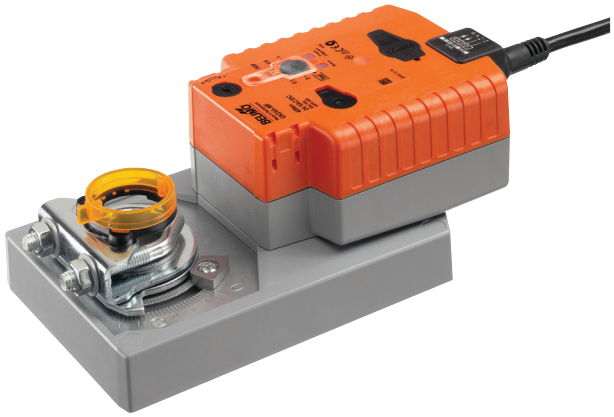
BELIMO

# Technical data sheet GK24A-MF

**Parameterisable SuperCap rotary actuator with emergency control function and extended functionalities for adjusting dampers in technical building installations and in laboratories**

- **Air damper size up to approx. 8 m²**
- **Nominal torque 40 Nm**
- **Nominal voltage AC/DC 24 V**
- **Control modulating DC (0)2...10 V Variable**
- **Position feedback DC 2...10 V Variable**
- **Design life SuperCaps: 15 years**



## 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 |
| | Power consumption for wire sizing note | Imax 20 A @ 5 ms |
| | Connection supply / control | Cable 1 m, 4 x 0.75 mm² |
| | Parallel operation | Yes (note the performance data) |
| **Functional data** | Torque motor | Min. 40 Nm |
| | Positioning signal Y | DC 0...10 V |
| | Positioning signal Y note | Input impedance 100 kΩ |
| | Control signal Y variable | Open-close<br>3-point (AC only)<br>Modulating (DC 0...32 V) |
| | Operating range Y | DC 2...10 V |
| | Operating range Y variable | Start point DC 0.5...30 V<br>End point DC 2.5...32 V |
| | Position feedback U | DC 2...10 V |
| | Position feedback U note | Max. 0.5 mA |
| | Position feedback U variable | Start point DC 0.5...8 V<br>End point DC 2.5...10 V |
| | Setting emergency setting position (POP) | 0...100%, adjustable in increments of 10%<br>(POP rotary knob on 0 corresponds to left end stop) |
| | Setting emergency setting position (POP) variable | 0...100%, adjustable |
| | 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 note | Y = 0 V: At switch position 0 (ccw rotation) / 1 (cw rotation) |
| | Direction of motion variable | electronically reversible |
| | Direction of motion emergency control function | selectable with switch 0...100% |
| | 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° |
| | Motor running time variable | 90...150 s |
| | Running time emergency control position | 35 s / 90° |
| | Running time emergency setting position note | <35 s @ 0...50°C |
| | Adaption setting range | manual |
| | Adaption setting range variable | No action<br>Adaption when switched on<br>Adaption after pushing the gear disengagement button |

## Technical data

| | | |
|---|---|---|
| **Functional data** | Override control | MAX (maximum position) = 100%<br>MIN (minimum position) = 0%<br>ZS (intermediate position, AC only) = 50% |
| | Override control variable | MAX = (MIN + 32%)...100%<br>MIN = 0%...(MAX – 32%)<br>ZS = MIN...MAX |
| | Sound power level motor | 52 dB(A) |
| | Sound power level emergency control position | 61 dB(A) |
| | Spindle driver | Universal spindle clamp reversible 12...26.7 mm |
| | Position indication | Mechanically, pluggable |
| **Safety** | 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, 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 UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1:02 |
| | Mode of operation | Type 1.AA |
| | Rated impulse voltage supply / control | 0.8 kV |
| | Control pollution degree | 3 |
| | Ambient temperature | -30...50°C |
| | Non-operating temperature | -40...80°C |
| | Ambient humidity | 95% r.h., non-condensing |
| | Maintenance | Maintenance-free |
| **Weight** | Weight | 2.0 kg |
| **Terms** | Abbreviations | POP = Power off position / emergency setting position<br>PF = Power fail delay time / bridging time |

