# BELIMO®

**Communicative rotary actuator for ball valves**

- Torque motor 5 Nm
- Nominal voltage AC/DC 24 V
- Control modulating, communicative 2...10 V variable
- Position feedback 2...10 V variable
- Conversion of sensor signals
- Communication via Belimo MP-Bus

## 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 | 2.5 W |
| | Power consumption in rest position | 1.3 W |
| | Power consumption for wire sizing | 5 VA |
| | Connection supply / control | Cable 1 m, 4 x 0.75 mm² |
| | Parallel operation | Yes (note the performance data) |
| **Functional data** | Torque motor | 5 Nm |
| | Communicative control | MP-Bus |
| | Operating range Y | 2...10 V |
| | Input Impedance | 100 kΩ |
| | Operating range Y variable | Start point 0.5...30 V<br>End point 2.5...32 V |
| | Options positioning signal | Open/close<br>3-point (AC only)<br>Modulating (DC 0...32 V) |
| | Position feedback U | 2...10 V |
| | Position feedback U note | Max. 0.5 mA |
| | Position feedback U variable | Start point 0.5...8 V<br>End point 2.5...10 V |
| | Position accuracy | ±5% |
| | Manual override | with push-button, can be locked |
| | Running time motor | 90 s / 90° |
| | Running time motor variable | 35...420 s |
| | Adaptation setting range | manual (automatic on first power-up) |
| | Adaptation setting range variable | No action<br>Adaptation when switched on<br>Adaptation after pushing the gear disengagement button |
| | Override control | MAX (maximum position) = 100%<br>MIN (minimum position) = 0%<br>ZS (intermediate position, AC only) = 50% |
| | Override control variable | MAX = (MIN + 33%)...100%<br>MIN = 0%...(MAX – 33%)<br>ZS = MIN...MAX |
| | Sound power level, motor | 35 dB(A) |
| | Position indication | Mechanically, pluggable |
| **Safety data** | Protection class IEC/EN | III Safety Extra-Low Voltage (SELV) |
| | Protection class UL | 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 E60730-1:02 |
| 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 |
| Rated impulse voltage supply / control | 0.8 kV |
| Control pollution degree | 3 |
| Ambient temperature | -30...50°C |
| Storage temperature | -40...80°C |
| Ambient humidity | Max. 95% r.H., non-condensing |
| Servicing | maintenance-free |
| **Weight**     Weight | 0.51 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 switch for changing the direction of rotation may only be operated by authorised specialists. The direction of rotation must not in particular be reversed in a frost protection circuit.
- 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.
- 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**

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. The measuring voltage U serves for the electrical display of the actuator position 0.5...100% and as slave control signal for other actuators.

Operation on Bus:

The actuator receives its digital positioning signal from the higher level controller via the MP-Bus and drives to the position defined. Connection U serves as communication interface and does not supply an analogue measuring voltage.

**Converter for sensors**

Connection option for a sensor (passive or active sensor or switching contact). The MP actuator serves as an analogue/digital converter for the transmission of the sensor signal via MP-Bus to the higher level system.

**Configurable actuators**

The factory settings cover the most common applications. Single parameters can be modified with the Belimo Service Tools MFT-P or ZTH EU.

**Simple direct mounting**

Straightforward direct mounting on the ball valve with only one central screw. The assembly tool is integrated in the plug-in position indication. The mounting orientation in relation to the ball valve can be selected in 90° steps.

| | |
|---|---|
| **Manual override** | Manual override with push-button possible (the gear is disengaged for as long as the button is pressed or remains locked). |
| **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** | The first time the supply voltage is switched on, i.e. at the time of commissioning, the actuator carries out an adaption, which is when the operating range and position feedback adjust themselves to the mechanical setting range.<br><br>The actuator then moves into the position defined by the positioning signal.<br><br>Factory setting: Y2 (counter-clockwise rotation). |
| **Adaptation and synchronisation** | An adaption can be triggered manually by pressing the "Adaption" button or with the PC-Tool. Both mechanical end stops are detected during the adaption (entire setting range).<br><br>Automatic synchronisation after pressing the gearbox disengagement button is configured. The synchronisation is in the home position (0%).<br><br>The actuator then moves into the position defined by the positioning signal.<br><br>A range of settings can be adapted using the PC-Tool (see MFT-P documentation) |

