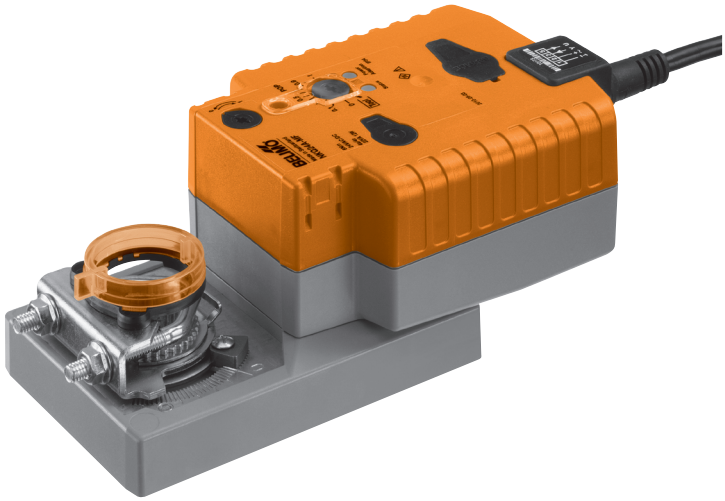
Parameterisable damper actuator with capacitor technology for adjusting air dampers with emergency control function and extended functionalities in ventilation and air-conditioning systems for building services installations and in laboratories

- **For air dampers up to approx. 1.2 m²**
- **Torque 6 Nm**
- **Nominal voltage AC/DC 24 V**
- **Control: modulating DC 0 ... 10 V or variable**
- **Position feedback DC 0 ... 10 V or variable**
- **Running time 4 s**
- **Design life SuperCaps 15 years**



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	≤22 VA (I_{max} 20 A @ 5 ms)		
Connection		Cable 1 m, 4 x 0.75 mm²		
Parallel operation		Yes (note the performance data)		
Functional data		**Factory settings**	**Variable**	**Setting**
Torque		≥6 Nm		
Inhibiting torque		≥6 Nm		
Control	Control signal Y	DC 0 … 10 V, input impedance 100 kΩ	Open-close, 3-point (only AC), modulating (DC 0 ... 32 V)	.....
	Operating range	DC 0.5 ... 10 V	Start point DC 0.5 ... 30 V 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 End point DC 2.5 ... 10 V	.....
Setting emergency position (POP)		0% (POP rotary button end stop, left)	0 ... 100%, adjustable in increments of 10% (POP rotary button)	.....
Bridging time (PF)		0 s	0 ... 5 s	.....
Position accuracy		±5%		
Direction of rotation	Motor	Reversible with switch ↷ / ↶		
	Emergency setting position	Reversible with switch 0 ... 100%, Adjustable in increments of 10%		
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		
Angle of rotation limiting		min. 30°∢		
Running time	Standard operation	4 s / 90°∢	4 ... 20 s	.....
	Emergency setting position	4 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 adaptation resp. synchronisation whenever the supply voltage is switched on	.....
Override control		MAX (maximum position) = 100% MIN (minimum position) = 0% ZS (intermediate position, only AC) = 50%	MAX = (MIN + 32%) ...100% MIN = 0% ... (MAX – 32%) ZS = MIN ... MAX	.....
Sound power level	Standard operation	≤60 dB (A) @ 4 s running time ≤42 dB (A) @ 20 s running time		
	Emergency setting position	≤60 dB (A)		
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 UL Class 2 Supply
Degree of protection	IP54 NEMA 2, UL Enclosure Type 2
EMC	CE according to 2004/108/EC
Certification	Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14 cULus according to UL 60730-1A and UL 60730-2-14 and CAN/CSA E60730-1:02
Mode of operation	Type 1.AA
Rated impulse voltage	0.8 kV
Control pollution degree	3
Ambient temperature	–30 ... +50°C
Non-operating temperature	–40 ... +80°C
Ambient humidity	95% r.h., non-condensating
Maintenance	Maintenance-free
Dimensions / Weight	
Dimensions	See «Dimensions» on page 8
Weight	Approx. 1.1 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 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.**
- **The cable must not be removed from the device.**
- **Adaption is necessary when the system is commissioned and after each adjustment of the angle (press the adaption push button once).**
- **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.**

