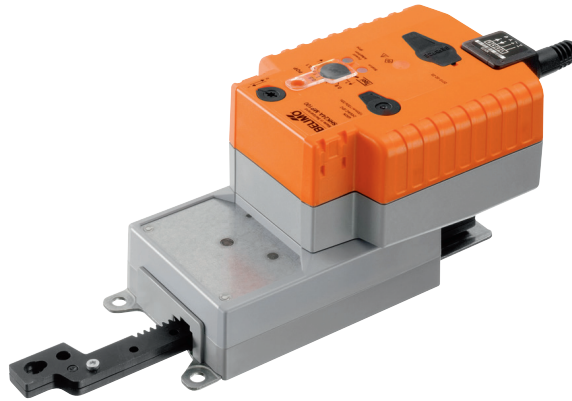


Configurable linear actuator fail-safe and extended functionalities for adjusting dampers and slide valves in technical building installations and in laboratories

- Air damper size up to approx. 3 m<sup>2</sup>
- Actuating force 450 N
- Nominal voltage AC/DC 24 V
- Control modulating 2...10 V variable
- Position feedback 2...10 V variable
- Length of Stroke Max. 100 mm, adjustable in 20 mm increments


**Technical data**

<b>Electrical data</b>	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	I <sub>max</sub> 20 A @ 5 ms
	Connection supply / control	Cable 1 m, 4 x 0.75 mm <sup>2</sup>
	Parallel operation	Yes (note the performance data)
	<b>Functional data</b>	Actuating force motor
Operating range Y		2...10 V
Input Impedance		100 kΩ
Options positioning signal		Open/close 3-point (AC only) Modulating (DC 0...32 V)
Operating range Y variable		Start point 0.5...30 V End point 2.5...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 End point 2.5...10 V
Setting fail-safe position		0...100%, adjustable in increments of 10% (POP rotary knob on 0 corresponds to retracted gear rod)
Bridging time (PF)		2 s
Bridging time (PF) variable		0...10 s
Position accuracy		±5%
Direction of motion motor		selectable with switch
Direction of motion note		Y = 0 V: with switch 0 (retracted) / 1 (extended)
Direction of motion variable		electronically reversible
Direction of motion fail-safe		selectable with switch 0...100% (retracted 0%)
Manual override		with push-button
Stroke		100 mm
Length of Stroke		Max. 100 mm, adjustable in 20 mm increments
Stroke limitation		can be limited on both sides with mechanical end stops
Running time motor		120 s / 100 mm
Running time motor variable		90...150 s / 100 mm
Running time fail-safe		35 s / 100 mm
Running time fail-safe note		<35 s @ 0...50°C
Adaptation setting range		manual
Adaptation setting range variable		No action Adaptation when switched on Adaptation after pushing the gear disengagement button
Override control		MAX (maximum position) = 100% MIN (minimum position) = 0% ZS (intermediate position, AC only) = 50%

**Technical data**

<b>Functional data</b>	Override control variable	MAX = (MIN + 5%)...100% MIN = 0%...(MAX – 5%) ZS = MIN...MAX
	Sound power level, motor	52 dB(A)
	Sound power level, fail-safe	61 dB(A)
<b>Safety</b>	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.AA
	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	
<b>Weight</b>	Weight	1.6 kg
<b>Terms</b>	Abbreviations	POP = Power off position / fail-safe position 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.
- The rotary supports and coupling pieces available as accessories and must always be used if transverse forces are likely. In addition, the actuator must not be tightly bolted to the application. It must remain movable via the rotary support (refer to «Assembly notes»).
- If a rotary support and/or coupling piece is used, actuation force losses are to be expected.
- If the actuator is exposed to severely contaminated ambient air, appropriate precautions must be taken on the system side. Excessive deposits of dust, soot etc. can prevent the gear rod from being extended and retracted correctly.
- If not installed horizontally, the gear disengagement push-button may only be actuated when there is no pressure on the gear rod.
- To calculate the actuating force required for air dampers and slide valves, the specifications supplied by the damper manufacturers concerning the cross section, the design, the installation site and the ventilation conditions must be observed.
- Self-adaptation is necessary when the system is commissioned or whenever the stroke limiting is adjusted (press the adaptation push-button).
- 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 fail-safe position by means of stored electrical energy.
- The actuator is connected with a standard modulating signal of 0...10 V and drives to the position defined by the positioning signal. Measuring voltage U serves for the electrical display of the damper position 0.5...100% and as a slave control signal for other actuators.