## Accessories

| | Description | Type |
|---|---|---|
| **Gateways** | Gateway MP zu BACnet MS/TP | UK24BAC |
| | Gateway MP to KNX | UK24EIB |
| | Gateway MP to Modbus RTU | UK24MOD |
| **Electrical accessories** | **Description** | **Type** |
| | Room temperature controller with 3 sequences | CR24-A3 |
| | Room temperature controller with 3 sequences | CR24-B3 |
| | Room temperature controller | CRK24-B1 |
| | | EXT-WR-FP20-MP |
| | Feedback potentiometer 10 kΩ add-on | P10000A |
| | Feedback potentiometer 1 kΩ add-on | P1000A |
| | Feedback potentiometer 140 Ω add-on | P140A |
| | Feedback potentiometer 200 Ω add-on | P200A |
| | Feedback potentiometer 2.8 kΩ add-on | P2800A |
| | Feedback potentiometer 5 kΩ add-on | P5000A |
| | Feedback potentiometer 500 Ω add-on | P500A |
| | Auxiliary switch 1 x SPDT add-on | S1A |
| | Auxiliary switch 2 x SPDT add-on | S2A |
| | Connection cable 5 m, A: RJ11 6/4 ZTH EU, B: 6-pin for connection to service socket | ZK1-GEN |
| | Connection cable 5 m, A: RJ11 6/4 ZTH EU, B: free wire end for connection to MP/ PP terminal | ZK2-GEN |
| | MP-Bus power supply for MP actuators | ZN230-24MP |
| **Service tools** | **Description** | **Type** |
| | Adapter for Service-Tool ZTH | MFT-C |
| | Belimo PC-Tool, Software for adjustments and diagnostics | MFT-P |
| | Service Tool, with ZIP-USB function, for parametrisable and communicative Belimo actuators, VAV controller and HVAC performance devices | ZTH EU |

## Electrical installation

⚠️ **Supply from isolating transformer.**

**Parallel connection of other actuators possible. Observe the performance data.**

**Direction of rotation switch is covered. Factory setting: Direction of rotation Y2.**
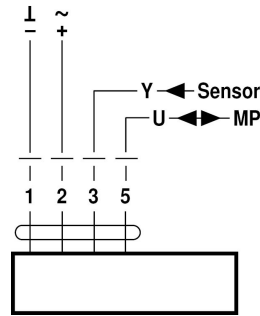
## Wiring diagrams

AC/DC 24 V, modulating

Y ◄── DC (0)2...10 V
U ──► DC 2...10 V

1  2  3  5
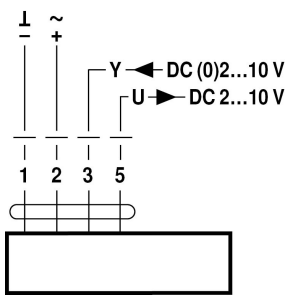
**Cable colours:**
1 = black
2 = red
3 = white
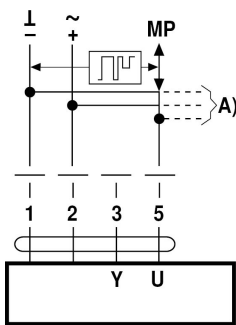5 = orange

Operation on the MP-Bus

Y ◄── Sensor
U ◄─► MP

1  2  3  5

**Cable colours:**
1 = black
2 = red
3 = white
5 = orange

## Functions

### Functions when operated on MP-Bus

Connection on the MP-Bus

MP

1  2  3  5

Y    U

MP-Bus Network topology

A) additional MP-Bus nodes (max. 8)
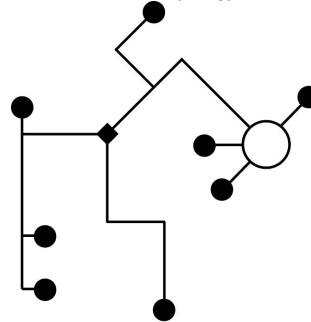
There are no restrictions for the network topology (star, ring, tree or mixed forms are permitted).
Supply and communication in one and the same 3-wire cable
• no shielding or twisting necessary
• no terminating resistors required

Connection of active sensors

MP

1  2  3  5

Y    U
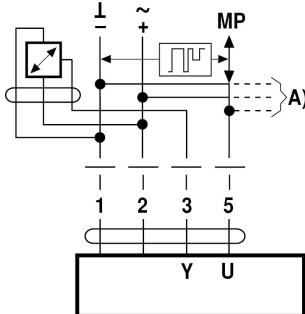
A) additional MP-Bus nodes (max. 8)
• Supply AC/DC 24 V
• Output signal DC 0...10 V
  (max. DC 0...32 V)
• Resolution 30 mV

