BELIMO

Communicative damper actuator fail-safe and extended functionalities in the IP66/67 protective housing for adjusting dampers in industrial plants and in technical building installations

- 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

MP⚡BUS
ASHRAE BACnet
Modbus

NFC

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	47 W
	Power consumption in rest position	6 W
	Power consumption for wire sizing	with 24 V 49 VA / with 240 V 66 VA
	Power consumption for wire sizing note	Imax 20 A @ 5 ms
	Auxiliary switch	2 x SPDT, 1 x 10° / 1 x 0...90°
	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
	Inhibiting torque static (voltage-free)	50 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%
	Direction of motion motor	electronically reversible
	Manual override	hand lever
	Angle of rotation	Max. 95°
	Angle of rotation note	can be limited on both sides with adjustable electrical end stops
	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)
	Mechanical interface	Form fit 17x17 mm
	Position indication	Scale plate 0...90
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

Technical data

Safety	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
	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	6.6 kg
Terms	Abbreviations	POP = Power off position / fail-safe position PF = Power fail delay time / bridging time

Safety notes

⚠️

- The device must not be used outside the specified field of application, especially not in aircraft or in any other airborne means of transport.

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

- Caution: Power supply voltage!

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

- 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.

- To calculate the torque required, the specifications supplied by the damper manufacturers concerning the cross-section, the design, the installation site and the ventilation conditions must be observed.

- The materials used may be subjected to external influences (temperature, pressure, construction fastening, effect of chemical substances, etc.), which cannot be simulated in laboratory tests or field trials. In case of doubt, we definitely recommend that you carry out a test. This information does not imply any legal entitlement. Belimo will not be held liable and will provide no warranty.

- If cables which are not authorised for UL (NEMA) Type 4X applications are used, then flexible metallic cable conduits or suitable threaded cable conduits of equal value are to be used.

- 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

Mode of operation

The actuator is equipped with a universal voltage feed module that can utilise supply voltages of AC 24...240 V and DC 24...125V.
The actuator moves the damper to the desired operating position at the same time as the integrated capacitors are charged. Interrupting the supply voltage causes the damper to be rotated back into the fail-safe position by means of stored electrical energy.
Conventional operation:
The actuator is connected with a standard modulating signal of 0...10 V and drives to the position defined by the positioning signal. Measuring voltage U serves for the electrical display of the damper position 0.5...100% and as a slave control signal for other actuators.
Operation on Bus:
The actuator is fitted with an integrated interface for BACnet MS/TP, Modbus RTU and MP-Bus. It receives the digital positioning signal from the control system and returns the current status.
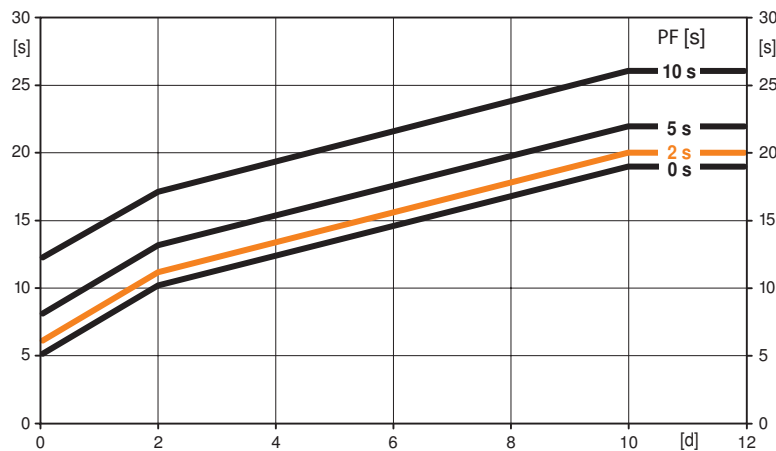
Pre-charging time (start up)

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.

