Rotary actuator fail-safe for butterfly valves

- Torque motor 160 Nm
- Nominal voltage AC 24...240 V / DC 24...125 V
- Control modulating, communicative, hybrid
- with 2 integrated auxiliary switches
- Conversion of sensor signals
- Communication via BACnet MS/TP, Modbus RTU, Belimo-MP-Bus or conventional control

Technical data

Electrical data		
	Nominal voltage	AC 24...240 V / DC 24...125 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...264 V / DC 19.2...137.5 V
	Power consumption in operation	52 W
	Power consumption in rest position	9 W
	Power consumption for wire sizing	with 24 V 54 VA / with 230 V 68 VA
	Power consumption for wire sizing note	Imax 20 A @ 5 ms
	Auxiliary switch	2 x SPDT, 1 x 10° / 1 x 0...90° (ex works 85°)
	Switching capacity auxiliary switch	1 mA...3 A (0.5 A inductive), AC 250 V
	Connection supply	Terminals 2.5 mm²
	Connection protective earth	earth terminal
	Connection control	Terminals 1.5 mm²
	Connection auxiliary switch	Terminals 2.5 mm²
	Parallel operation	Yes (note the performance data)

Functional data		
	Torque motor	160 Nm
	Communicative control	BACnet MS/TP Modbus RTU MP-Bus
	Operating range Y	2...10 V
	Input Impedance	100 kΩ
	Operating range Y variable	0.5...10 V 4...20 mA
	Position feedback U	2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	0.5...10 V
	Setting fail-safe position	0...100%, adjustable with Belimo Assistant App (ex works 0%)
	Bridging time (PF) variable	0...10 s, adjustable with Belimo Assistant App (ex works 2 s)
	Position accuracy	±5%
	Manual override	hand lever
	Running time motor	35 s / 90°
	Running time motor variable	30...120 s
	Running time fail-safe	30 s / 90°
	Sound power level, motor	68 dB(A)
	Sound power level, fail-safe	61 dB(A)
	Position indication	Mechanically (integrated)

Safety		
	Protection class IEC/EN	I protective earth (PE)
	Protection class UL	I protective earth (PE)
	Degree of protection IEC/EN	IP66/67
	Degree of protection NEMA/UL	NEMA 4X
	Enclosure	UL Enclosure Type 4X
	EMC	CE according to 2014/30/EU
	Low voltage directive	CE according to 2014/35/EU
	Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14
	Certification UL	cULus according to UL60730-1A, UL60730-2-14 and CAN/CSA E60730-1:02

PRKCA-BAC-S2-T

Rotary actuator fail-safe, modulating, communicative, hybrid, AC 24...240 V / DC 24...125 V, 160 Nm, Running time motor 35 s

BELIMO®

Technical data

Safety	Certification UL note	The UL marking on the actuator depends on the production site, the device is UL-compliant in any case
	Mode of operation	Type 1.AA
	Rated impulse voltage supply	4 kV
	Rated impulse voltage control	0.8 kV
	Rated impulse voltage auxiliary switch	2.5 kV
	Control pollution degree	3
	Ambient temperature	-30...50°C
	Storage temperature	-40...80°C
	Ambient humidity	Max. 100% r.H.
	Servicing	maintenance-free
Mechanical data	Connection flange	F07 (F05 only with accessory)
Weight	Weight	8.5 kg
Terms	Abbreviations	POP = Power off position / fail-safe position CPO = Controlled power off / controlled fail-safe PF = Power fail delay time / bridging time

Safety notes

⚠️

- This device has been designed for use in stationary heating, ventilation and air-conditioning systems and must not be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.

- Caution: Power supply voltage!

- The device has a protective earthing. Incorrect connection of the protective earth can lead to hazards due to electrical shock.

- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.

- Apart from the connection box, the device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.

- The device contains electrical and electronic components and must not be disposed of as household refuse. All locally valid regulations and requirements must be observed.

- The two switches integrated in the actuator are to be operated either on power supply voltage or at safety extra-low voltage. The combination power supply voltage/safety extra-low voltage is not permitted.

Product features

Fields of application
The actuator is particularly suitable for utilisation in outdoor applications and is protected against the following weather conditions:
- UV radiation
- Dirt / Dust
- Rain / Snow
- Air humidity

Product features

Pre-charging time (start up)

The capacitor actuators require a pre-charging time. This time is used for charging the capacitors up to a usable voltage level. This ensures that, in the event of a power failure, the actuator can move at any time from its current position into the preset fail-safe position.

