

Communicative rotary actuator fail-safe for adjusting dampers in technical building installations

- Air damper size up to approx. 2 m²
- Torque motor 10 Nm
- Nominal voltage AC/DC 24 V
- Control modulating, communicative, hybrid
- Communication via BACnet MS/TP, Modbus RTU, Belimo-MP-Bus or conventional control
- Conversion of sensor signals


Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Nominal voltage range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Power consumption in operation	7 W
	Power consumption in rest position	3.5 W
	Power consumption for wire sizing	9.5 VA
	Connection supply / control	Cable 1 m, 6x 0.75 mm ²
Data bus communication	Communicative control	BACnet MS/TP Modbus RTU (factory setting) MP-Bus
	Number of nodes	BACnet / Modbus see interface description MP-Bus max. 8
Functional data	Torque motor	10 Nm
	Torque fail-safe	10 Nm
	Operating range Y	2...10 V
	Operating range Y variable	0.5...10 V
	Position feedback U	2...10 V
	Position feedback U note	Max. 1 mA
	Position feedback U variable	Start point 0.5...8 V End point 2...10 V
	Position accuracy	±5%
	Direction of motion motor	selectable with switch L/R
	Direction of motion fail-safe	selectable by mounting L/R
	Manual override	by means of hand crank and locking switch
	Angle of rotation	Max. 95°
	Angle of rotation note	adjustable starting at 33% in 2.5% steps (with mechanical end stop)
	Running time motor	150 s / 90°
	Running time motor variable	40...150 s
	Running time fail-safe	<20 s @ -20...50°C / <60 s @ -30°C
	Adaptation setting range	manual
	Adaptation setting range variable	No action Adaptation when switched on Adaptation after using the hand crank
	Override control, controllable via bus communication	MAX (maximum position) = 100% MIN (minimum position) = 0% ZS (intermediate position) = 50%

Technical data

Functional data	Override control variable	MAX = (MIN + 32%)...100% MIN = 0%...(MAX – 32%) ZS = MIN...MAX
	Sound power level, motor	40 dB(A)
	Mechanical interface	Universal shaft clamp 10...25.4 mm
	Position indication	Mechanical
	Service life	Min. 60'000 fail-safe positions
	Safety data	Protection class IEC/EN
Power source UL		Class 2 Supply
Degree of protection IEC/EN		IP54
Degree of protection NEMA/UL		NEMA 2
Enclosure		UL Enclosure Type 2
EMC		CE according to 2014/30/EU
Certification IEC/EN		IEC/EN 60730-1 and IEC/EN 60730-2-14
UL Approval		cULus according to UL60730-1A, UL60730-2-14 and CAN/CSA E60730-1 The UL marking on the actuator depends on the production site, the device is UL-compliant in any case
Hygiene test		According to VDI 6022 Part 1 / SWKI VA 104-01, cleanable and disinfectable, low emission
Type of action		Type 1.AA
Rated impulse voltage supply / control		0.8 kV
Pollution degree		3
Ambient humidity		Max. 95% RH, non-condensing
Ambient temperature		-30...50°C [-22...122°F]
Storage temperature		-40...80°C [-40...176°F]
Servicing		maintenance-free
Weight	Weight	2.1 kg

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.
- Outdoor application: only possible in case that no (sea) water, snow, ice, insulation or aggressive gases interfere directly with the device and that it is ensured that the ambient conditions remain within the thresholds according to the data sheet at any time.
- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied with during installation.
- 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.
- Cables must not be removed from the device.
- To calculate the torque required, the specifications supplied by the damper manufacturers concerning the cross-section and the design, as well as the installation situation and the ventilation conditions must be observed.
- 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.