PKCA-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**

Product features

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 damper shaft with form fit insert.
Manual override	The damper 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. In the event of a power failure, the actuator will move into the selected fail-safe position, taking into account the bridging time which was set.
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
Service Tools	Converter Bluetooth / NFC	ZIP-BT-NFC

	Description	Type
Sensors	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
	Duct Sensor Humidity / Temperature active 140 mm x 19.5 mm	22DTH-11M
	Outdoor Sensor Humidity, Temperature active with weather shield	22UTH-11
	Differential Pressure Sensor Air 0...250 Pa, LCD	22ADP-18QB

Electrical installation

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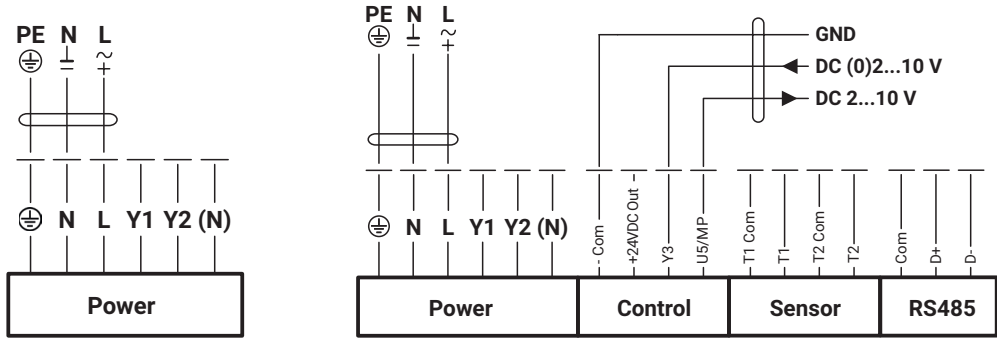
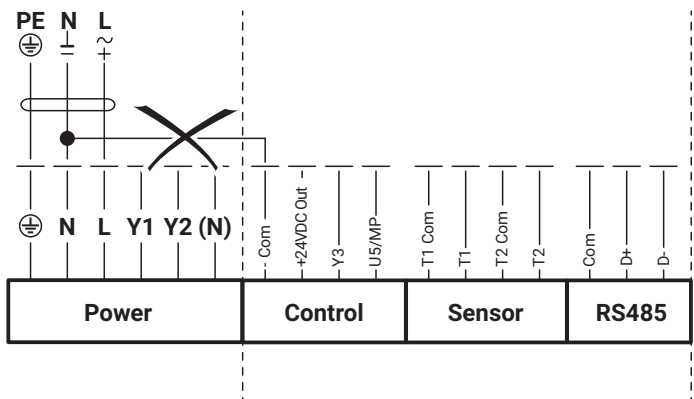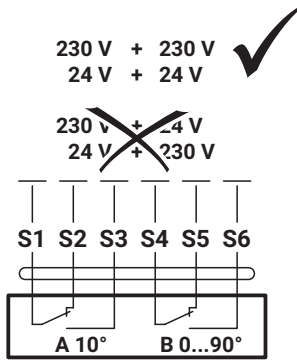**BELIMO**®

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

Connection auxiliary switch

Power supply must not be connected to the signal terminals!