The duration of the pre-charging time depends mainly on following factors:
– Duration of the power failure
– PF delay time (bridging time)

Typical pre-charging time
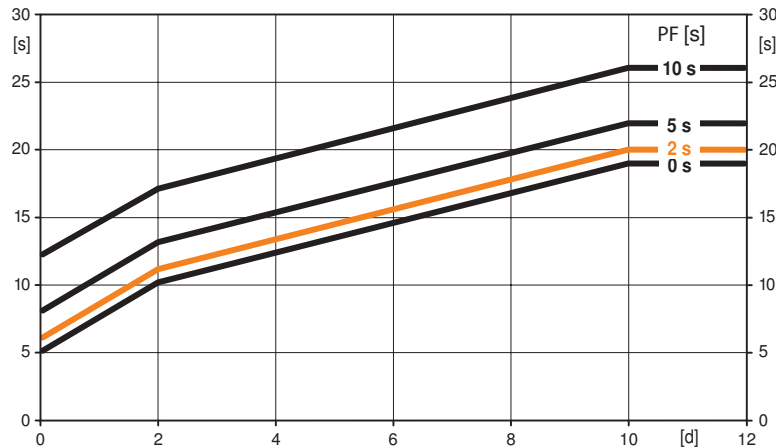
[d] = Electricity interruption in days
[s] = Pre-charging time in seconds
PF[s] = Bridging time
Calculation example: Given an electricity interruption of 3 days and a bridging time (PF) set at 5 s, the actuator requires a pre-charging time of 14 s after the electricity has been reconnected (see graphic).

PF [s]	[d]				
	0	**1**	**2**	**7**	**≥10**
0	5	8	10	15	19
2	6	9	11	16	20
5	8	11	13	18	22
10	12	15	17	22	26
			[s]		

Delivery condition (capacitors)

The actuator is completely discharged after delivery from the factory, which is why the actuator requires approximately 20 s pre-charging time before initial commissioning in order to bring the capacitors up to the required voltage level.

Converter for sensors

Connection option for two sensors (passive, active or switching contacts). In this way, the analogue sensor signal can be easily digitised and transferred to the bus systems BACnet or Modbus.

Parametrisable actuators

The factory settings cover the most common applications.
The Belimo Assistant App is required for parametrisation via Near Field Communication (NFC) and simplifies commissioning. Moreover, it provides a variety of diagnostic options.
The ZTH EU service tool provides a selection of both diagnostic and setting options.

Combination analogue - communicative (hybrid mode)

With conventional control by means of an analogue positioning signal, BACnet or Modbus can be used for the communicative position feedback

Simple direct mounting

Simple direct mounting on the butterfly valve. The mounting orientation in relation to the butterfly valve can be selected in 90° (angle) increments.

Manual override

The valve can be manually operated using a hand crank. Unlocking is carried out manually by removing the hand crank.

Internal heating

An internal heater prevents condensation buildup.
Thanks to the integrated temperature and humidity sensor, the built-in heater automatically switches on/off.

High functional reliability

The actuator is overload protected, requires no limit switches and automatically stops when the end stop is reached.

Setting fail-safe position (POP)

The desired fail-safe position can be set 0...100% with the "Belimo Assistant App" or ZTH EU. The setting always refers to the adapted angle of rotation range. In the event of a power failure, the actuator will move into the selected fail-safe position.

Product features

Bridging time	Electrical interruptions can be bridged up to a maximum of 10 s. In the event of a power failure, the actuator will remain stationary in accordance with the set bridging time. If the power failure is greater than the set bridging time, then the actuator will move into the selected fail-safe position. The pre-programmed bridging time is set to 2 s. This can be modified on site in operation with the use of the "Belimo Assistant App".
Flexible signalization	The actuator has one auxiliary switch with a fixed setting (10°) and one adjustable auxiliary switch (0...90°).

Accessories

	Description	Type
Gateways	Gateway MP zu BACnet MS/TP	UK24BAC
	Gateway MP to Modbus RTU	UK24MOD
	Gateway MP to LonWorks	UK24LON
	Gateway MP to KNX	UK24EIB

	Description	Type
Electrical accessories	Connection cable 5 m, A: RJ11 6/4 ZTH EU, B: 6-pin service socket for Belimo device	ZK1-GEN

	Description	Type
Sensors	Duct/Immersion Temperature Sensor 50 mm x 6 mm Pt1000	01DT-1BH
	Duct/Immersion Temperature Sensor 50 mm x 6 mm Ni1000	01DT-1CH
	Duct/Immersion Temperature Sensor 100 mm x 6 mm Pt1000	01DT-1BL
	Duct/Immersion Temperature Sensor 100 mm x 6 mm Ni1000	01DT-1CL
	Duct/Immersion Temperature Sensor 150 mm x 6 mm Pt1000	01DT-1BN
	Duct/Immersion Temperature Sensor 150 mm x 6 mm Ni1000	01DT-1CN
	Duct/Immersion Temperature Sensor 200 mm x 6 mm Pt1000	01DT-1BP
	Duct/Immersion Temperature Sensor 200 mm x 6 mm Ni1000	01DT-1CP
	Duct/Immersion Temperature Sensor 300 mm x 6 mm Pt1000	01DT-1BR
	Duct/Immersion Temperature Sensor 300 mm x 6 mm Ni1000	01DT-1CR
	Duct/Immersion Temperature Sensor 450 mm x 6 mm Pt1000	01DT-1BT
	Duct/Immersion Temperature Sensor 450 mm x 6 mm Ni1000	01DT-1CT