Connection of external switching contact

Δp

MP

1  2  3  5

Y    U
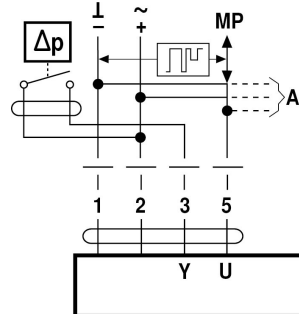
A) additional MP-Bus nodes (max. 8)
• Switching current 16 mA @ 24 V
• Start point of the operating range must be parametrised on the MP actuator as ≥ 0.5 V

Connection of passive sensors

MP

1  2  3  5

Y    U
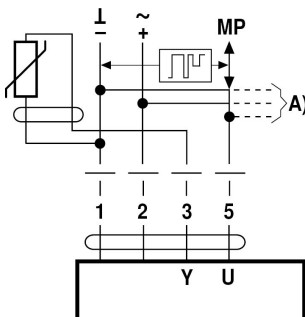
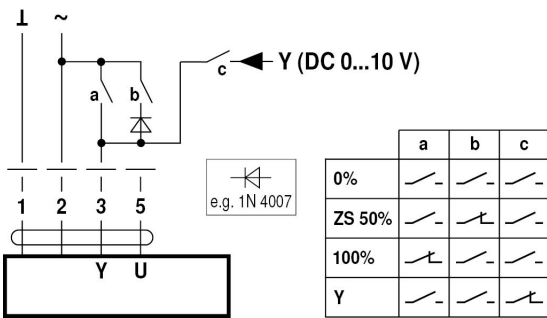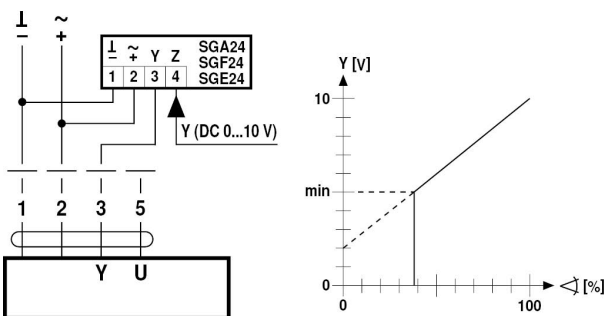| Ni1000 | −28...+98 °C | 850...1600 Ω [2] |
| PT1000 | −35...+155 °C | 850...1600 Ω [2] |
| NTC | −10...+160 °C [1] | 200 Ω...60 kΩ [2] |

A) additional MP-Bus nodes (max. 8)
1) Depending on the type
2) Resolution 1 Ohm

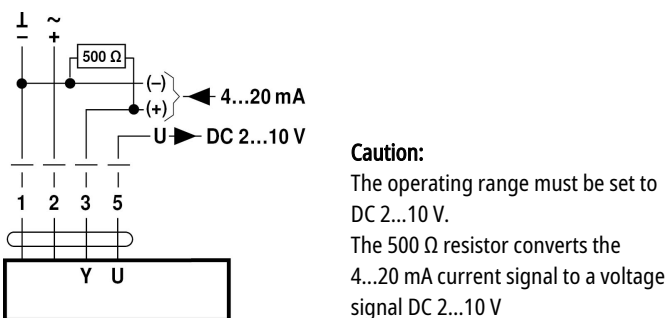## Functions with basic values (conventional mode)
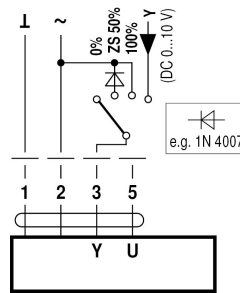
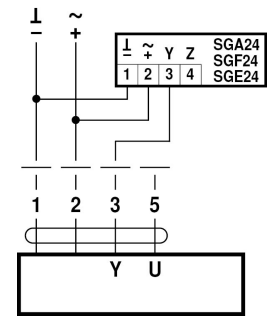Override control with AC 24 V with relay contacts



|          | a | b | c |
|----------|---|---|---|
| 0%       |   |   |   |
| ZS 50%   |   |   |   |
| 100%     |   |   |   |
| Y        |   |   |   |

Override control with AC 24 V with rotary switch



e.g. 1N 4007

Control remotely 0...100% with positioner SG..



