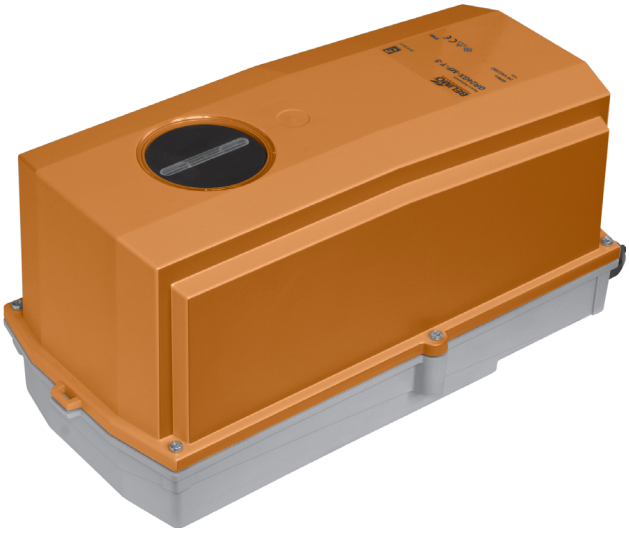
**Parameterisable damper actuator with capacitor technology in the IP66 protective housing for adjusting air dampers with emergency control function and extended functionalities in ventilation and air-conditioning systems for building services installations and in laboratories**

- **For air dampers up to approx. 8 m²**
- **Torque 40 Nm**
- **Nominal voltage AC/DC 24 V**
- **Control: modulating DC 0 ... 10 V or variable**
- **Position feedback DC 0 ... 10 V or variable**

**Optimum weather protection for outdoor applications**



## Technical data

| | | | | |
|---|---|---|---|---|
| **Electrical data** | | | | |
| Nominal voltage | | AC 24 V, 50/60 Hz / DC 24 V | | |
| Nominal voltage range | | AC 19.2 ... 28.8 V / DC 21.6 ... 28.8 V | | |
| Power consumption | In operation | 11 W @ nominal torque | | |
| | At rest | <3 W | | |
| | For wire sizing | ≤21 VA ($I_{max}$ 20 A @ 5 ms) | | |
| Connection | | Cable 1 m, 4 x 0.75 mm² (halogen-free) | | |
| Parallel operation | | Yes (note the performance data) | | |
| **Functional data** | | **Factory settings** | **Variable** | **Setting** |
| Torque | | ≥40 Nm | | |
| Inhibiting torque | | ≥40 Nm | | |
| Control | Control signal Y | DC 0 … 10 V, input impedance 100 kΩ | Open-close, 3-point (only AC)<br>Modulating (DC 0 ... 32 V) | ..... |
| | Operating range | DC 0.5 ... 10 V | Start point DC 0.5 ... 30 V<br>End point DC 2.5 ... 32 V | ..... |
| Position feedback (Measuring voltage U) | | DC 0.5 ... 10 V, max. 0.5 mA | Start point DC 0.5 ... 8 V<br>End point DC 2.5 ... 10 V | ..... |
| Setting emergency position (POP) | | 0% (POP rotary button end stop, left) | 0 ... 100% | ..... |
| Bridging time (PF) | | 2 s | 1 ... 10 s | ..... |
| Position accuracy | | ±5% | | |
| Direction of rotation | Motor | As an option with ↷/↶ | | |
| | Emergency setting position | Reversible with switch 0 ... 100% | | |
| Direction of rotation Y = 0 V | | At switch position 1 ↷ or 0 ↶, respectively | Electronically reversible | ..... |
| Manual override | | Gearing latch disengaged with push button | | |
| Angle of rotation | | Max. 95°∢, can be limited at both ends with adjustable mechanical end stops | | |
| Running time | Standard operation | 150 s / 90°∢ | 90 ... 150 s | ..... |
| | Emergency setting position | 35 s @ 0 ... 50°C | | |
| Automatic adjustment of running time, operating range and measuring signal U to match the mechanical angle of rotation | | Manual triggering of the adaption by pressing the «Adaption» button | Automatic adaption whenever the supply voltage is switched on, or manual triggering | ..... |
| Override control | | MAX (maximum position) = 100%<br>MIN (minimum position) = 0%<br>ZS (intermediate position, only AC) = 50% | MAX = (MIN + 32%) ... 100%<br>MIN = 0% ... (MAX – 32%)<br>ZS = MIN ... MAX | ..... |
| Sound power level | Standard operation | ≤53 dB (A) @ 90 s running time<br>≤52 dB (A) @ 150 s running time | | |
| | Emergency setting position | ≤61 dB (A) | | |
| Service life | Design life | 15 years | | |
| | Full cycles | 100,000 | | |
| | Part cycles | 1,000,000 | | |
| Position indication | | Mechanical, pluggable | | |

**Terms and abbreviations**

POP = Power off position / emergency setting position
PF = Power fail delay time / bridging time

## Technical data *(continued)*

| | |
|---|---|
| **Safety** | |
| Protection class | **III** Safety extra-low voltage<br>UL Class 2 Supply |
| Degree of protection | IP66<br>NEMA 4, UL Enclosure Type 4 |
| EMC | CE according to 2004/108/EC |
| Certification | Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14<br>cULus according to UL 60730-1A and UL 60730-2-14<br>and CAN/CSA E60730-1:02 |
| Mode of operation | Type 1.AA |
| Rated impulse voltage | 0.8 kV |
| Control pollution degree | 4 |
| Ambient temperature | –30 ... +50°C |
| Non-operating temperature | –40 ... +80°C |
| Ambient humidity | 100% r.h. |
| Maintenance | Maintenance-free |
| **Dimensions / Weight** | |
| Dimensions | See «Dimensions» on page 8 |
| Weight | Approx. 4.8 kg |