Product features

Mode of operation	The actuator is fitted with an integrated interface for BACnet MS/TP, Modbus RTU and MP-Bus. It receives the digital control signal from the control system and returns the current status.
Converter for sensors	Connection option for a sensor (passive, active or with switching contact). In this way, the analogue sensor signal can be easily digitised and transferred to the bus systems : BACnet, Modbus or MP-Bus.
Parametrisable actuators	<p>The factory settings cover the most common applications. Single parameters can be modified with the Belimo service tools MFT-P or ZTH EU.</p> <p>The communication parameters of the bus systems (address, baud rate etc.) are set with the ZTH EU. Pressing the "Address" button on the actuator while connecting the supply voltage resets the communication parameters to the factory setting.</p> <p>Quick addressing: The BACnet and Modbus address can alternatively be set using the buttons on the actuator and selecting 1...16. The selected value is added to the "basic address" parameter and results in the absolute BACnet and Modbus address.</p>
Combination analogue - communicative (hybrid mode)	With conventional control by means of an analogue control signal, BACnet or Modbus can be used for the communicative position feedback
Simple direct mounting	Simple direct mounting on the damper shaft with a universal shaft clamp, supplied with an anti-rotation device to prevent the actuator from rotating.
Manual override	By using the hand crank the damper can be actuated manually and engaged with the locking switch at any position. Unlocking is carried out manually or automatically by applying the operating voltage.
Adjustable angle of rotation	Adjustable angle of rotation with mechanical end stops.
High functional reliability	The actuator is overload protected, requires no limit switches and automatically stops when the end stop is reached.
Home position	<p>The first time the supply voltage is switched on, i.e. at the time of commissioning, the actuator carries out a synchronisation. The synchronisation is in the home position (0%).</p> <p>The actuator then moves into the position defined by the control signal.</p>
Adaptation and synchronisation	<p>An adaptation can be triggered manually by pressing the "Adaptation" button or with the PC-Tool. Both mechanical end stops are detected during the adaptation (entire setting range). Automatic synchronisation after actuating the hand crank is programmed. The synchronisation is in the home position (0%).</p> <p>The actuator then moves into the position defined by the control signal.</p> <p>A range of settings can be adapted using the PC-Tool (see MFT-P documentation)</p>

Accessories

Electrical accessories	Description	Type
	Auxiliary switch 2x SPDT	S2A-F
	Feedback potentiometer 200 Ω	P200A-F
	Feedback potentiometer 1 kΩ	P1000A-F
Mechanical accessories	Description	Type
	Shaft extension 240 mm ø20 mm for damper shaft ø8...22.7 mm	AV8-25
	End stop indicator	IND-AFB
	Shaft clamp reversible, for central mounting, for damper shafts ø12.7 / 19.0 / 25.4 mm	K7-2
	Ball joint suitable for damper crank arm KH8 / KH10	KG10A
	Ball joint suitable for damper crank arm KH8	KG8
	Damper crank arm Slot width 8.2 mm, clamping range ø10...18 mm	KH8
	Actuator arm, for 3/4" shafts, clamping range ø10...22 mm, Slot width 8.2 mm	KH-AFB

Accessories

	Description	Type
	Form fit insert 10x10 mm, Multipack 20 pcs.	ZF10-NSA-F
	Form fit insert 12x12 mm, Multipack 20 pcs.	ZF12-NSA-F
	Form fit insert 16x16 mm, Multipack 20 pcs.	ZF16-NSA-F
	Mounting kit for linkage operation for flat and side installation	ZG-AFB
	Baseplate extension	Z-SF
	Anti-rotation mechanism 230 mm, Multipack 20 pcs.	Z-ARS230L
	Hand crank 63 mm	ZKN2-B
Tools	Description	Type
	Service tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices	ZTH EU
	Belimo PC-Tool, Software for adjustments and diagnostics	MFT-P
	Adapter for Service-Tool ZTH	MFT-C
	Connecting cable 5 m, A: RJ11 6/4 ZTH EU, B: 6-pin for connection to service socket	ZK1-GEN
	Connecting cable 5 m, A: RJ11 6/4 ZTH EU, B: free wire end for connection to MP/PP terminal	ZK2-GEN

Electrical installation


Supply from isolating transformer.

The wiring of the line for BACnet MS/TP / Modbus RTU is to be carried out in accordance with applicable RS-485 regulations.

Modbus / BACnet: Supply and communication are not galvanically isolated. Connect earth signal of the devices with one another.

Wire colours:

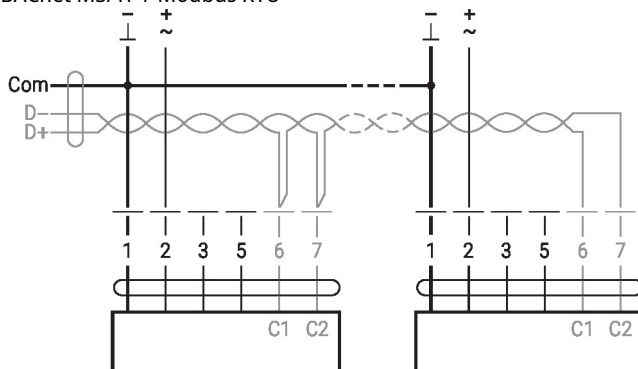
- 1 = black
- 2 = red
- 3 = white
- 5 = orange
- 6 = pink
- 7 = grey

Functions:

- C1 = D- = A (wire 6)
- C2 = D+ = B (wire 7)