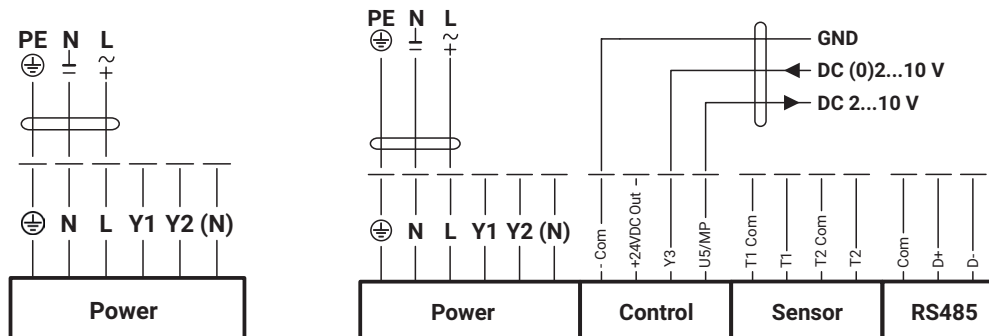## Electrical installation

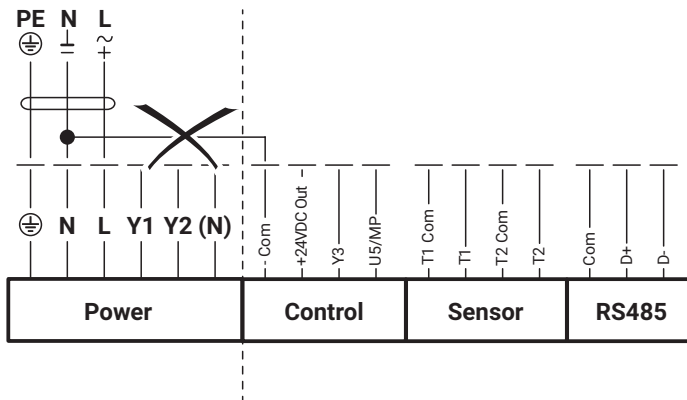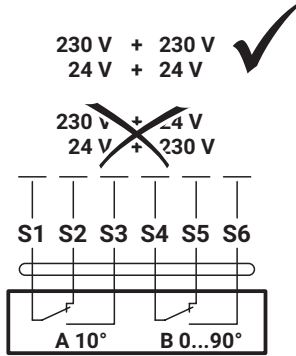|		
⚠️	**Notes**	• Caution: Power supply voltage! • Parallel connection of other actuators possible. Observe the performance data. • The wiring of the line for BACnet MS/TP / Modbus RTU is to be carried out in accordance with applicable RS485 regulations.

Wiring diagrams

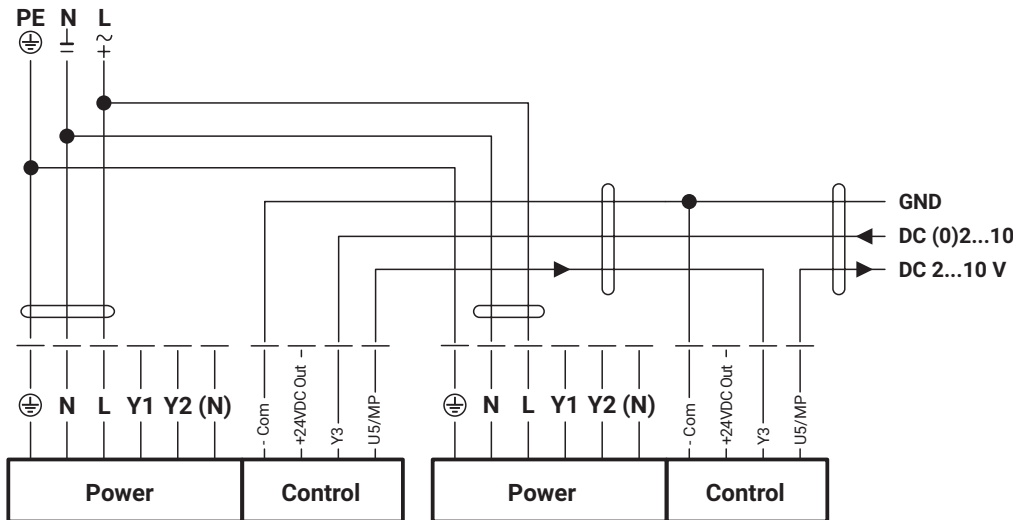AC 24...240 V / DC 24...125 V   Modulating control

