Technical data sheet AVK24A-MP-RE

Communicative globe valve actuator with fail-safe for 2-way and 3-way globe valves

- **Actuating force 2000 N**
- **Nominal voltage AC/DC 24 V**
- **Control modulating, communicative 2...10 V variable**
- **Stroke 32 mm**
- **Conversion of sensor signals**
- **Communication via Belimo MP-Bus**

MP-BUS

RETROFIT

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	5 W
	Power consumption in rest position	2 W
	Power consumption for wire sizing	9.5 VA
	Connection supply / control	Terminals 4 mm² (cable Ø4...10 mm)
	Parallel operation	Yes (note the performance data)
Functional data	Actuating force motor	2000 N
	Communicative control	MP-Bus
	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	Spindle 0...100%, adjustable (POP rotary knob)
	Bridging time (PF) variable	1...10 s
	Position accuracy	±5%
	Manual override	with push-button
	Stroke	32 mm
	Running time motor	150 s / 32 mm
	Running time motor variable	90...150 s
	Running time fail-safe	35 s / 32 mm
	Adaptation setting range	manual (automatic on first power-up)
	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%
	Override control variable	MAX = (MIN + 33%)...100% MIN = 0%...(MAX – 33%) ZS = MIN...MAX
	Sound power level, motor	60 dB(A)
	Sound power level, fail-safe	60 dB(A)
	Position indication	Mechanically, 5...32 mm stroke
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
	Enclosure	UL Enclosure Type 2
	EMC	CE according to 2014/30/EU

Technical data

Safety	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	0...50 °C
	Storage temperature	-40...80 °C
	Ambient humidity	Max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	3.5 kg
Terms	Abbreviations	POP = Power off position / fail-safe position CPO = Controlled power off / controlled fail-safe 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 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 switch for changing the direction of motion and so the closing point may be adjusted only by authorised specialists. The direction of motion is critical, particularly in connection with frost protection circuits.
- 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 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

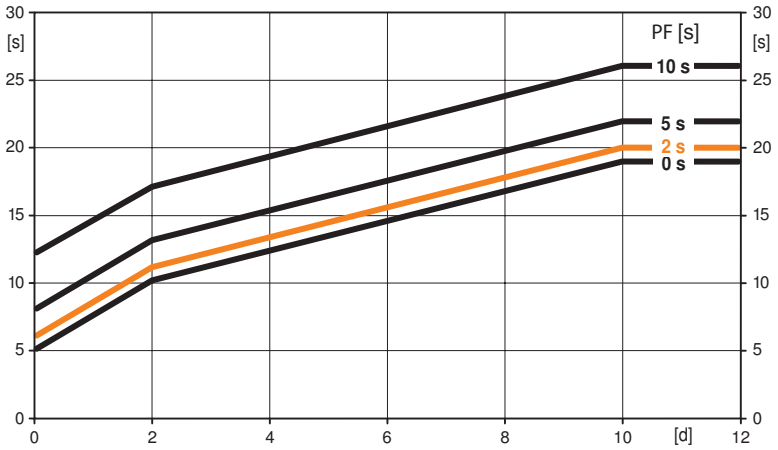
Conventional operation:
The actuator is connected with a standard modulating signal of 0...10 V and moves to the position defined by the positioning signal at the same time as the integrated capacitors are loaded.
Interrupting the supply voltage causes the valve to be moved to the selected fail-safe position by means of stored electrical energy.
Operation on Bus:
The actuator receives its digital positioning signal from the higher level controller via the MP-Bus and drives to the position defined. Connection U serves as communication interface and does not supply an analogue measuring voltage.

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



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.

Converter for sensors

Connection option for a sensor (passive or active sensor or switching contact). The MP actuator serves as an analogue/digital converter for the transmission of the sensor signal via MP-Bus to the higher level system.

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.

Installation on third-party valves

The retrofit actuators for installation on a wide range of valves from various manufacturers are comprised of an actuator, universal valve neck adapter and universal valve stem adapter. Adapt the valve neck and valve stem to begin with, then attach the retrofit actuator to the valve neck adapter, connect to the valve and start up. The valve neck adapter/actuator can be rotated through 360° on the valve neck, provided it is permitted by the size of the installed valve.

