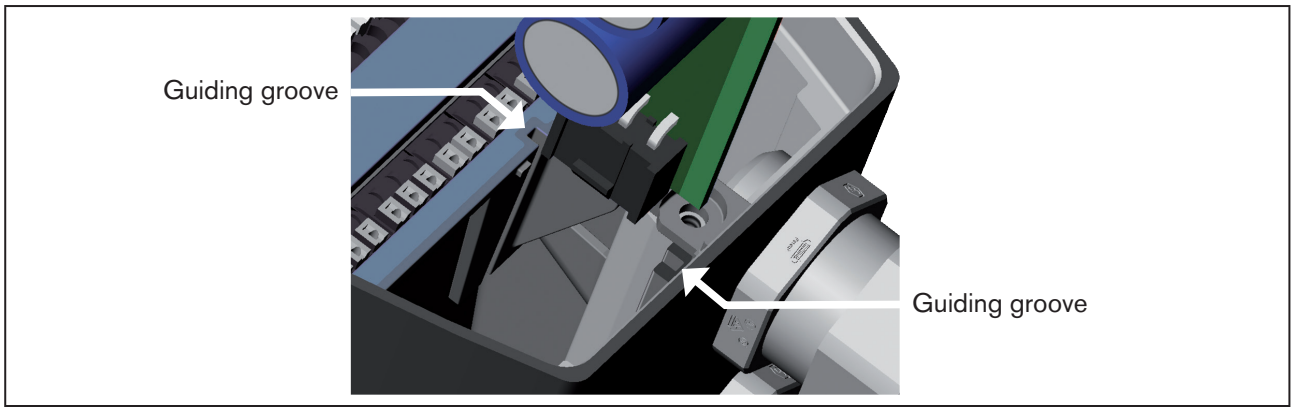

Figure 7: Inserting SAFEPOS energy-pack

→ 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 Type label

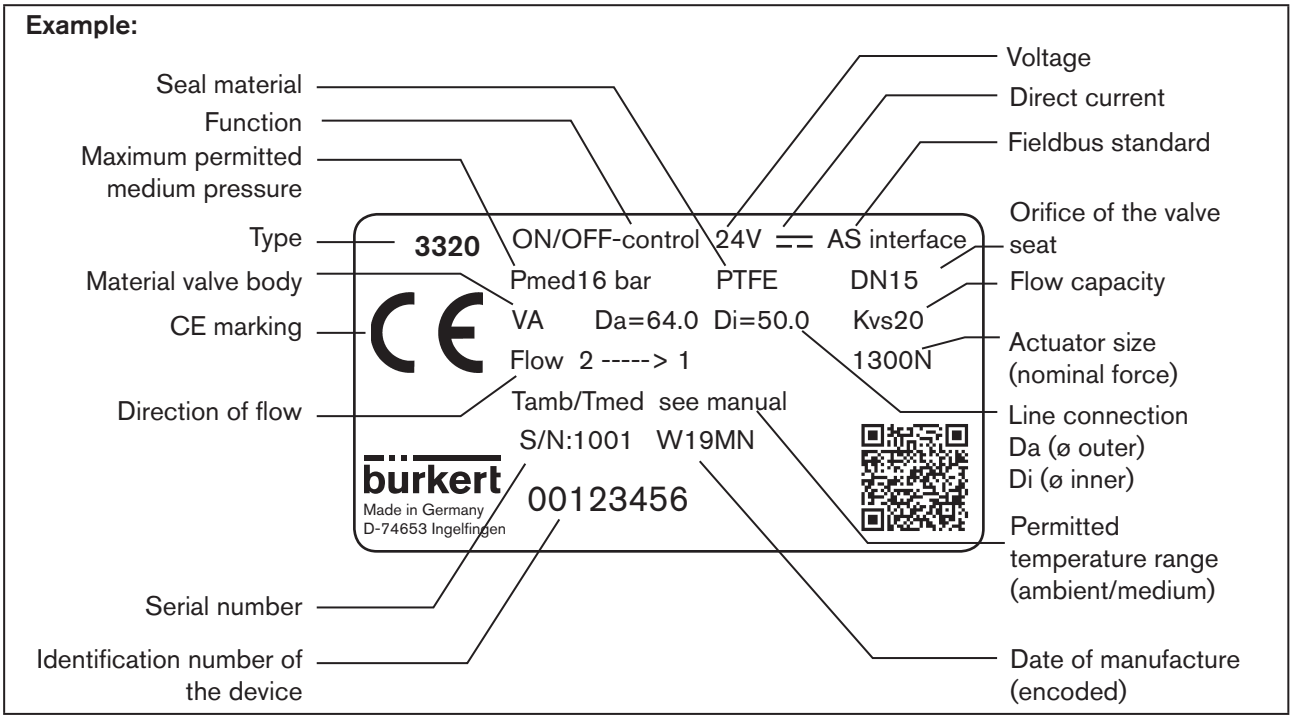

Figure 8: Description of the type label (example)

8.4 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. Liquid media: Water, alcohol, oil, propellant, hydraulic fluid, saline solution, alkali, organic solvent.
Degree of protection:	IP65 and IP67 in accordance with IEC 529, EN 60529.
Direction of flow:	If a direction of inflow is required, this is specified on the type label by an arrow and the numbers 1 and 2. The numbers 1 and the 2 stand for identification also on the valve body. Direction of inflow see chapter "6 Structure and function"

8.4.1 Permitted temperature ranges

Minimum temperatures	Ambient: Medium:	-25 °C (-13 °F) -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. On devices with seat seal PTFE/steel, max. +130 °C (266 °F) absolute. On devices with seat seal PEEK/steel, max. + 185 °C (365 °F) absolute.

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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.

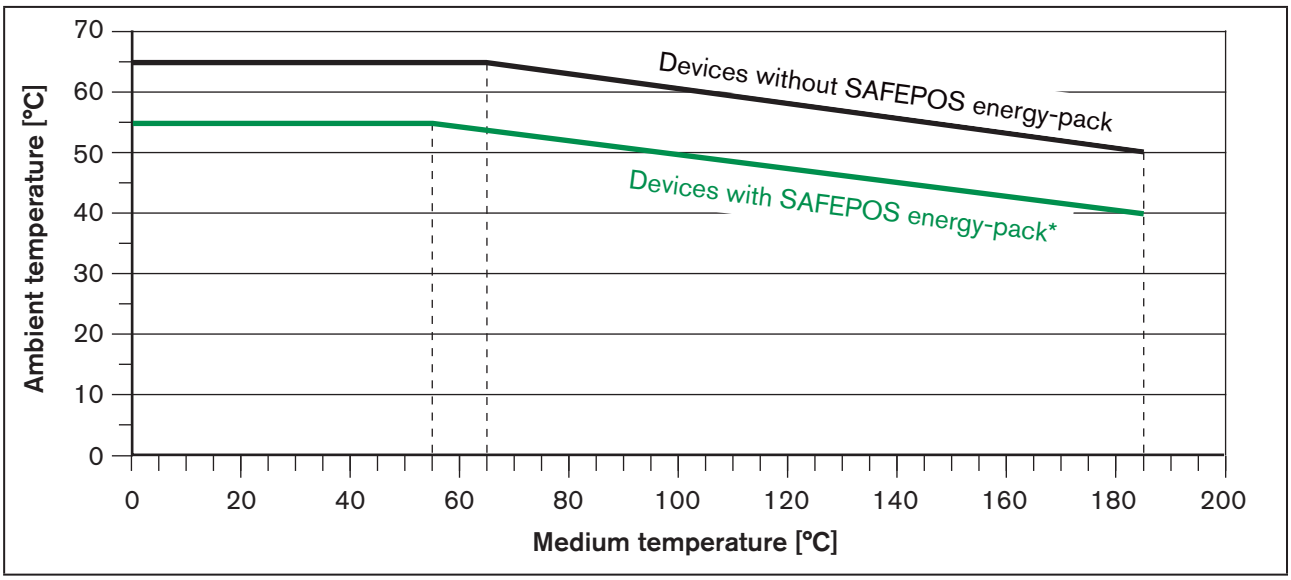

Figure 9: Temperature graph

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

8.5 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		
Possible connection types:	Socket connection G ½...G 2 (NPT, RC on request) Welded connection according to EN ISO 1127 (ISO 4200), DIN 11850 Series 2 Also for globe valves of Type 3321: Flanged connection in accordance with DIN 2634, ANSI B16.5 class 150, JIS 10K Other connections on request	

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Electrical connection:	by connection terminals or circular plugs
Installation position:	any position, preferably with actuator facing up

8.6 Electrical data

Protection class	3 according to DIN EN 61140 (VDE 0140)
Electrical connections	Cable gland, 2x M20 or 2 circular plug-in connectors M12, 5-pin and 8-pin
Operating voltage	24 V DC ± 10 % max. residual ripple 10 %
Operating current [A]*	max. 3 A 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
Life time energy pack SAFEPOS energy-pack	depending on the operating conditions up to 10 years. The life time 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
Standby consumption [W]*	min. 2 W, max. 4 W
Average consumption Electronics without actuator [W]*	standard consumption typically 3 W SAFEPOS energy-pack 0.5 W
Energy consumption actuator for 1 cycle [Ws]*	(see following graphs)

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

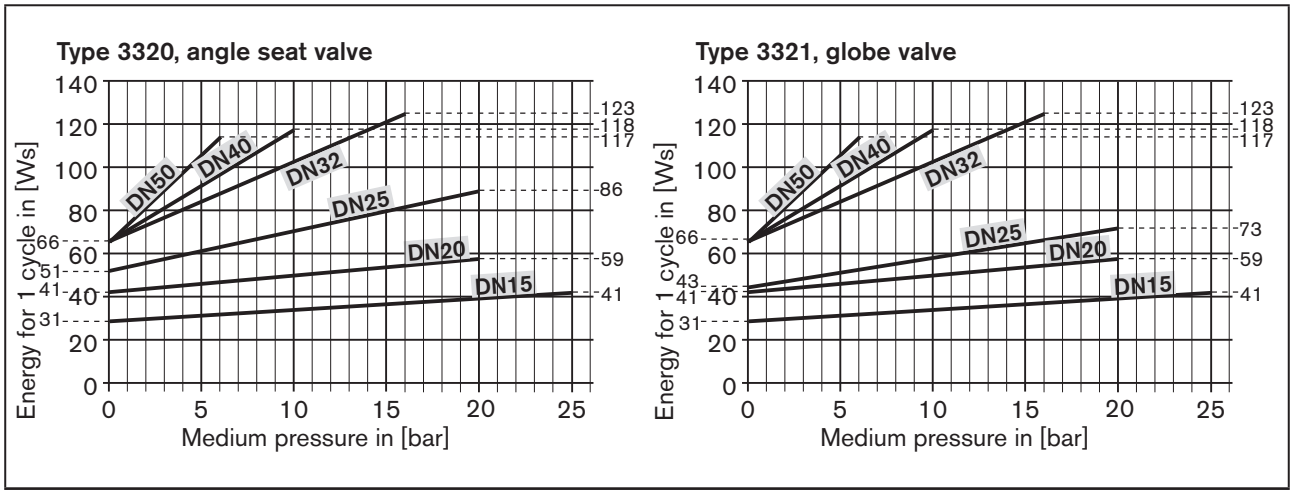

Figure 10: Energy consumption of actuator

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NOTE!

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 input, the digital outputs and the analog output 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.

8.7 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.

DN	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

DN	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.

NOTE!

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.

9.2 Devices with socket or flanged connection

9.2.1 Installation requirements

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

Direction of flow: If a direction of inflow is required, this is specified on the type label by an arrow and the numbers 1 and 2. The numbers 1 and the 2 stand for identification also on the valve body. Direction of inflow see chapter "6 Structure and function"

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.).

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.

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→ 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 Devices with welded housing

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

NOTE!

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 57.

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.

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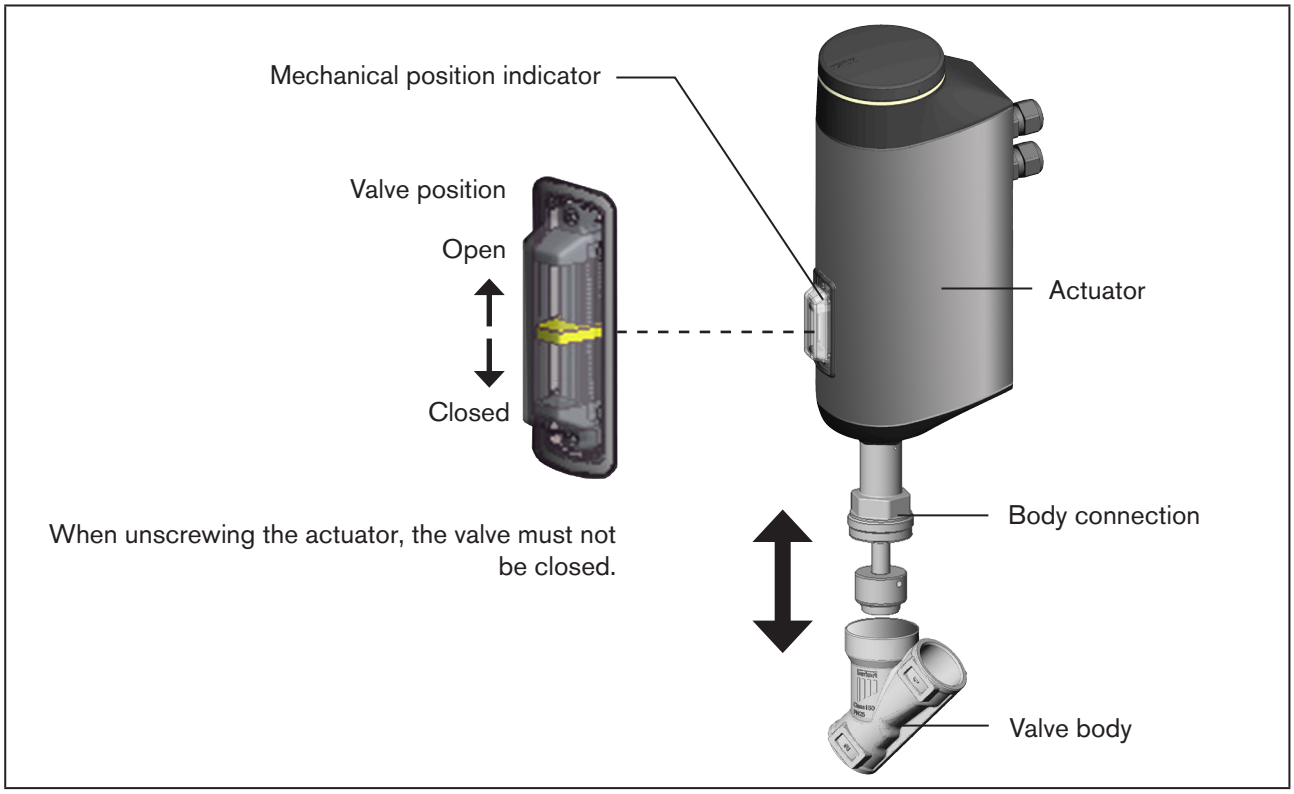

Figure 11: Installation of electromotive actuator (angle seat valve shown in the example)

9.3.3 Installation requirements

Installation position: Any position

Direction of flow: If a direction of inflow is required, this is specified on the type label by an arrow and the numbers 1 and 2. The numbers 1 and the 2 stand for identification also on the valve body. Direction of inflow see chapter "6 Structure and function"

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.).