## Safety notes

- **The actuator is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.**
- **It may only be installed by suitably trained personnel. Any legal regulations or regulations issued by authorities must be observed during installation.**
- **The cover of the protective housing may be opened for adjustment and servicing. When it is closed afterwards, the housing must seal tight (see installation instructions).**
- **The device on the inside may only be opened up in the factory. It does not contain any parts that can be replaced or repaired by the user.**
- **The cable must not be removed from the device on the inside.**
- **When calculating the required torque, the specifications supplied by the damper manufacturers (cross-section, design, installation site), and the air flow conditions must be observed.**
- **The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.**
- **The actuator is not designed for applications where chemical influences (gases, fluids) are present or for utilisation in corrosive environments in general.**
- **The materials used may be subjected to external influences (temperature, pressure, constructional fixture, effect of chemical substances, etc.), which cannot be simulated in laboratory tests or field trials.**
  **In case of doubt, we definitely recommend that you carry out a test. This information does not imply any legal entitlement. Belimo will not be held liable and will provide no warranty.**
- **For UL (NEMA) Type 4 applications flexible metallic cable conduits or threaded cable conduits of equal value are to be used.**
- **The actuator may not be used in plenum applications (e.g. suspended ceilings or raised floors).**

## Product features

**Fields of application**

The actuator is particularly suitable for utilisation in outdoor applications and is protected against the following weather conditions:
– UV radiation
– rain / snow
– dirt / dust
– humidity
– Changing atmosphere / frequent and severe temperature fluctuations (recommendation: use the actuator with integrated factory-installed heating which can be ordered separately to prevent internal condensation *)

* in development

## Product features *(continued)*

**Mode of operation**

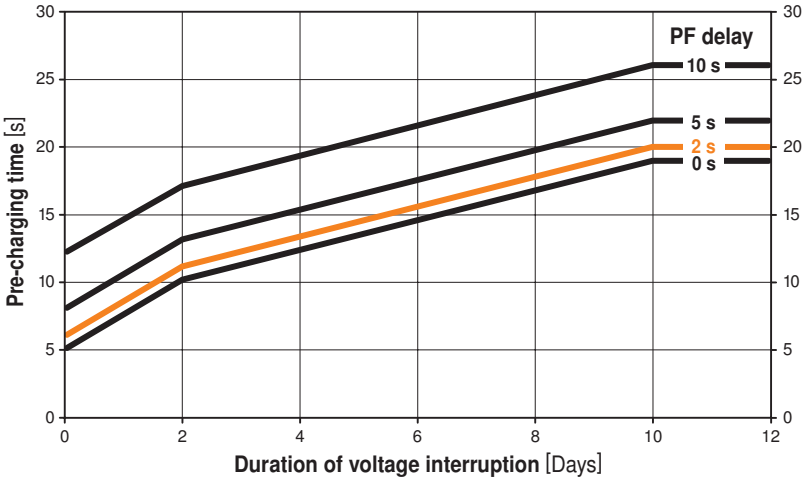
The actuator moves the air damper to the desired operating position at the same time as the integrated capacitors are loaded. Interrupting the supply voltage causes the air damper to be rotated back into the emergency setting position by means of stored electrical energy.
The actuator is controlled with a standard modulating signal of DC 0 ... 10 V and travels to the position defined by the control signal. The measuring voltage U serves for the electrical display of the damper position 0 ... 100%.

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

Typical pre-charging times

| PF delay [s] | Duration of voltage interruption [Days] | | | | |
|---|---|---|---|---|---|
| | 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 |
| | Pre-charging time [s] | | | | |




Calculation example:
In the event of a voltage interruption of 3 days and a set bridging time (PF) of 5 s, the actuator requires a pre-charging time of 14 s (see graphic on page 2) after the voltage has been reconnected.

**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. Input and output signals and other parameters can be altered with the BELIMO service tool MFT-P or with the ZTH-GEN adjustment and diagnostic tool.

**Simple direct mounting**

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

**Manual override**

Manual override with push button possible (the gear is disengaged for as long as the button remains pressed down).

**High operational reliability**

The actuator is overload-proof, requires no limit switches and automatically stops when the end stop is reached.

**Home position / Start**

The clamp of the actuator is set ex-works to 0°◁.
After the supply voltage has been applied, the actuator moves into the position defined by the control 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

*(continued)*

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

The «Emergency setting position» rotary button can be used to adjust the desired emergency setting position (POP) between 0 and 100% in 10% increments.
The rotary button applies only to the adapted angle of rotation range of between 30 and 95°∢.
No minimum or maximum set values are taken into account.
In the event of a voltage interruption, the actuator will move into the selected emergency setting position, taking into account the bridging time.

Settings

The rotary button must be set to the «Tool» position for retroactive settings of the emergency setting position with the BELIMO service tool MFT-P.
Once the rotary button is set back to the range 0 … 100%, the manually set value will have positioning authority

**Bridging time (PF)**

Voltage interruptions can be bridged up to a maximum of 10 s.
In the event of a voltage interruption, the actuator will remain stationary in accordance with the set bridging time. If the voltage 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 at the site of operations with the use of the BELIMO service tool MFT-P.

Settings

The rotary button must not be set to the «Tool» position!
Only the values need to be entered for retroactive adjustments of the bridging time with the BELIMO service tool MFT-P.

