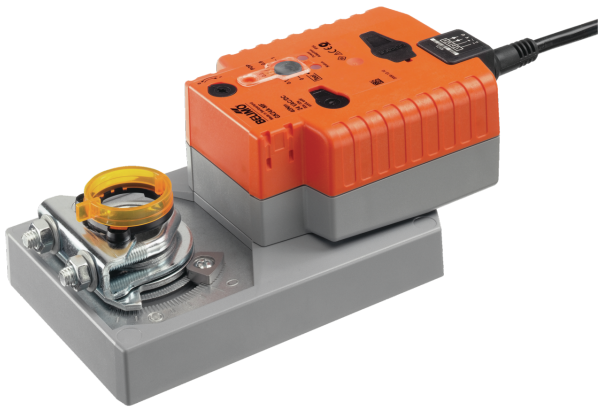
Communicative damper actuator fail-safe and extended functionalities for adjusting dampers in technical building installations

- Air damper size up to approx. 8 m²
- Torque motor 40 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



Picture may differ from product

## 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 | 11 W |
| | Power consumption in rest position | 3 W |
| | Power consumption for wire sizing | 21 VA |
| | Inrush current (Imax) | 20.0 A @ 5 ms |
| | Connection supply / control | Cable 1 m, 6x 0.75 mm² |
| **Data bus communication** | Communicative control | BACnet MS/TP<br>Modbus RTU (factory setting)<br>MP-Bus |
| | Number of nodes | BACnet / Modbus see interface description<br>MP-Bus max. 8 |
| **Functional data** | Torque motor | 40 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<br>End point 2...10 V |
| | Setting fail-safe position | 0...100%, adjustable in increments of 10% (POP rotary knob on 0 corresponds to left end stop) |
| | Bridging time (PF) | 2 s |
| | Bridging time (PF) variable | 0...10 s |
| | Position accuracy | ±5% |
| | Direction of motion motor | selectable with switch 0/1 |
| | Direction of motion variable | electronically reversible |
| | Direction of motion fail-safe | selectable with switch 0...100% |
| | Direction of motion note | Y = 0%: At switch position 0 (ccw rotation) / 1 (cw rotation) |
| | Manual override | with push-button |
| | Angle of rotation | Max. 95° |
| | Angle of rotation note | can be limited on both sides with adjustable mechanical end stops |
| | Running time motor | 150 s / 90° |
| | Running time motor variable | 90...150 s |
| | Running time fail-safe | 35 s / 90° |
| | Sound power level, motor | 52 dB(A) |

## Technical data

| | | |
|---|---|---|
| **Functional data** | Sound power level, fail-safe | 61 dB(A) |
| | Adaptation setting range | manual |
| | Adaptation setting range variable | No action<br>Adaptation when switched on<br>Adaptation after pushing the manual override button |
| | Override control, controllable via bus communication | MAX (maximum position) = 100%<br>MIN (minimum position) = 0%<br>ZS (intermediate position) = 50% |
| | Override control variable | MAX = (MIN + 32%)...100%<br>MIN = 0%...(MAX – 32%)<br>ZS = MIN...MAX |
| | Mechanical interface | Universal shaft clamp reversible 12...26.7 mm |
| | Position indication | Mechanical, pluggable |
| **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 |
| | Housing | 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<br>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 |
| | 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 | 1.1 kg |
| **Terms** | Abbreviations | POP = Power off position / fail-safe position<br>PF = Power fail delay time / bridging time |

## 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 if no (sea) water, snow, ice, sunlight or aggressive gases act directly on the device and if it is ensured that the ambient conditions remain within the limit values specified in the data sheet at all times.
- 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.
- Self adaptation is necessary when the system is commissioned and after each adjustment of the angle of rotation (press the adaptation push-button once).
- 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

**Operating mode**

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.