## Safety notes

- The device must not be used outside the specified field of application, especially not 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 actuator and that is ensured that the ambient conditions remain at any time within the thresholds according to the data sheet.
- 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 site and the ventilation conditions must be observed.
- Self adaption is necessary when the system is commissioned and after each adjustment of the angle of rotation (press the adaption 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

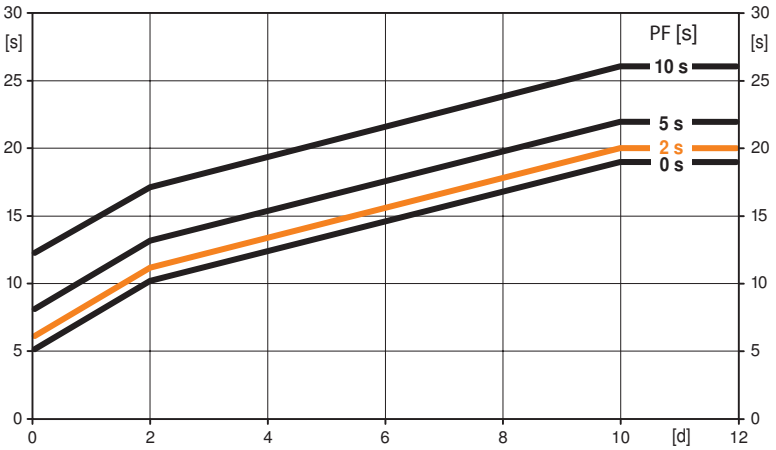
**Mode of operation**

The actuator moves the damper to the desired operating position at the same time as the integrated capacitors are charged. Interrupting the supply voltage causes the damper to be rotated back into the emergency setting position (POP) by means of stored electrical energy.
The actuator is connected with a standard modulating signal of DC 0...10V and drives to the position defined by the positioning signal. Measuring voltage U serves for the electrical display of the damper position 0...100% and as slave control signal for other actuators.

**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 an electricity interruption, the actuator can move at any time from its current position into the preset emergency setting position (POP).
The duration of the pre-charging time depends mainly on following factors:
– Duration of the electricity interruption
– PF delay time (bridging time)

Typical pre-charging time




| 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] | | | | |

[d] = Electricity interruption in days
[s] = Pre-charging time in seconds
PF[s] = Bridging time
Calculation example: Given an electricity interruption of 3 days and a bridging time (PF) set at 5 s, the actuator requires a pre-charging time of 14 s after the electricity has been reconnected (see graphic).

**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.

**Parameterisable 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**

Simple direct mounting on the damper spindle with an universal spindle clamp, supplied with an anti-rotation device to prevent the actuator from rotating.

**Manual override**

Manual control with push-button possible - temporary. The gear 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 positioning signal.

**Direction of rotation switch**

When actuated, the direction of rotation switch changes the running direction in normal operation. The direction of rotation switch has no influence on the emergency setting position (POP) which has been set.

## Product features

**Adaption 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).
A range of settings can be adapted using the PC-Tool (see MFT-P documentation)

**Emergency setting position (POP) rotary knob**

The «Emergency setting position» rotary knob can be used to adjust the desired emergency setting position (POP) between 0 and 100% in 10% increments.
The rotary knob refers only to the adapted angle of rotation range between 30 and 95°. No set Min or Max values are observed.
In the event of a electricity interruption, the actuator will move into the selected emergency setting position (POP), 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 emergency setting position (POP) 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.

**Bridging time**

Electricity interruptions can be bridged up to a maximum of 10 s.
In the event of an electricity interruption, the actuator will remain stationary in accordance with the set bridging time. If the electricity interruption is greater than the set bridging time, then the actuator will move into the selected emergency setting position (POP).
The bridging time set ex-works is 2 s. This can be modified on site in operation with the use 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.