## Accessories

**Electrical accessories**

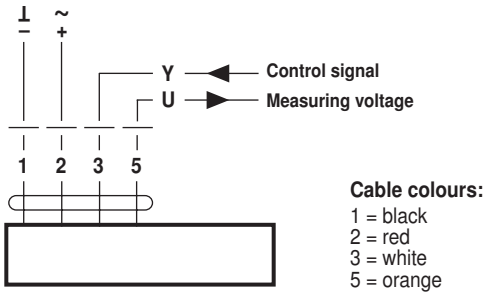
| Description | Data sheet |
|---|---|
| Auxiliary switch S..A.. | T2 - S..A.. |
| Feedback potentiometer P..A.. | T2 - P..A.. |
| BELIMO service tool MFT-P | |
| Adjustment and diagnostic device ZTH-GEN | |
| Position sensor SGA24, SGE24 and SGF24 | T2 - SG..24 |
| Digital position indication ZAD24 | T2 - ZAD24 |
| Room temperature controller CR24.. | S4 - CR24-.. |
| Heating with mechanical hygrostat * | |
| Heating with adjustable thermostat * | |

* in development

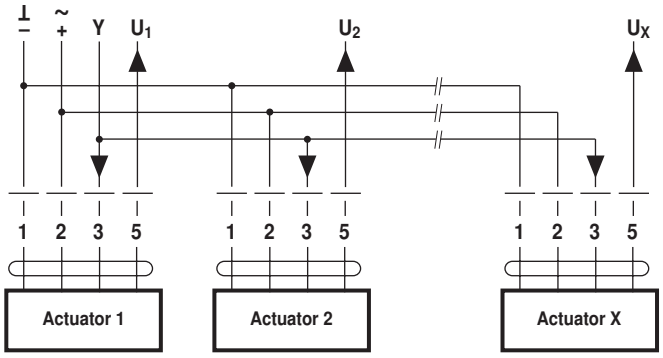
## Electrical installation

**Wiring diagram**

**Note**
Connect via safety isolation transformer.




**Wiring diagram for parallel operation**

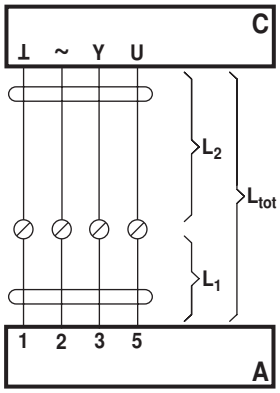



**Notes**

- A maximum of eight actuators can be connected in parallel.
- Parallel operation is permitted only on separated axes.
- It is imperative that the performance data be observed with parallel operation.

## Electrical installation *(continued)*

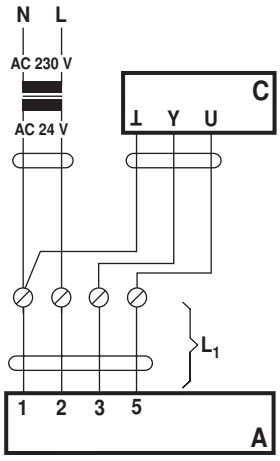
### Cable lengths




**A** = Actuator
**C** = Control unit
$L_1$ = Belimo connecting cable, 1 m (4 x 0.75 mm²)
$L_2$ = Customer cable
$L_{tot}$ = Maximum cable length

| Cross section $L_2$ ⊥ / ~ | Max. cable length $L_{tot} = L_1 + L_2$ | | Example for DC |
|---|---|---|---|
| | AC | DC | |
| 0.75 mm² | ≤40 m | ≤20 m | 1 m ($L_1$) + 19 m ($L_2$) |
| 1.00 mm² | ≤50 m | ≤30 m | 1 m ($L_1$) + 29 m ($L_2$) |
| 1.50 mm² | ≤80 m | ≤45 m | 1 m ($L_1$) + 44 m ($L_2$) |
| 2.50 mm² | ≤130 m | ≤80 m | 1 m ($L_1$) + 79 m ($L_2$) |

**Note**
When several actuators are connected in parallel, the maximum cable length must be divided by the number of actuators.