**Pre-charging time (start up)**

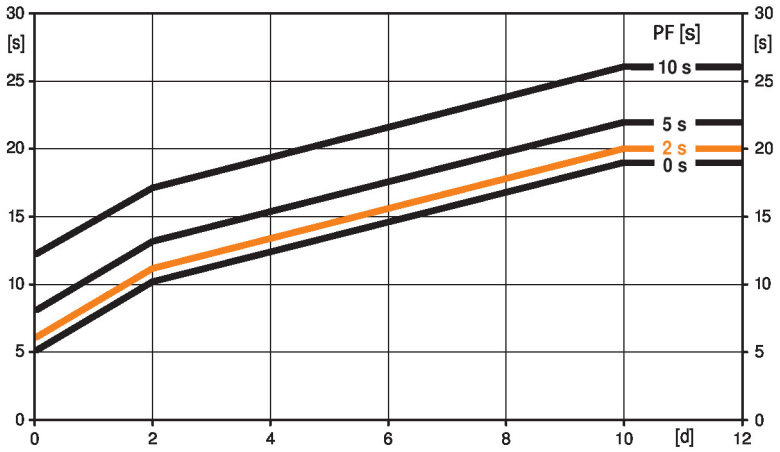
The capacitor actuators require a pre-charging time. This time is used for charging the capacitors up to a usable voltage level. This ensures that, in the event of a power failure, the actuator can move at any time from its current position into the preset fail-safe position.

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] = Power failure in days
[s] = Pre-charging time in seconds
PF[s] = Bridging time
Calculation example: Given a power failure of 3 days and a bridging time (PF) set at 5 s, the actuator requires a pre-charging time of 14 s after the power 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.

## Product features

**Bridging time**

Power failures 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, the actuator will move into the selected fail-safe position.

The bridging time set at the factory is 2 s. It can be modified on site in operation by means of the Belimo service tool MFT-P.

Settings: The rotary knob must not be set to the "Tool" position!

For retroactive adjustments of the bridging time with the Belimo service tool MFT-P or with the ZTH EU adjustment and diagnostic device only the values need to be entered.

**Setting fail-safe position (POP)**

The rotary knob fail-safe position can be used to adjust the desired fail-safe position 0...100% in 10% increments.

The rotary knob refers only to the adapted angle of rotation range 30°...95°. No set min. or max. values are observed.

In the event of a power failure, the actuator will move into the selected fail-safe position, taking into account the bridging time that has been set.

Settings: The rotary knob must be set to the «Tool» position for retroactive settings of the fail-safe position with the Belimo service tool MFT-P. Once the rotary knob is set back to the range 0...100%, the manually set value will have positioning authority.

**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.

**Configurable device**

The factory settings cover the most common applications. Single parameters can be modified with Belimo Assistant 2.

**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 mechanism to prevent the actuator from rotating.

**Manual override**

Manual control with push-button possible - temporary. The gear train is disengaged and the actuator decoupled for as long as the button is pressed.

**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 a synchronisation. The synchronisation is in the home position (0%).

The actuator then moves into the position defined by the control signal.

**Adaptation and synchronisation**

An adaptation can be triggered manually by pressing the "Adaptation" button or with Belimo Assistant 2. Both mechanical end stops are detected during the adaptation (entire setting range).

Automatic synchronisation after pressing the manual override button is configured. 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 made using Belimo Assistant 2.

**Setting direction of motion**

When actuated, the direction of the rotation switch changes the running direction in normal operation. The direction of the rotation switch has no influence on the fail-safe position which has been set.

## Accessories

**Tools**

| Description | Type |
|---|---|
| Service tool for wired and wireless setup, on-site operation and troubleshooting. | Belimo Assistant 2 |
| Belimo Assistant Link Bluetooth and USB to NFC and MP-Bus converter for configurable and communicative devices | LINK.10 |

## Accessories

| | Description | Type |
|---|---|---|
| | Connecting cable 5 m, A: RJ11 6/4 LINK.10, B: 6-pin for connection to service socket | ZK1-GEN |
| | Connecting cable 5 m, A: RJ11 6/4 LINK.10, B: free wire end for connection to MP/PP terminal | ZK2-GEN |

| Electrical accessories | Description | Type |
|---|---|---|
| | Auxiliary switch 1x SPDT add-on | S1A |
| | Auxiliary switch 2x SPDT add-on | S2A |
| | Feedback potentiometer 140 Ω add-on | P140A |
| | Feedback potentiometer 1 kΩ add-on | P1000A |
| | Feedback potentiometer 10 kΩ add-on | P10000A |
| | Adapter for auxiliary switch and feedback potentiometer, Multipack 20 pcs. | Z-SPA |

| Mechanical accessories | Description | Type |
|---|---|---|
| | Actuator arm for standard shaft clamp | AH-GMA |
| | Damper crank arm Slot width 8.2 mm, clamping range ø14...25 mm | KH10 |
| | Mounting kit for linkage operation for flat installation | ZG-GMA |

* Adapter Z-SPA

It is imperative that this adapter will be ordered if an auxiliary switch or a feedback potentiometer is required and if at the same time the shaft clamp is installed on the rear side of the actuator (e.g. with short shaft installation).