## Accessories

**Electrical accessories**

| Description | Type |
|---|---|
| Auxiliary switch, add-on, 1 x SPDT | S1A |
| Auxiliary switch, add-on, 2 x SPDT | S2A |
| Feedback potentiometer 140 Ohm, add-on | P140A |
| Feedback potentiometer 140 Ohm, add-on, grey | P140A GR |
| Feedback potentiometer 200 Ohm, add-on | P200A |
| Feedback potentiometer 500 Ohm, add-on | P500A |
| Feedback potentiometer 500 Ohm, add-on, grey | P500A GR |
| Feedback potentiometer 1 kOhm, add-on | P1000A |
| Feedback potentiometer 1 kOhm, add-on, grey | P1000A GR |
| Feedback potentiometer 2.8 kOhm, add-on | P2800A |
| Feedback potentiometer 2.8 kOhm, add-on, grey | P2800A GR |
| Feedback potentiometer 5 kOhm, add-on | P5000A |
| Feedback potentiometer 5 kOhm, add-on, grey | P5000A GR |
| Feedback potentiometer 10 kOhm, add-on | P10000A |
| Feedback potentiometer 10 kOhm, add-on, grey | P10000A GR |
| Adapter for auxiliary switch and feedback potentiometer | Z-SPA* |
| Signal converter voltage/current, supply AC/DC 24V | Z-UIC |
| Digital position indicator for front-panel mounting, 0...99%, front mass 72 x 72 mm | ZAD24 |
| Range controller for wall mounting, adjustable electron. Min./max. angle of rotation limitation | SBG24 |
| Positioner for wall mounting, range 0...100% | SGA24 |
| Positioner in a conduit box, range 0...100% | SGE24 |
| Positioner for front-panel mounting, range 0...100% | SGF24 |
| Positioner for wall mounting, range 0...100% | CRP24-B1 |
| Connection cable 5 m, A+B: RJ12 6/6, To ZTH/ZIP-USB-MP | ZK1-GEN |
| Connection cable 5 m, A: RJ11 6/4, B: Free wire end, To ZTH/ZIP-USB-MP | ZK2-GEN |

## Accessories

| | Description | Type |
|---|---|---|
| **Mechanical accessories** | Actuator arm, for standard spindle clamp (reversible) K-SA | AH-GMA |
| | Damper crank arm, for damper spindles | KH10 |
| | Mounting kit for linkage operation, GM..A | ZG-GMA |

| | Description | Type |
|---|---|---|
| **Service Tools** | Service tool 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 to Service Tool ZTH | MFT-C |

* 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 spindle clamp is installed on the rear side of the actuator (e.g. with short-axis installation).

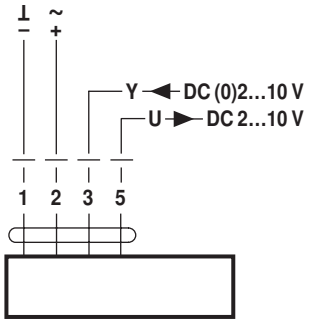
## Electrical installation

**Notes**

- Connection via safety isolating transformer.
- Parallel connection of other actuators possible. Observe the performance data.

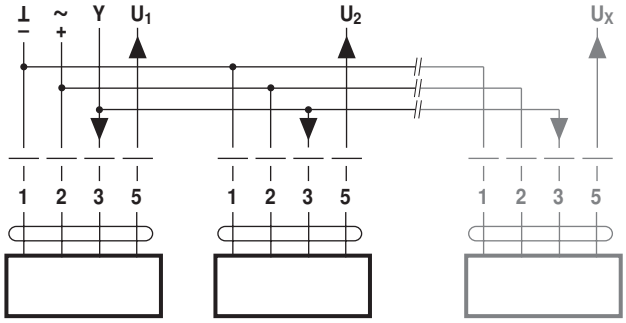
### Wiring diagrams

AC/DC 24 V, modulating




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

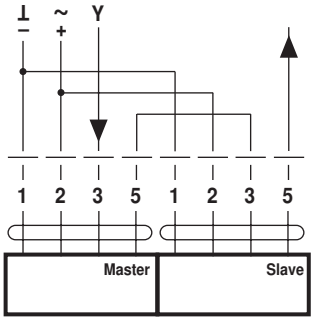
Parallel operation




**Notes**
• A maximum of eight actuators can be connected in parallel.
• Parallel operation is permitted only on non-connected axes.
• Do not fail to observe performance data with parallel operation.