Installation on Belimo valves

Use standard actuators from Belimo for mounting on Belimo globe valves.

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.
The stroke can be adjusted by using a hexagon socket screw key (5 mm), which is inserted into the top of the actuator. The stroke shaft extends when the key is rotated clockwise.

High functional reliability

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

Position indication

The stroke is indicated mechanically on the bracket with tabs. The stroke range adjusts itself automatically during operation.

Product features

Home position

Factory setting: Actuator spindle is retracted.
The first time the supply voltage is switched on, i.e. at the time of commissioning, the actuator carries out an adaption, which is when the operating range and position feedback adjust themselves to the mechanical setting range.
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.

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 to the adapted or programmed height of stroke. In the event of a power failure, the actuator will move into the selected fail-safe position, taking into account the bridging time (PF) of 2 s which was set ex-works.
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.

Bridging time

Electrical interruptions 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, then the actuator will move into the selected fail-safe position.
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!
Only the values need to be entered for retroactive adjustments of the bridging time with the Belimo service tool MFT-P.

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).
Automatic synchronisation after pressing the gearbox disengagement button is configured. The synchronisation is in the home position (0%).
The actuator then moves into the position defined by the positioning signal.
A range of settings can be adapted using the PC-Tool (see MFT-P documentation)

Accessories

Gateways

Description	Type
Gateway MP zu BACnet MS/TP	UK24BAC
Gateway MP to Modbus RTU	UK24MOD
Gateway MP to LonWorks	UK24LON
Gateway MP to KNX	UK24EIB

Electrical accessories

Description	Type
Auxiliary switch 2 x SPDT add-on	S2A-H
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
Connecting board MP-Bus for wiring boxes EXT-WR-FP..-MP	ZFP2-MP
MP-Bus power supply for MP actuators	ZN230-24MP

Service Tools

Description	Type
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

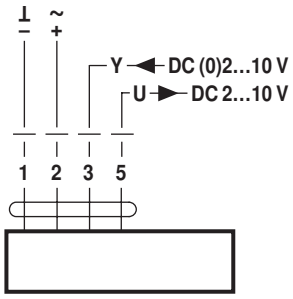
Notes

- Connection via safety isolating transformer.
- Parallel connection of other actuators possible. Observe the performance data.
- Direction of stroke switch factory setting: Actuator spindle retracted (▲).

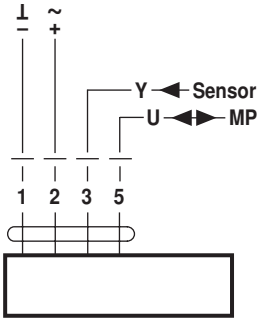
Electrical installation

Wiring diagrams

AC/DC 24 V, modulating



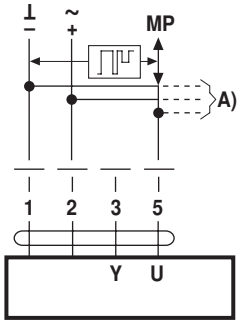
Operation on the MP-Bus



Functions

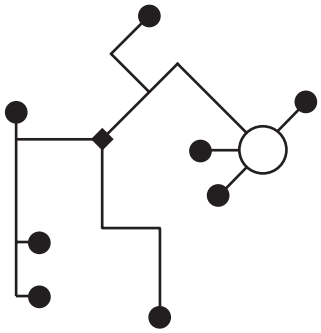
Functions when operated on MP-Bus

Connection on the MP-Bus



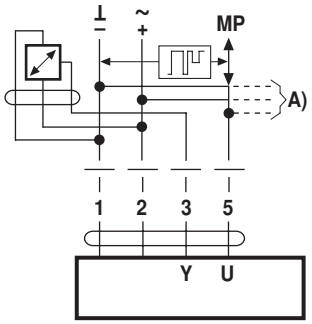
A) more actuators and sensors (max.8)