Product features

Mode of operation

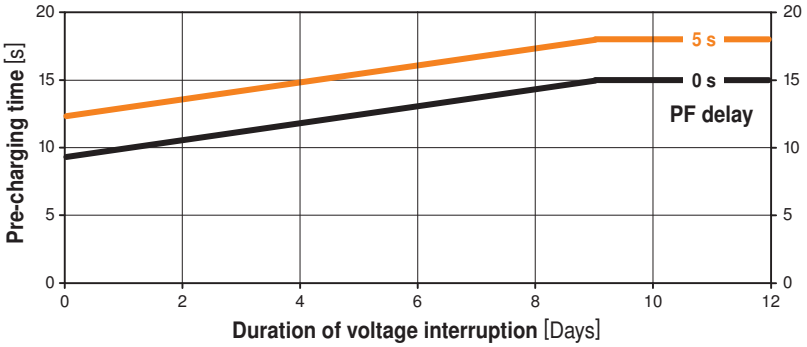
The actuator moves the air damper to the desired operating position at the same time as the integrated capacitors are loaded. Interrupting the supply voltage causes the air damper to be rotated back into the emergency setting position by means of stored electrical energy.
The actuator is controlled with 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	9	10	11	13	15
5	12	13	14	16	18
	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 above) 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 15 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 MFT-P BELIMO Service Tool 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 functional reliability

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

Home position / Start

The spindle 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.

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 is in reference 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 voltage interruption, the actuator will move into the selected emergency setting position, taking into account the set 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

Product features

(continued)

Bridging time (PF)

Voltage interruptions can be bridged up to a maximum of 5 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 0 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.

Adjustable angle of rotation

Adjustable angle of rotation with mechanical end stops.
A minimum permissible angle of rotation of 30° must be allowed for.

Adaption and synchronisation

With the adaption, the upper and lower spindle end stops are detected and stored in the actuator.
The detection of the mechanical end stops makes it possible to have a gentle approach of the end positions, thus protecting the actuator mechanics.
During synchronization, the actuator moves into home position for angle referencing. This ensures a correct position modulation.

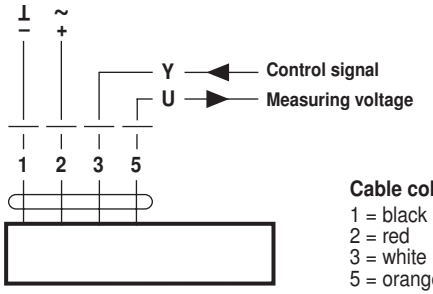
Accessories

	Description	Data sheet
Electrical accessories	Auxiliary switch S..A..	T2 - S..A..
	Feedback potentiometer P..A..	T2 - P..A..
	Adapter Z-SPA This adapter must be ordered if an auxiliary switch or a feedback potentiometer is required.	
	BELIMO service tool MFT-P	
	ZTH-GEN adjustment and diagnostic device	
	Positioner SGA24, SGE24 and SGF24	T2 - SG..24
	Digital position indicator ZAD24	T2 - ZAD24
	Room temperature controller CR24..	S4 - CR24-..
Mechanical accessories	Various accessories	T2 - Z-NKQ..A..

Electrical installation

Wiring diagram

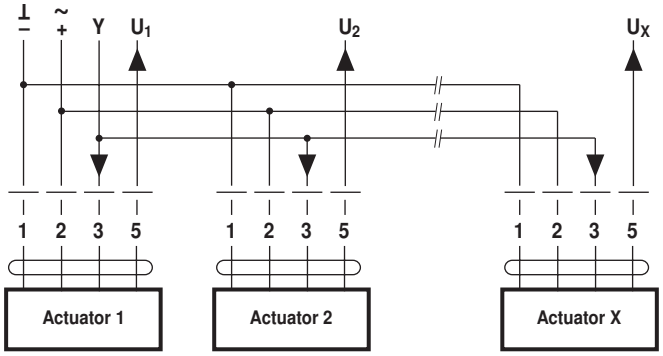
Note
Connect via safety isolation transformer.



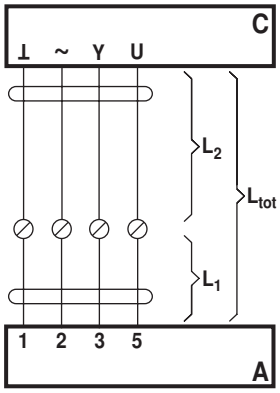
Cable colours:
1 = black
2 = red
3 = white
5 = orange

Wiring diagram for parallel operation

Information
- 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.