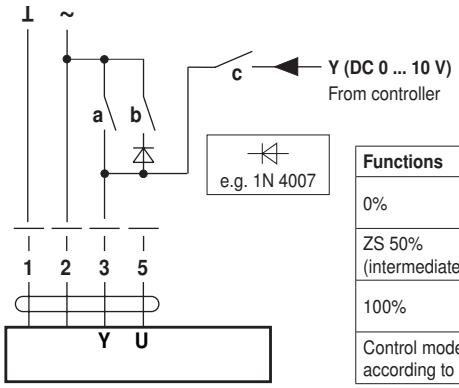



**A** = Actuator
**C** = Control unit
$L_1$ = Belimo connecting cable, 1 m (4 x 0.75 mm²)

**Note**
There are no special restrictions on installation if the supply and data cable are routed separately.

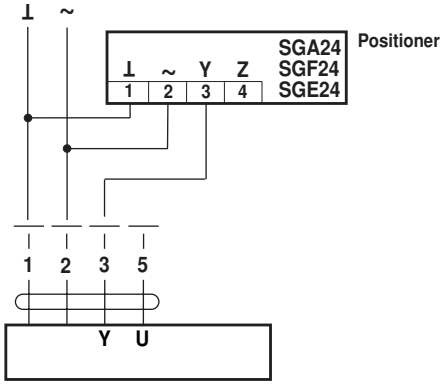
## Functions with basic values

### Override control with AC 24 V with relay contacts

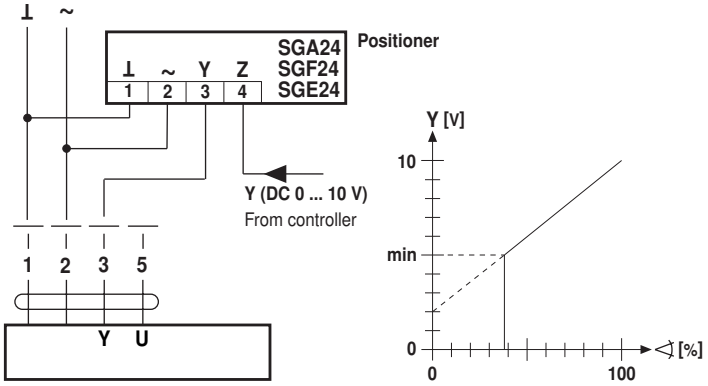



| Functions | a | b | c |
|---|---|---|---|
| 0% | ⟋ | ⟋ | ⟋ |
| ZS 50% (intermediate position) | ⟋ | ⌐ | ⟋ |
| 100% | ⌐ | ⟋ | ⟋ |
| Control mode according to Y | ⟋ | ⟋ | ⌐ |

### Remote control 0 ... 100%

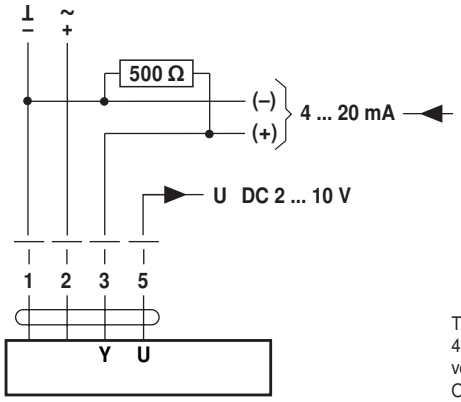



### Minimum limit



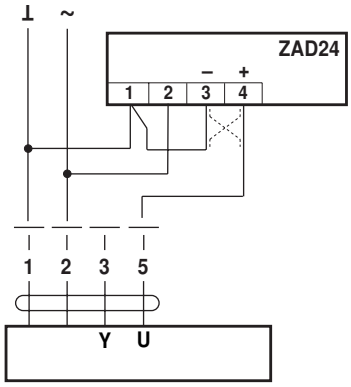
## Functions with basic values *(continued)*

### Control with 4 ... 20 mA via external resistance



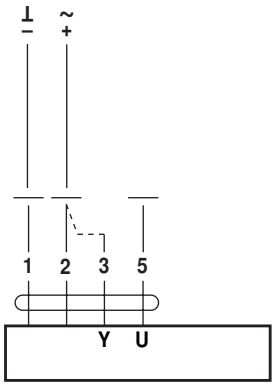

The 500 Ω-resistor converts the 4 ... 20 mA current signal to a voltage signal DC 2 ... 10 V.
Operating range set to DC 2 ... 10 V

### Position indication




Adapting the direction of rotation

### Functional check

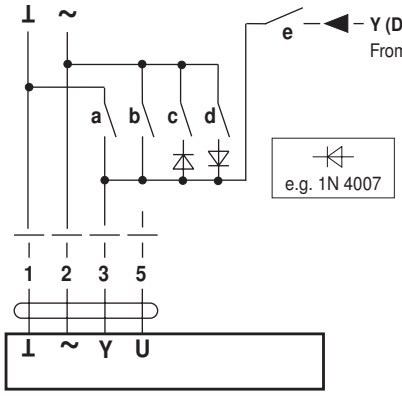



**Procedure**

- Apply 24 V to connection 1 and 2
- Disconnect connection 3:
  - For direction of rotation 0:
    Actuator turns in the direction of ↶
  - For direction of rotation 1:
    Actuator turns in the direction of ↷
- Short circuit connections 2 and 3:
  - Actuator runs in the opposite direction

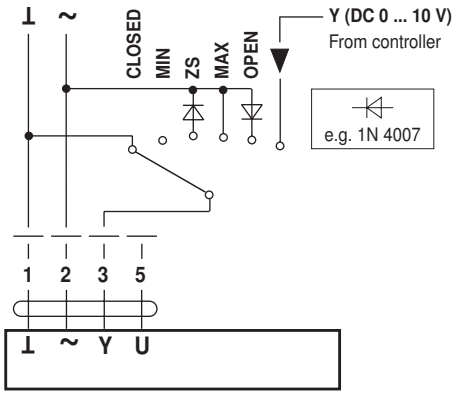
## Functions for actuators with specific parameters

### Override control and limiting with AC 24 V with relay contacts

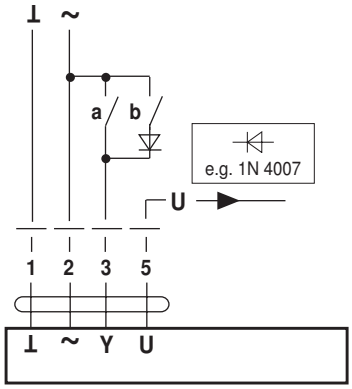



| Functions | a | b | c | d | e |
|---|---|---|---|---|---|
| CLOSED | ⌞ | ⌝ | ⌝ | ⌝ | ⌝ |
| MIN | ⌝ | ⌝ | ⌝ | ⌝ | ⌝ |
| ZS (intermediate position) | ⌝ | ⌝ | ⌞ | ⌝ | ⌝ |
| MAX | ⌝ | ⌞ | ⌝ | ⌝ | ⌝ |
| OPEN | ⌝ | ⌝ | ⌝ | ⌞ | ⌝ |
| Control mode according to Y | ⌝ | ⌝ | ⌝ | ⌝ | ⌞ |