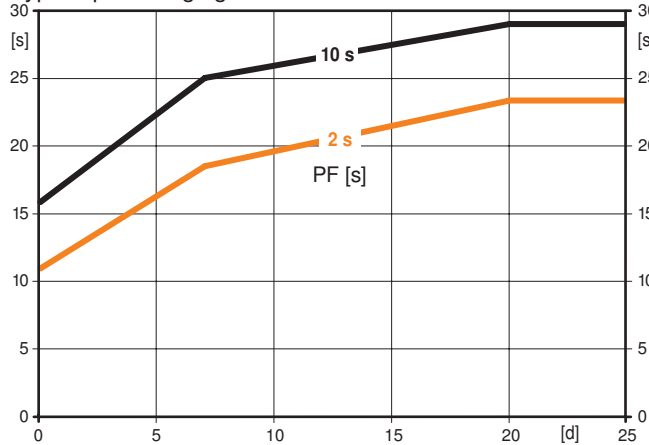
**Product features**

**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] = Electricity interruption in days

[s] = Pre-charging time in seconds

PF[s] = Bridging time

Calculation example: Given an electricity interruption of 7 days and a bridging time (PF) set at 2 s, the actuator requires a pre-charging time of 18 s after the electricity has been reconnected (see graphic).

PF [s]	[d]		
	0	7	≥20
2	11	18	23
10	16	25	29

**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.

**Parametrisable 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**

The actuator can be directly connected with the application using the enclosed screws. The head of the gear rod is connected to the moving part of the ventilating application individually on the mounting side or with the Z-KS1 coupling piece provided for this purpose.

**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.

**Adjustable stroke**

If a stroke limitation will be adjusted, the operating range on this side of the gear rod can be used starting with an extension length of 20 mm and then can be limited respectively in increments of 20 mm by means of the mechanical end stops Z-AS1.

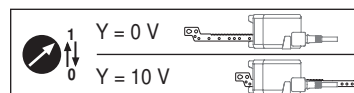
**High functional reliability**

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.



**Setting direction of stroke**

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

## Product features

<b>Setting fail-safe position (POP)</b>	<p>The rotary knob fail-safe position can be used to adjust the desired fail-safe position 0...100% in 10% increments. The rotary knob only refers to the adapted stroke range 30...100mm. 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 which was set.</p> <p>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.</p>
<b>Bridging time</b>	<p>Electrical interruptions can be bridged up to a maximum of 10 s.</p> <p>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, then the actuator will move into the selected fail-safe position.</p> <p>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.</p> <p>Settings: The rotary knob must not be set to the "Tool" position!</p> <p>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.</p>
<b>Adaption and synchronisation</b>	<p>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).</p> <p>A range of settings can be adapted using the PC-Tool (see MFT-P documentation)</p>

## Accessories

	Description	Type
<b>Electrical accessories</b>	Range controller for wall mounting	SBG24
	Positioner for wall mounting	SGA24
	Positioner for built-in mounting	SGE24
	Positioner for front-panel mounting	SGF24
	Positioner for wall mounting	CRP24-B1
	Connection cable 5 m, A: RJ11 6/4 ZTH EU, B: 6-pin service socket for Belimo device	ZK1-GEN
	Connection cable 5 m, A: RJ11 6/4 ZTH EU, B: free wire end for connection to MP/PP terminal	ZK2-GEN
<b>Mechanical accessories</b>	<b>Description</b>	<b>Type</b>
	End stop kit, Multipack 20 pcs.	Z-AS1
	Rotary support, for linear actuator	Z-DS1
	Coupling piece M8	Z-KS1
<b>Service Tools</b>	<b>Description</b>	<b>Type</b>
	Service Tool, with ZIP-USB function	ZTH EU
	Belimo PC-Tool, Software for adjustments and diagnostics	MFT-P
	Adapter for Service-Tool ZTH	MFT-C