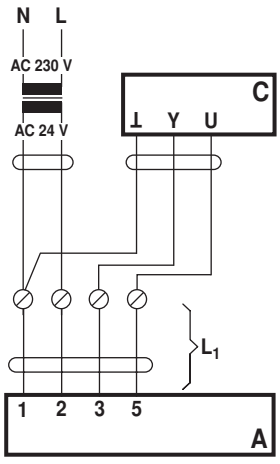
Cable lengths



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 signal cable length must be divided by the number of actuators.

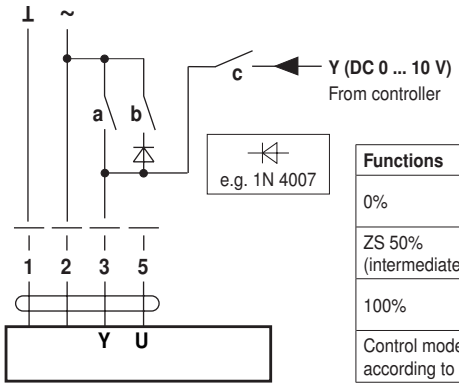


A = Actuator
C = Control unit
L_1 = Belimo connecting cable, 1 m (4 x 0.75 mm²)

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

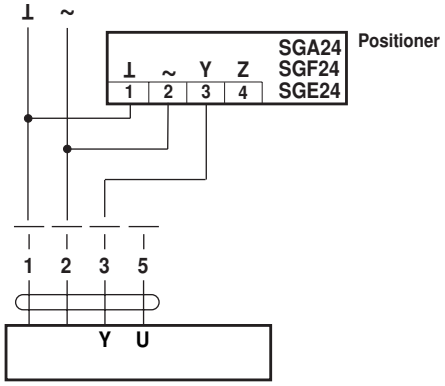
Functions with basic values

Override control with AC 24 V with relay contacts

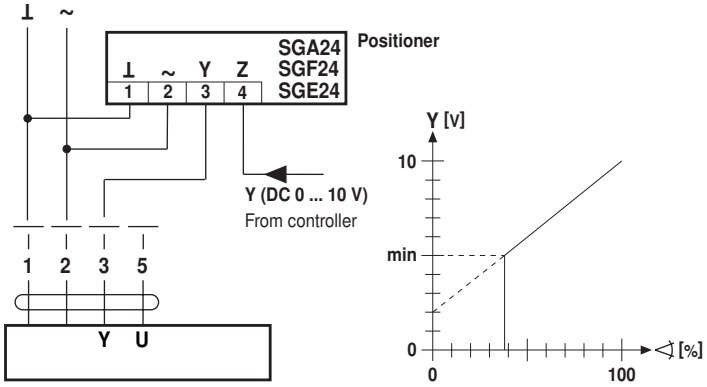


Functions	a	b	c
0%	⌐	⌐	⌐
ZS 50% (intermediate position)	⌐	⌐	⌐
100%	⌐	⌐	⌐
Control mode according to Y	⌐	⌐	⌐

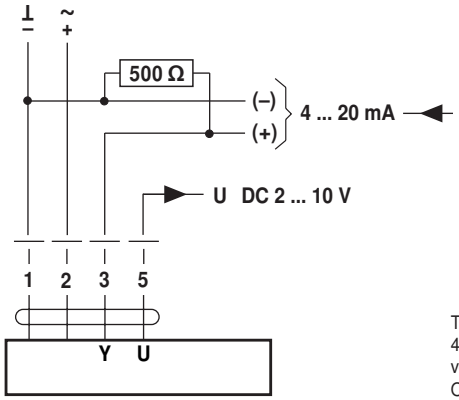
Remote control 0 ... 100%



Minimum limit

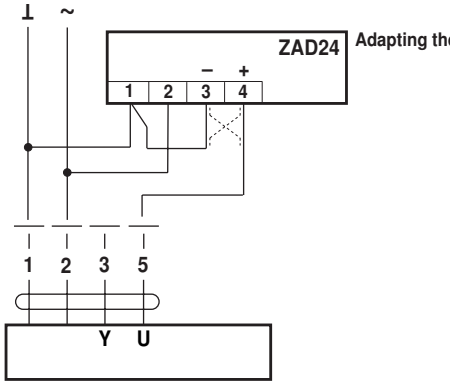


Control with 4 ... 20 mA via external resistance

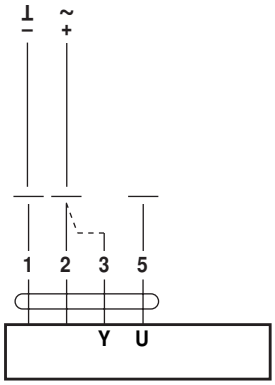


The 500 Ω resistor converts the 4 ... 20 mA current signal to a voltage signal DC 2 ... 10 V.
Operating range set to DC 2 ... 10 V.