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Electrical installation

Follow-up control (position-dependent)
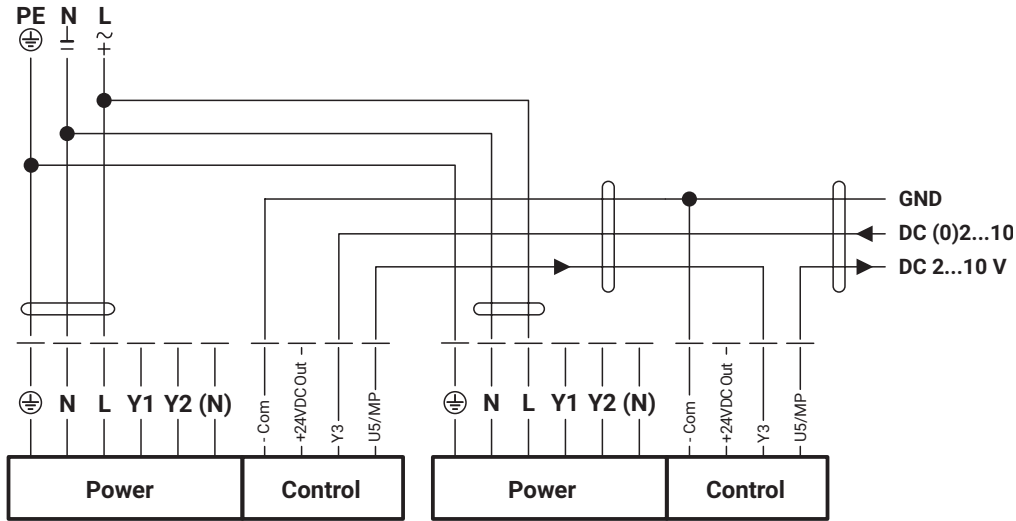
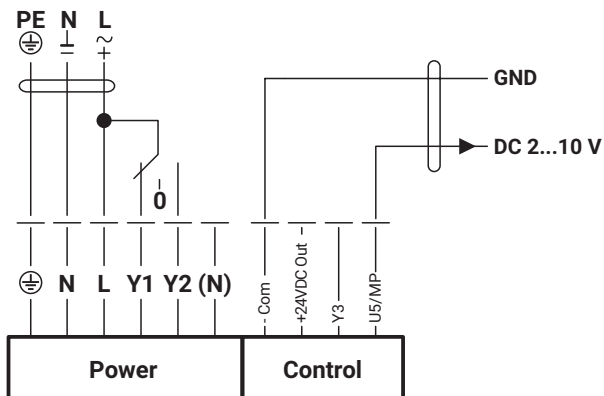## Functions

Functions for devices with specific parameters (Parametrisation necessary)
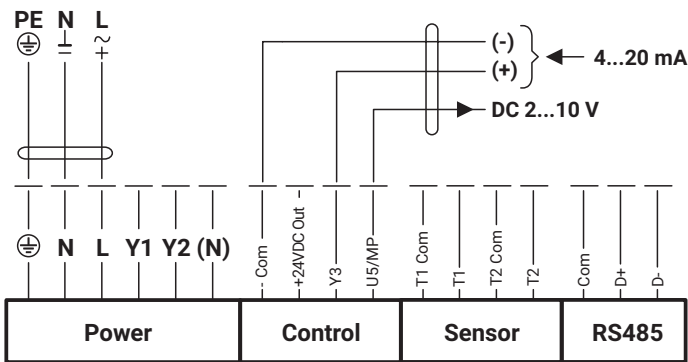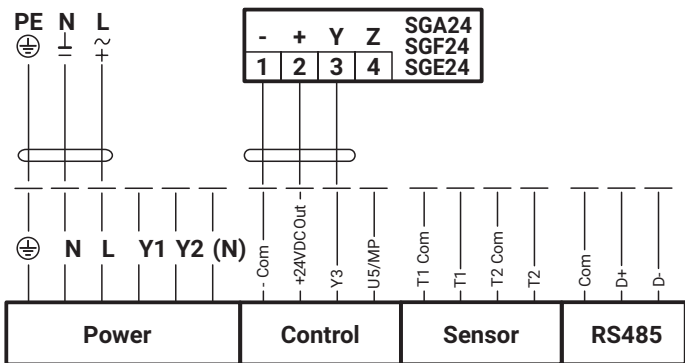
Control open/close