MP-Bus Network topology



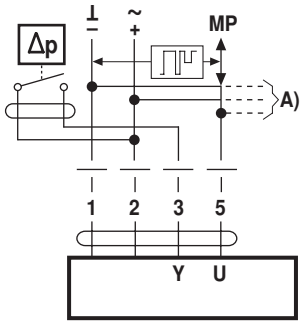
There are no restrictions for the network topology (star, ring, tree or mixed forms are permitted).
Supply and communication in one and the same 3-wire cable
- no shielding or twisting necessary
- no terminating resistors required

Connection of active sensors



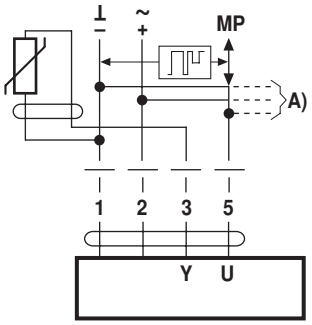
A) more actuators and sensors (max.8)
- Supply AC/DC 24 V
- Output signal DC 0...10 V (max. DC 0...32 V)
- Resolution 30 mV

Connection of external switching contact



A) more actuators and sensors (max.8)
- Switching current 16 mA @ 24 V
- Start point of the operating range must be parameterised on the MP actuator as ≥ 0.5 V

Connection of passive sensors



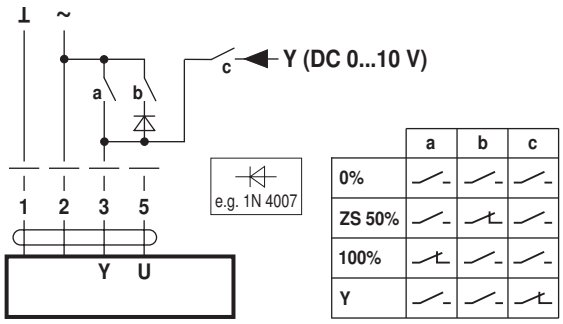
Ni1000	–28...+98 °C	850...1600 Ω 2)
PT1000	–35...+155 °C	850...1600 Ω 2)
NTC	–10...+160 °C 1)	200 Ω...60 kΩ 2)

A) more actuators and sensors (max.8)
1) Depending on the type
2) Resolution 1 Ohm

Functions

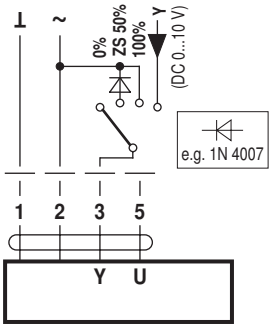
Functions with basic values (conventional mode)

Override control with AC 24 V with relay contacts

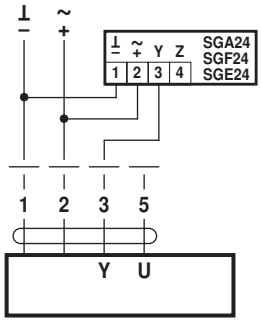


	a	b	c
0%	_/_	_/_	_/_
ZS 50%	_/_	_|_	_/_
100%	_|_	_/_	_/_
Y	_/_	_/_	_|_

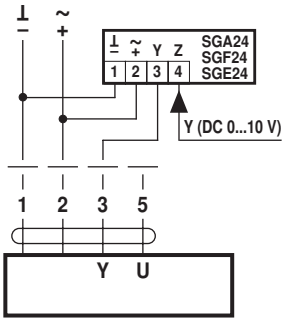
Override control with AC 24 V with rotary switch

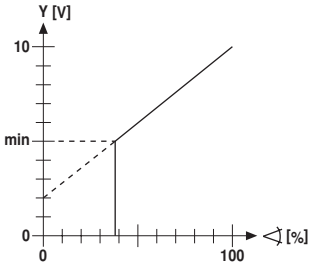


Control remotely 0...100% with positioner SG..