## Electrical installation

**Supply from isolating transformer.**

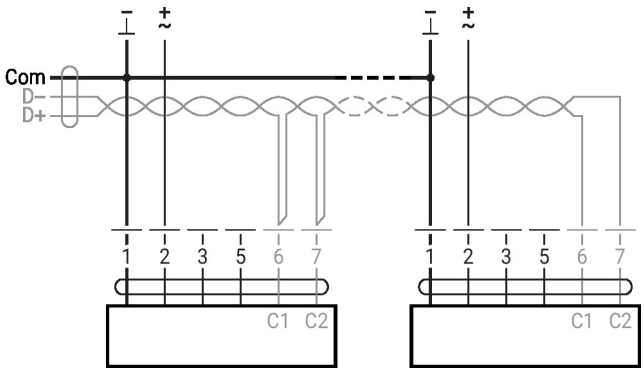
**The wiring of the line for BACnet MS/TP / Modbus RTU is to be carried out in accordance with applicable RS-485 regulations.**

**Modbus / BACnet: Supply and communication are not galvanically isolated. COM and ground of the devices must be connected to each other.**

**Wire colours:**
1 = black
2 = red
3 = white
5 = orange
6 = pink
7 = grey

**Functions:**
C1 = D- (wire 6)
C2 = D+ (wire 7)

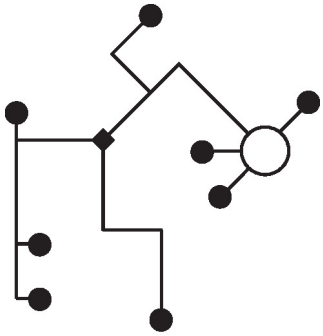
BACnet MS/TP / Modbus RTU



## Further electrical installations

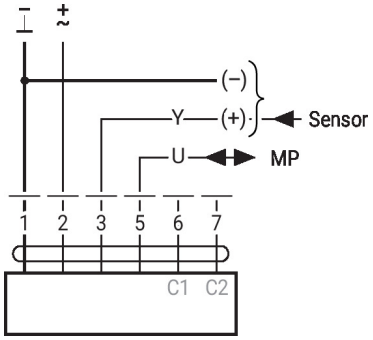
### MP-Bus

MP-Bus Network topology



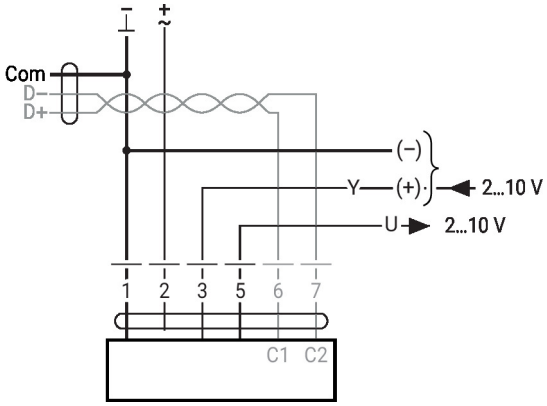
There are no restrictions for the network topology (star, ring, tree or mixed forms are permitted).
Supply and communication in one and the same 3-wire cable
• no shielding or twisting necessary
• no terminating resistors required

MP-Bus



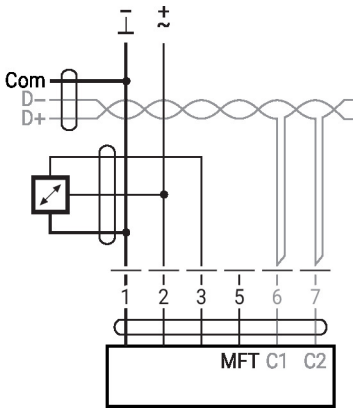

### Functions with specific parameters (configuration necessary)

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




### Sensor connection

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

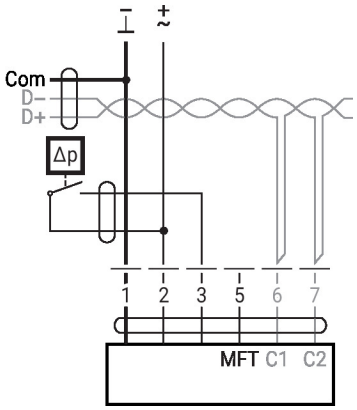



Possible input voltage range:
0...10 V
Resolution 30 mV

## Further electrical installations

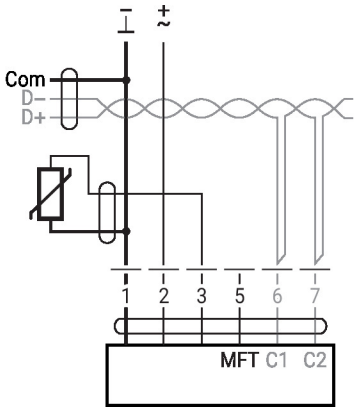
### Sensor connection

Connection with switching contact, e.g. differential pressure switch




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 configured on the MOD actuator as ≥0.5 V.