Control 3-point

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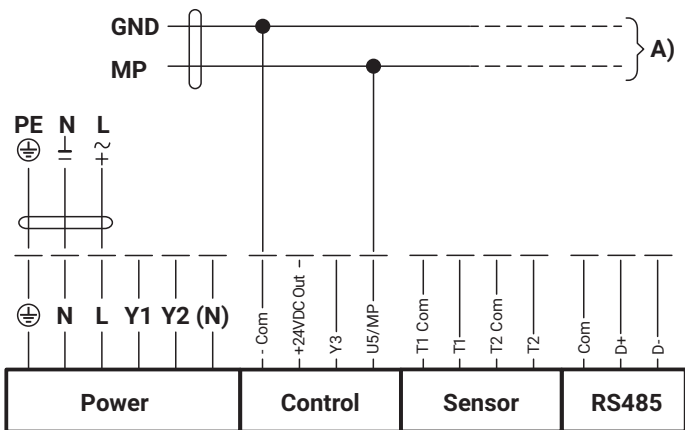Rotary actuator fail-safe, modulating, communicative, hybrid, AC 24...240 V / DC 24...125 V, 160 Nm, Running time motor 35 s

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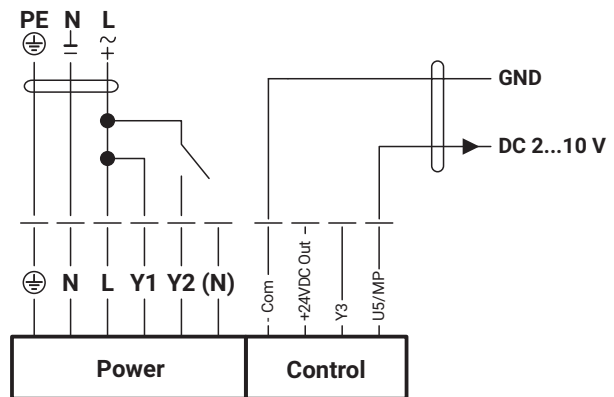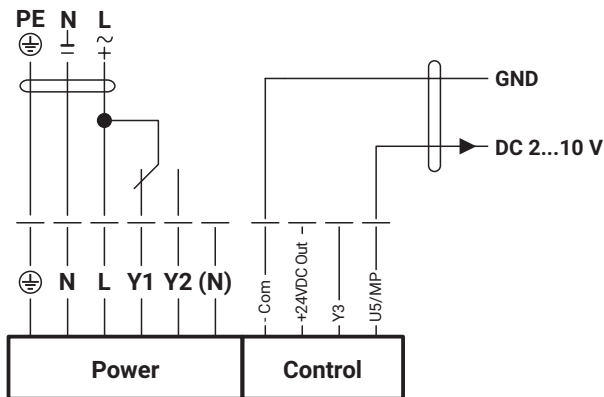
Functions

Control 4...20 mA

PE N L

(-)
(+) } ← 4...20 mA
→ DC 2...10 V

⏚ N L Y1 Y2 (N)	- Com +24VDC Out - Y3 U5/MP	T1 Com T1 T2 Com T2	Com D+ D-
Power	**Control**	**Sensor**	**RS485**

Positioner SG..

PE N L

-	+	Y	Z	SGA24
1	2	3	4	SGF24
				SGE24

⏚ 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 on the MP-Bus

GND
MP
} A)

PE N L

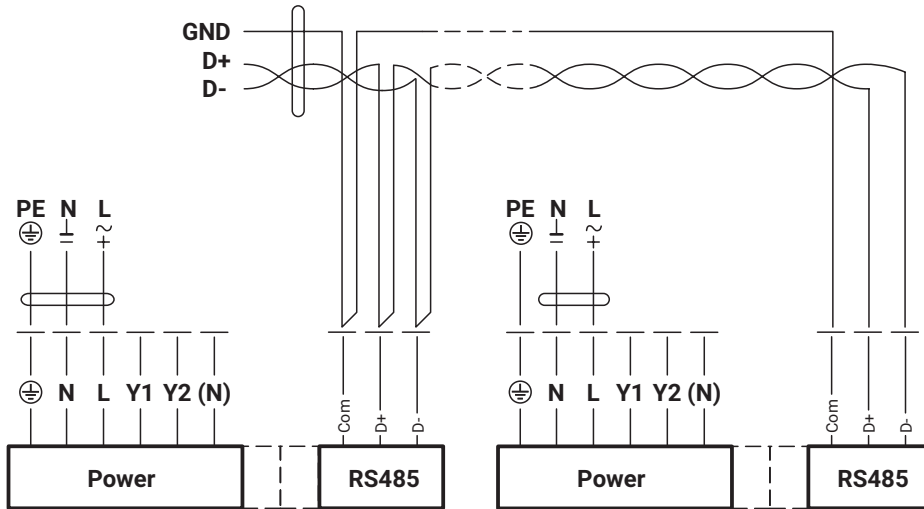| ⏚ N L Y1 Y2 (N)	- Com +24VDC Out - Y3 U5/MP	T1 Com T1 T2 Com T2	Com D+ D-
Power	**Control**	**Sensor**	**RS485**