Wiring diagrams

BACnet MS/TP / Modbus RTU

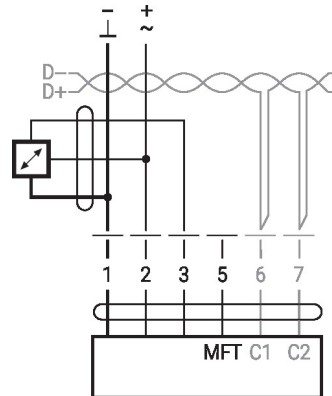
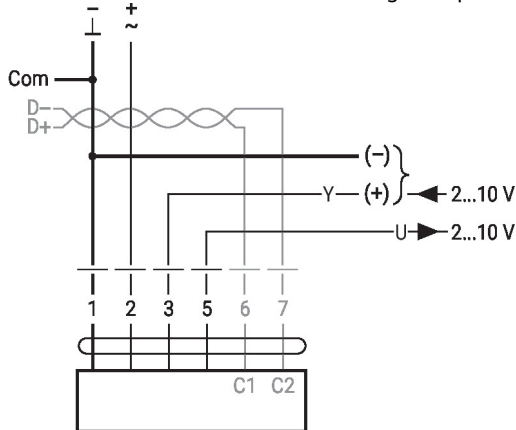


Functions

Functions with specific parameters (Parametrisation necessary)

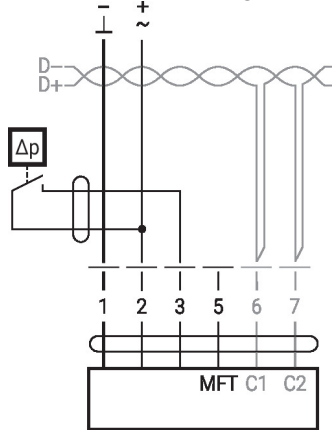
Modbus RTU / BACnet MS/TP with analogue setpoint (hybrid mode)

Connection with active sensor, e.g. 0...10 V @ 0...50°C



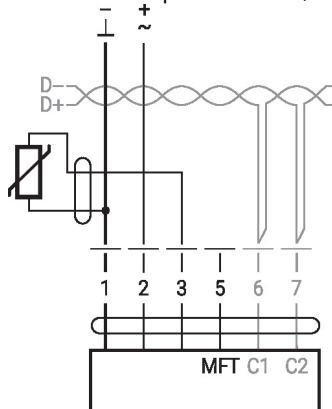
Possible input voltage range:
0...10 V
Resolution 30 mV

Connection with switching contact, e.g. Δp monitor



Switching contact requirements:
The switching contact must be able to switch a current of 16 mA at 24 V accurately.
Start point of the operating range must be parametrised on the MOD actuator as ≥ 0.5 V.

Connection with passive sensor, e.g. Pt1000, Ni1000, NTC



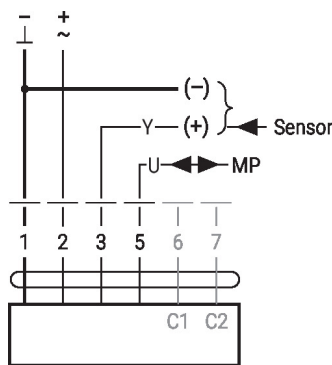
Ni1000	-28...+98°C	850...1600 Ω ²⁾
PT1000	-35...+155°C	850...1600 Ω ²⁾
NTC	-10...+160°C ¹⁾	200 Ω...60 kΩ ²⁾

1) depending on type
2) Resolution 1 Ohm
Compensation of the measured value is recommended

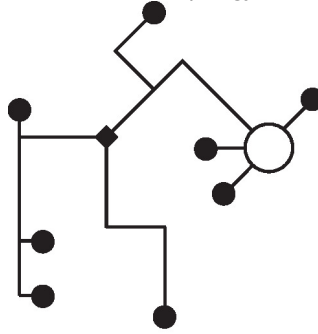
Functions

Functions with specific parameters (Parametrisation necessary)

MP-Bus



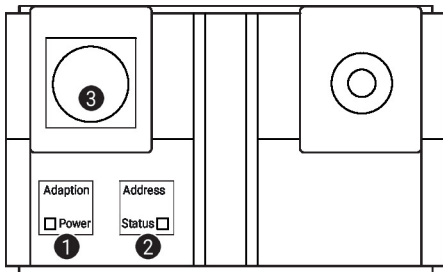
MP-Bus Network topology



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

Operating controls and indicators


1 Membrane key and LED display green

Off:	No power supply or malfunction
On:	In operation
Flashing:	In address mode: Pulses according to set address (1...16) When starting: Reset to factory setting (Communication)
Press button:	In standard mode: Triggers angle of rotation adaptation In address mode: Confirmation of set address (1...16)