PRKCA-BAC-S2-T

Rotary actuator fail-safe, modulating, communicative, hybrid, AC 24...240 V / DC 24...125 V, 160 Nm, Running time motor 35 s

BELIMO

Electrical installation

Connection auxiliary switch

230 V + 230 V ✓
24 V + 24 V

230 V + 24 V ✗
24 V + 230 V

S1 S2 S3 S4 S5 S6

A 10°   B 0...90°

PE N L

PE N L Y1 Y2 (N)   - Com   +24VDC Out -   Y3   U5/MP   T1 Com   T1   T2 Com   T2   Com   D+   D-

| Power | Control | Sensor | RS485 |

Power supply must not be connected to the signal terminals!

Follow-up control (position-dependent)

PE N L

GND
DC (0)2...10
DC 2...10 V

PE N L Y1 Y2 (N)   - Com   +24VDC Out -   Y3   U5/MP

PE N L Y1 Y2 (N)   - Com   +24VDC Out -   Y3   U5/MP

| Power | Control | Power | Control |

PRKCA-BAC-S2-T

Rotary actuator fail-safe, modulating, communicative, hybrid, AC 24...240 V / DC 24...125 V, 160 Nm, Running time motor 35 s

BELIMO

Functions

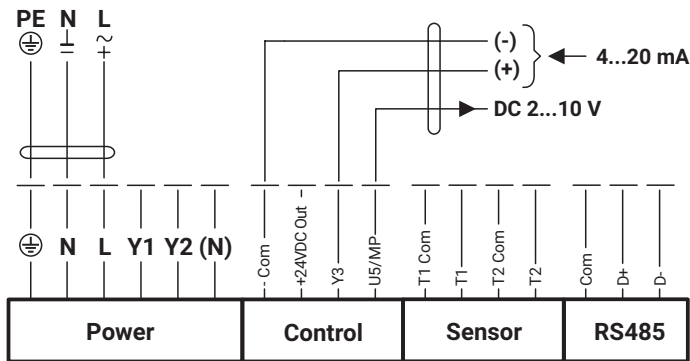**Functions for devices with specific parameters (Parametrisation necessary)**
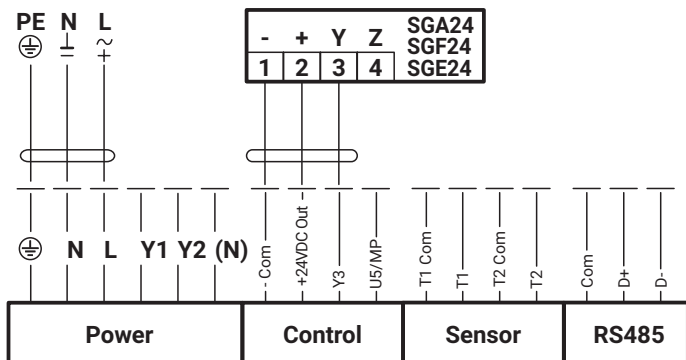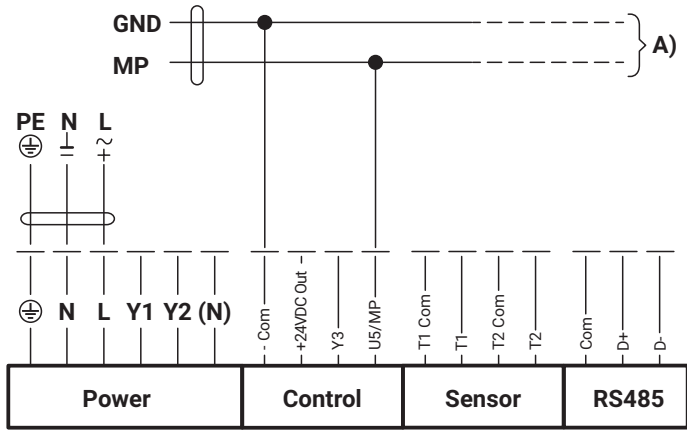
Control open/close
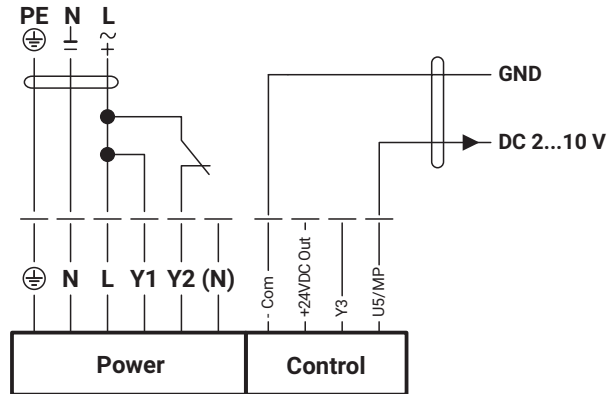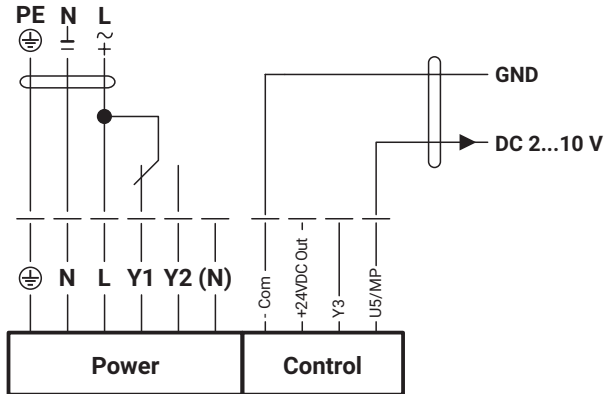
Control 3-point
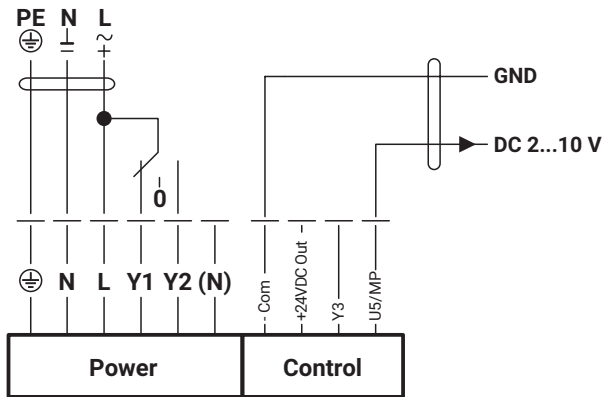
Control 4...20 mA