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

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

A) Additional actuators (max. 8)

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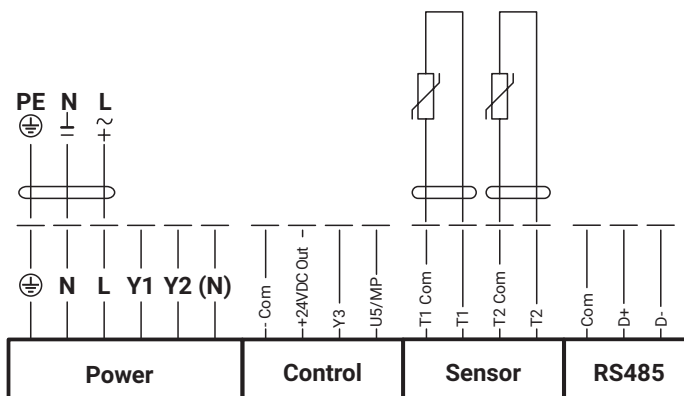
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Functions

Connection BACnet MS/TP / Modbus RTU

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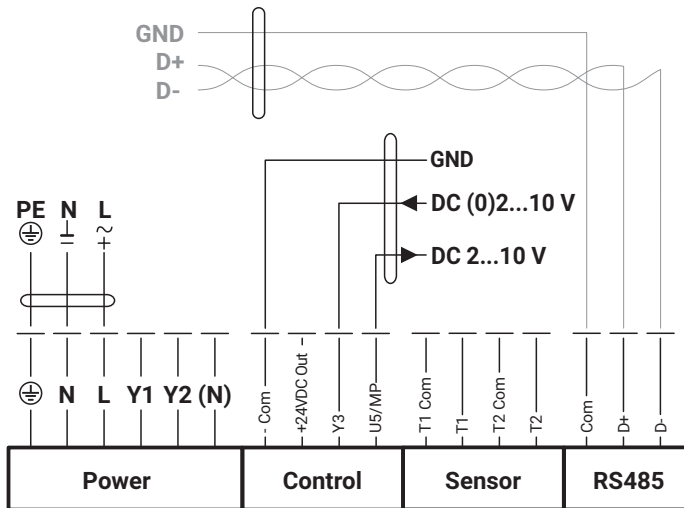
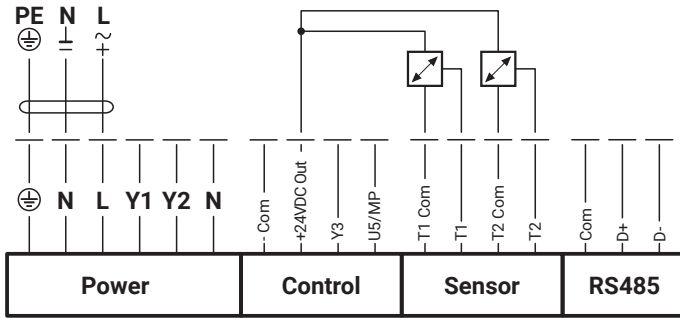Connection of passive sensors (BACnet MS/TP / Modbus RTU)