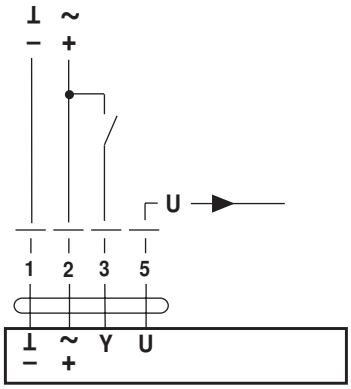
### Override control and limiting with AC 24 V with rotary switch



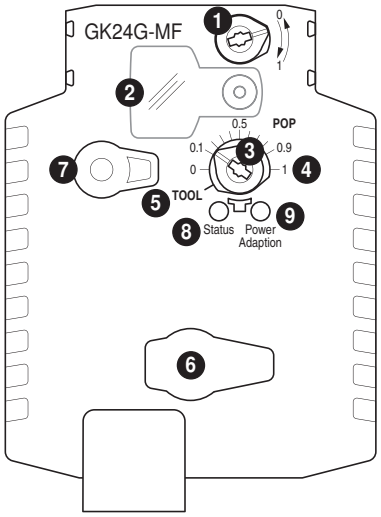

### 3-point control




### Open-close control



## Indicators and operating elements

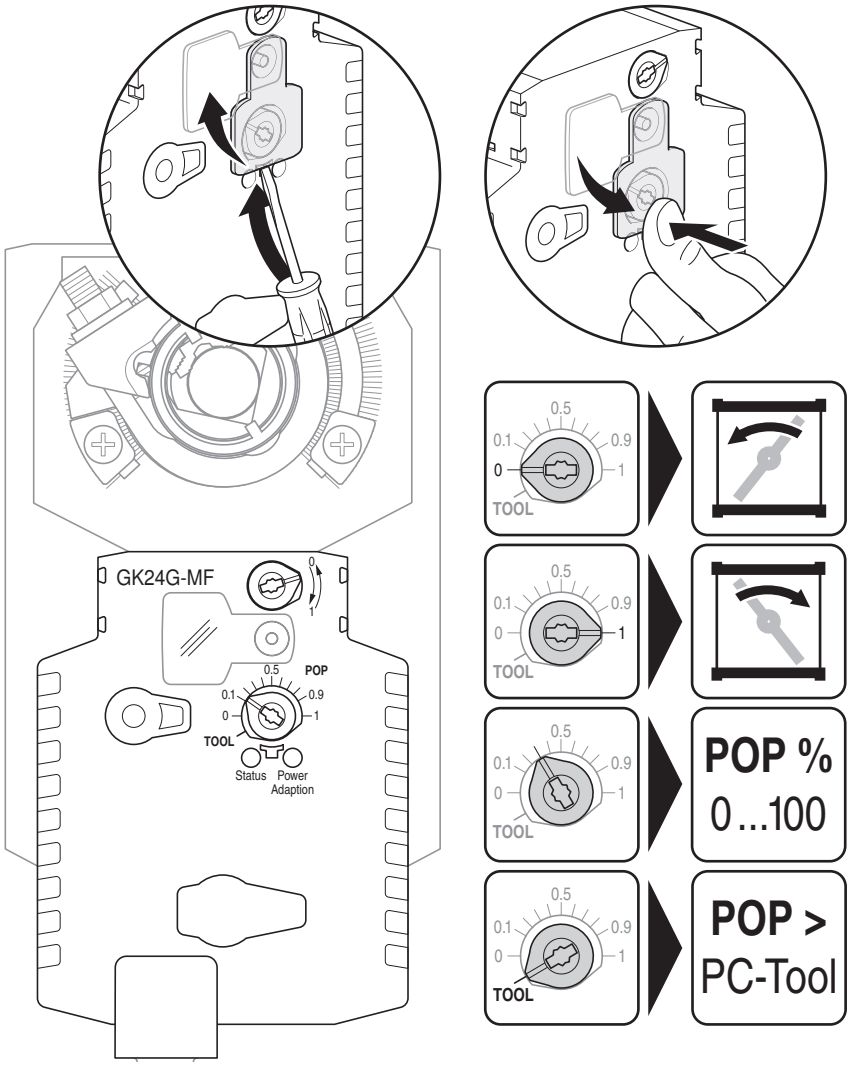



1. **Direction of rotation switch**
2. **Cover, POP button**
3. **POP button**
4. **Scale for manual adjustment**
5. **Position for adjustment with tool**
6. **Tool socket**
7. **Disengagement button**

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

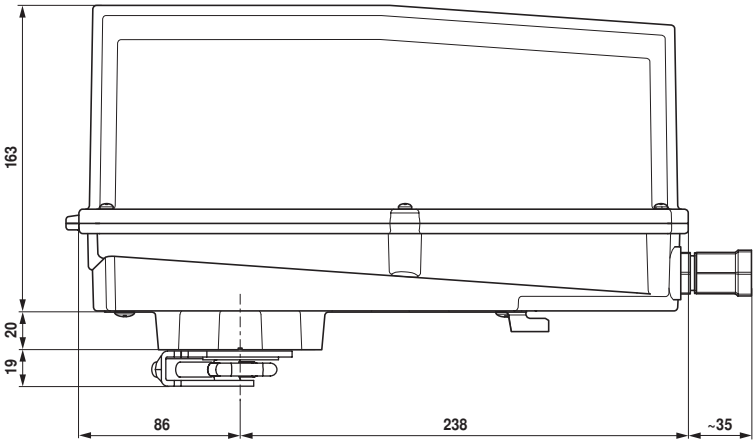
9. **Press button:** Triggers angle of rotation adaption, followed by standard operation