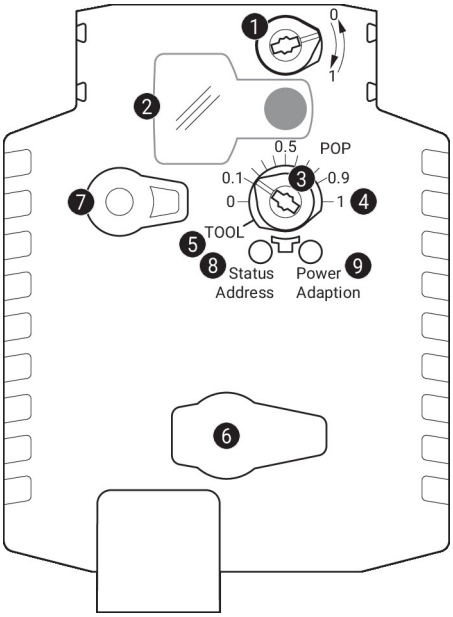
Connection with passive sensor, e.g. Pt1000, Ni1000, NTC




| | | |
|---|---|---|
| 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

## Operating controls and indicators




**1 Direction-of-rotation switch**

Switch over: Direction of rotation changes

**2 Cover, POP button**

**3 POP button**

**4 Scale for manual adjustment**

**5 Position for adjustment with tool**

**6 Service plug**
For connecting configuration and service tools

**7 Manual override button**

Press button: Gear train disengages, motor stops, manual override possible

Release button: Gear train engages, synchronisation starts, followed by standard mode

**8 Push-button** (LED yellow)

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)

**9 Push-button** (LED green)

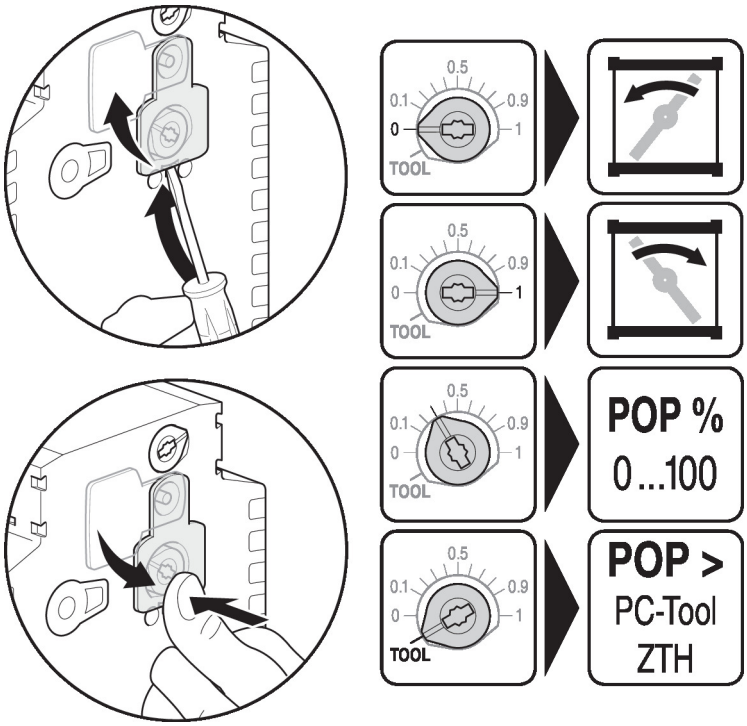
Press button: In opreration: Triggers angle-of-rotation adaptation, followed by standard mode
In address mode: Confirmation of set address (1...16)

LED displays

| yellow 8 | green 9 | Meaning / function |
|---|---|---|
| Off | On | Operation OK |
| Off | Flashing | POP function active<br>When starting: Reset to factory setting (Communication) |
| On | Off | - Pre-charging time SuperCap<br>- Fault SuperCap<br>- Wiring error in supply |
| Off | Off | Not in operation |
| On | On | Adaptation or synchronisation process active |
| On | Flashing | Actuator in address mode<br>Pulses according to set address (1...16) |
| Flickering | On | BACnet / Modbus communication active |