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.

NOTE!

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.

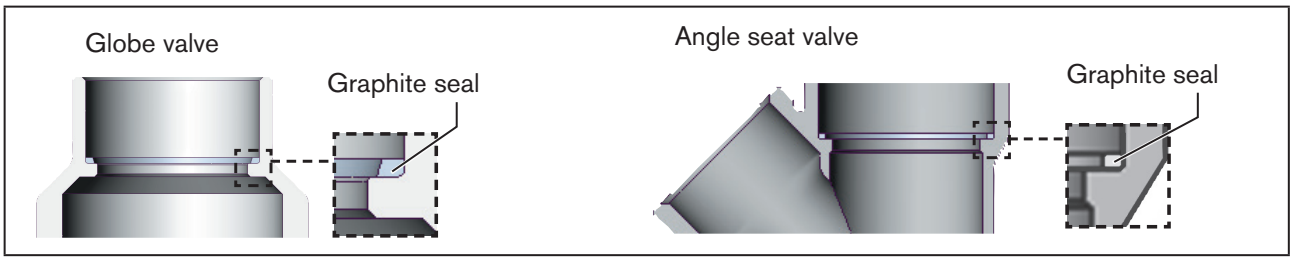

Figure 12: Graphite seal of the valve body

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 11: Installation of electromotive actuator (angle seat valve shown in the example)".

→ 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.

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→ Screw actuator onto the valve body.

Connection size	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

Definition of connection size
The connection size denotes the diameter of the line 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".

NOTE!

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 mechanical end position – running X.TUNE" on page 44.

9.4 Rotating the actuator

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

NOTE!

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.

WARNING!

If incorrect direction of rotation, risk of injury due to discharge of medium and pressure release.

If the direction of rotation is wrong, the body connection may become detached.

▸ Rotate actuator in the indicated direction only (see "Figure 13: Rotating the actuator").

→ Rotate the actuator, preferably 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.

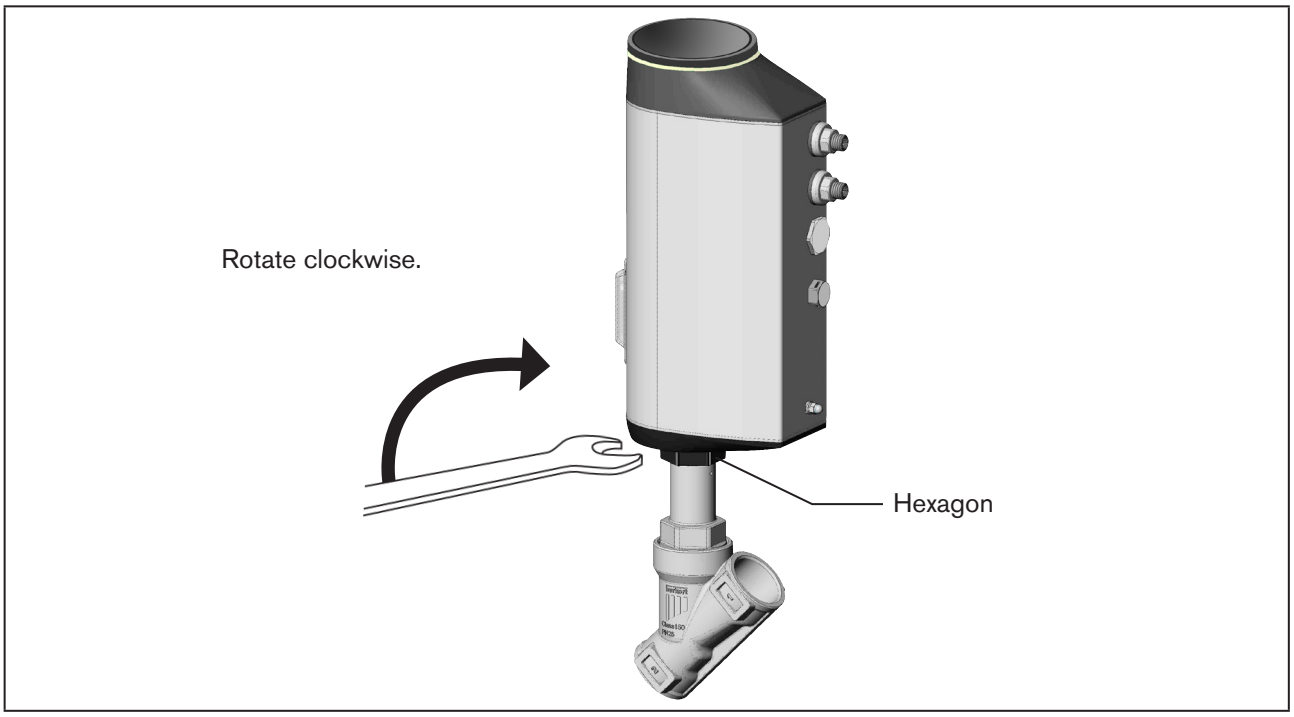

Figure 13: Rotating the actuator

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".

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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:

NOTE!

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

→ Fix the holding device in place using suitable means.

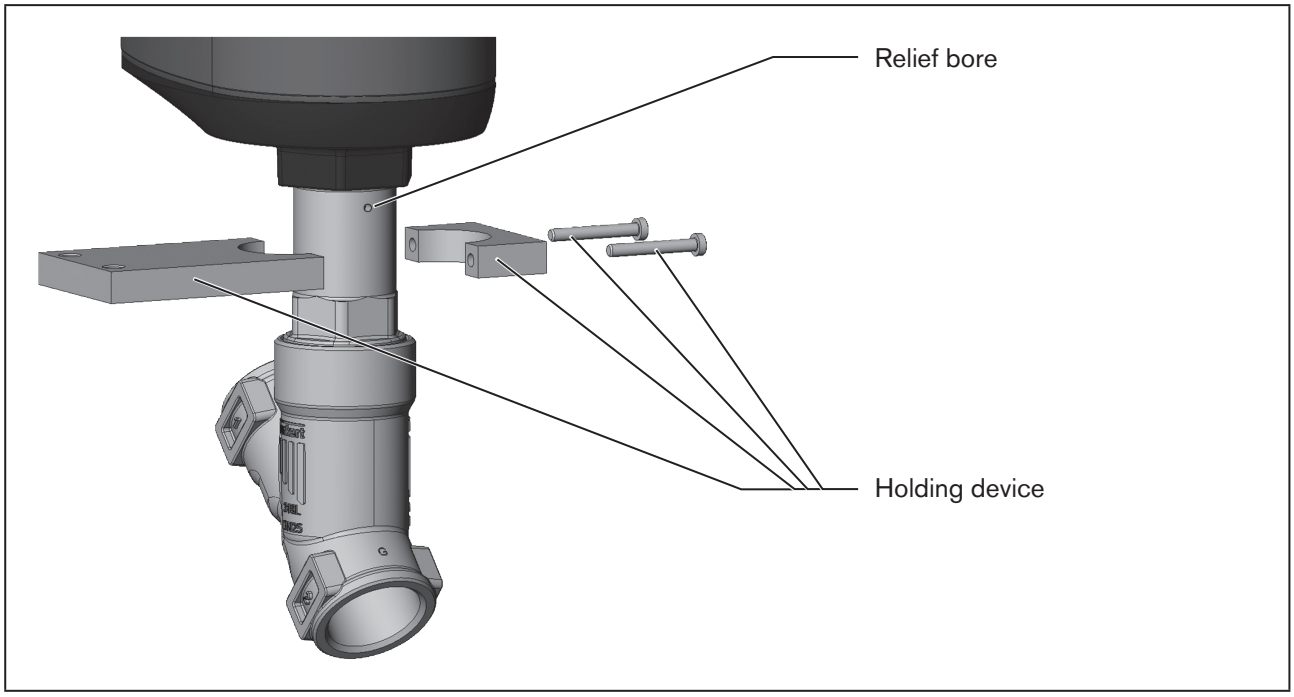

Figure 14: Attaching the holding device

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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 DC
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.

NOTE!

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

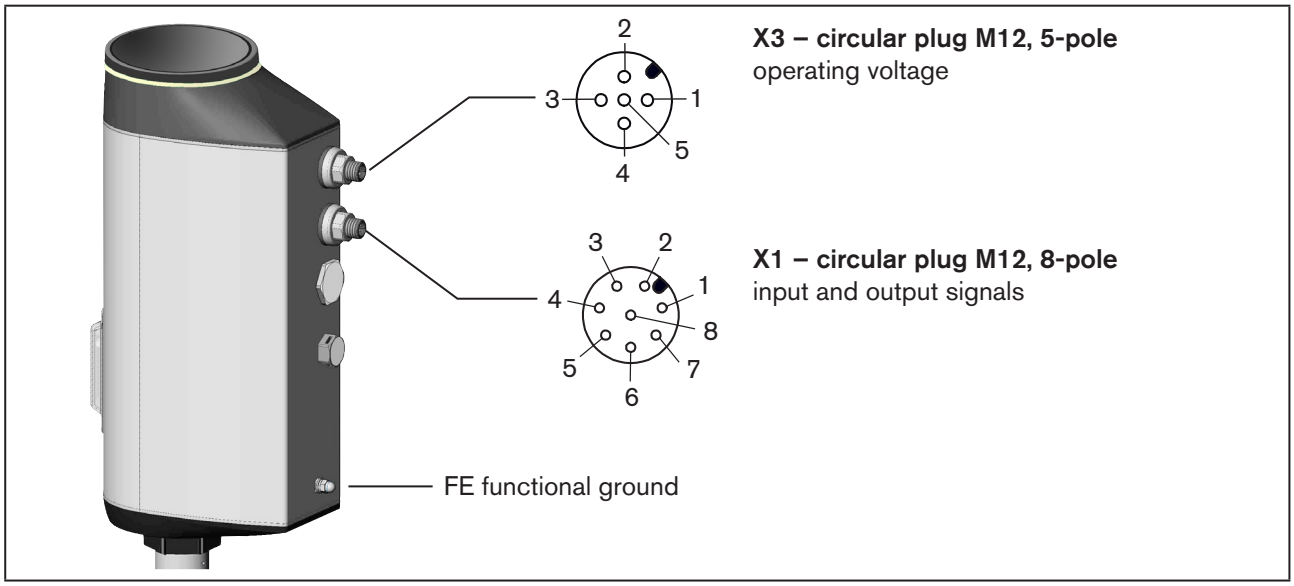

Figure 15: Description of the circular plug-in connectors

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 DC ± 10 % 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: X6 – 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.

NOTE!

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.

1. Removing dummy cover:

→ To release, rotate the dummy cover counter-clockwise by 90° and remove from the actuator housing.

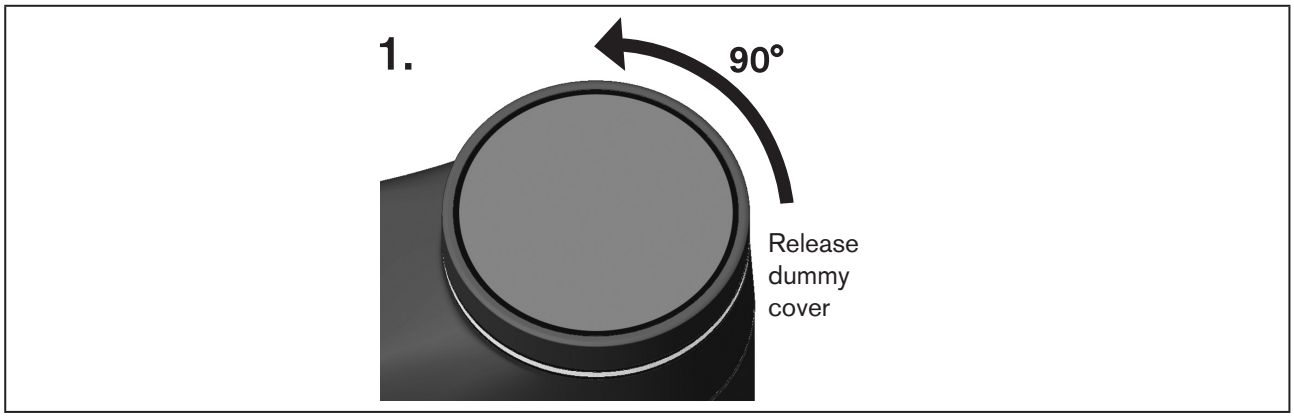

Figure 16: Removing dummy cover from the actuator housing

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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.

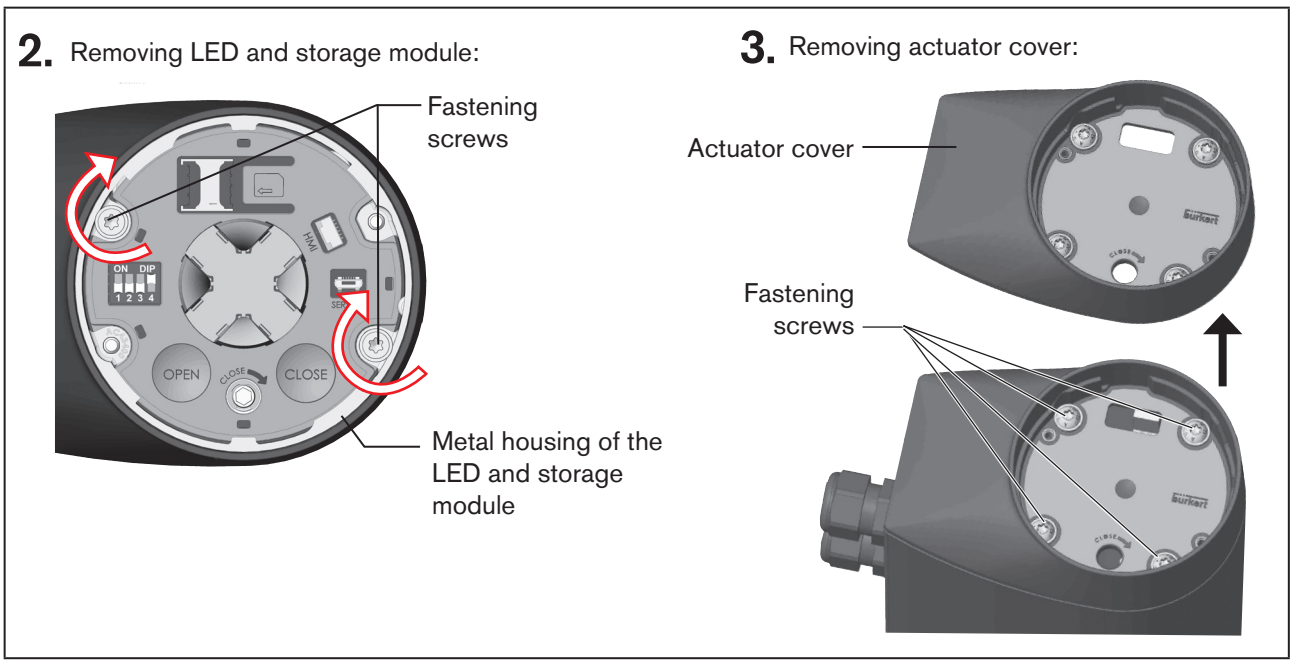

Figure 17: Remove LED and storage module and remove actuator cover

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.