Positioner SG..

Note
Maximum output power «+ 24VDC out» 1.2 W @ 50 mA!
A separate safety transformer must be used for higher performance!

PRKCA-BAC-S2-T

Rotary actuator fail-safe, modulating, communicative, hybrid, AC 24...240 V / DC 24...125 V, 160 Nm, Running time motor 35 s
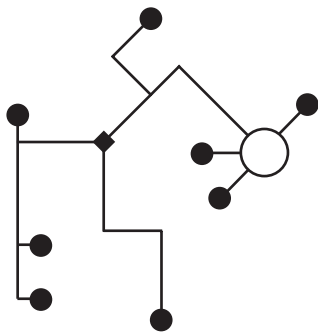
BELIMO

Functions

Connection on the MP-Bus
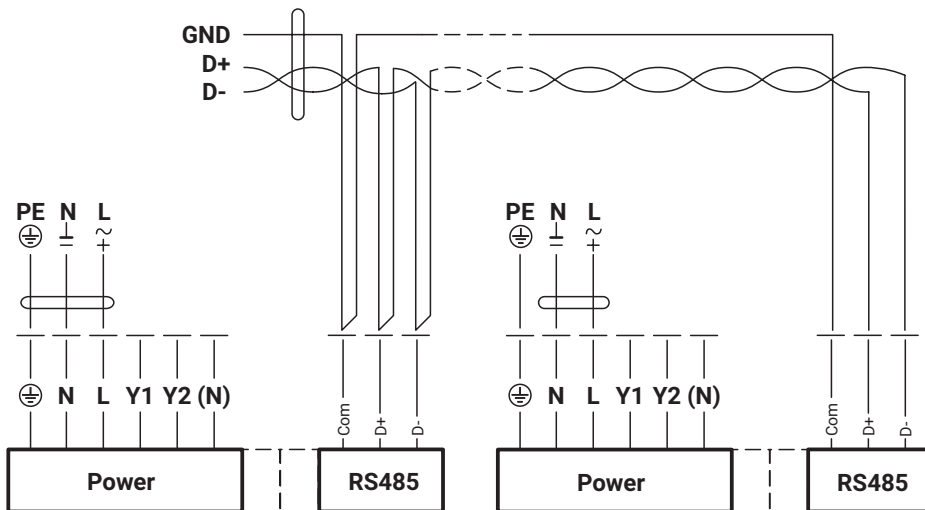

A) Additional actuators (max. 8)