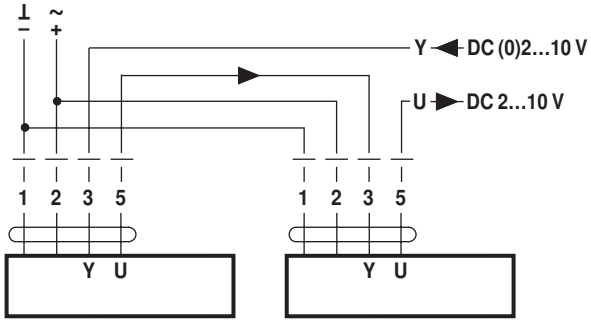


Minimum limit with positioner SG..

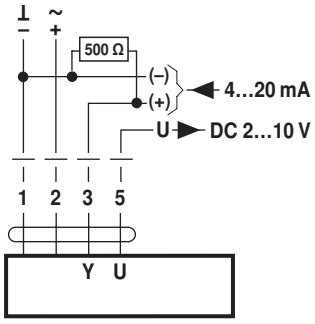




Follow-up control (position-dependent)

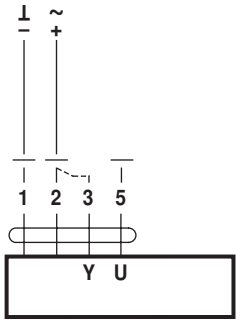


Control with 4...20 mA via external resistor



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

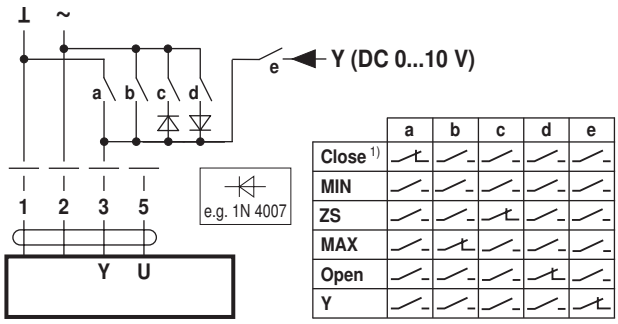


Procedure
1. Apply 24 V to connection 1 and 2
2. Disconnect connection 3:
- with upwards direction of motion: closing point at top
- with downwards direction of motion: closing point at bottom
3. Short circuit connections 2 and 3:
- Actuator runs in the opposite direction

Functions

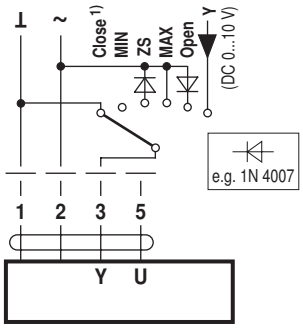
Functions for devices with specific parameters (Parametrisation necessary)

Override control and limiting with AC 24 V with relay contacts



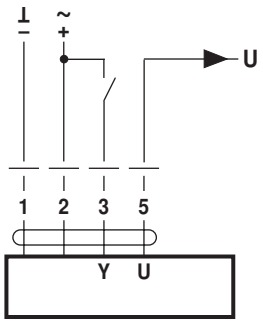
	a	b	c	d	e
Close [1]					
MIN					
ZS					
MAX					
Open					
Y					

Override control and limiting with AC 24 V with rotary switch

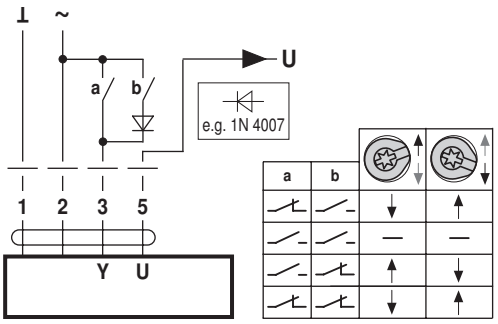


1) **Caution:** This function is only guaranteed if the start point of the operating range is defined as min. 0.5 V.

