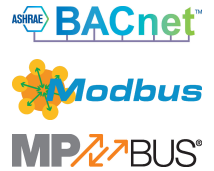


Communicative rotary actuator fail-safe for adjusting dampers in technical building installations

- Air damper size up to approx. 4 m²
- Torque motor 20 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 | 8.5 W |
| | Power consumption in rest position | 3.5 W |
| | Power consumption for wire sizing | 11 VA |
| | Connection supply / control | Cable 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 | 20 Nm |
| | Torque fail-safe | 20 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 | 70...220 s |
| | Running time fail-safe | <20 s @ -20...50°C / <60 s @ -30°C |
| | Adaptation setting range | manual |
| | 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 |
| Sound power level, motor | 40 dB(A) | |
| Mechanical interface | Universal shaft clamp 10...25.4 mm | |
| Position indication | Mechanical | |

| | | |
|------------------------|--|---|
| Functional data | 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 |
| | 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 |
| | 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 | 2.3 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, insolation 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 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 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 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 analogue control 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 rotating.</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 synchronisation. The synchronisation is in the home position (0%). 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%). The actuator then moves into the position defined by the control 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 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 |
| | 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 15x15 mm, Multipack 20 pcs. | ZF15-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 |

| 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:

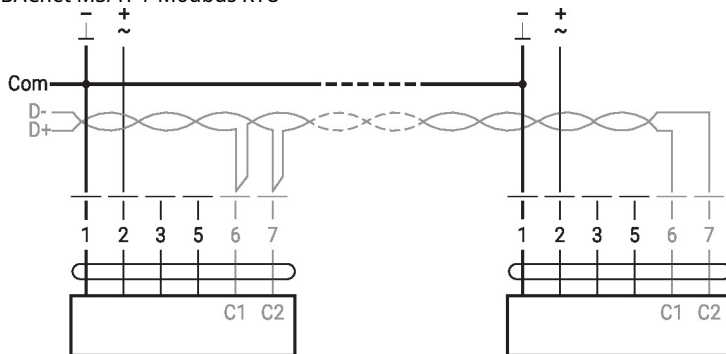
- 1 = black
- 2 = red
- 3 = white
- 5 = orange
- 6 = pink
- 7 = grey

Functions:

- C1 = D- = A
- C2 = D+ = B

Wiring diagrams

BACnet MS/TP / Modbus RTU

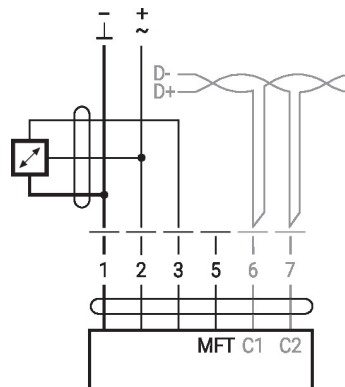
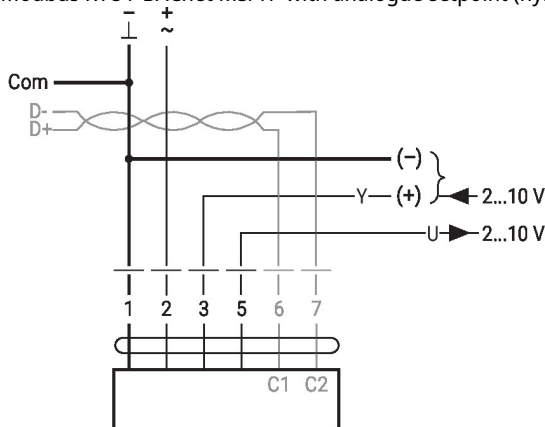


Functions

Functions with specific parameters (Parametrisation necessary)

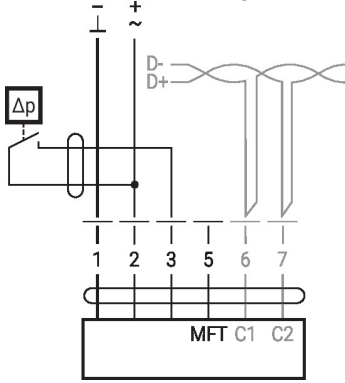
Modbus RTU / BACnet MS/TP with analogue setpoint (hybrid mode)

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



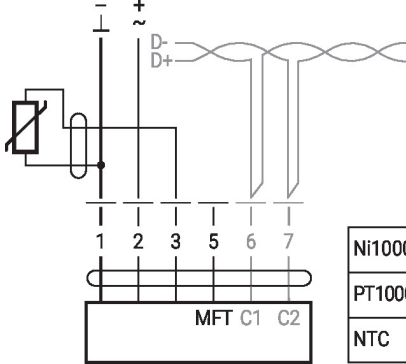
Possible input voltage range:
0...10 V
Resolution 30 mV

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.