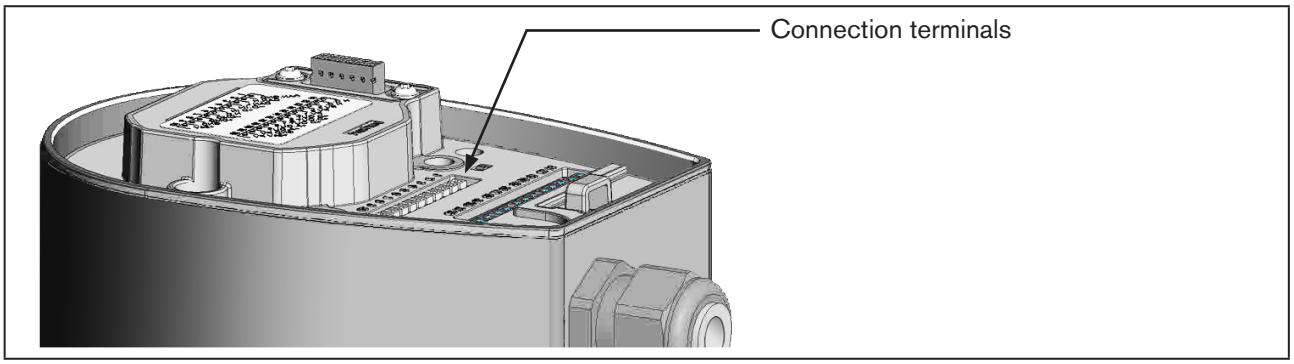

Figure 18: Location of the connection terminals

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10.2.3 Connecting the cables

→ Push the cables through the cable gland.

NOTE!

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 41.

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

NOTE!

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).

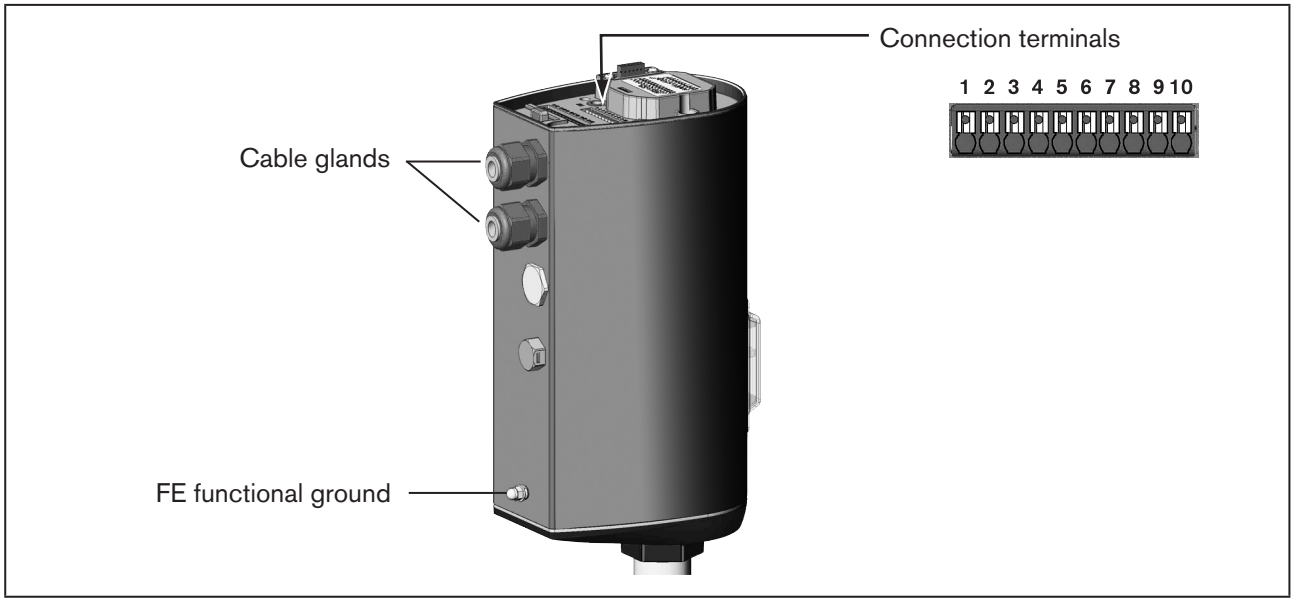

Figure 19: Connecting the cables

→ 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 DC ± 10 % max. residual ripple 10 %
9	GND
1*	CAN_GND ⚠ 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

NOTE!

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.

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

→ Put on dummy cover and rotate clockwise by 90° until it engages.

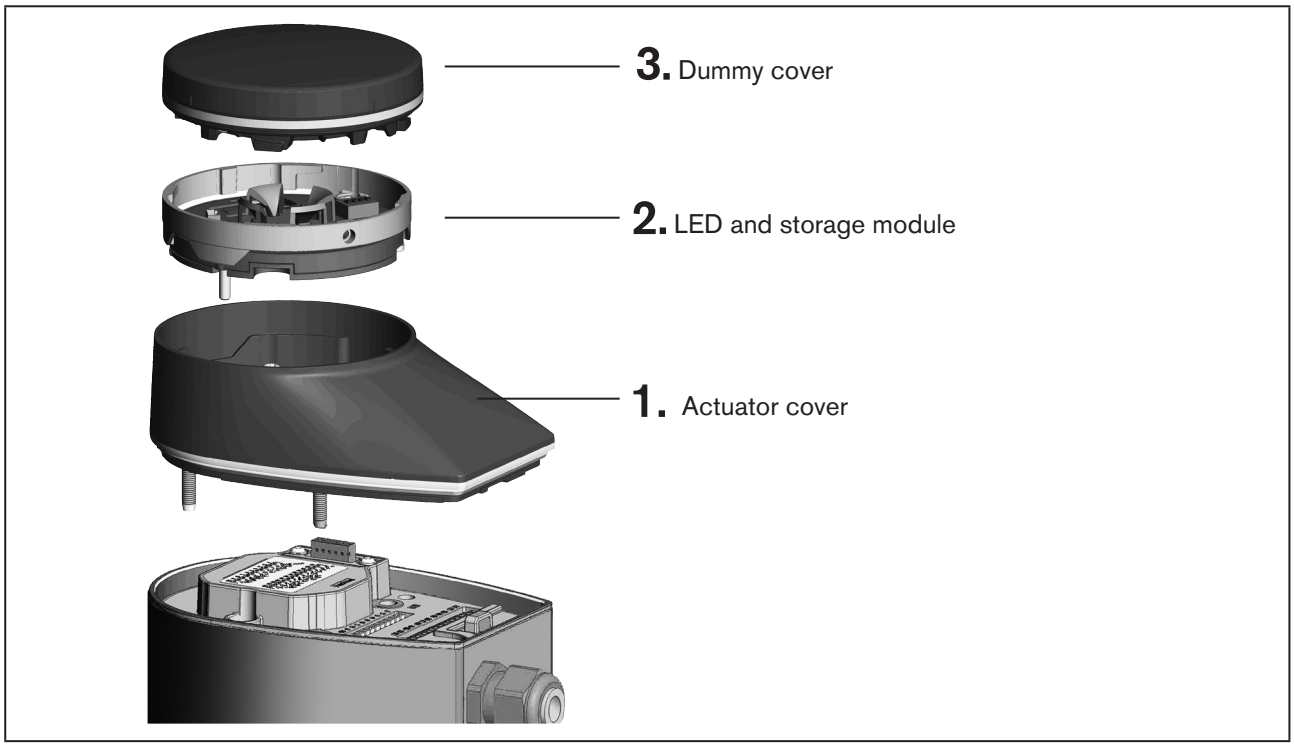

Figure 20: Closing the device

→ 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".

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.

NOTE!

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 mechanical end position – running X.TUNE"

- The device must be in the MANUAL operating state.

11.2 Setting operating state

Devices are delivered with the MANUAL operating state preset. Set the operating state to AUTOMATIC for starting up. For description see chapter "13.1 Switching operating state, AUTOMATIC – MANUAL"

11.3 Basic settings

In the case of devices in the as-delivered state, all basic settings required for starting up have already been made at the factory.

Overview of basic factory settings:

Device version	Basic factory settings			
	Signal type	**Digital input** chapter "13.2"	**Safety position** chapter "13.2"	**Adjusting the mechanical end position (X.TUNE)** chapter "11.4"
Standard	analog	24 V	close	performed at factory
Option gateway	gateway	is specified by the fieldbus		

Table 13: Basic factory settings

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There are different ways of making basic settings on the device.

- **Basic setting on the PC or tablet**
  Possible on all device types and device versions.
  The setting is made in the "Bürkert-Communicator" PC software which can be downloaded free of charge from the Bürkert homepage.
  In addition to the PC software, the USB büS interface set, available as an accessory, is required. Communication is established by the büS service interface of the device (see "12.4 büS service interface").
- **Adjusting the mechanical end position (X.TUNE function) using 2 capacitive buttons on the device.**

11.4 Adjusting the mechanical end position – running X.TUNE

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

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

NOTE!

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.

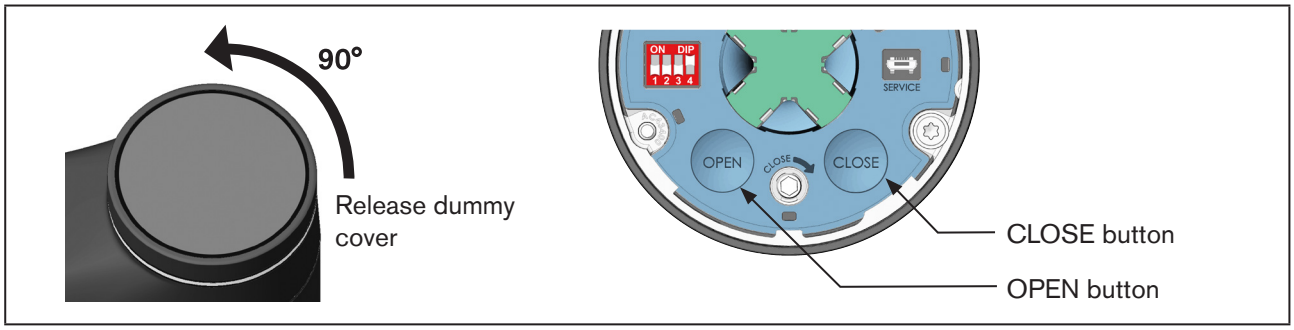

Figure 21: Adjusting the mechanical end position using the buttons in the device

→ To release, rotate the dummy cover counter-clockwise by 90° and remove from the actuator housing.

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.

11.4.2 Adjustment 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 14: Possible error message following cancellation of the X.TUNE function

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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**
  The device can be set alternatively also 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 15: Operating options

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12.2 Display elements

Representation of the display elements:

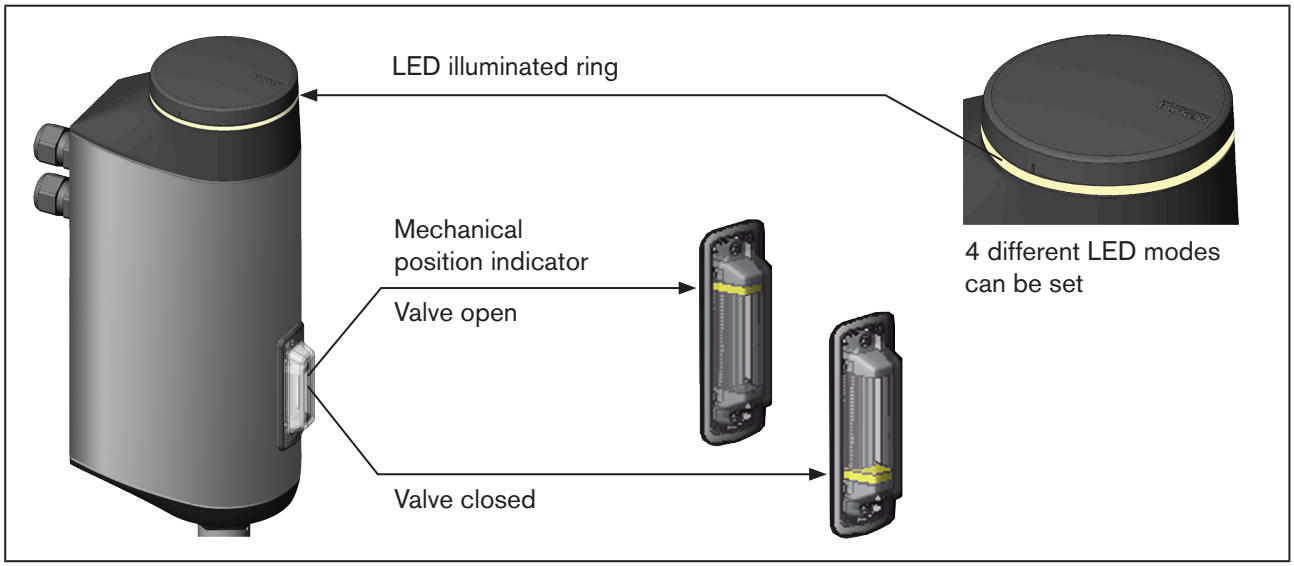

Figure 22: Display elements

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

* 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".

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12.2.2 Setting LED mode

To set LED mode, you must change to 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.