MP-Bus Network topology

There are no restrictions for the network topology (star, ring, tree or mixed forms are permitted).
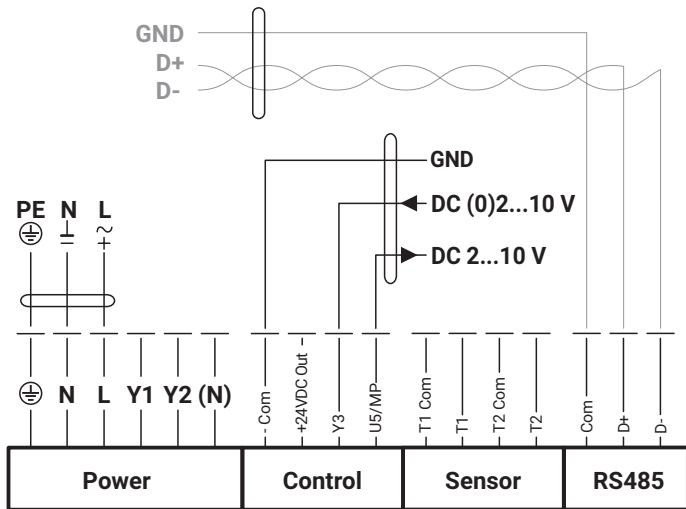Supply and communication in one and the same 3-wire cable
• no shielding or twisting necessary
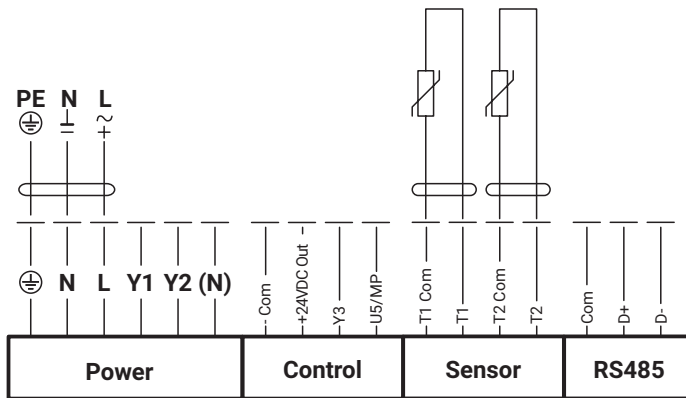• no terminating resistors required

Connection BACnet MS/TP / Modbus RTU

PRKCA-BAC-S2-T

Rotary actuator fail-safe, modulating, communicative, hybrid, AC 24...240 V / DC 24...125 V, 160 Nm, Running time motor 35 s

BELIMO®

Functions

Connection BACnet MS/TP / Modbus RTU with analog setpoint (hybrid mode)

GND
D+
D-

GND
DC (0)2...10 V
DC 2...10 V

PE N L

PE ⊥ ∼
⏚ ⊥ +

⏚ N L Y1 Y2 (N)

- Com
+24VDC Out -
Y3
U5/MP
T1 Com
T1
T2 Com
T2
Com
D+
D-

| Power | Control | Sensor | RS485 |

Connection of passive sensors (BACnet MS/TP / Modbus RTU)

PE N L

PE ⊥ ∼
⏚ ⊥ +

⏚ N L Y1 Y2 (N)

- Com
+24VDC Out -
Y3
U5/MP
T1 Com
T1
T2 Com
T2
Com
D+
D-

| Power | Control | Sensor | RS485 |

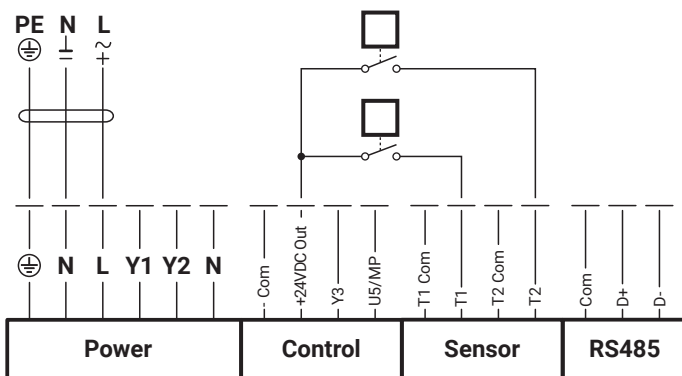| 1)	2)
200 Ω...2 kΩ	0.1 Ω
2 kΩ...10 kΩ	1 Ω
10 kΩ...55 kΩ	10 Ω

1) Resistance range
2) Resolution
- Suitable for Ni1000 and Pt1000
- Suitable Belimo types 01DT-…

Connection of active sensors (BACnet MS/TP / Modbus RTU)