Position indication



Functional check

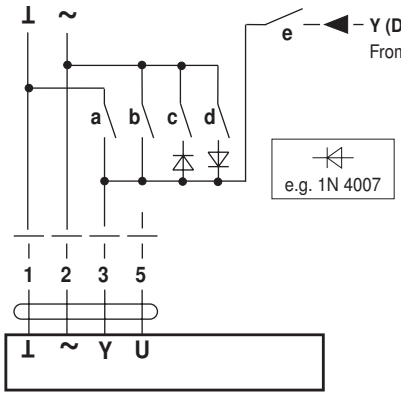


Procedure

- 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

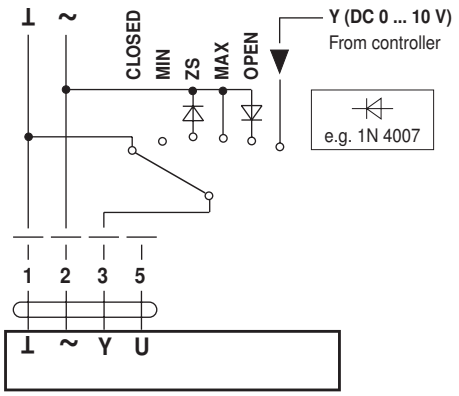
Functions for actuators with specific parameters

Override control and limiting with AC 24 V with relay contacts

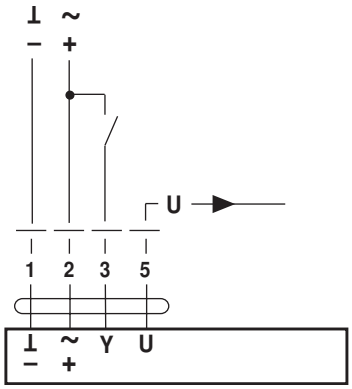


Functions	a	b	c	d	e
CLOSED					
MIN					
ZS (intermediate position)					
MAX					
OPEN					
Control mode according to Y					

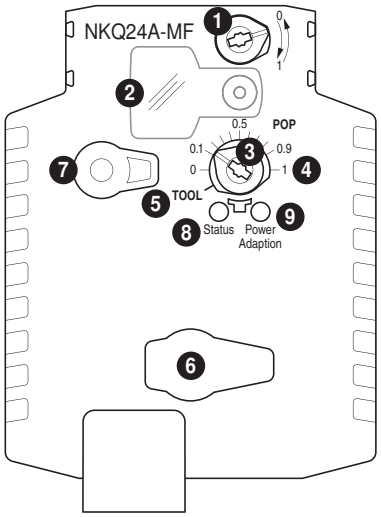
Override control and limiting with AC 24 V with rotary switch



Open-close control



Indicators and operating elements



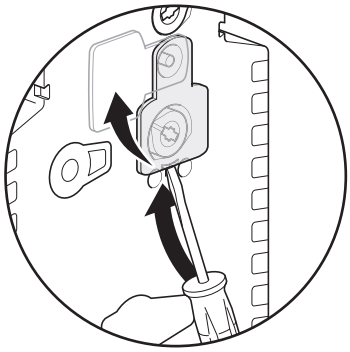
1. **Direction of rotation switch**
2. **Cover, POP button**
3. **POP button**
4. **Scale for manual adjustment**
5. **Position for adjustment with tool**
6. **Tool socket**
7. **Disengagement button**

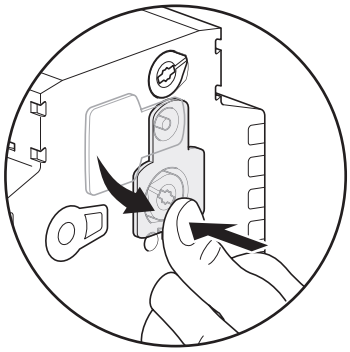
LED displays 8 yellow	LED displays 9 green	Meaning / function
Off	Illuminated	Operation OK / without fault
Illuminated	Off	Fault
Off	Off	Not in operation
Illuminated	Illuminated	Adaptation procedure running
Blinking	Illuminated	Communication with programming tool