## Electrical installation



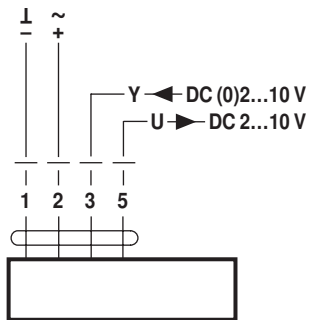
### Notes

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

Electrical installation

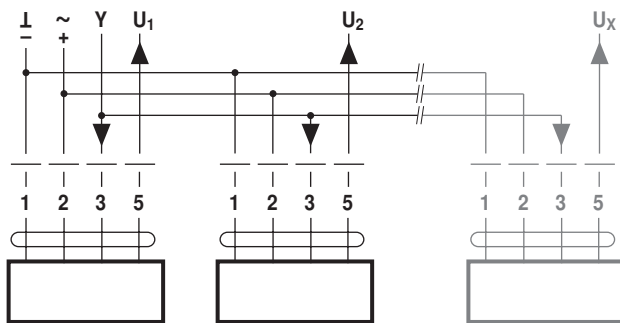
Wiring diagrams

AC/DC 24 V, modulating



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

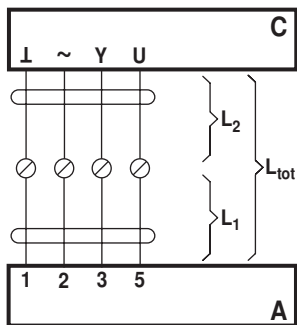
Parallel operation



**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.

Signal cable lengths

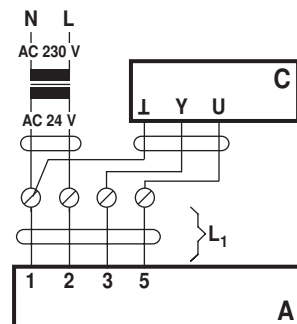


L <sub>2</sub> ┴ / ~	L <sub>tot</sub> = L <sub>1</sub> + L <sub>2</sub>	
	AC	DC
0.75 mm <sup>2</sup>	≤30 m	≤5 m
1.00 mm <sup>2</sup>	≤40 m	≤8 m
1.50 mm <sup>2</sup>	≤70 m	≤12 m
2.50 mm <sup>2</sup>	≤100 m	≤20 m

A = Actuator  
C = Control unit (controlling unit)  
L1 = Connecting cable of the actuator  
L2 = Customer cable  
Ltot = Maximum signal cable length

**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 (controlling unit)  
L1 = Connecting cable of the actuator

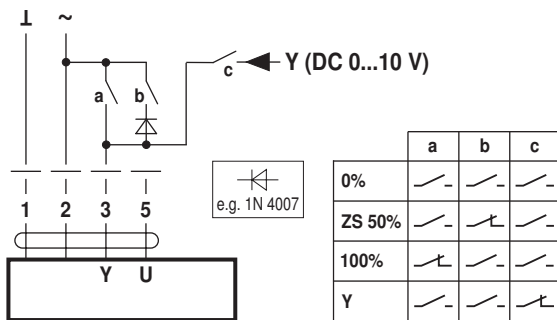
**Note:**

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

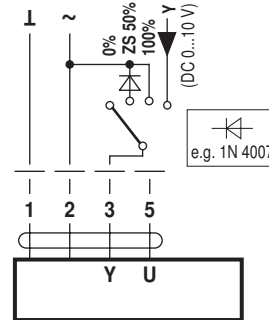
**Functions**

**Functions with basic values (conventional mode)**

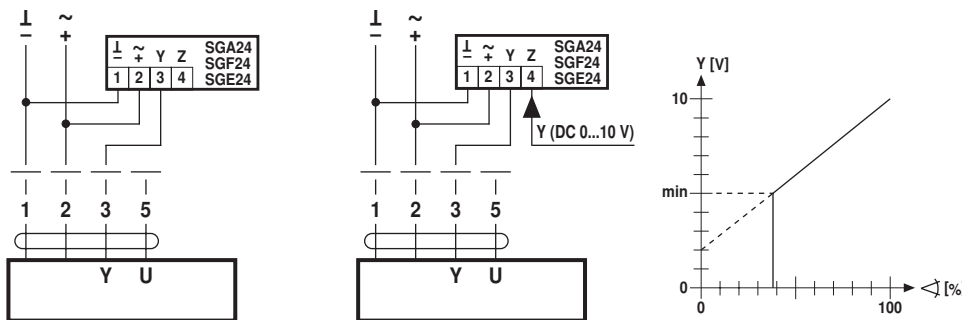
Override control with AC 24 V with relay contacts