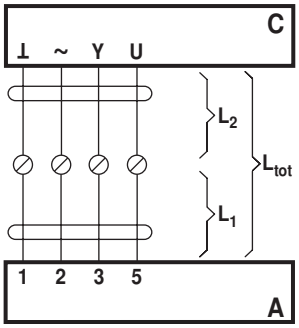
## Electrical installation

Wiring diagram piggyback operation (mechanically coupled actuators)




**Notes**
- A maximum of two actuators can be connected in Master-Slave operation.
- The Master-Slave operation is permitted only on one fixed spindle or on two mechanically coupled spindles.
- The programming of the Master actuator is adopted by the Slave actuator.

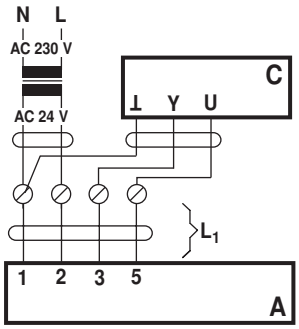
Signal cable lengths




| $L_2$ ⊥ / ~ | $L_{tot} = L_1 + L_2$ | |
|---|---|---|
| | AC | DC |
| 0.75 mm² | ≤30 m | ≤5 m |
| 1.00 mm² | ≤40 m | ≤8 m |
| 1.50 mm² | ≤70 m | ≤12 m |
| 2.50 mm² | ≤100 m | ≤20 m |

A = actuator
C = control unit
L1 = actuator connecting cable
L2 = customer cable
Ltot = maximum signal cable length

**Note:**
In the event of several actuators switched in parallel, the maximum signal cable length is to be divided by the number of actuators.



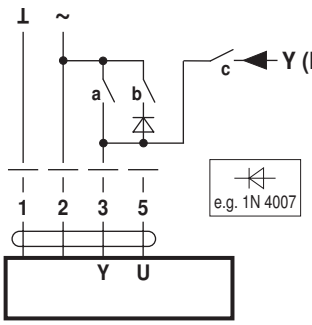

A = actuator
C = control unit
L1 = actuator connecting cable

**Note:**
If supply and data line are handled separately, then no special limitations apply for the installation.

## Functions

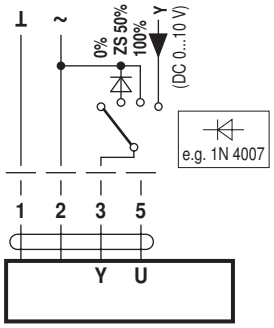
### Functions with basic values (conventional mode)

Override control with AC 24 V with relay contacts



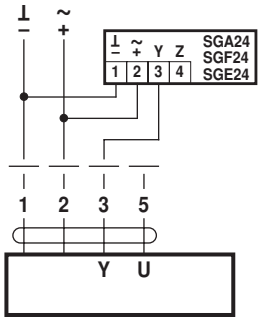

| | a | b | c |
|---|---|---|---|
| 0% | _/_ | _/_ | _/_ |
| ZS 50% | _/_ | __ | _/_ |
| 100% | __ | _/_ | _/_ |
| Y | _/_ | _/_ | __ |

Override control with AC 24 V with rotary switch

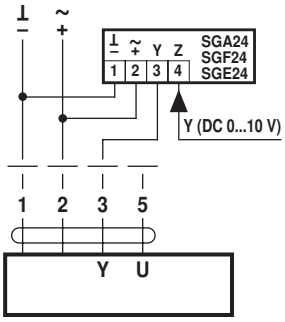


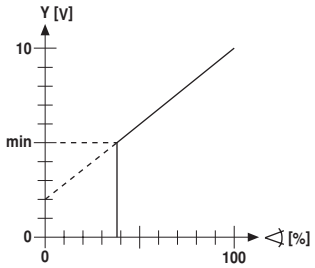
## Functions

Remote control 0...100% with positioner SG..

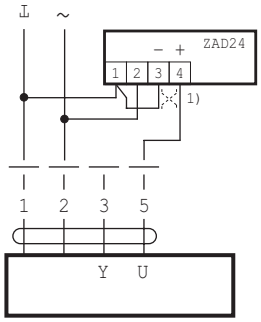



Minimum limit with positioner SG..