12.2.3 Mechanical position indicator

The valve position can be read off on the mechanical position indicator even if the supply voltage fails (see "Figure 22: Display elements")

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12.3 Operating elements

Representation of the operating elements:

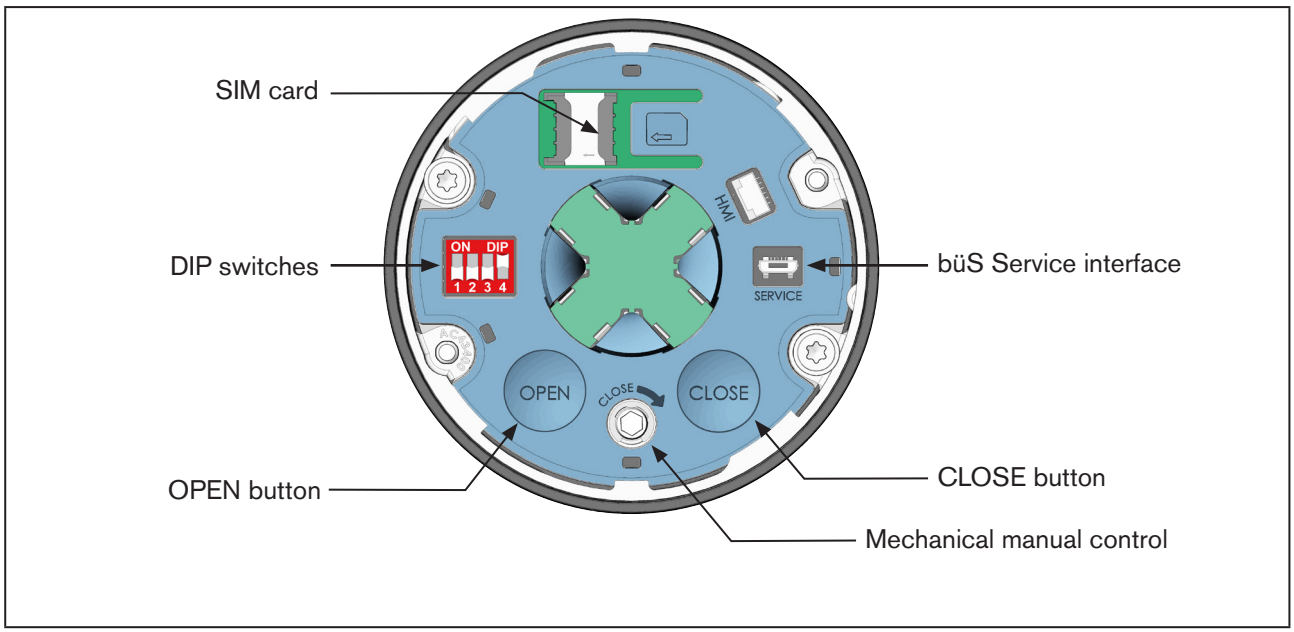

Figure 23: Operating elements

12.3.1 DIP switches

Settings

Switch 1: Activate or deactivate safety position, see chapter "13.2" on page 53.
Switch 2: Select safety position between NO and NC, see chapter "13.2" on page 53.
Switch 3: Not used.
Switch 4: For switching between AUTOMATIC mode and MANUAL mode.
See chapter "13.1" on page 52.

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 mechanical end position – running 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 12).

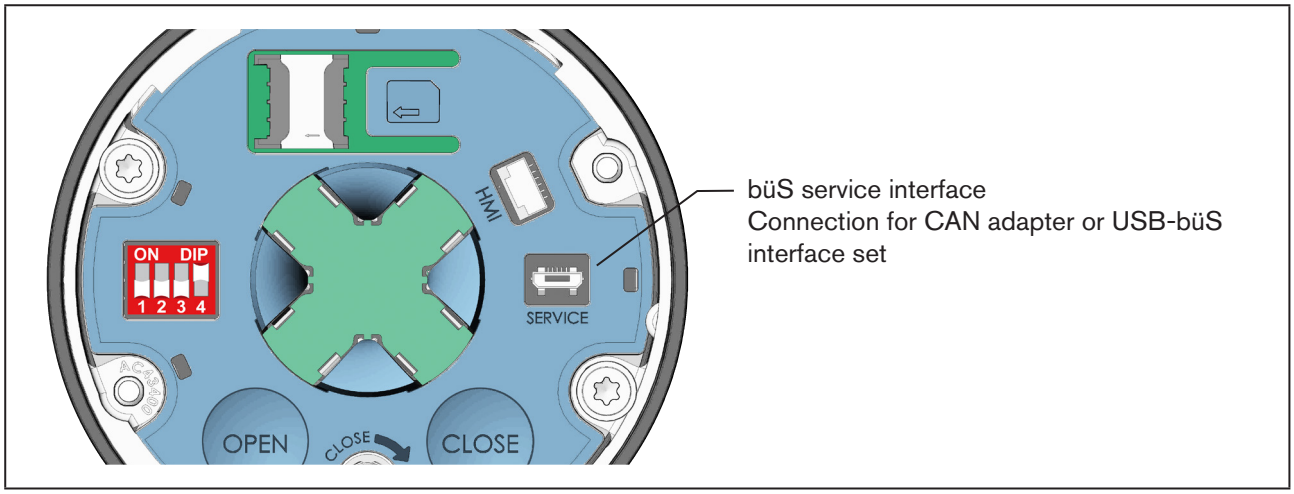

Figure 24: büS service interface

For devices with EtherNet/IP the büS service interface is on the underside of the fieldbus gateway (see chapter "17.4 Access to the büS service interface" on page 68)

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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.

A SIM card which has just been inserted is checked by the device for existing 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.

NOTE!

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".

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.

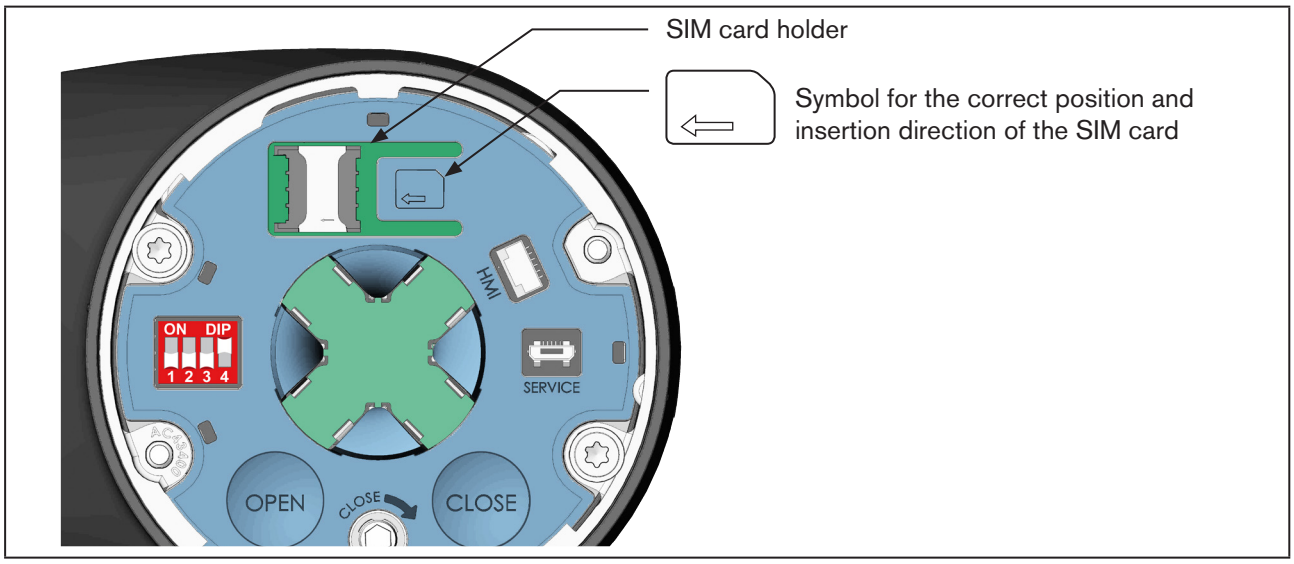

Figure 25: Inserting the SIM card

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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.

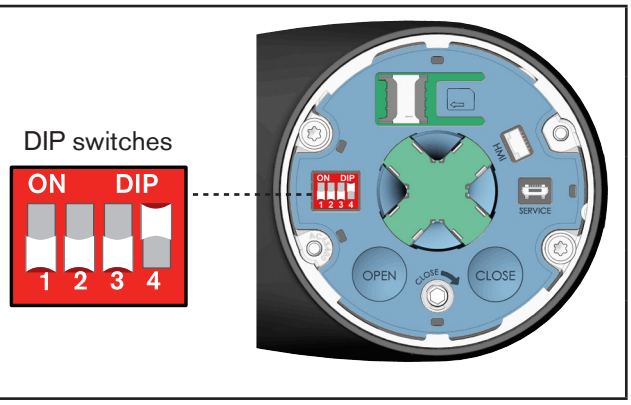

Table 16: Overview of basic functions

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 by 90° and remove from the actuator housing.

→ Push DIP switch 4 downwards. The device is now in operating state AUTOMATIC.

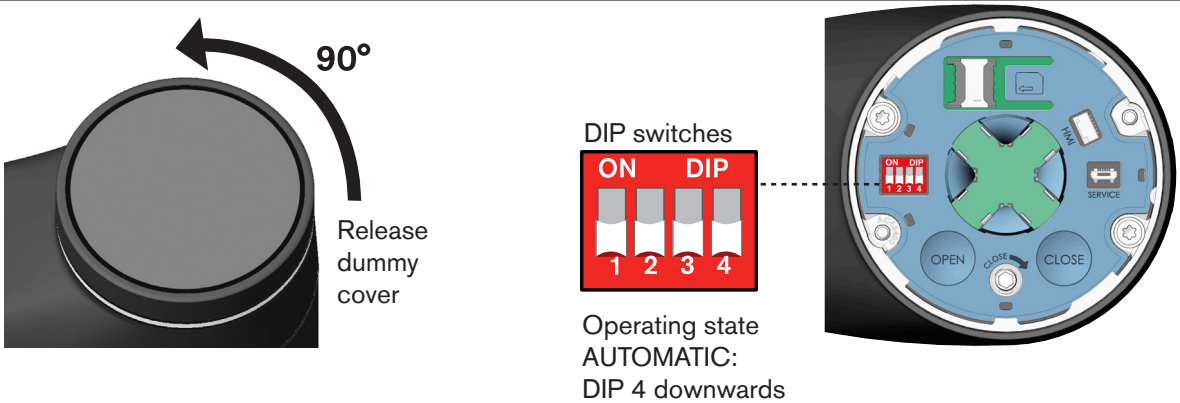

Figure 26: Setting operating state AUTOMATIC

→ 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 2 (NC/NO)		DIP 1 (Safety position activated / deactivated)	Safety position	Set-point value (0...5 V) Log 0	Set-point value (10...30 V) Log 1
NC	OFF	ON	Closed	Closed	Open
	OFF	OFF	None (actuator stops)	Closed	Open
NO	ON	ON	Open	Open	Closed
	ON	OFF	None (actuator stops)	Open	Closed

Table 17: Setting effective direction and safety position

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

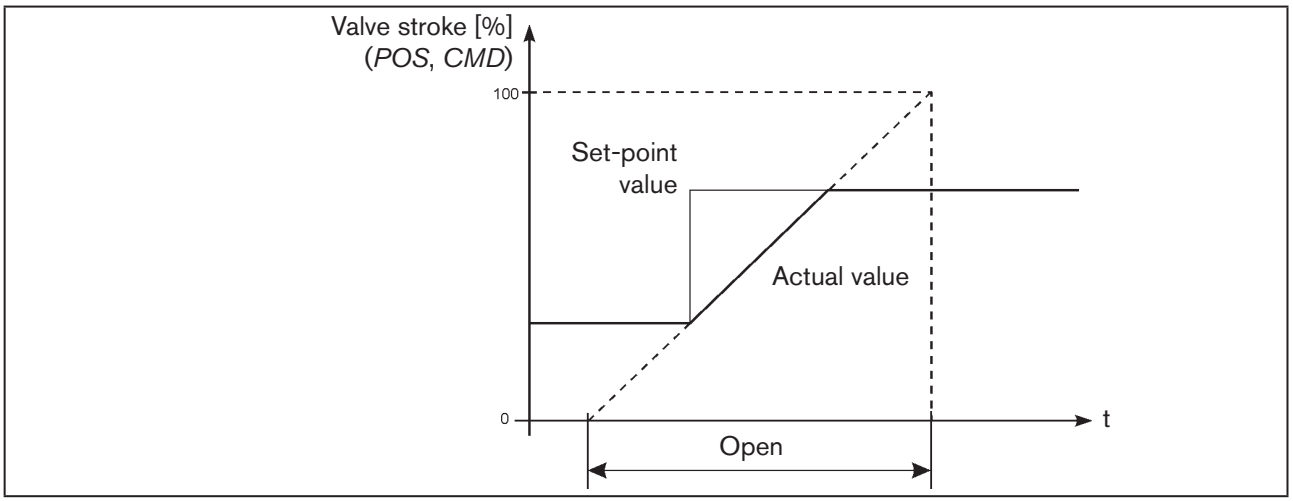

Figure 27: X.TIME graph

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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**.

→ 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 %*

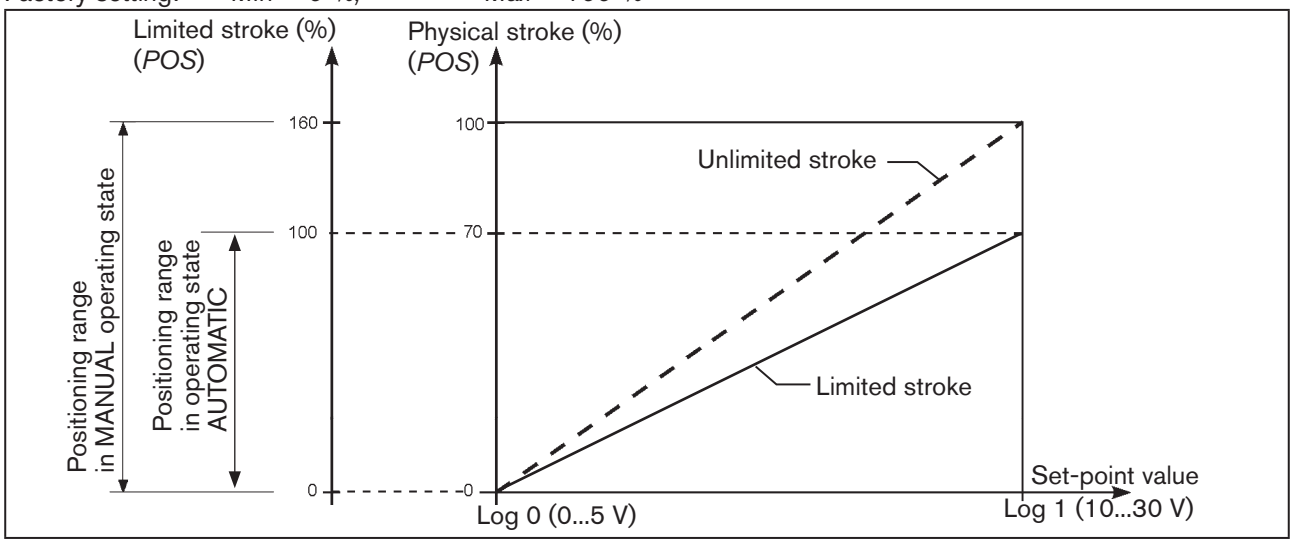

Figure 28: X.LIMIT graph

NOTE!