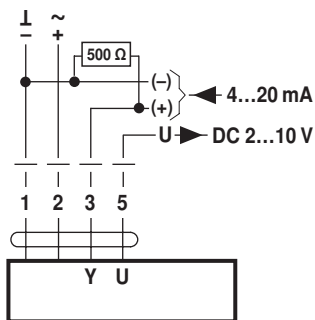
Override control with AC 24 V with rotary switch



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

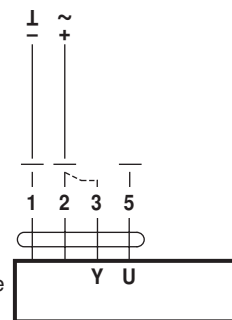


Control with 4...20 mA via external resistor



**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

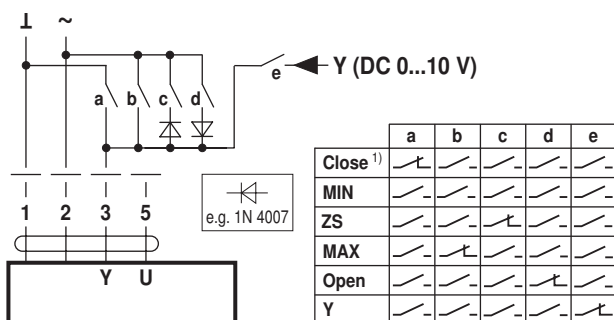


**Procedure**

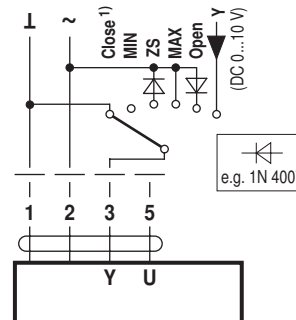
1. Apply 24 V to connection 1 and 2
2. Disconnect connection 3:
  - for direction of stroke 0: Actuator travels in the direction "retracted"
  - for direction of stroke 1: Actuator travels in the direction "extended"
3. Short circuit connections 2 and 3:
  - Actuator runs in the opposite direction

**Functions for devices with specific parameters (Parametrisation necessary)**

Override control and limiting with AC 24 V with relay contacts



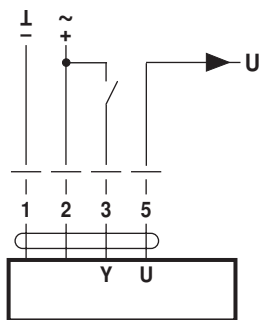
Override control and limiting with AC 24 V with rotary switch



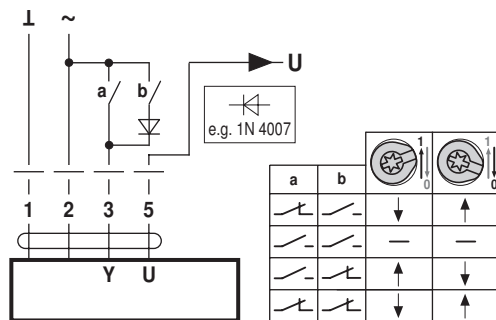
1) **Caution:** This function is only guaranteed if the start point of the operating range is defined as min. 0.5 V.