Control open/close

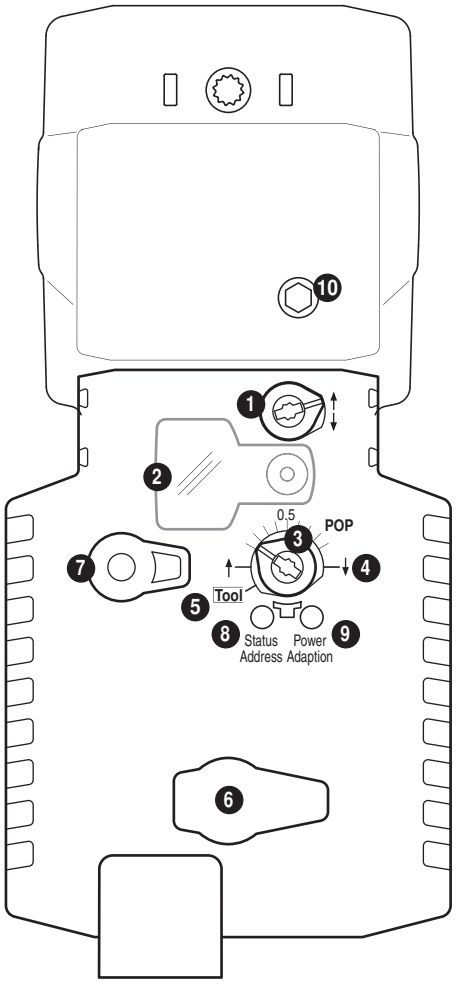


Control 3-point



a	b		
		↓	↑
		—	—
		↑	↓
		↓	↑

Operating controls and indicators



1 **Direction of stroke switch**
Switch over: Direction of stroke changes

2 **Cover, POP button**

3 **POP button**

4 **Scale for manual adjustment**

5 **Position for adjustment with tool**

6 **Service plug**
For connecting the parameterisation and service tools

7 **Gear disengagement button**
Press button: Gear disengaged, motor stops, manual override possible
Release button: Gear engaged, standard mode

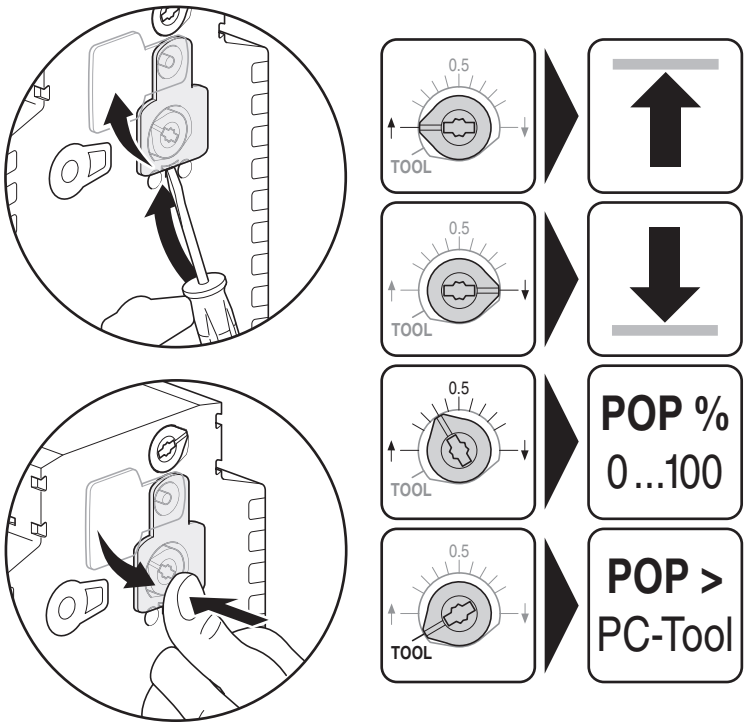
LED displays		Meaning / function
8 yellow	**9** green	
Off	On	Operation OK
Off	Flashing	POP function active
On	Off	– Pre-charging time SuperCap – Fault SuperCap – Wiring error in supply
Off	Off	Not in operation
On	On	Adaptation process active
Flickering	On	Communication active