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

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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.

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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.

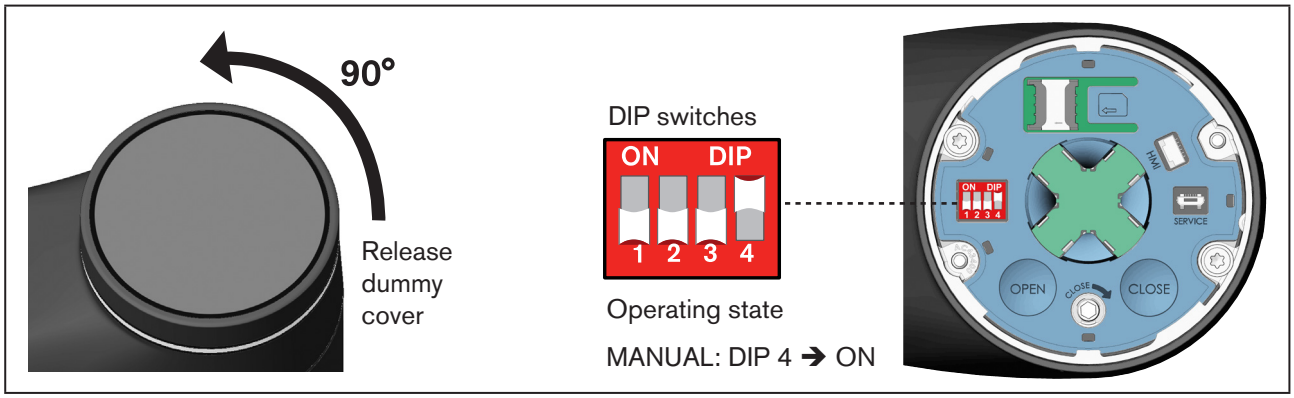

Figure 29: Setting MANUAL operating state

→ To release, rotate the dummy cover counter-clockwise by 90° and remove from the actuator housing.

→ Set DIP switch 4 to ON. The device is now in MANUAL operating state (see "Figure 29").

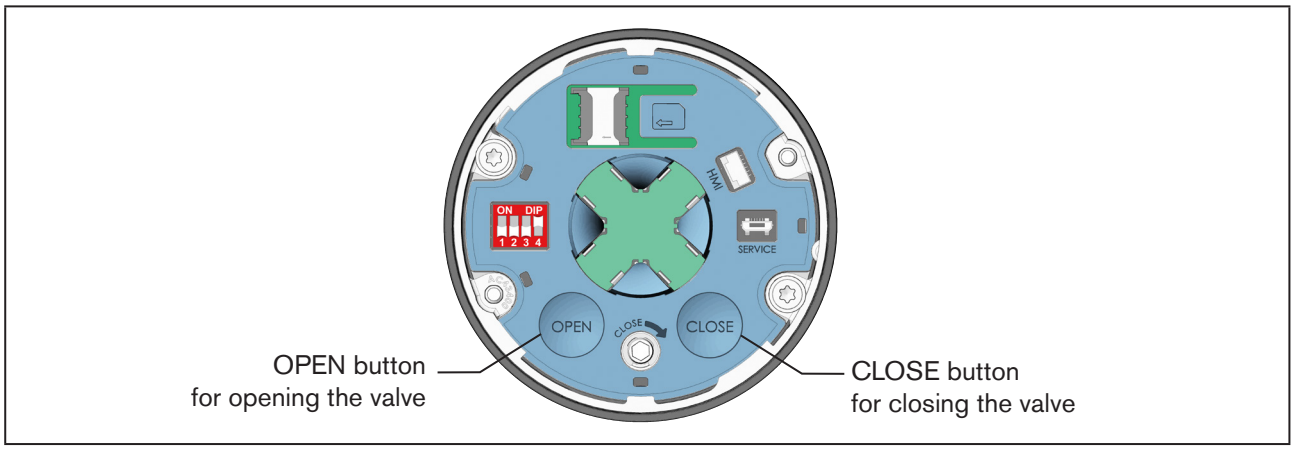

Figure 30: Electrical manual actuation of devices

→ Using the OPEN button and CLOSE button, open or close the valve (see "Figure 30").

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

→ Close the dummy cover.

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15.2 Actuating valve mechanically

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

NOTE!

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

→ To release, rotate the dummy cover counter-clockwise by 90° and remove from the actuator housing.

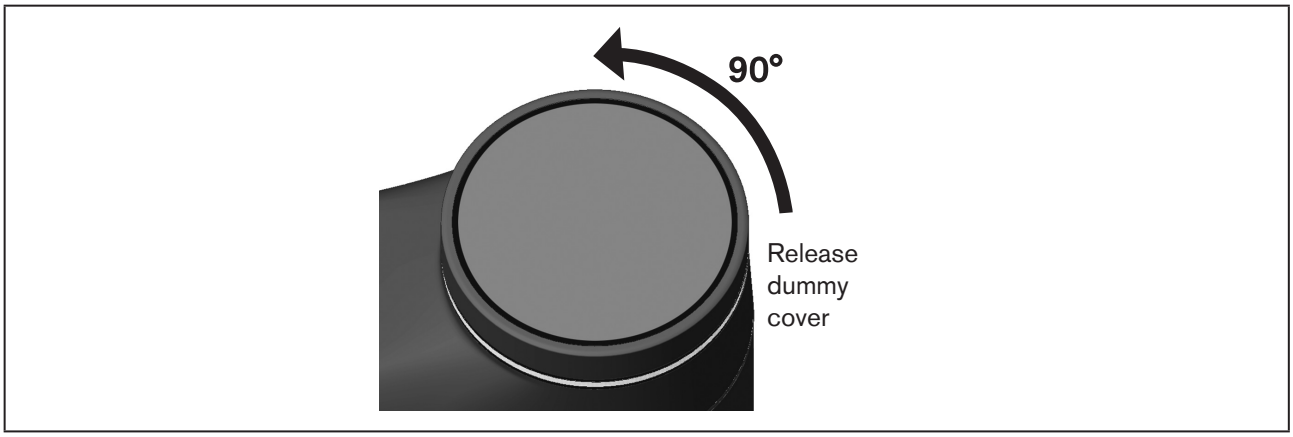

Figure 31: Removing dummy cover from the actuator housing

→ To adjust the valve, use an Allen key with 4 mm width across flats.

NOTE!

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

The position indicator must detect when the valve end positions are reached (see "Figure 32").

→ Applying a gentle pressure, couple the mechanical manual control and simultaneously turn the Allen key (see "Figure 33").

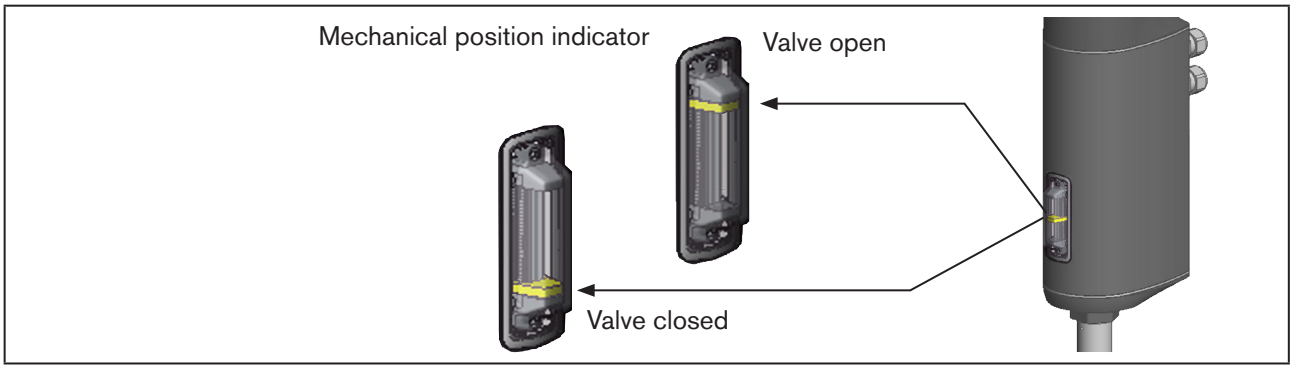

Figure 32: Mechanical position indicator

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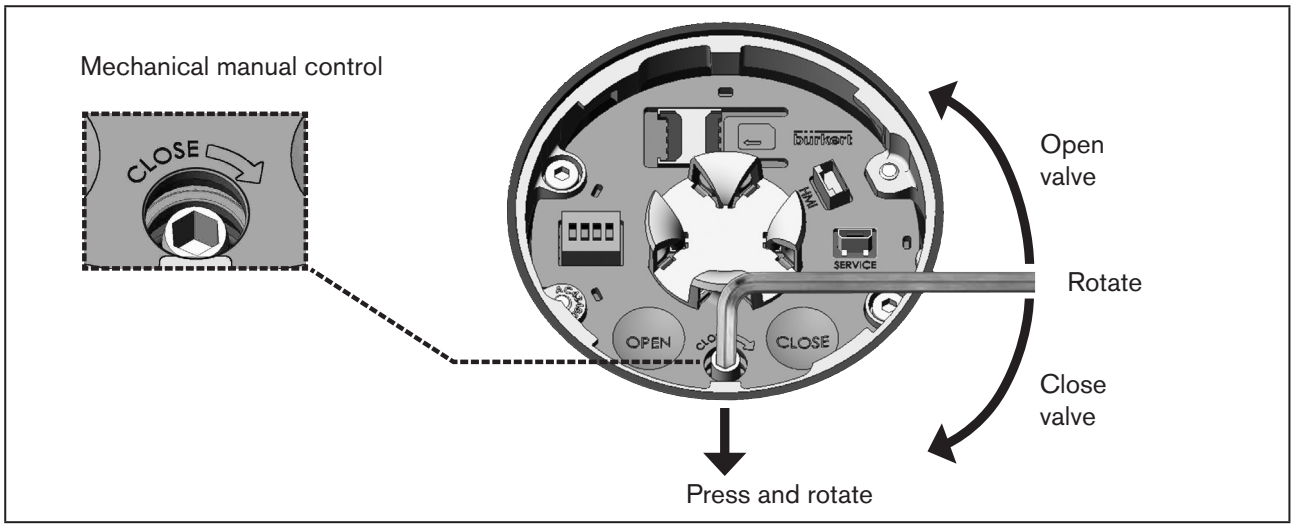

Figure 33: Mechanical manual control

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

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

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16 OPERATING STRUCTURE AND 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