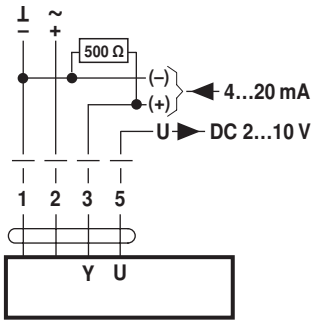



Position indication



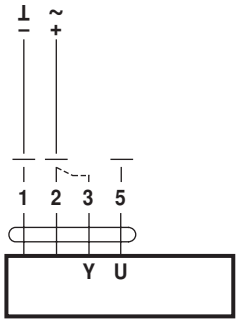

Control with 4...20 mA via external resistor




(1) Adapting the direction of rotation

**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

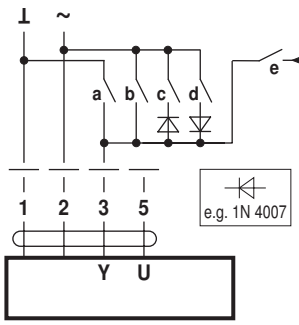
Functional check




**Procedure**
1. Connect 24V to connections 1 and 2
2. Disconnect connection 3:
– with direction of rotation 0:
Actuator rotates to the left
– with direction of rotation 1:
Actuator rotates to the right
3. Short-circuit connections 2 and 3:
– Actuator runs in opposite direction

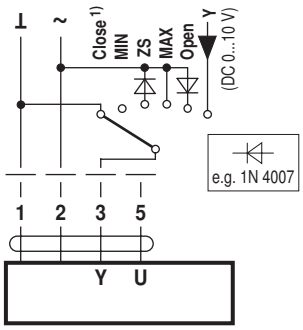
### Functions for actuators with specific parameters (Parametrisation with PC-Tool necessary)

Override control and limiting with AC 24 V with relay contacts




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

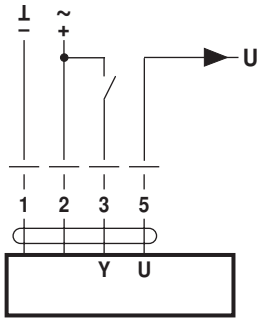
Override control and limiting with AC 24 V with rotary switch



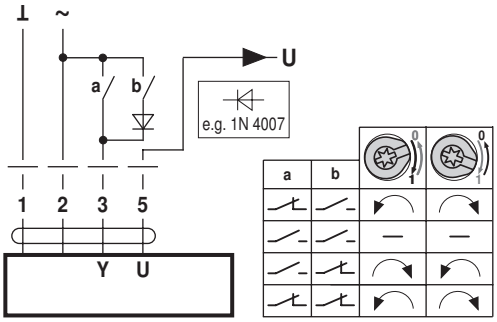

1) **Caution:** This function is only guaranteed if the start point of the operating range is defined as min. 0.5 V.