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-…

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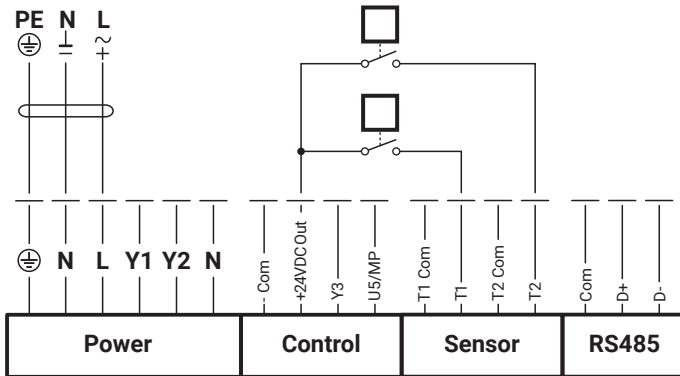
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Functions

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

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)

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

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

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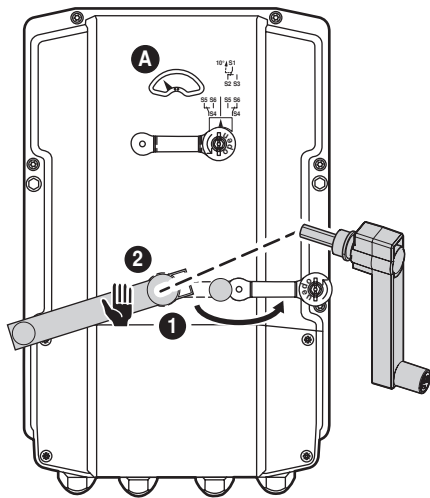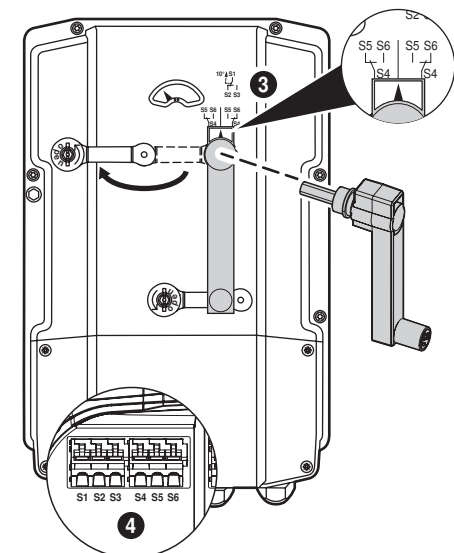
❶ Gear disengagement
Opening the manual override cover and adjusting the hand crank.
Manual override is possible.

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
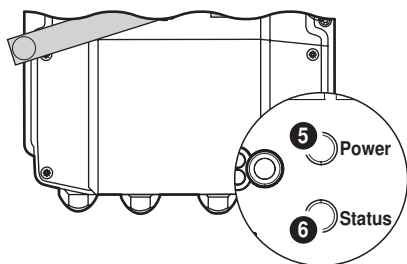
❺ Push-button and LED display green
Off: No power supply or malfunction
On: In operation
Press button: Triggers test run, followed by standard mode

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

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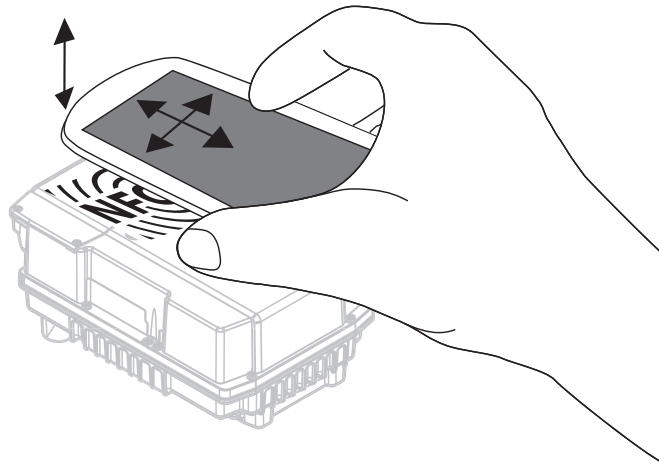
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Service