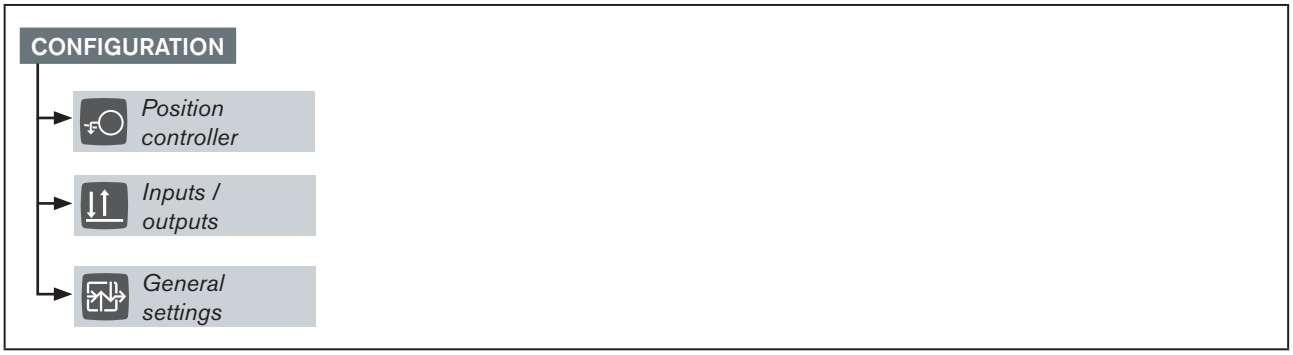

Figure 34: Operating structure - 1, Position controller

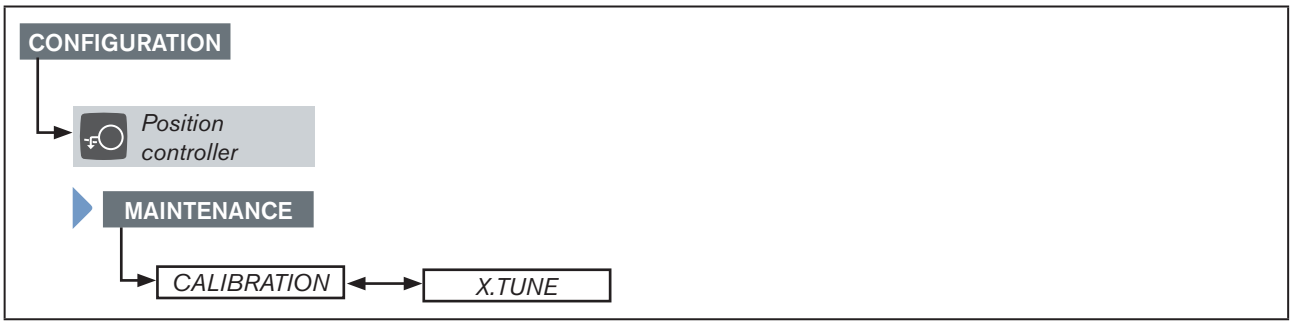

Figure 35: Operating structure - 2, Maintenance position controller

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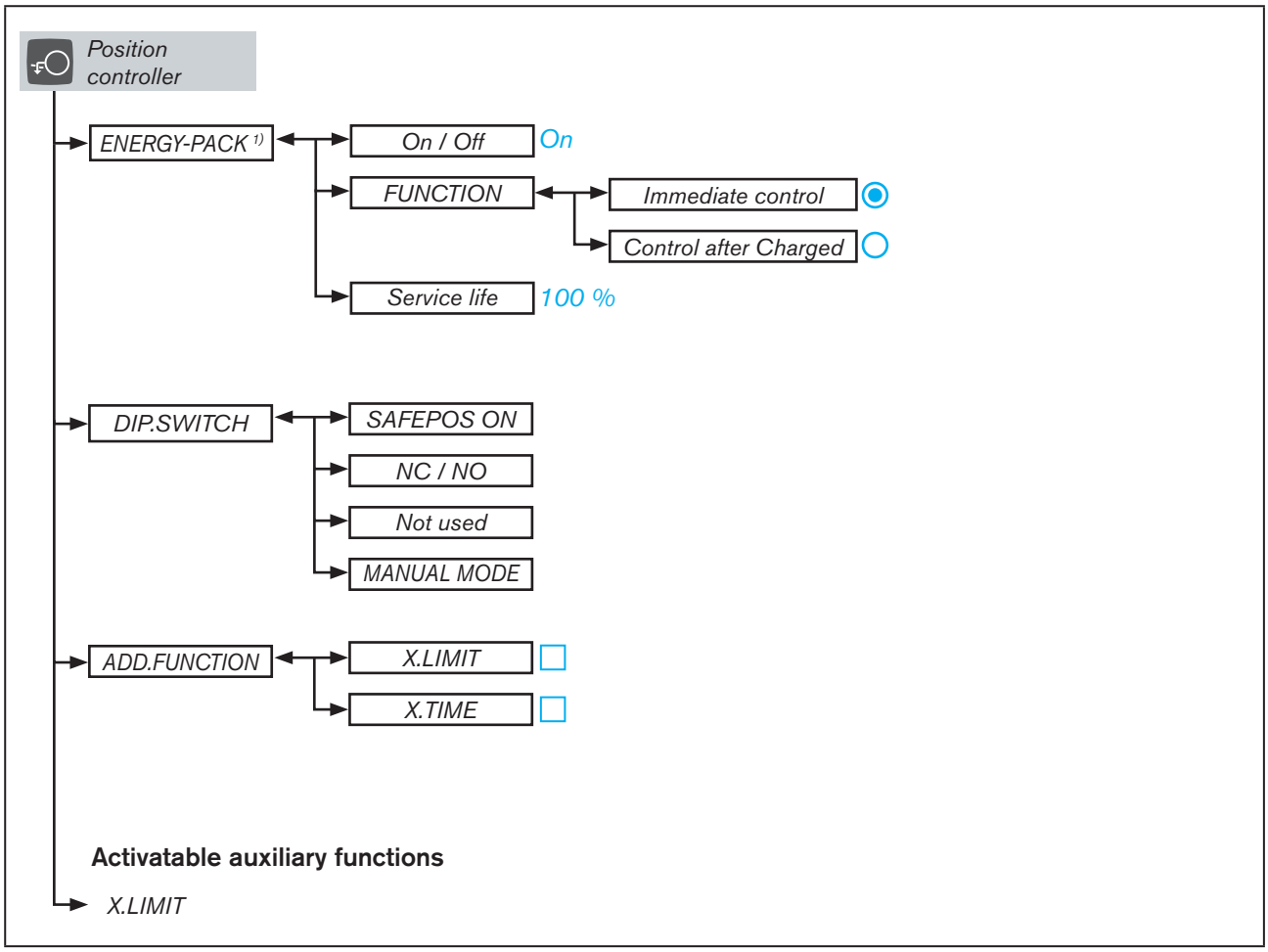

Figure 36: Operating structure - 3, Configuration area position controller

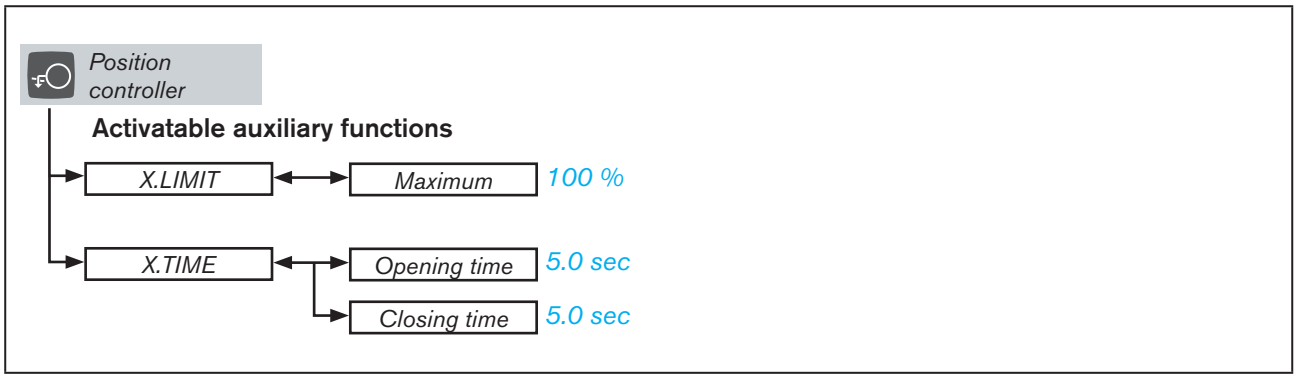

Figure 37: Operating structure - 4, Configuration area position controller

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

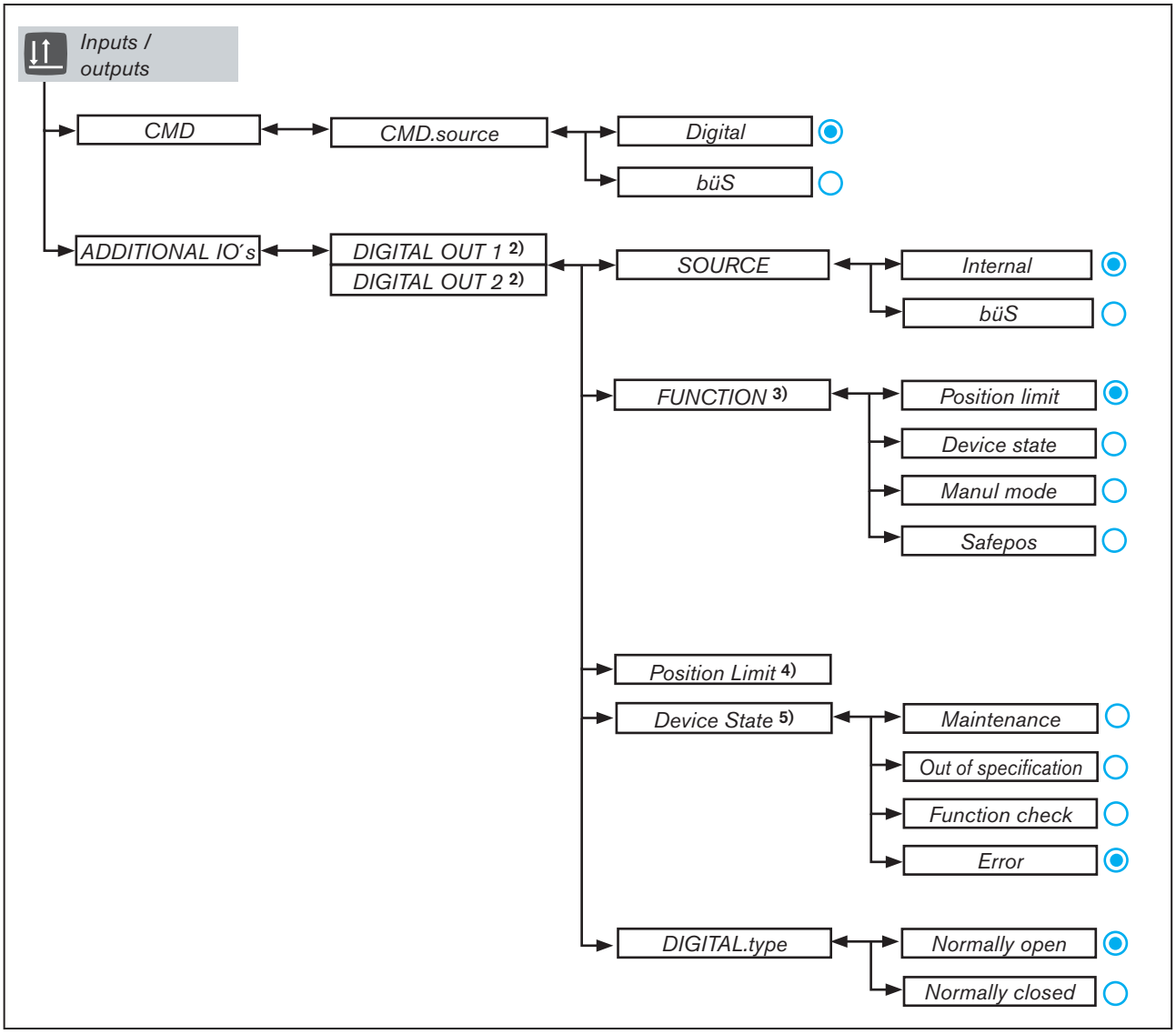

Figure 38: Operating structure - 5, Configuration area inputs / outputs

2) Only available for devices with the digital output option.

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

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

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

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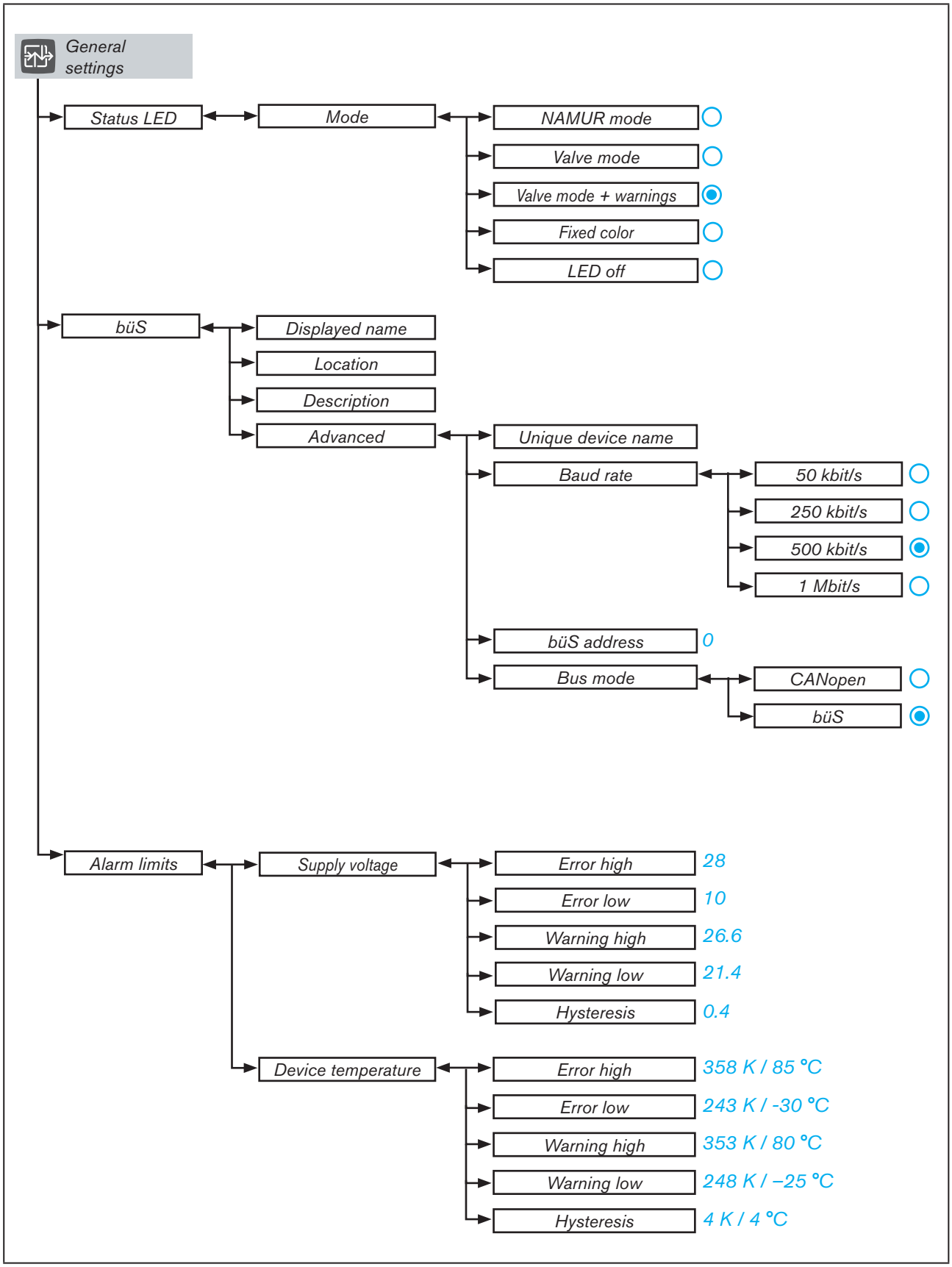

Figure 39: Operating structure - 6, Configuration area general settings

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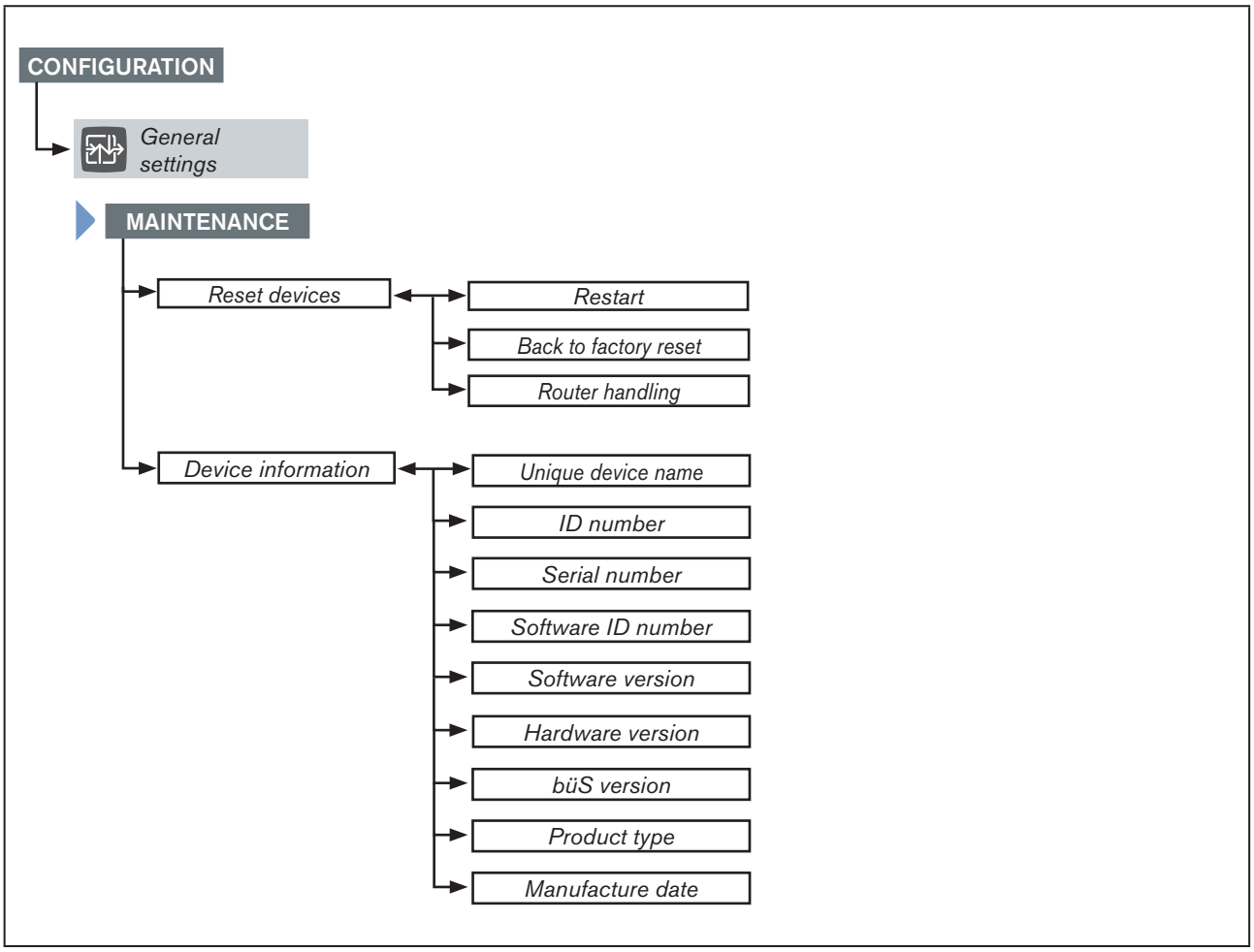