## Operating controls and indicators

Setting fail-safe position (POP)



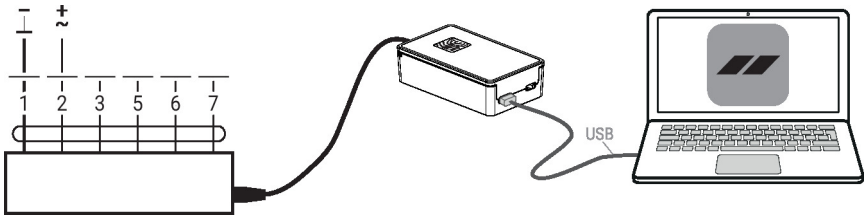

## Service

Using Belimo Assistant 2, device parameters can be modified. Belimo Assistant 2 can operate on a smartphone, tablet or PC. The available connection options vary depending on the hardware on which Belimo Assistant 2 is installed.

For more information about Belimo Assistant 2, refer to the Quick Guide – Belimo Assistant 2.

**Wired connection**

Belimo devices can be accessed by connecting Belimo Assistant Link to the USB port on a PC or laptop and to the Service Socket or MP-Bus wire on the device.




**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.

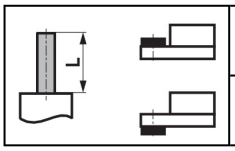
4. Confirm the address setting by pressing the green "Adaptation" button.

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.

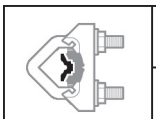
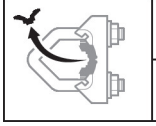
The resulting BACnet MS/TP and Modbus RTU address is made up of the set basic address plus the short address (e.g. 100+7=107).

## Dimensions

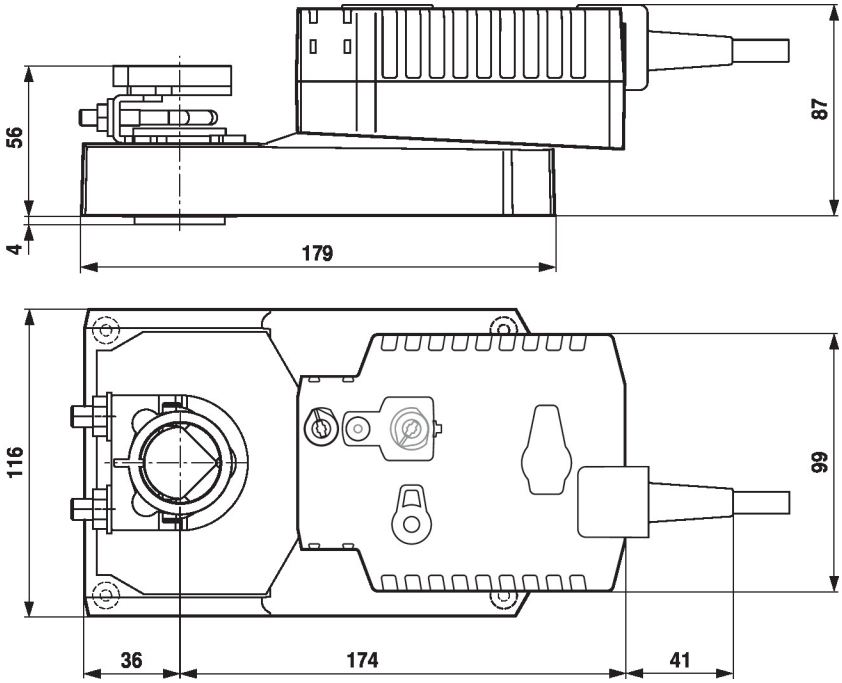
### Shaft length

| | |
|---|---|
|  | Min. 52 mm [2.05"] |
| | Min. 20 mm [0.75"] |

### Clamping range

| | | |
|---|---|---|
|  | | |
| | 12...22 | 12...18 |
|  | | |
| | 22...26.7 | 12...18 |

*Option: Shaft clamp mounted below: If an auxiliary switch or a feedback potentiometer is used the adapter Z-SPA is required.




## Further documentation

- Tool connections
- BACnet Interface description
- Modbus Interface description
- Overview MP Cooperation Partners
- MP Glossary
- Introduction to MP-Bus Technology
- Quick Guide – Belimo Assistant 2