**Setting the POP Power off position**

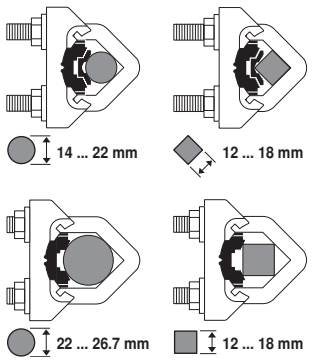


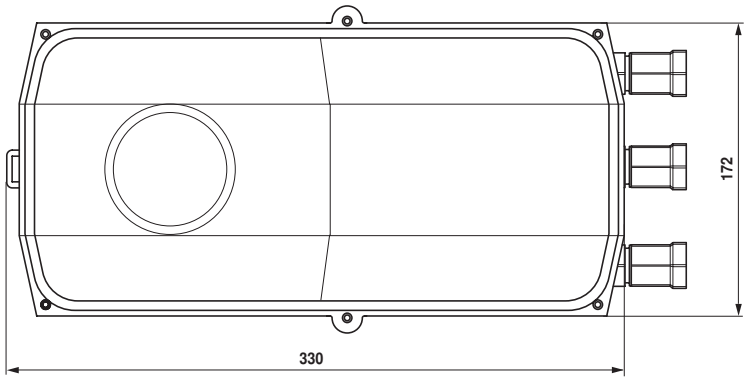
## Dimensions [mm]

### Dimensional drawings




| Damper spindle | Length | ○ | □ | ◇ |
|---|---|---|---|---|
| | 16 ... 75 | 14 ... 26.7 | ≥12 | ≤25.5 |



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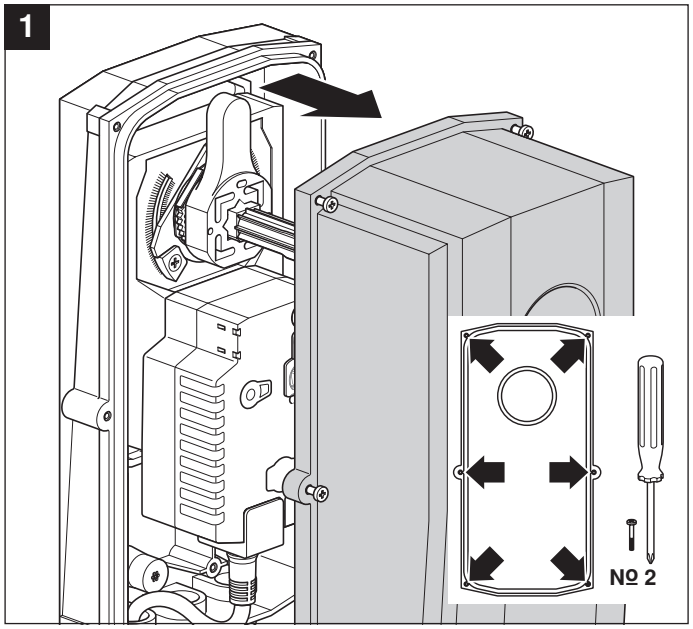


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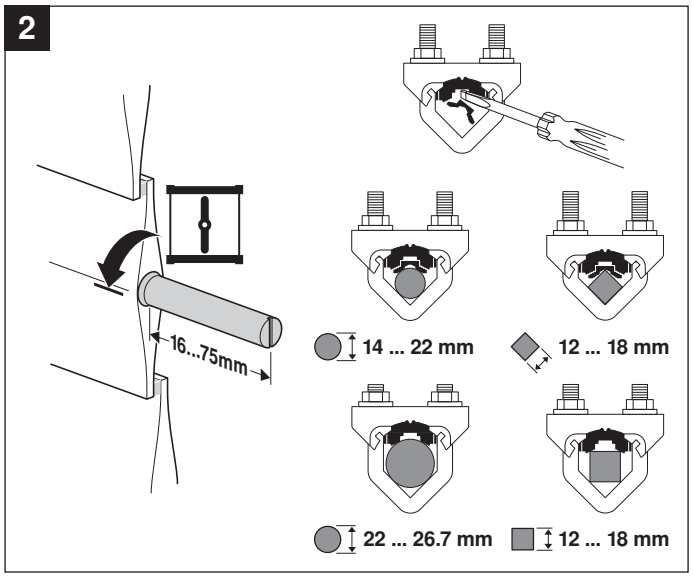


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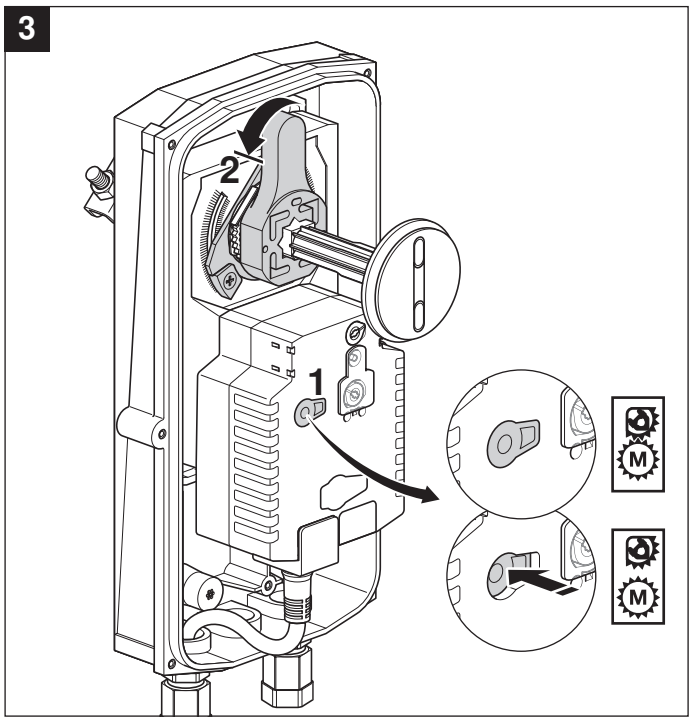