SGA24
SGF24
SGE24

Minimum limit with positioner SG..



SGA24
SGF24
SGE24

Y (DC 0...10 V)

Follow-up control (position-dependent)



Y ◄ DC (0)2...10 V

U ► DC 2...10 V

Control with 4...20 mA via external resistor



500 Ω
(−)
(+)  } ◄ 4...20 mA

U ► DC 2...10 V

**Caution:**
The operating range must be set to DC 2...10 V.
The 500 Ω resistor converts the 4...20 mA current signal to a voltage signal DC 2...10 V
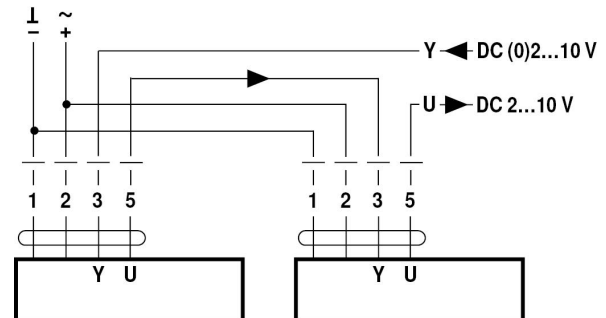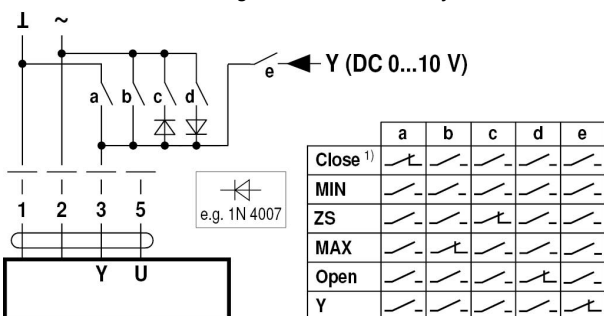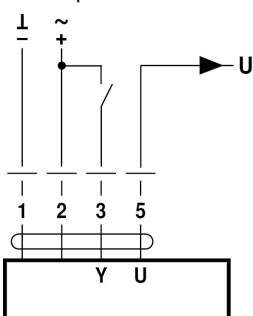
Functional check
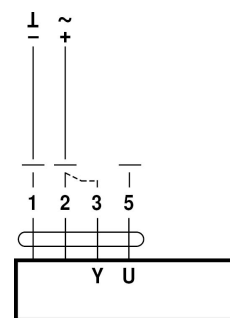


**Procedure**
1. Connect 24 V to connections 1 and 2
2. Disconnect connection 3:
– with direction of rotation Y1:
Actuator rotates to the left
– with direction of rotation Y2
Actuator rotates to the right
3. Short-circuit connections 2 and 3:
– Actuator runs in opposite direction

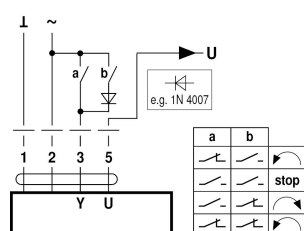## Functions for actuators with specific parameters (Parametrisation necessary)

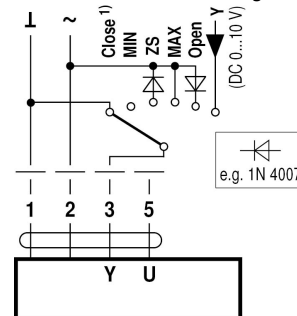Override control and limiting with AC 24 V with relay contacts



Y (DC 0...10 V)

e.g. 1N 4007

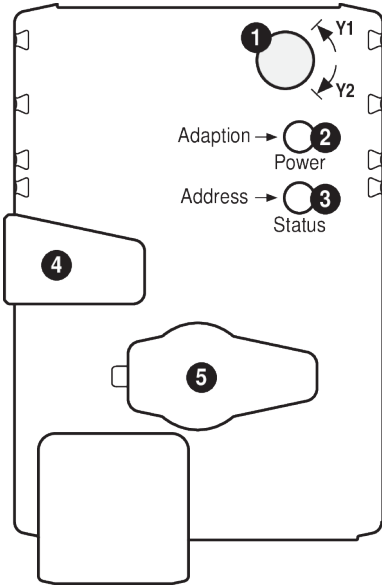|          | a | b | c | d | e |
|----------|---|---|---|---|---|
| Close [1] |   |   |   |   |   |
| MIN      |   |   |   |   |   |
| ZS       |   |   |   |   |   |
| MAX      |   |   |   |   |   |
| Open     |   |   |   |   |   |
| Y        |   |   |   |   |   |

Override control and limiting with AC 24 V with rotary switch



e.g. 1N 4007

[1] **Caution:** This function is only guaranteed if the start point of the operating range is defined as min. 0.5 V.