NFC connection

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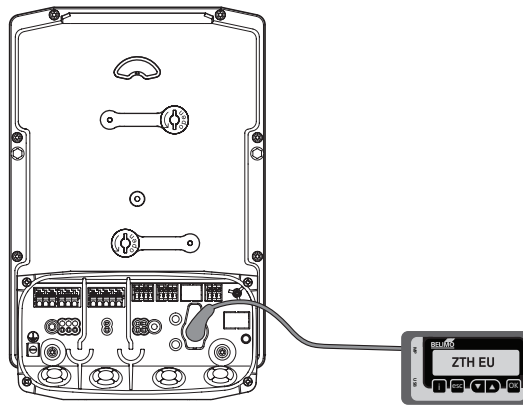
Requirement:
- NFC- or Bluetooth-capable smartphone
- Belimo Assistant App (Google Play & Apple AppStore)

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

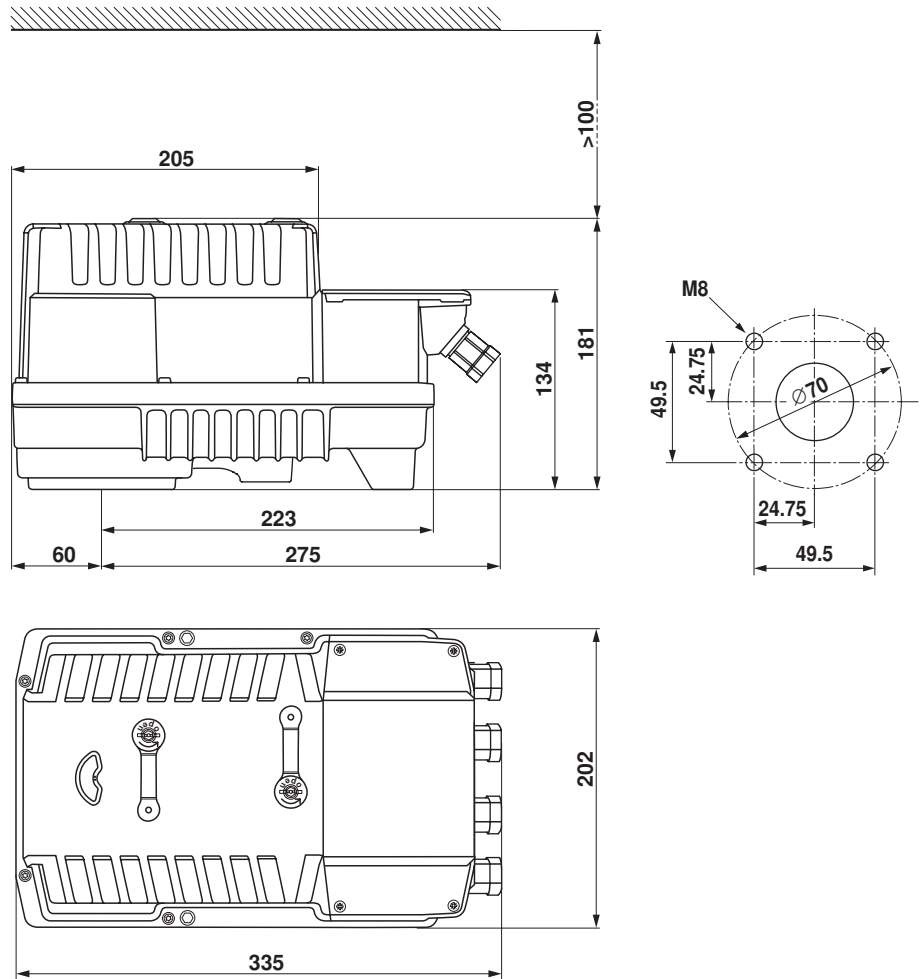The actuator can be configured by the ZTH EU via the service socket.

PKCA-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

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Dimensions [mm]

Spindle length

L	-	
	⌷	22.5...33

□
17 x 17

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
- Installation instructions for actuators