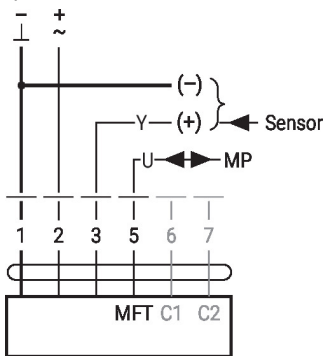
Connection with passive sensor, e.g. Pt1000, Ni1000, NTC



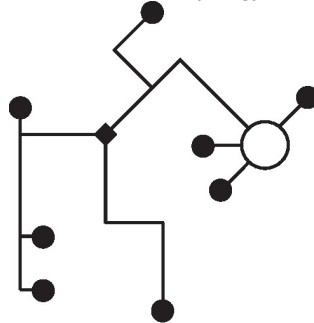
| | | |
|--------|----------------------------|---|
| Ni1000 | -28...+98°C | 850...1600 Ω ²⁾ |
| PT1000 | -35...+155°C | 850...1600 Ω ²⁾ |
| NTC | -10...+160°C ¹⁾ | 200 Ω ...60 k Ω ²⁾ |

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

Operation on the MP-Bus



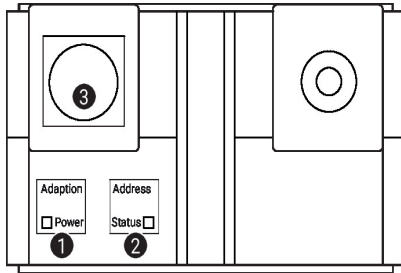
MP-Bus Network topology



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

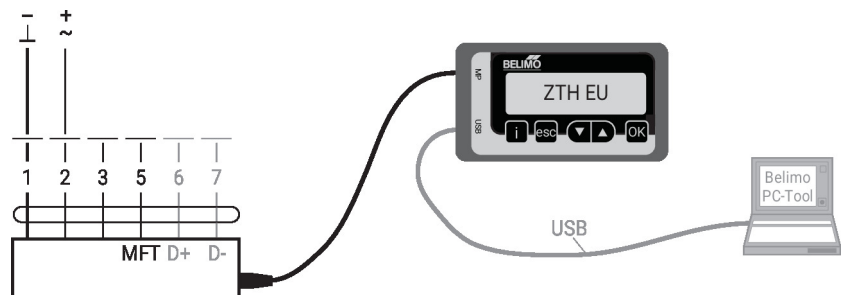
Service

- Quick addressing**
1. Press the "Address" button until the green "Power" LED is no longer illuminated. 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).

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



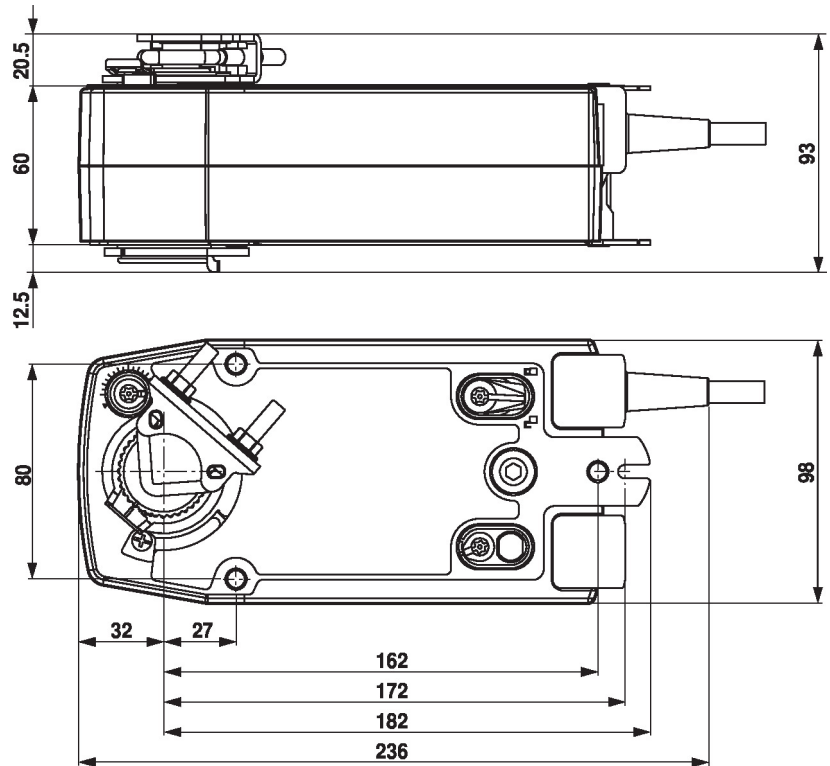
Dimensions

Spindle length

| | | |
|--|--|---------|
| | | Min. 85 |
| | | Min. 15 |

Clamping range

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



Application notes

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