Communication-capable globe valve actuator with emergency control function for 2-way and 3-way globe valves

- Actuating force 1000 N
- Nominal voltage AC/DC 24 V
- Control modulating
- Nominal stroke 20 mm
- Actuating time 35 s / 20 mm
- Communication via LONWORKS® (FTT-10A)
- Conversion of sensor signals
- Integrated temperature controller
- Design life SuperCaps 15 years

LONMARK®

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	4.5 W
	Power consumption at rest	1.5 W
	Power consumption for wire sizing	9 VA
	Connection supply / control	Cable 1 m, 6 x 0.75 mm²
Data for LONWORKS®	Certified	According to LONMARK® 3.3
	Processor	Neuron 3150
	Transceiver	FTT-10A, compatible with LPT-10
	Functional Profile as per LONMARK®	Damper actuator object #8110 Open Loop Sensor Object #1 Thermostat Object #8060
	LNS plug-in for actuator / sensor / controller	Can be run with any LNS-based integration tool (min. for LNS 3.x)
	Service button and status LED	According to LONMARK® guidelines
	Conductors, cables	Signal cable lengths, cable specifications and topology of the LONWORKS® network in accordance with the ECHELON® guidelines
Functional data	Actuating force	1000 N
	Position feedback U	DC 2...10 V
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	Start point DC 0.5 ... 8V End point DC 2.5 ... 10V
	Setting emergency setting position	Actuator spindle 0...100%, adjustable (POP rotary knob)
	Bridging time (PF) variable	1...10 s
	Position accuracy	5% absolute
	Manual override	Gear disengagement with push-button
	Nominal stroke	20 mm
	Actuating time	35 s / 20 mm
	Variable actuating time	35...150 s / 20 mm
	Actuating time emergency control function	35 s / 20 mm
	Override control, controllable via nviManOvrd	MAX (maximum position) = 100% MIN (minimum position) = 0% ZS (intermediate position) = 50%
	Override control, controllable via nviManOvrd, modifiable	ZS = MIN...MAX
	Sound power level motor max.	60 dB(A)
	Sound power level emergency setting position max.	60 dB(A)
	Position indication	Mechanical 5 … 20 mm stroke
Safety	Protection class IEC/EN	III Safety extra-low voltage
	Degree of protection IEC/EN	IP54
	EMC	CE according to 2004/108/EC
	Certification IEC/EN	Certified to: IEC/EN 60730-1 and IEC/EN 60730-2-14
	Principle of operation	Type 1.AA

Technical data

Safety	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 approx.	1,610 kg

Safety notes

⚠

- This actuator has been designed for application in stationary heating, ventilation and air-conditioning systems and is not allowed to be used outside the specified field of application, especially not in aircraft or in any other airborne means of transport.

- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied with during installation.
- The switch for changing the direction of motion/the closing point may be adjusted only by authorised personnel. The direction of stroke 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 cable must not be removed from the device.
- 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

Principle of operation   The actuator is equipped with an integrated interface for LONWORKS®. The actuator can be integrated and connected directly with LONWORKS® via transceiver FTT-10A. Interrupting the supply voltage causes the valve to be moved to the selected emergency setting position (POP) by means of stored electrical energy.

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 the following factors:
–   Duration of the voltage interruption
–   PF delay time (bridging time)

Product features

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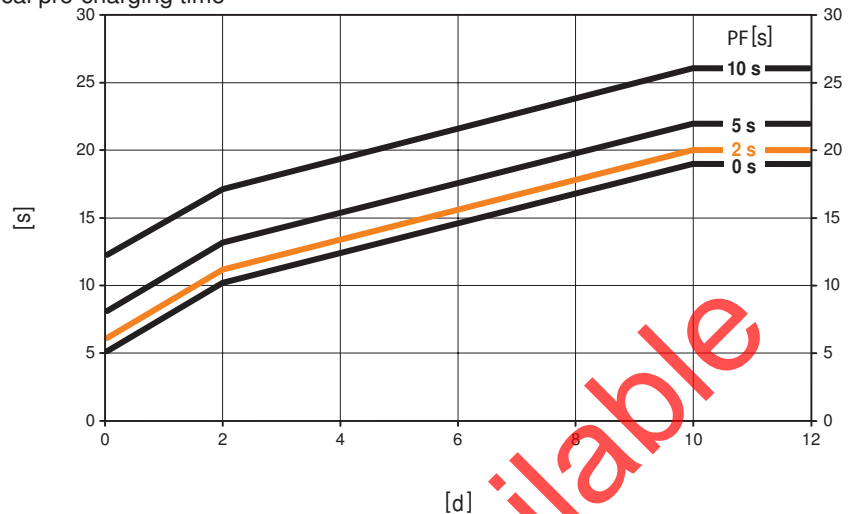
[d] = Electricity interruption in days
[s] = Pre-charging time in seconds
PF[s] = Bridging time
Calculation example: In the event of an electricity interruption of 3 days and a set bridging time (PF) of 5 s, the actuator requires a pre-charging time of 14 s (see graphic) after the voltage has been reconnected.

