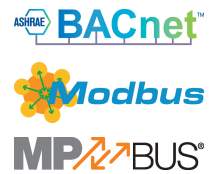


Communicative rotary actuator fail-safe for adjusting dampers in technical building installations

- Air damper size up to approx. 2 m²
- Torque motor 90 in-lb [10 Nm]
- Nominal voltage AC/DC 24 V
- Control modulating, communicative, Hybrid
- Conversion of sensor signals
- Communication via BACnet MS/TP, Modbus RTU, Belimo-MP-Bus or conventional control



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 3 ft. [1 m], 6 x 0.75 mm ²
Data bus communication	Communicative control	BACnet MS/TP Modbus RTU (default setting) MP-Bus
	Number of nodes	BACnet / Modbus see interface description MP-Bus max. 8
Functional data	Torque motor	90 in-lb [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 @ -4...122°F [-20...50°C], <60 s @ -22°F [-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%	
Override control variable	MAX = (MIN + 32%)...100% MIN = 0%...(MAX - 32%) ZS = MIN...MAX	

Functional data	Noise 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	III, Safety Extra-Low Voltage (SELV)
	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
	Certification UL	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
	Mode of operation	Type 1.AA
	Rated impulse voltage supply / control	0.8 kV
	Pollution degree	3
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	Max. 95% RH, non-condensing
	Servicing	maintenance-free
Weight	Weight	4.6 lb [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 actuator and that is ensured that the ambient conditions remain at any time within the thresholds according to the data sheet.
- Only authorized specialists may carry out installation. All applicable legal or institutional installation regulations must be complied 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, the design, 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 positioning 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 analog sensor signal can be easily digitized 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 value selected is added to the «Basic address» parameter and results in the effective BACnet and Modbus address.</p>
Combination analogue - communicative (hybrid mode)	<p>With conventional control by means of an analog positioning signal, BACnet or Modbus can be used for the communicative position feedback</p>
Simple direct mounting	<p>Simple direct mounting on the damper shaft with a universal shaft clamp, supplied with an anti-rotation device to prevent the actuator from revolving.</p>
Manual override	<p>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.</p>
Adjustable angle of rotation	<p>Adjustable angle of rotation with mechanical end stops.</p>
High functional reliability	<p>The actuator is overload protected, requires no limit switches and automatically stops when the end stop is reached.</p>
Home position	<p>The first time the supply voltage is switched on, i.e. at the time of commissioning, the actuator carries out a synchronization. The synchronization is in the home position (0%). The actuator then moves into the position defined by the positioning 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 synchronization after actuating the hand crank is programmed. The synchronization is in the home position (0%). The actuator then moves into the position defined by the positioning signal. A range of settings can be adapted using the PC-Tool (see MFT-P documentation)</p>

Accessories

Electrical accessories	Description	Type
	Auxiliary switch 2 x 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 Ø 8...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, Multipack 10 pcs.	KG10A
	Ball joint suitable for damper crank arm KH8, Multipack 10 pcs.	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
	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
	Base plate extension	Z-SF
	Anti-rotation mechanism 230 mm, Multipack 20 pcs.	Z-ARS230L
	Hand crank 63 mm	ZKN2-B

Service tools	Description	Type
	Service Tool, with ZIP-USB function, for programmable 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
	Connection cable 16 ft [5 m], A: RJ11 6/4 ZTH EU, B: 6-pin for connection to service socket	ZK1-GEN
	Connection cable 16 ft [5 m], A: RJ11 6/4 ZTH EU, B: free wire end for connection to MP/PP terminal	ZK2-GEN

Electrical installation



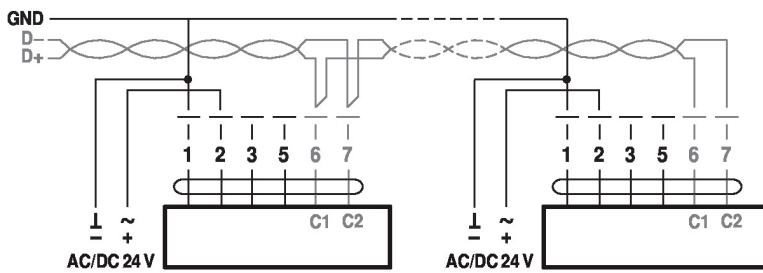
Supply from isolating transformer.