Figure 40: Operating structure - 7, Maintenance general settings

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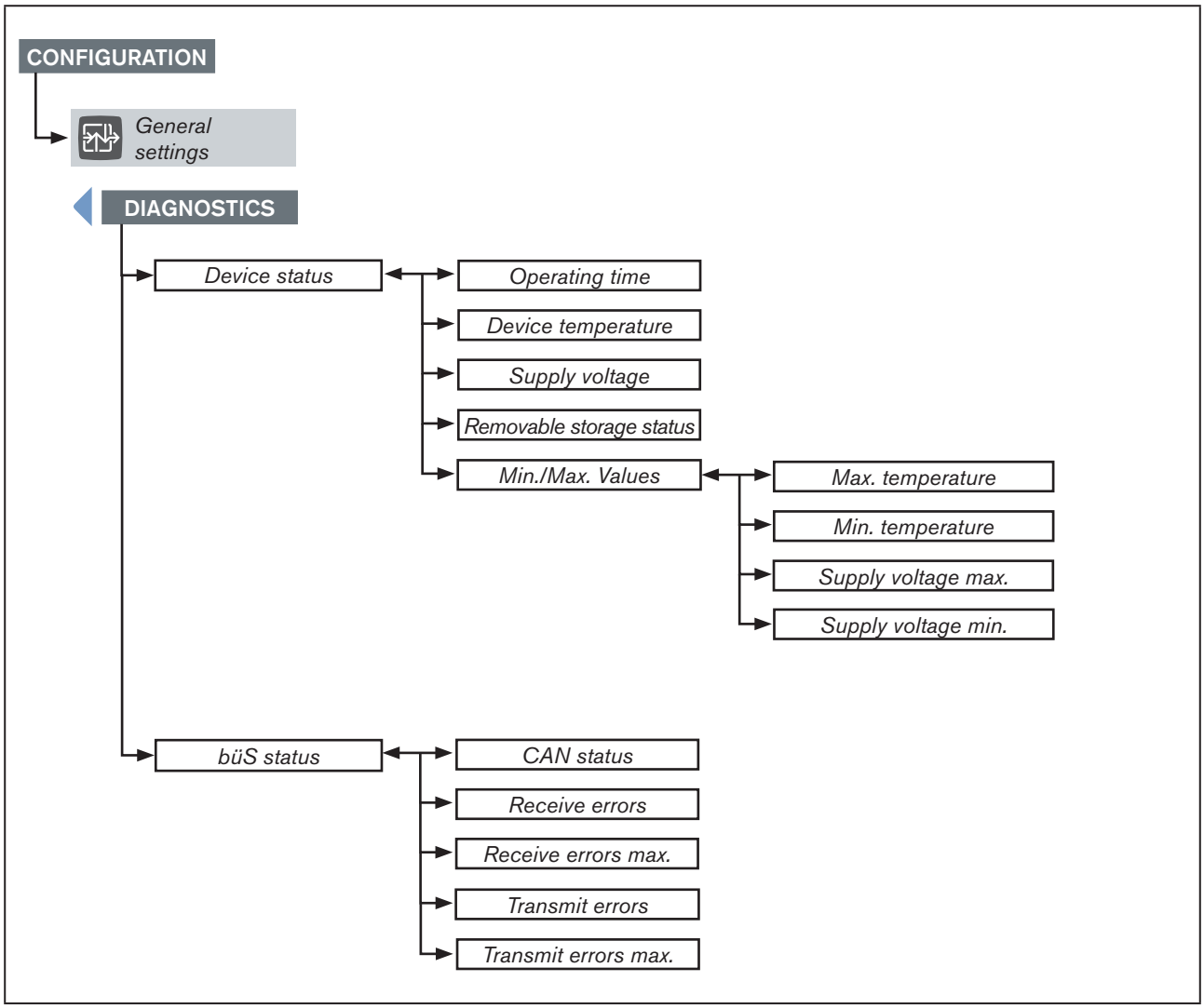

Figure 41: Operating structure - 8, Diagnostics general settings

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17 FIELDBUS GATEWAY
EtherNet/IP, PROFINET and Modbus TCP

17.1 View

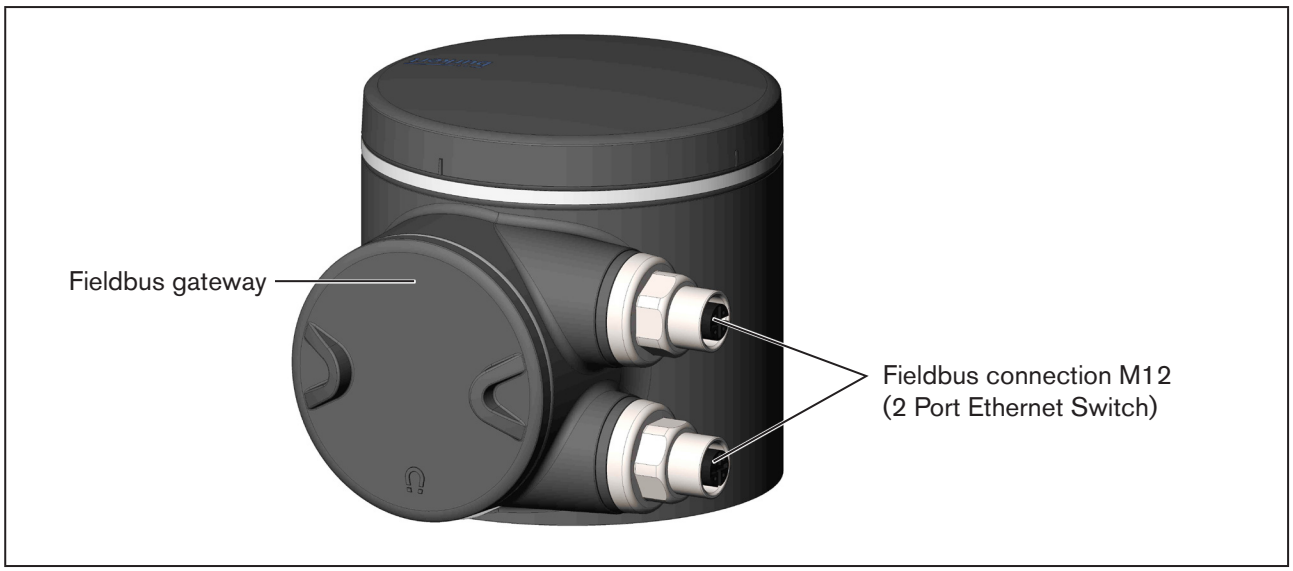

Figure 42: Fieldbus gateway

17.2 Technical data

Network speed	10/100 mbps
Auto negotiation	Yes
Auto MDI/MDI-X	Yes
Switch function	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)

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17.3 Electrical connection

The EtherNet/IP is connected with a circular plug-in connector M12, 4-pole.

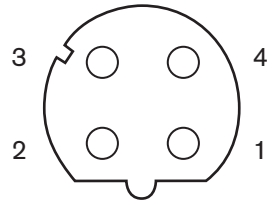	Pin 1	Transmit +
	Pin 2	Receive +
	Pin 3	Transmit –
	Pin 4	Receive –

Table 18: Electrical assignment EtherNet/IP

NOTE!

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

As the metal housing of the M12 circular plug-in connector is connected to the actuator housing, the functional ground must be grounded on the actuator housing. For the grounding use a short line (max. 1m) with a cross-section of at least 1.5 mm².

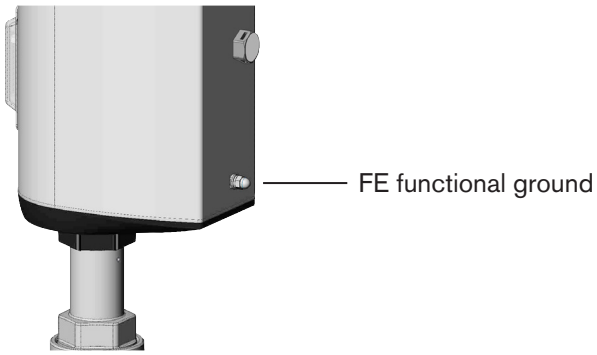

Figure 43: Functional earth

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 access, open the cover using a screwdriver.

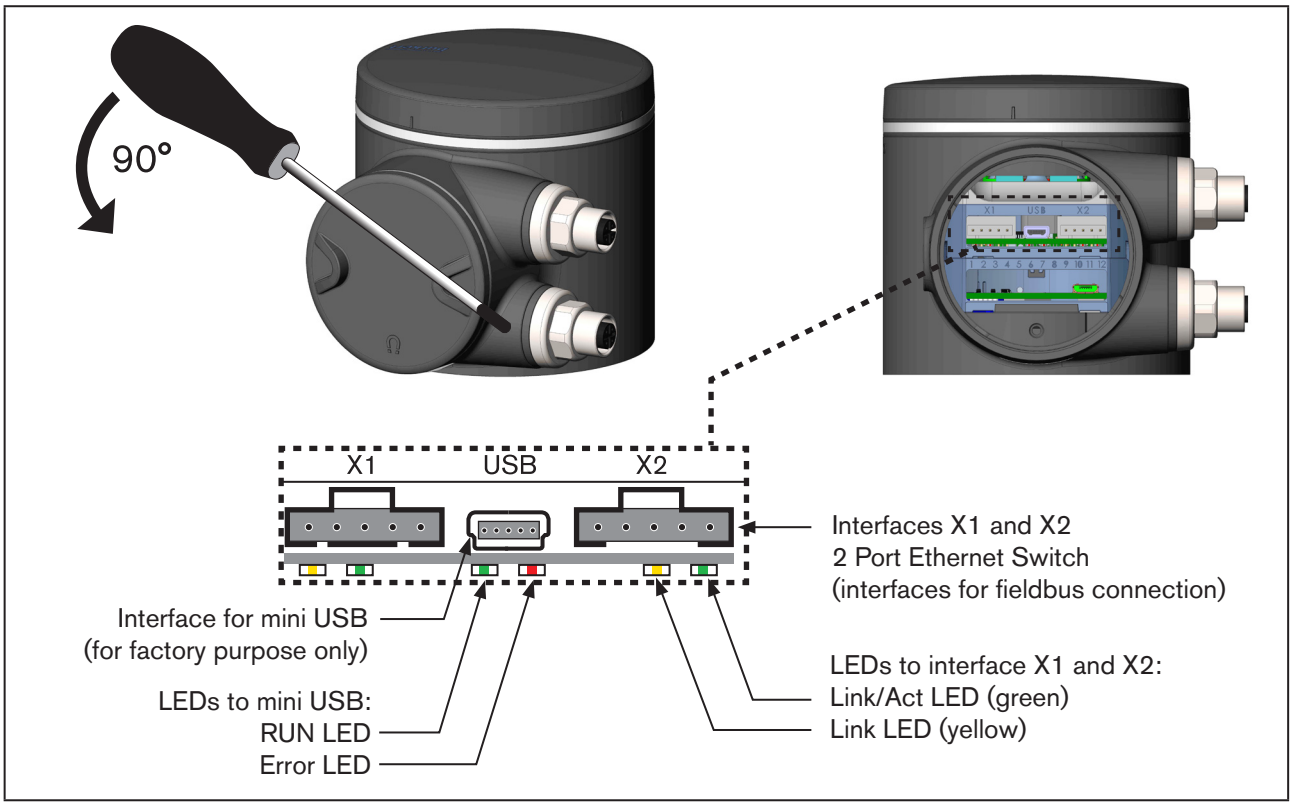

Figure 44: LEDs for status display of the network connection

NOTE!

The mini USB interface is for the factory service only.

Description of the LEDs:

LED status		Description / cause of error	Procedure
RUN LED	Active	Connection to control active.	-
	Not active	Connection to control not active.	Check cables.
Error LED	Active	Connection to control not active.	Check cables.
	Not active	Connection to control active.	-

Table 19: LED status displays of the mini USB interface

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

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LED status		Description / cause of error	Procedure
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 access, open the cover using a screwdriver. See "Figure 44".

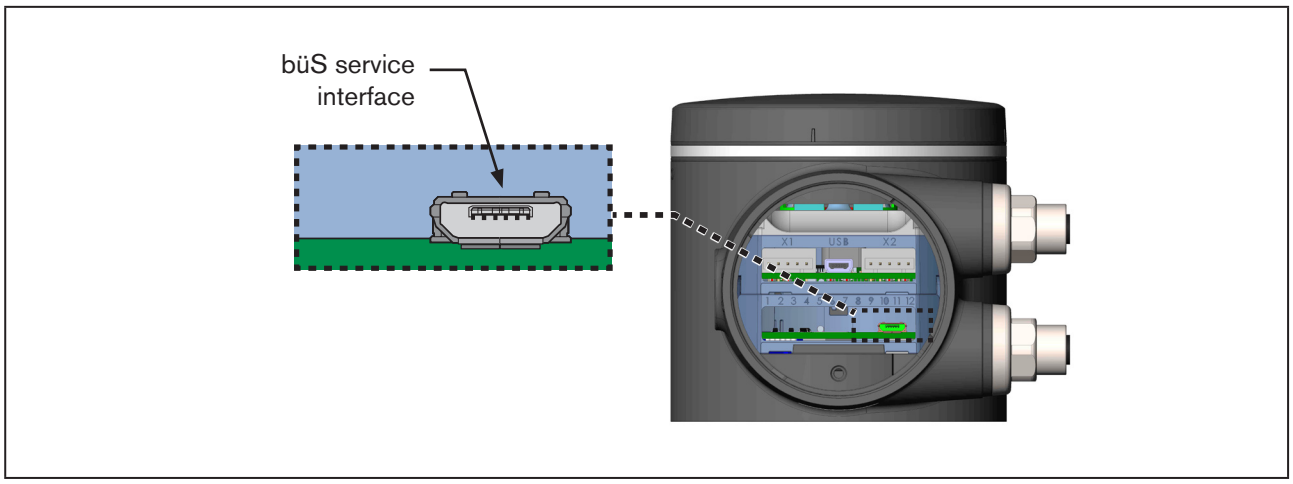

Figure 45: büS service interface for Fieldbus Gateway version

17.5 Web server

The configuration of the EtherNet device required for integration in the network can be implemented by 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).