Control open/close



U

Control 3-point with AC 24 V



U

e.g. 1N 4007

| a | b |      |
|---|---|------|
|   |   |      |
|   |   | stop |
|   |   |      |

## Operating controls and indicators



**❶ Direction of rotation switch**

Switch over:       Direction of rotation changes

**❷ Push-button and LED display green**

| | |
|---|---|
| Off: | No power supply or malfuntion |
| On: | In operation |
| Press button: | Triggers angle of rotation adaptation, followed by standard mode |

**❸ Push-button and LED display yellow**

| | |
|---|---|
| Off: | Standard mode |
| Flickering: | MP communication active |
| On: | Adaptation or synchronising process active |
| Flashing: | Request for addressing from MP master |
| Press button: | Confirmation of the addressing |

**❹ Gear disengagement button**

| | |
|---|---|
| Press button: | Gear disengages, motor stops, manual override possible |
| Release button: | Gear engages, synchronisation starts, followed by standard mode |

**❺ Service plug**

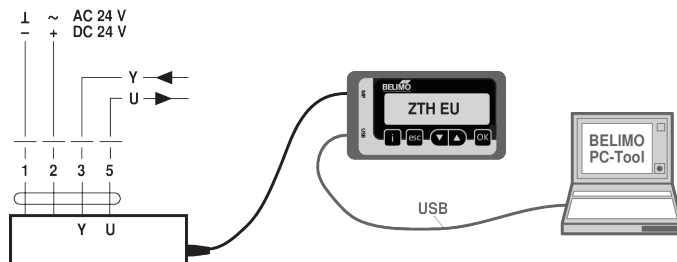For connecting parameterisation and service tools

**Check power supply connection**

❷ Off and ❸ On      Possible wiring error in power supply
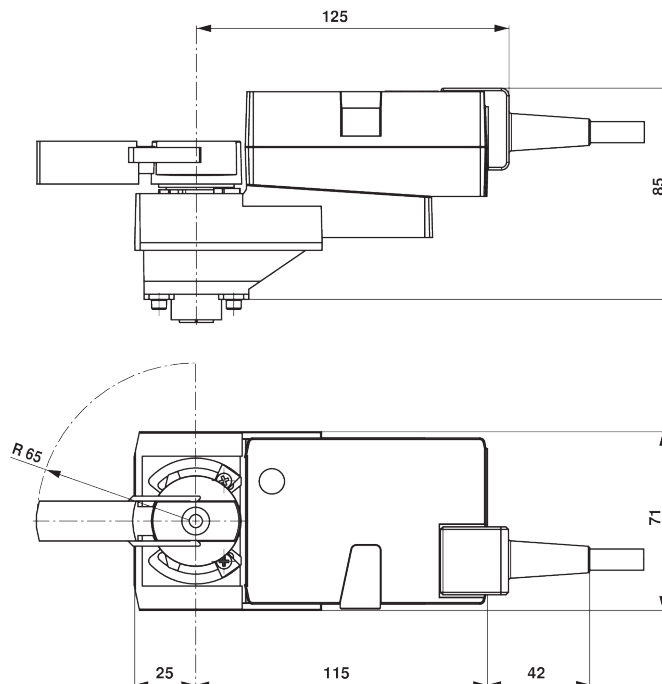
## Service

**Service Tools connection**     The actuator can be parametrised by ZTH EU via the service socket.

For an extended parametrisation the PC tool can be connected.

### Connection ZTH EU / PC-Tool



## Dimensions

**Dimensional drawings**

**Further documentation**

- Overview MP Cooperation Partners
- Tool connections
- Introduction to MP-Bus Technology
- The complete product range for water applications
- Data sheets for ball valves
- Installation instructions for actuators and/or ball valves
- General notes for project planning