The wiring of the line for BACnet MS/TP / Modbus RTU is to be carried out in accordance with applicable RS485 regulations.

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

Wiring diagrams

BACnet MS/TP / Modbus RTU



Cable colors:

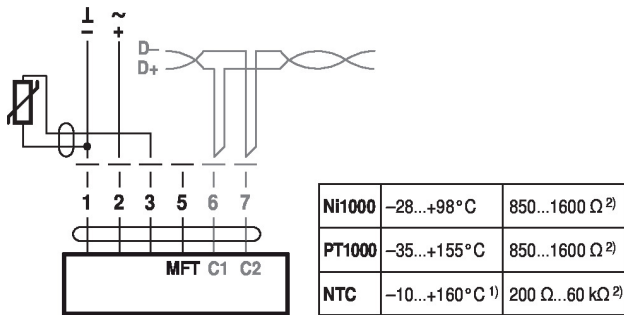
- 1= black
- 2 = red
- 3 = white
- 5 = orange
- 6 = pink
- 7 = grey

BACnet / Modbus signal assignment:

C1 = D- = A

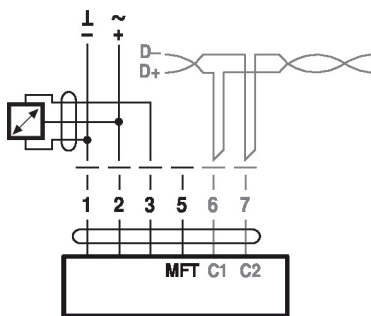
C2 = D+ = B

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



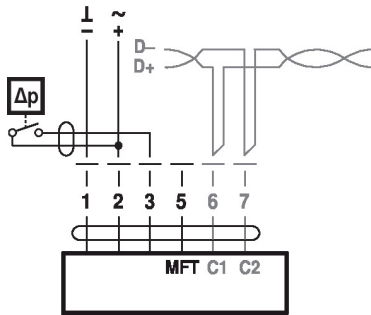
- 1) depending on type
 - 2) Resolution 1 Ohm
- Compensation of the measured value is recommended

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



Possible voltage range:
0...32 V (resolution 30 mV)

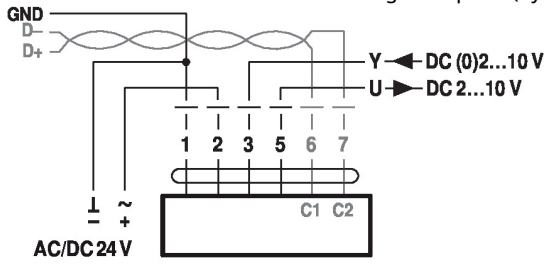
Connection with switching contact, e.g. Δp monitor



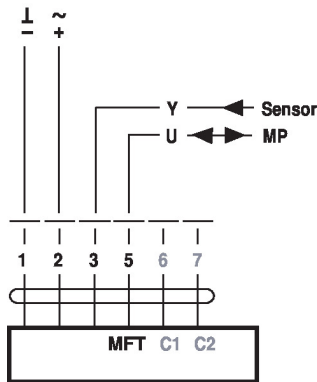
Requirements for switching contact:

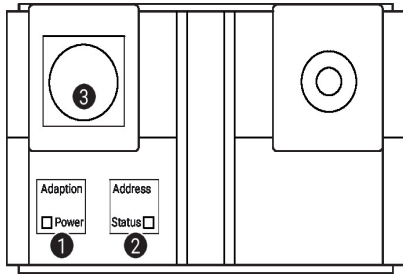
The switching contact must be able to accurately switch a current of 16 mA @ 24 V.