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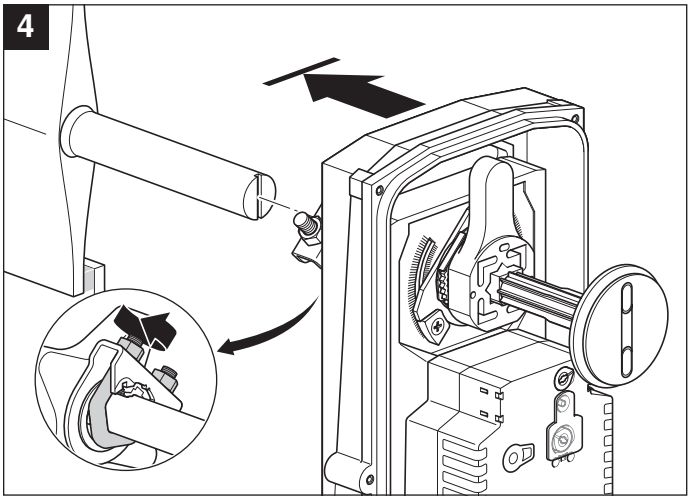

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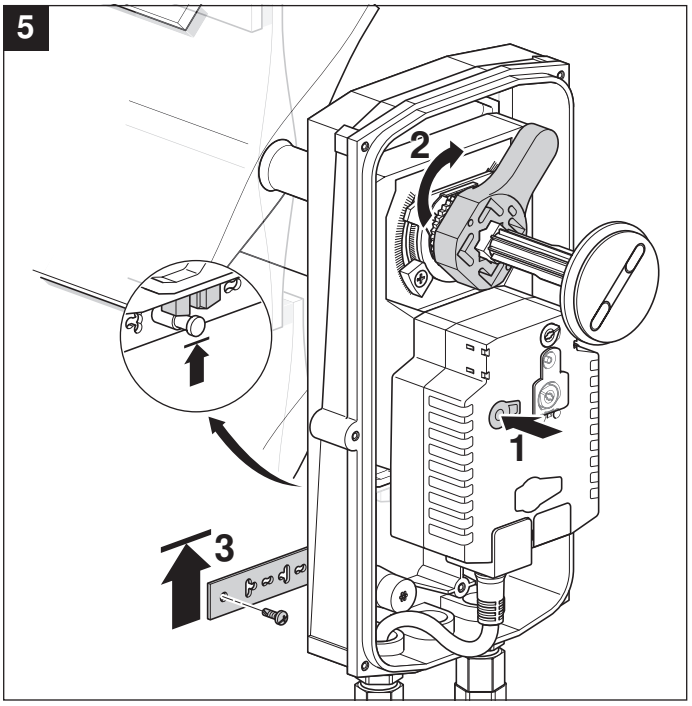


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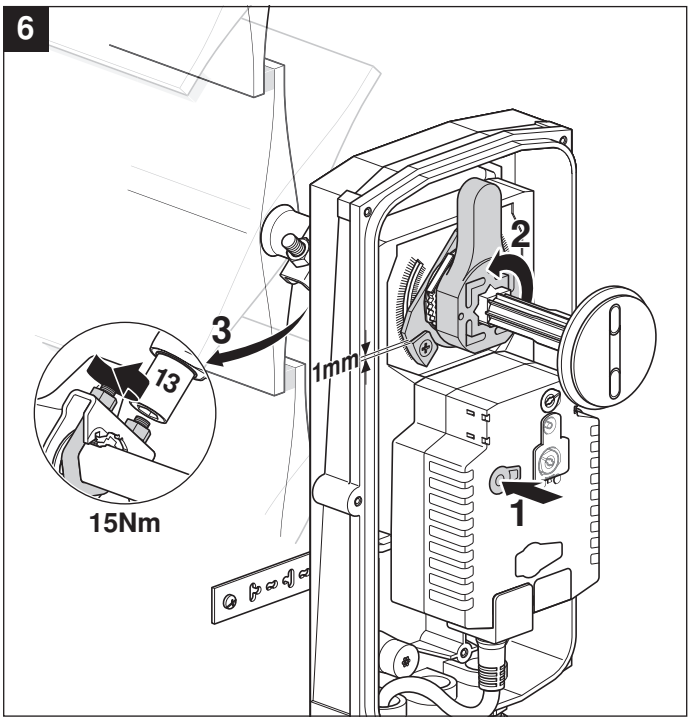