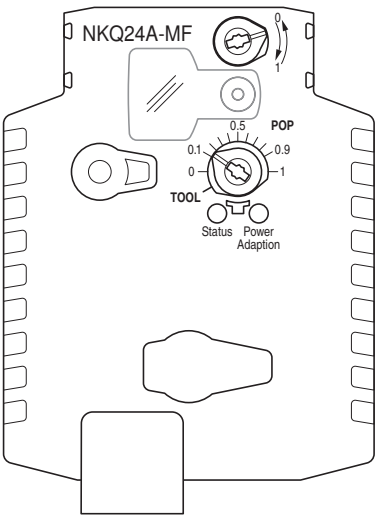
9. **Press button:** Triggers angle of rotation adaption, followed by standard operation

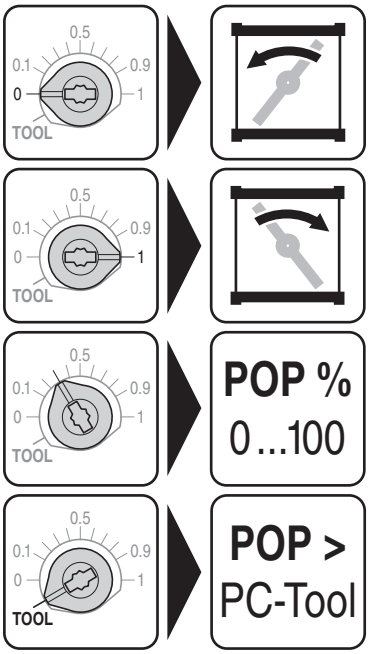
Indicators and operating elements *(continued)*

Setting the POP Power Off position



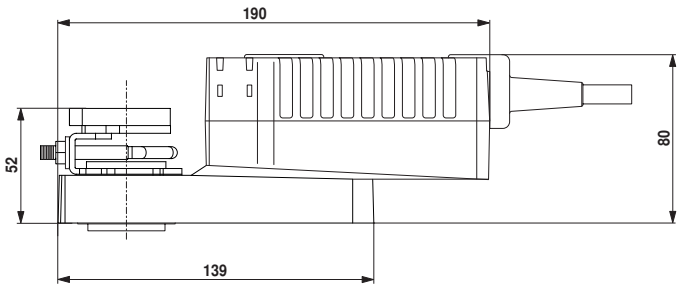


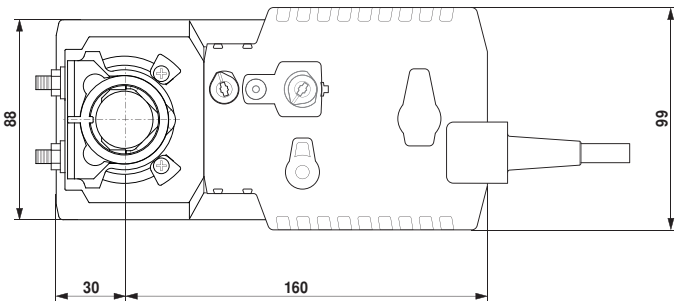




Dimensions [mm]

Dimensional drawings





Damper spindle	Length	⊙	□	◇
	≥42	8 ... 26.7	≥8	≤26.7
*	≥20	8 ... 20	≥8	≤20

* Option (Accessories K-SA)
When an auxiliary switch or a feedback potentiometer is used, see «Accessories»