PE N L

PE ⊥ ∼
⏚ ⊥ +

⏚ N L Y1 Y2 N

- Com
+24VDC Out -
Y3
U5/MP
T1 Com
T1
T2 Com
T2
Com
D+
D-

| Power | Control | Sensor | RS485 |
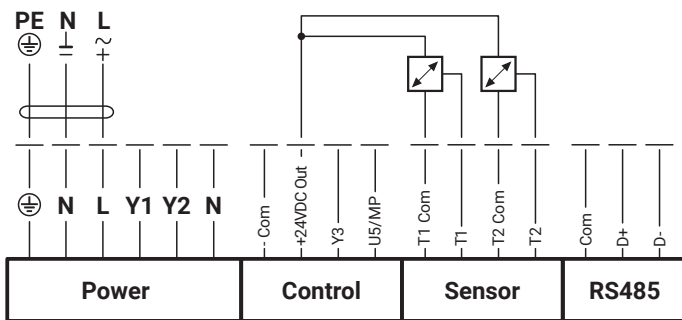
Possible input voltage range:
DC 0...10 V (resolution 5 mV)
For example, to capture:
- Active temperature sensors
- Flow sensors
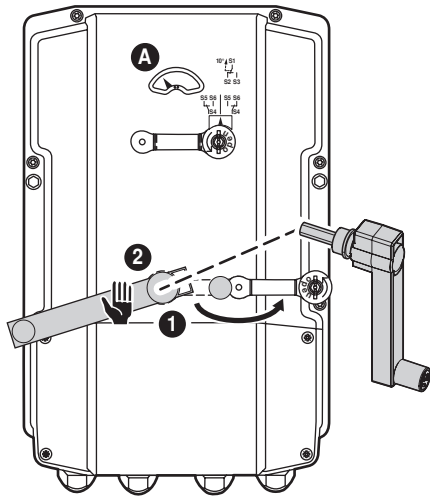- Pressure / differential pressure sensors

Switching contact connection (BACnet MS/TP / Modbus RTU)

PE N L

PE ⊥ ∼
⏚ ⊥ +

⏚ N L Y1 Y2 N

- Com
+24VDC Out -
Y3
U5/MP
T1 Com
T1
T2 Com
T2
Com
D+
D-

| Power | Control | Sensor | RS485 |

Requirements for switching contact:
The switching contact must be able to accurately switch a current of 10 mA @ 24 V.
For example, to capture:
- Flow monitors
- Operation / malfunction messages of chillers

PRKCA-BAC-S2-T

Rotary actuator fail-safe, modulating, communicative, hybrid, AC 24...240 V / DC 24...125 V, 160 Nm, Running time motor 35 s

BELIMO

Operating controls and indicators

Auxiliary switch settings

⚠ **Note: Perform settings on the actuator only in deenergised state.**

For the auxiliary switch position settings, carry out points ❶ to ❹ successively.

❶ **Gear disengagement**
Opening the manual override cover and adjusting the hand crank.
Manual override is possible.

❷ **Manual override control**
Turn the hand crank until the desired switching position Ⓐ is indicated and then remove the crank.
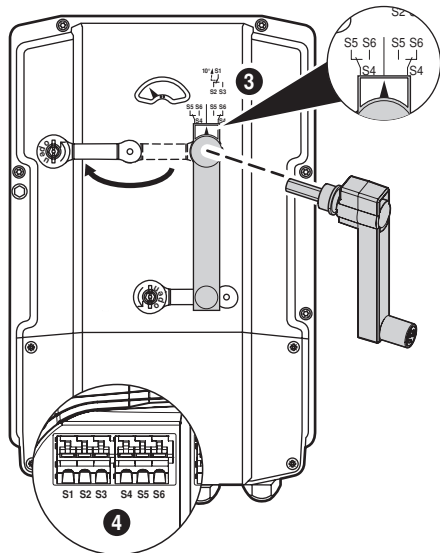

❸ **Auxiliary switch**
For the auxiliary switch position settings, carry out points ❶ to ❹ successively.
Opening the auxiliary switch adjustment cover and adjusting the hand crank.
Turn the crank until the arrow points to the vertical line

❹ **Terminals**
Connect continuity tester to S4 + S5 or to S4 + S6.
If the auxiliary switch should switch in the opposite direction, rotate the hand crank by 180°.

Push-button and display
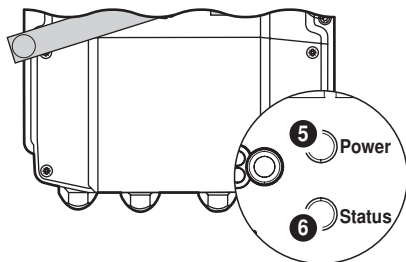
❺ **Push-button and LED display green**
Off: In operation
On: In operation
Press button: Triggers test run, followed by standard mode