## Functions

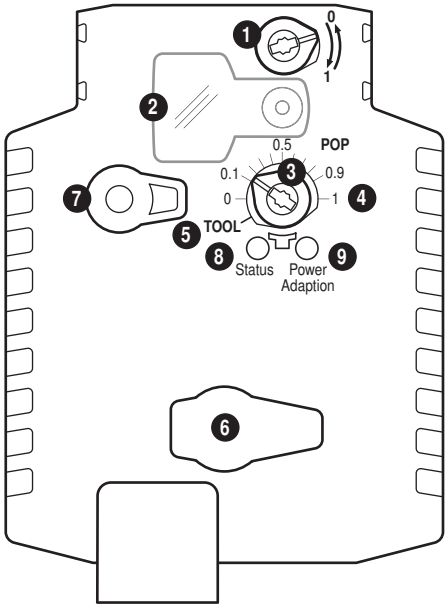
Control open-close




Control 3-point



## Operating controls and indicators

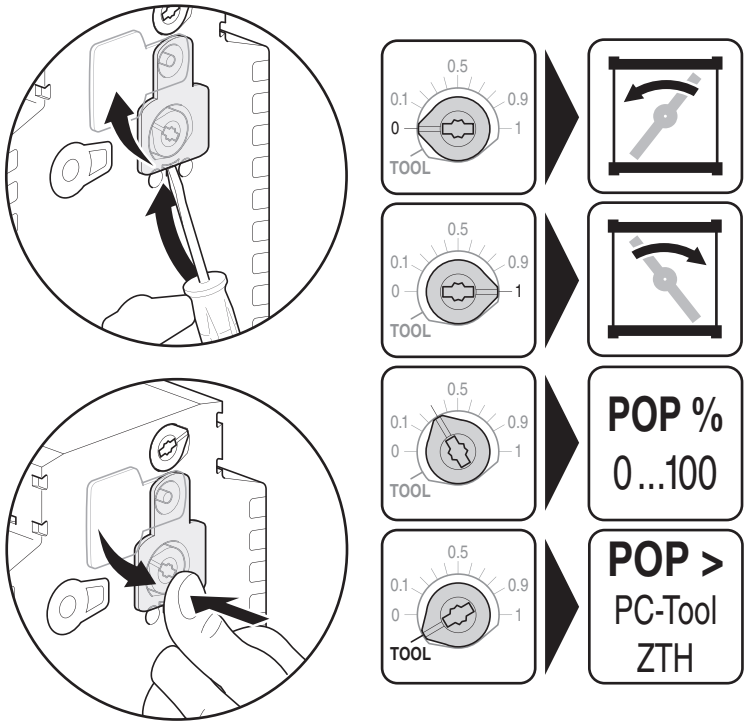



1. **Direction of rotation switch**
2. **Cover, POP button**
3. **POP button**
4. **Scale for manual adjustment**
5. **Position for adjustment with tool**
6. **Tool socket**
7. **Disengagement button**

| LED displays 8 yellow | LED displays 9 green | Meaning / function |
|---|---|---|
| Off | On | Operation OK / without fault |
| Off | Flashing | POP function active |
| On | Off | Fault |
| Off | Off | Not in operation |
| On | On | Adaptation procedure running |
| Flashing | On | Communication with programming tool |

9. **Press button:** Triggers angle of rotation adaption, followed by standard operation

Setting emergency setting position (POP)

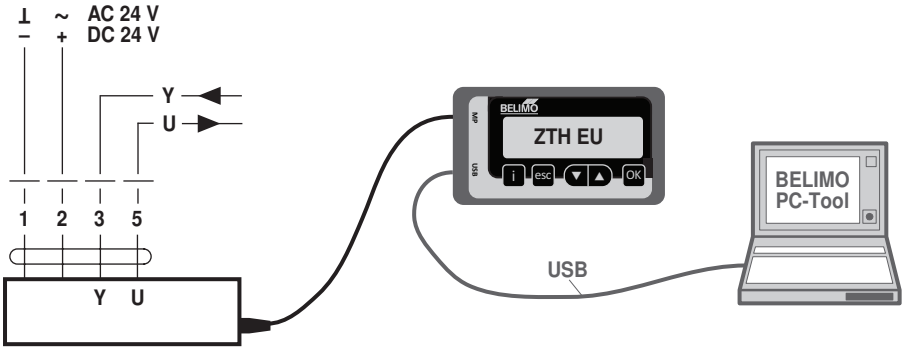


## Service

**Service Tools connection**

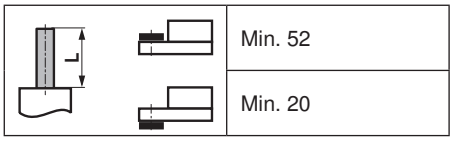
The actuator can be parameterised by ZTH EU via the service socket.
For an extended parameterisation the PC tool can be connected.

Connection ZTH EU / PC-Tool



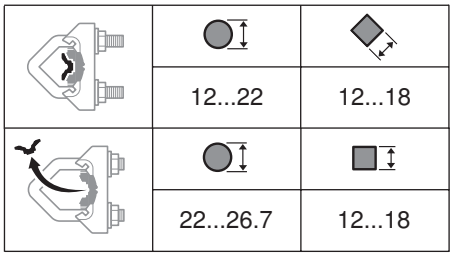

## Dimensions [mm]

**Spindle length**




| | |
|---|---|
| | Min. 52 |
| | Min. 20 |

**Clamping range**



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

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

**Dimensional drawings**