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]				

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). In this way, the analogue sensor signal can be easily digitised and passed along to LONWORKS®.

Integrated temperature controller — The actuator has an integrated temperature controller (Thermostat Object LONMARK® #8060). This makes it easy to implement individual room control solutions.

Adjustable-parameter actuators — The factory settings cover the most common applications. Individual parameters can be altered with the BELIMO service tool MFT-P or with the service tool ZTH-GEN.

Direct mounting — Simple direct mounting on the globe valve by means of form-fit hollow clamping jaws. The actuator can be rotated by 360° on the valve neck.

Manual override — Manual override with push-button possible - temporary. The gear is disengaged and the actuator decoupled for as long as the button is pressed / latched.
The stroke can be adjusted by using a hexagon socket screw key (4 mm), which is inserted into the top of the actuator. The stroke spindle 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.

Combination valve/actuator — Refer to the valve documentation for suitable valves, their permitted medium temperatures and closing pressures.

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

Home position — Setting ex-works: Actuator spindle is retracted.
When valve-actuator combinations are shipped, the direction of motion is set in accordance with the closing point of the valve.

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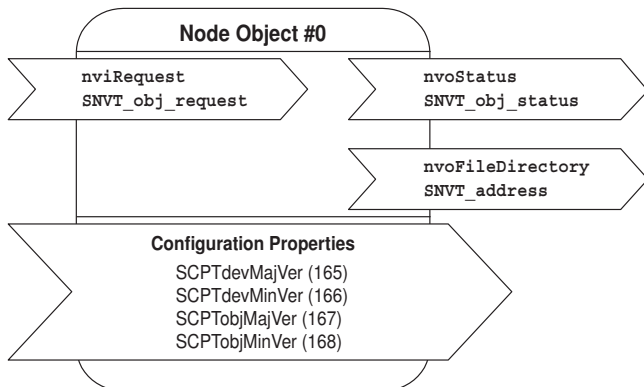
Product features

Adaption of stroke range	The first time the supply voltage is switched on, i.e. at the time of commissioning, the actuator carries out a stroke adaption, which is when the operating range and position feedback adjust themselves to the mechanical stroke. Manual triggering of the adaption can be carried out by pressing the "Adaption" button or with the PC-Tool.
Rotary knob emergency setting position	The "Emergency setting position" rotary knob can be used to adjust the desired emergency setting position (POP) from 0% to 100% in 10% increments. The rotary knob is in reference to the adapted or programmed height of stroke. In the event of an electricity interruption, the actuator will move into the selected emergency setting 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 emergency setting 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 (PF)	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 at the site of operations 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.

Accessories

	Description	Type
Service tools	Manual parameterizing device, for MF/MP/Modbus/LonWorks actuators and VAV-Control	ZTH-GEN
	Belimo PC-Tool, software for adjustments and diagnostics	MFT-P

Functional profile according to LONMARK®

The LON-capable actuator is certified by LONMARK®. Die following actuator functions are made available via the LONWORKS® network as standardised network variables in accordance with LONMARK®: the Node Object #0, the Damper Actuator Object #8110, the Open Loop Sensor Object #1 and the Thermostat Object #8060.

Node Object #0

nviRequest
SNVT_obj_request

nvoStatus
SNVT_obj_status

nvoFileDirectory
SNVT_address

Configuration Properties
SCPTdevMajVer (165)
SCPTdevMinVer (166)
SCPTobjMajVer (167)
SCPTobjMinVer (168)

Damper Actuator Object #8110

nviRelStpt
SNVT_lev_percent

nvoActualValue
SNVT_lev_percent

nviActuatState
SNVT_switch

nvoAbsAngle
SNVT_angle_deg

nviManOvrd
SNVT_hvac_overid

nvoAbsAirFlow
SNVT_flow

Configuration Properties
SCPTobjMajVer (167)
SCPTobjMinVer (168)

SCPTminSendTime (52)
SCPTmaxSendTime (49)
SCPTmaxRcvTime (48)
SCPTminDeltaAngl (43)
SCPTminDeltaFlow (47)
SCPTserialNumber (179)
SCPTactuatorType (41)
SCPToemType (61)
SCPTlocation (17)
SCPTnomAngle (58)
SCPTnomAirFlow (57)
SCPTminSetpoint (53)
SCPTmaxSetpoint (50)
SCPTdriveTime (45)
SCPTdirection (44)