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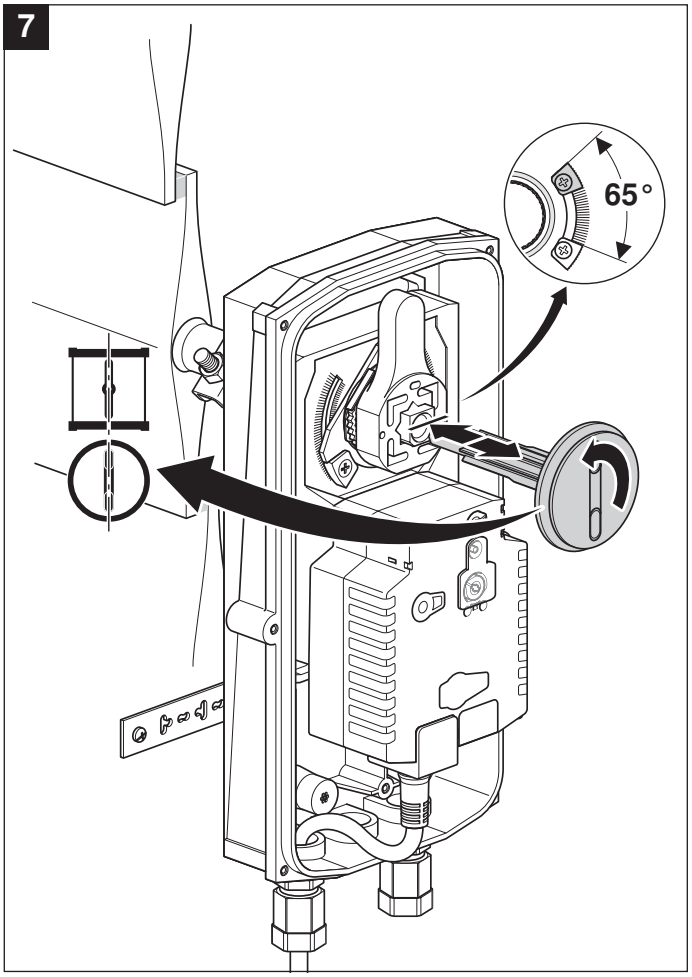


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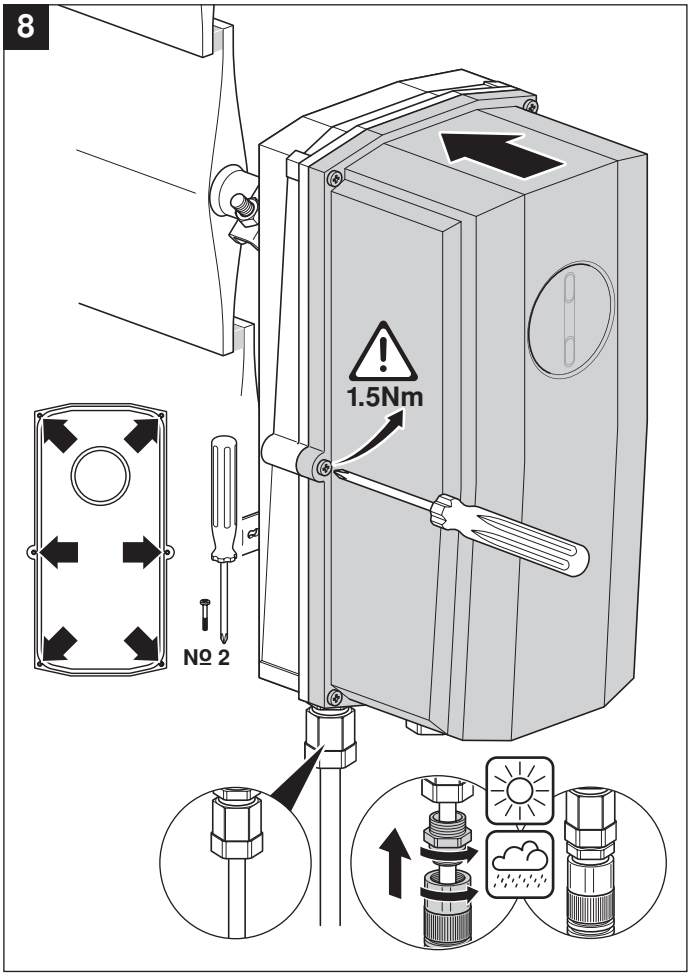
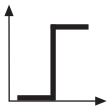
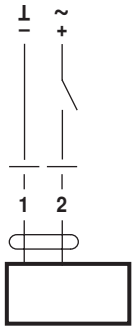




**AC 24 V / DC 24 V**

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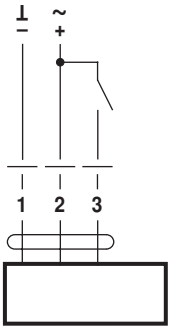


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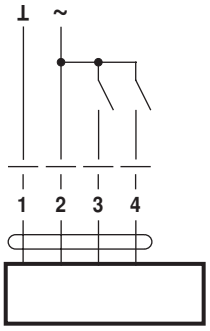


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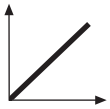

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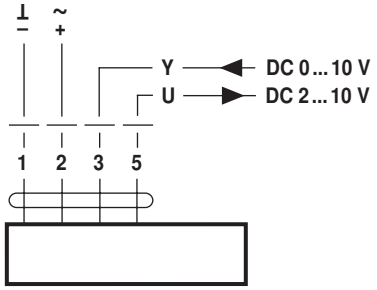


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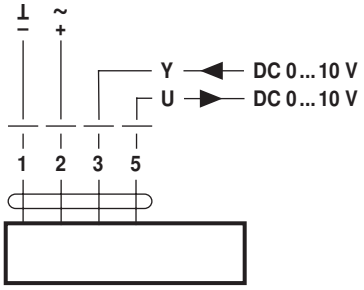


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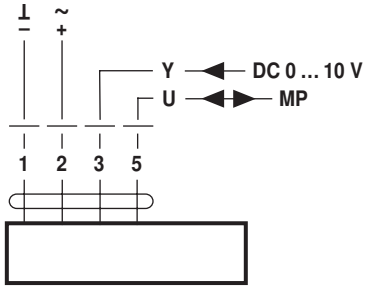


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