2 Membrane key and LED display yellow

Off:	Standard mode
On:	Adaptation or synchronisation process active or actuator in address mode (LED display green flashing)
Flickering:	BACnet / Modbus communication active
Press button:	In operation (>3 s): Switch address mode on and off In address mode: Address setting by pressing several times When starting (>5 s): Reset to factory setting (Communication)

3 Service plug

For connecting parametrisation and service tools

Operating elements

The manual override, locking switch and direction of rotation switch elements are available on both sides

Service

Quick addressing

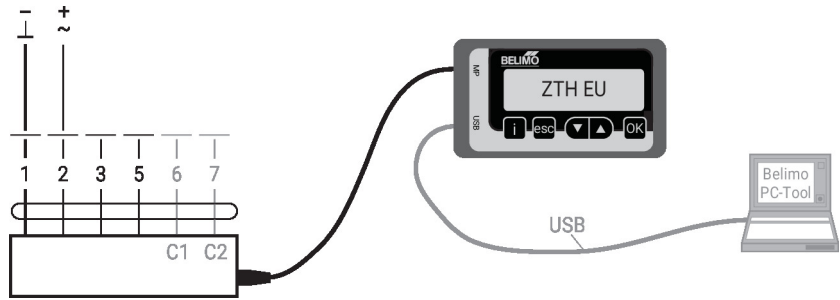
1. Press the "Address" button until the green "Power" LED is no longer illuminated. The green "Power" LED flashes in accordance with the previously set address.
2. Set the address by pressing the "Address" button the corresponding number of times (1...16).
3. The green LED flashes in accordance with the address that has been entered (1...16). If the address is not correct, it can be reset in accordance with step 2.
4. Confirm the address setting by pressing the green "Adaptation" button.

If the address is not confirmed within 60 seconds, the address procedure will be ended. Any address change that has already been started will be discarded.

The resulting BACnet MS/TP and Modbus RTU address is made up of the set basic address plus the short address (e.g. 100+7=107).

Service

Tool connection The actuator can be parametrised by ZTH EU via the service socket.
For an extended parametrisation the PC tool can be connected.



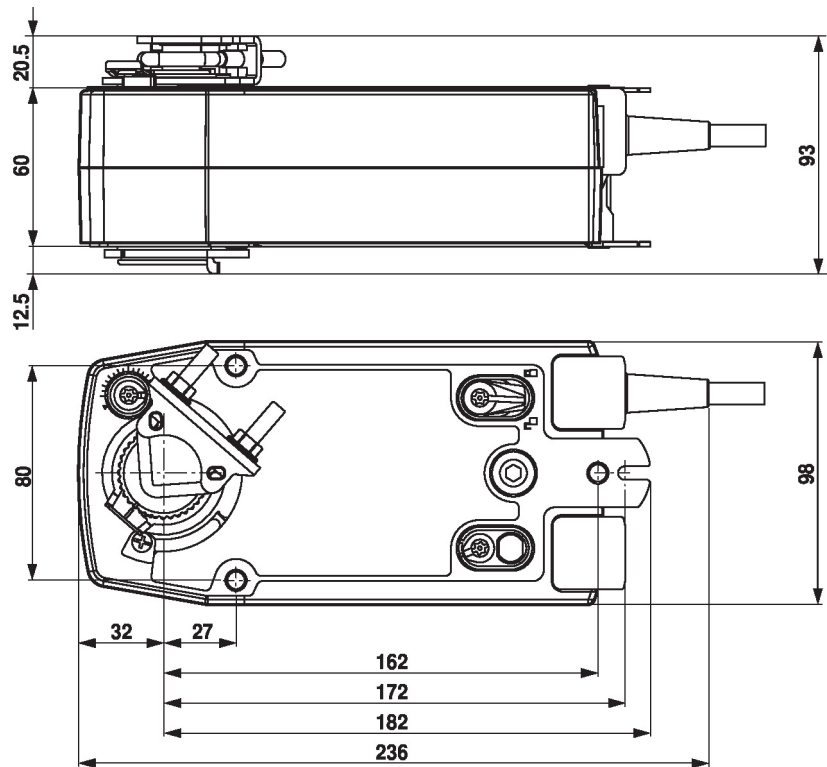
Dimensions

Spindle length

	Min. 85
	Min. 15

Clamping range

	10...22	10	14...25.4
	19...25.4	12...18	



Further documentation

- Tool connections
- BACnet Interface description
- Modbus Interface description
- Overview MP Cooperation Partners
- MP Glossary
- Introduction to MP-Bus Technology

Application notes

- For digital control of actuators in VAV applications patent EP 3163399 must be considered.