8 **Push-button** (LED yellow)
Press button: Confirmation of the addressing

9 **Push-button** (LED green)
Press button: Triggers stroke adaptation, followed by standard mode

10 **Manual override**
Clockwise: Actuator spindle extends
Counterclockwise: Actuator spindle retracts

Setting emergency setting position (POP)

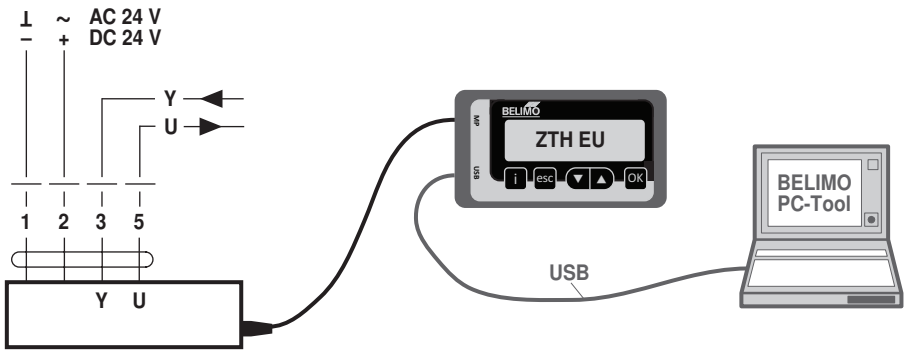


Service

Service Tools connection

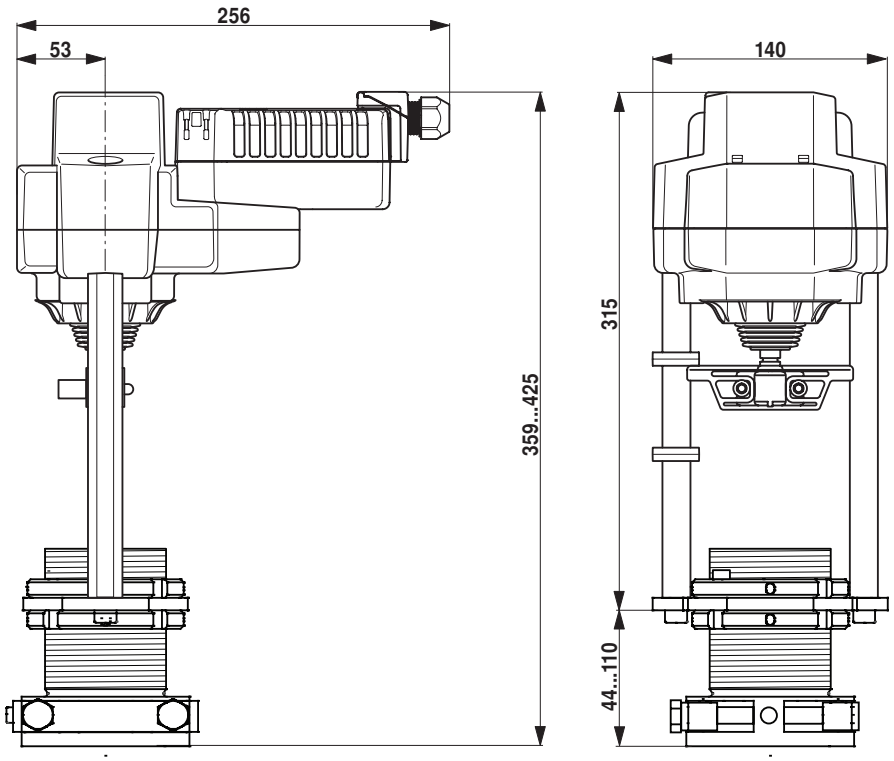
The actuator can be parametrised by ZTH EU via the service socket.
For an extended parametrisation the PC tool can be connected.

Connection ZTH EU / PC-Tool



Dimensions [mm]

Dimensional drawings



Further documentation

- Tool connections
- Introduction to MP-Bus Technology
- Overview MP Cooperation Partners
- Data sheets for globe valves
- Installation instructions for actuators