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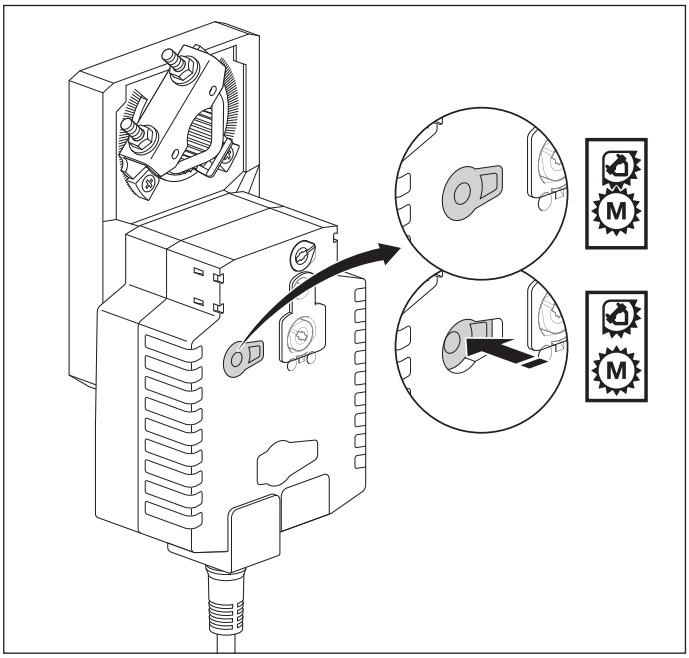
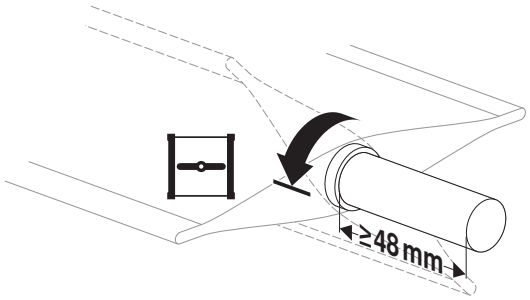
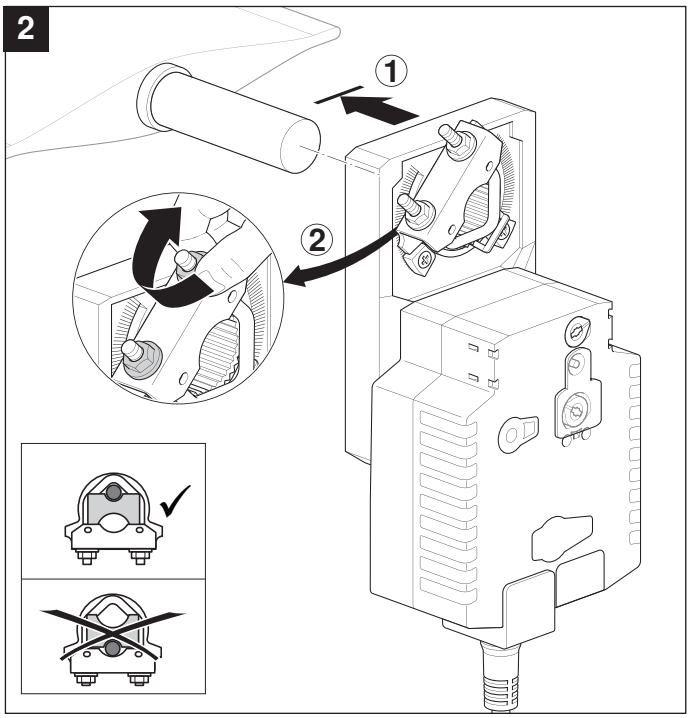


1



8 ... 26.7 mm	≥8 mm	≤26.7 mm

2



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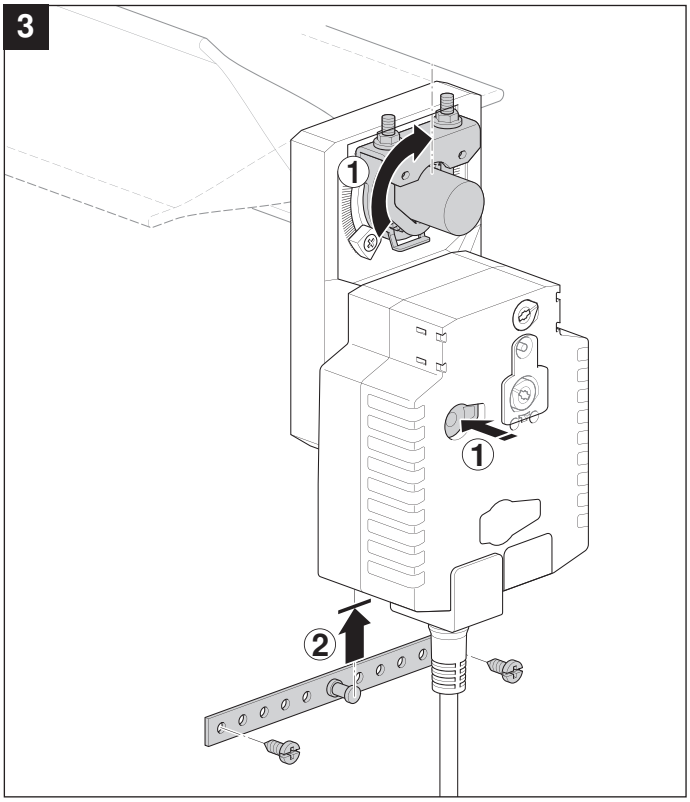