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



Operation on the MP-Bus



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 In standard mode: Triggers angle of rotation adaptation
- button: 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 In operation (>3 s): Switch address mode on and off
- button: 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

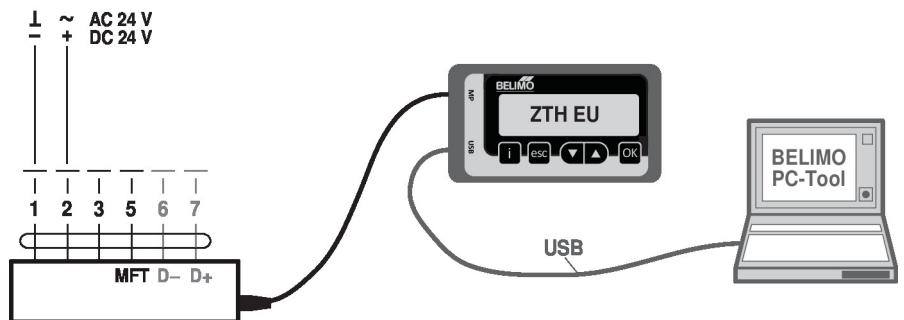
Service

- Quick addressing**
1. Press the "Address" button until the green "Power" LED is no longer illuminated. 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 (...16). If the address is not correct, then this can be reset in accordance with Step 2.
 4. Confirm the address setting by pressing the green "Adaptation" button.

If no confirmation occurs for 60 seconds, then the address procedure is 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 tools connection** The actuator can be configured by ZTH EU via the service socket.
For an extended configuration the PC tool can be connected.



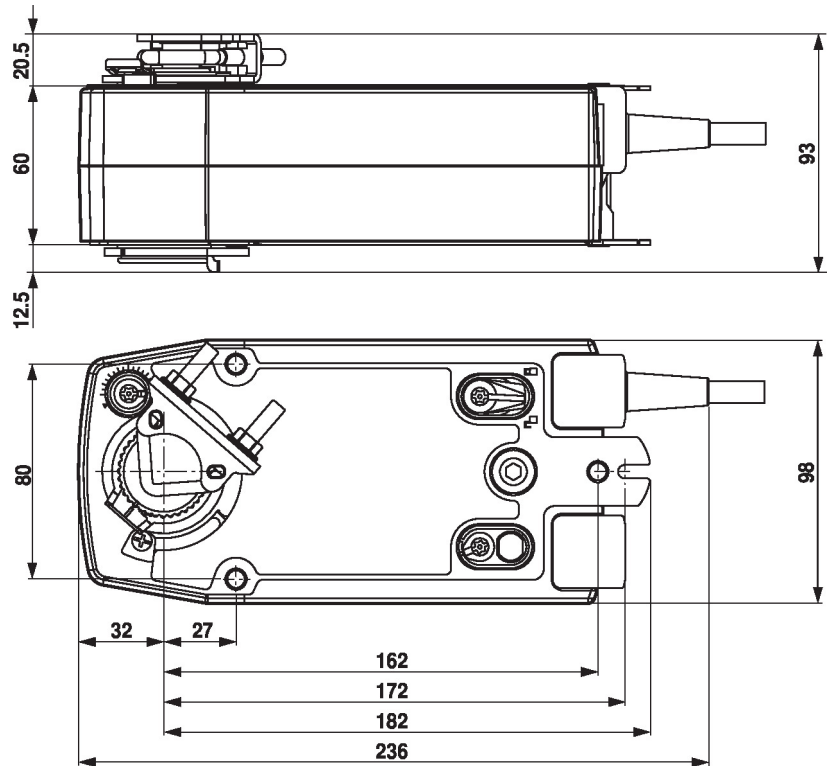
Dimensions

Stem 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.