Functions

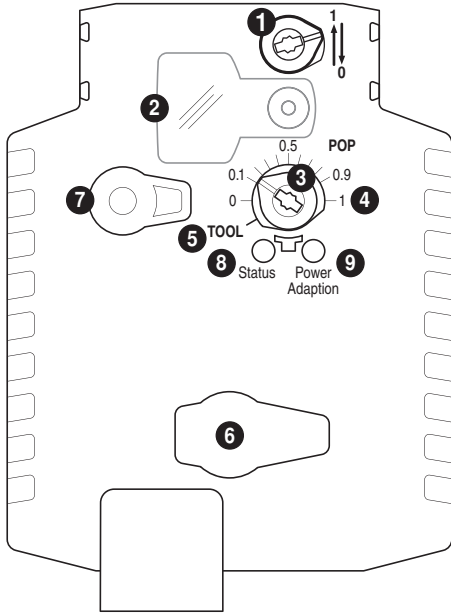
Control open/close



Control 3-point



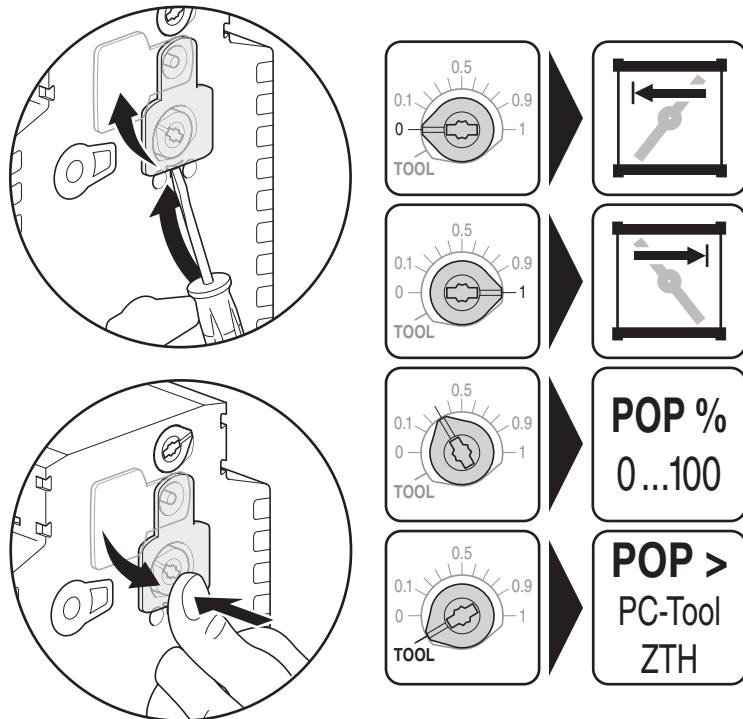
Operating controls and indicators



- 1 Direction of stroke 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		Meaning / function
8 yellow	9 green	
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 stroke adaption, followed by standard operation  
Setting emergency setting position (POP)



## Installation notes



### Notes

- If a rotary support and/or coupling piece is used, losses in the actuation force losses are to be expected.

### Applications without transverse force

The linear actuator is screwed directly to the housing at three points. Afterwards, the head of the gear rod is fastened to the moving part of the ventilation application (e.g. damper or slide valve).

### Applications with transverse forces

The coupling piece with the internal thread (Z-KS1) is connected to the head of the gear rod. The rotary support (Z-DS1) is screwed to the ventilation application. Afterwards, the linear actuator is screwed to the previously mounted rotary support with the enclosed screw. Afterwards, the coupling piece, which is mounted to the head of the gear rod, is attached to the moving part of the ventilating application (e.g. damper or slide valve). The transverse forces can be compensated for to a certain limit with the rotary support and/or coupling piece. The maximum permissible swivel angle of the rotary support and coupling piece is 10° (angle), laterally and upwards.

### Stroke limitation

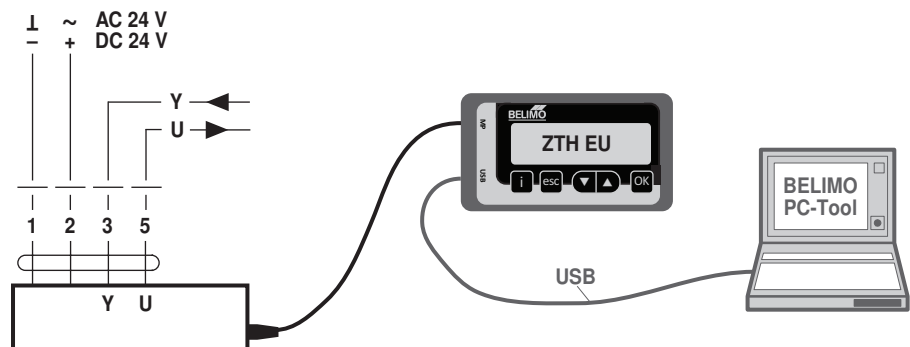
If the stroke limitations are used on the gear rod, the mechanical operating range on this side of the gear rod can be used starting with an extension length of 20 mm.

## 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 [mm]

Dimensional drawings