→ Connect the PC to the EtherNet device with a network cable.

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17.5.2 Access to the web server

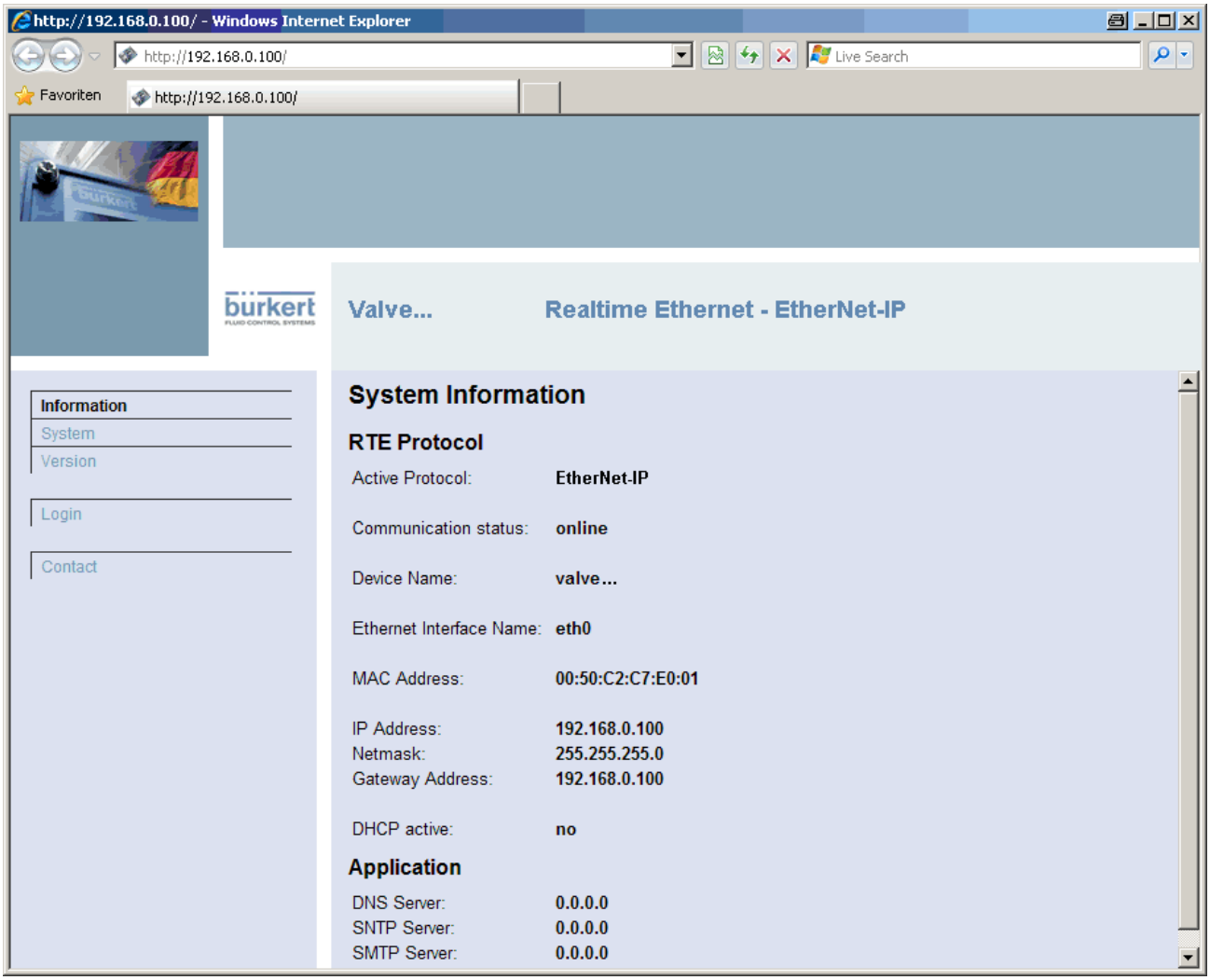

Figure 46: Access to the web server via the Default IP

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→ Open an Internet browser.

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

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

Configuration of several devices:

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

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

17.5.3 Configuring EtherNet device

Logging into the system:

→ Input user name and password. User name: **Admin**
Password: **admin**

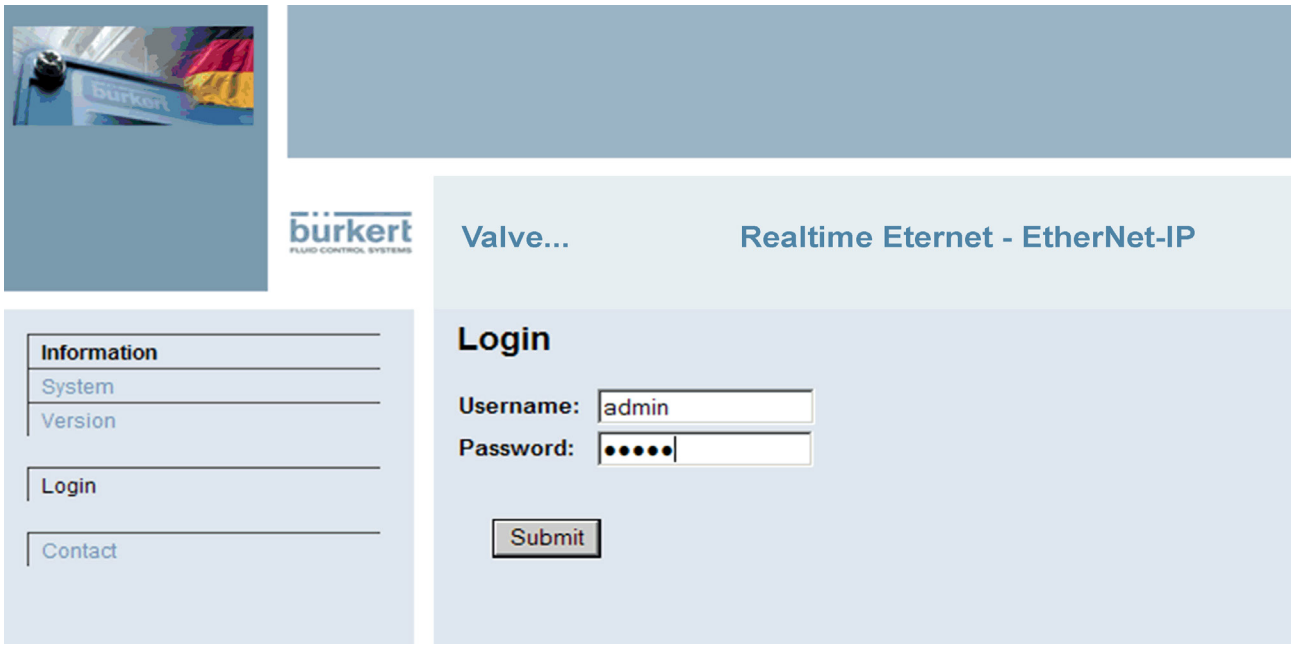

Figure 47: Logging into the system

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).

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

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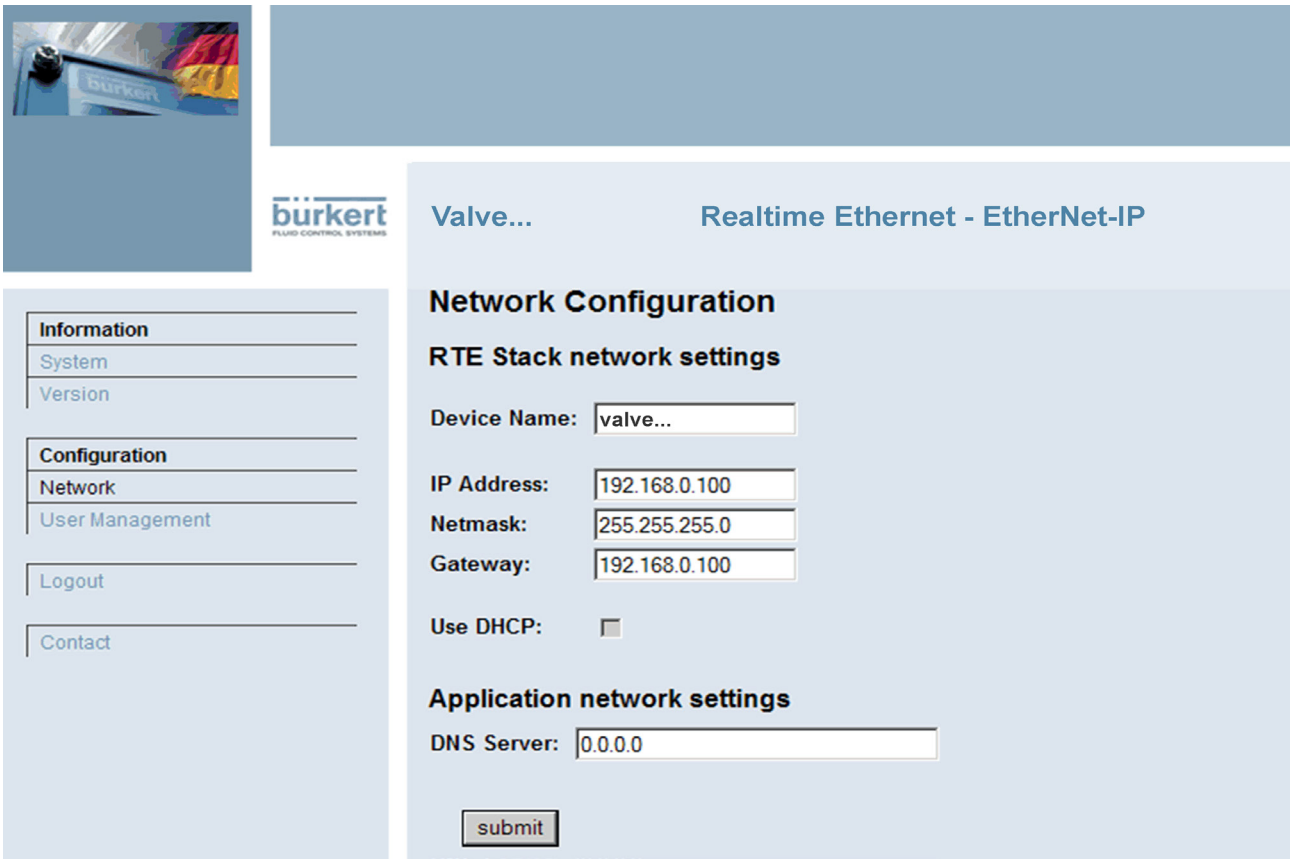

Figure 48: Configuring EtherNet device

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.

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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.

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) Specified address (node D) and object → Observe byte sequence: Little Endian. ▪ Byte 3: Device address (NODE ID) ▪ Byte 2: Sub index ▪ Byte 1: Index (low byte) ▪ Byte 0: Index (high byte)	RW	0	1	1	0xc7	1	1	FC16	1000	2
Data length	(UNIT32) Reserved	RW	0	1	2	c7	2	1	FC16	1002	2
Value in UNIT32	(UNIT32) Value of the required object	RO	0	1	3	c7	3	1	FC16	1004	2
Value as string	(C_String) Value if greater than 4 bytes	RO	0	1	4	c7	4	1	FC16	1006	10
Result	(UNIT32) 0x00000000 finished 0xFFFFFFFF running	RO	0	1	5	c7	5	1	FC4	1016	2
Start/Cancel	(UNIT8) Start or cancel the function	RW	0	1	6	c7	6	1	FC6	1018	2

Table 21: Object route function

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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

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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).

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 NAMUR NE 107	Corresponds to the device status of type 3320 and 3321	RO

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

Table 25: Device status NAMUR NE 107

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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. Byte 1: defines the device behavior if a device fails.	RW
Control word**	Byte 0: Address of the device to be controlled. Byte 1: Node (device) management according to CANopen specification.	RW

*

Byte 1	Byte 0
0: reserved 1: Do not cancel allocation to missing device	0: Automatic mode (büS standard) 1: Input for operation with COM 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 repair and maintenance instructions. Find these instructions on our homepage at: www.buerkert.com → Type 3320, 3321.

18.2.1 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	Description	Device behavior	Procedure
Low capacity. Energy pack must be changed soon.	The remaining life time of the energy pack is approx. 25 %.	Maintenance message.	Replace SAFEPOS energy pack soon, or in good time before the life time 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. 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. 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, 8-pole, (length 2 m)	919061
Connection cable with M12 socket, 4-pole, (length 5 m)	918038
USB büS interface set:	
büS service interface (büS stick + 0.7 m cable with M12 plug)	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 to DN20	693770
Holding device for line connection DN25 to 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

20.1.1 USB interface

The PC requires a USB interface for communication with the devices, also an adapter with an interface driver (see "Table 30: Accessories").

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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			285 834
Seal set for packing gland	Spindle ø10 mm, DN15...DN40		285 685
	Spindle ø14 mm, DN50		285 722
Peek spindle guide for the packing gland	Spindle ø10 mm	Housing DN15	683180
		Housing DN20	683180
		Housing DN25	683180
		Housing DN32	683180
		Housing DN40	683180
	Spindle ø14 mm	Housing DN50	683181

Table 31: Spare parts for Types 3320 and 3321

20.2.2 Spare parts for angle seat valve of Type 3320

Pendulum disk set for Type 3320		
DN	Order number	
	PEEK/steel	PTFE/steel
13/15	656 591	632 752
20	656 592	632 756
25	658 126	632 761
32	685 177	679 623
40	685 162	679 872
50	684 554	679 875

Table 32: Pendulum disk set for Type 3320

20.2.3 Spare parts for globe valve of Type 3321

Pendulum disk set for Type 3320		
DN	Order number	
	PEEK/steel	PTFE/steel
13/15	656 604	650 517
20	656 592	650 756
25	658 126	650 761
32	685 177	650 623
40	685 162	650 872
50	684 554	650 875

Table 33: Pendulum disk set for Type 3321

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20.3 Installation tools

20.3.1 Installation tools for valves of Types 3320 and 3321

Modified socket wrench for packing gland (series-production status from April 2012)			
Spindle ⌀ [mm]	**Housing DN**	**Wrench size**	**Order number**
10	15...40	SW16	683 221
14	50	SW24	683 223

Table 34: Installation tools for Types 3320 and 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.

→ Disconnect the electrical connection.

→ Remove device.

22 PACKAGING, TRANSPORT

NOTE!

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

NOTE!

Incorrect storage may damage the device.

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

24 DISPOSAL

NOTE!

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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