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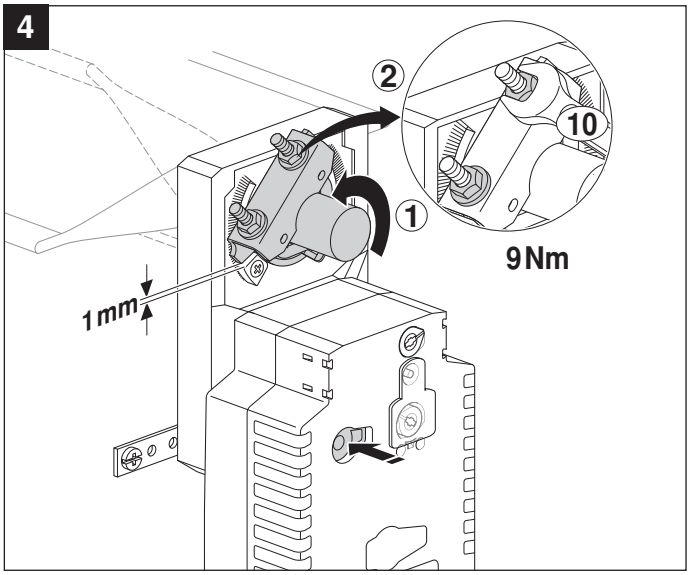

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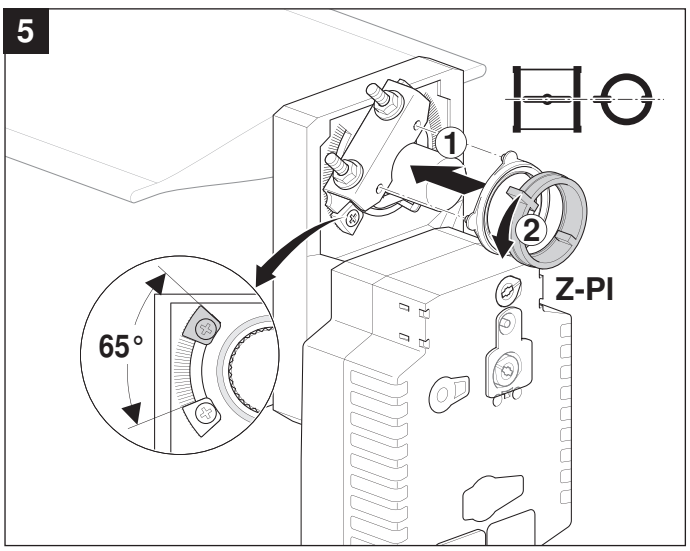
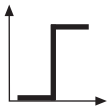
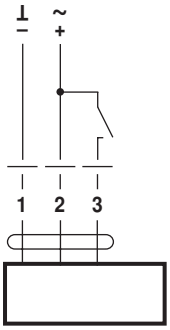




AC 24 V / DC 24 V



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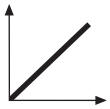
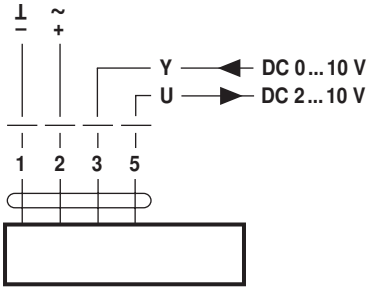


AC 24 V / DC 24 V



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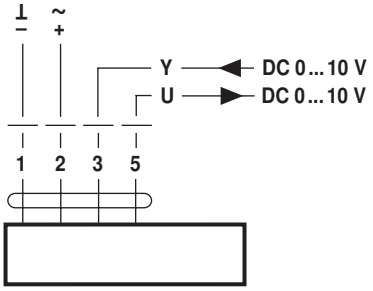

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