❻ **Push-button and LED display yellow**
Off: Standard mode
On: Test run active
Flickering: BACnet / Modbus communication active
Flashing: Request for addressing from MP master
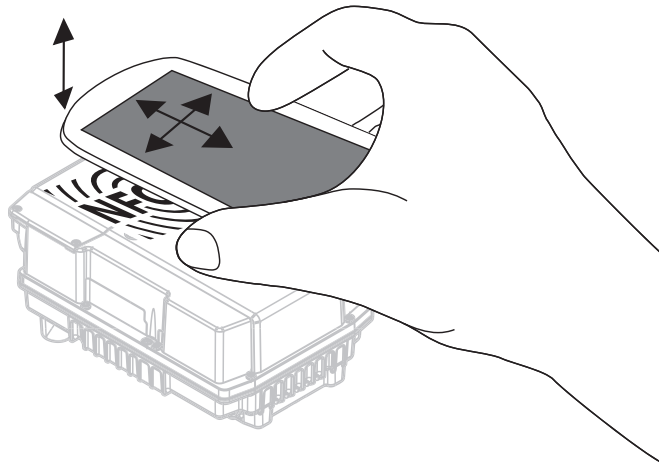Press button: Confirmation of the MP addressing

Service

NFC connection

Belimo equipment marked with the NFC logo can be operated with the Belimo Assistant App.
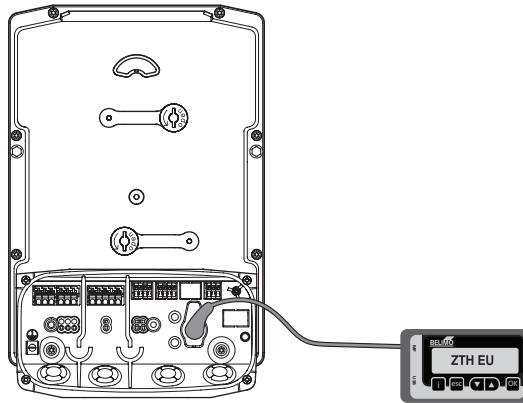
Requirement:
- NFC- or Bluetooth-capable smartphone
- Belimo Assistant App (Google Play & Apple AppStore)

Align NFC-capable smartphone on the actuator so that both NFC antennas are superposed.

Connect Bluetooth-enabled smartphone via the Bluetooth-to-NFC Converter ZIP-BT-NFC to the actuator. Technical data and operation instructions are shown in the ZIP-BT-NFC data sheet.
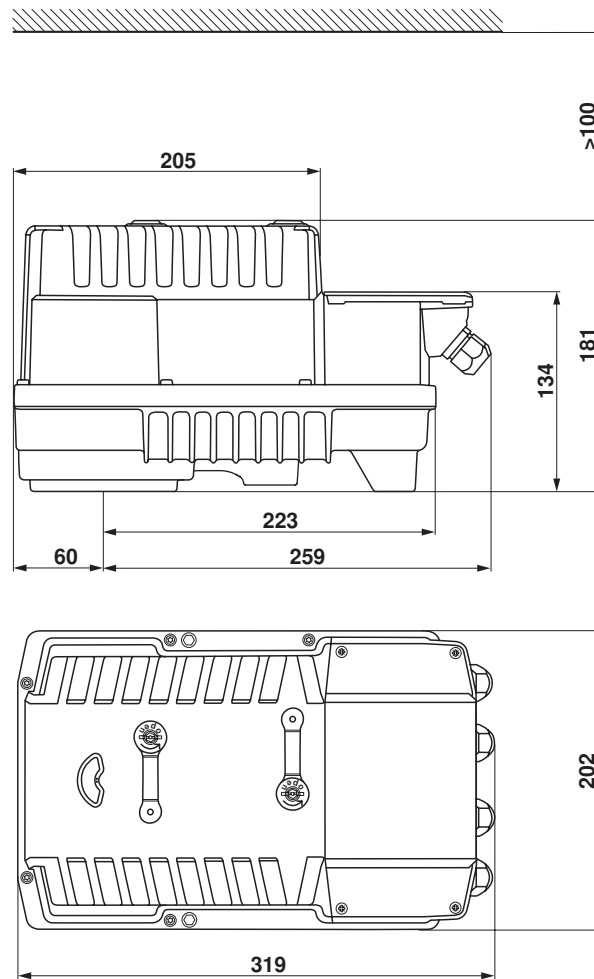

Service Tools connection

The actuator can be configured by the ZTH EU via the service socket.

PRKCA-BAC-S2-T

Rotary actuator fail-safe, modulating, communicative, hybrid, AC 24...240 V / DC 24...125 V, 160 Nm, Running time motor 35 s

BELIMO®

Dimensions [mm]

Dimensional drawings

Further documentation

- Tool connections
- Description Protocol Implementation Conformance Statement PICS
- Description Modbus register
- Overview MP Cooperation Partners
- Introduction to MP-Bus Technology
- MP Glossary
- The complete product range for water applications
- Data sheets for butterfly valves
- Installation instructions for actuators and/or butterfly valves
- General notes for project planning