Open Loop Sensor Object #1

nvoSensorValue
SNVT_xxx

Configuration Properties
SCPTobjMajVer (167)
SCPTobjMinVer (168)

SCPTminSendTime (52)
SCPTmaxSendTime (49)
SCPTsndDelta (27)
SCPTmaxNVLength (255)
SCPTnvType (254)
UCPTadFunction (1)
UCPTadTransformation (2)
SCPTtrnsTblX (28)
SCPTtrnsTblY (29)
SCPTinvrtOut (16)

Node Object #0

The node object contains the object status and object request functions.
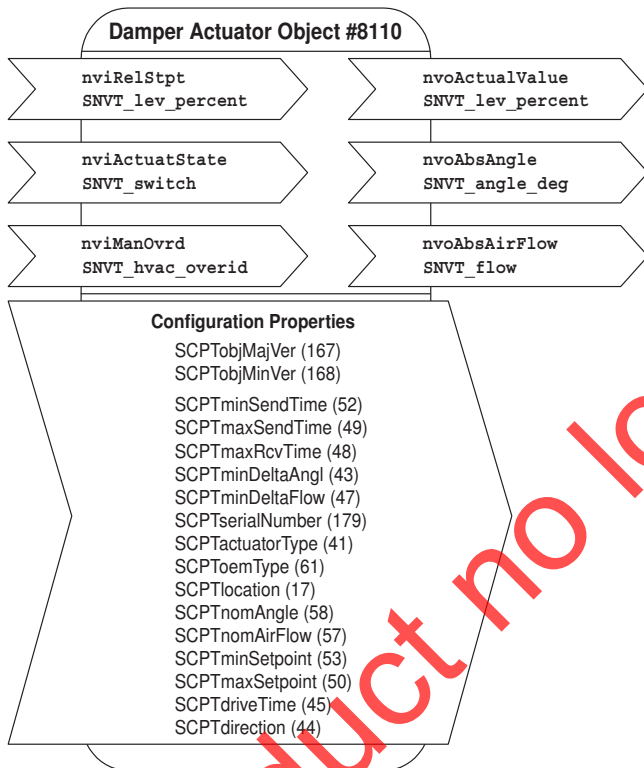
nviRequest: SNVT_obj_request
Input variable for requesting the status of a particular object in the node.

nvoStatus: SNVT_obj_status
Output variable that outputs the current status of a particular object in the node.

nvoFileDirectory: SNVT_address
Output variable that shows information in the address range of the Neuron chip.

Damper Actuator Object #8110

The actuator object is used to display the functions of the actuator on the page of the LONWORKS® network.

nviRelStpt: SNVT_lev_percent
The nominal position is assigned to the actuator via this input variable. This variable is normally linked to the output variable of an HVAC controller.

nviActuateState: SNVT_switch
A preset position is assigned to the actuator via this input variable. Note on priority: The variable which was most recently active, either nviActuatorState or nviRelStpt, has priority.

nviManOvrd: SNVT_hvac_overid
This input variable can be used to manually override the actuator into a particular position.

**nvoActualValue: SNVT_lev_percent**
This output variable shows the current actual position of the actuator and can be used for control circuit feedback or for displaying positions.

nvoAbsAngle: SNVT_angle_deg
This output variable shows the current angle of rotation / stroke of the actuator and can be used to display the position or for service purposes.

nvoAbsAirFlow: SNVT_flow
This output variable is inactive with this actuator and shows a constant value of 65535 (this variable is only active in conjunction with LON-capable VAV controllers).
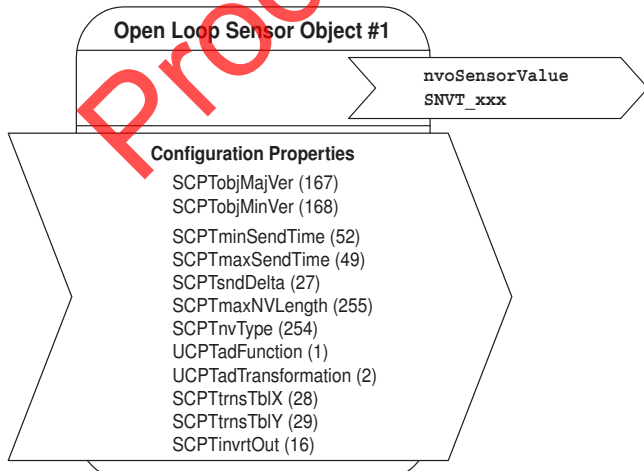
Open Loop Sensor Object #1

One sensor can be connected to the actuator.
A passive resistance sensor (e.g. Ni1000), an active sensor (output 0 ... 32 V) or a switch (On/Off) can be connected. In the case of the open loop sensor object, the measured sensor values are transferred to the LONWORKS® network.
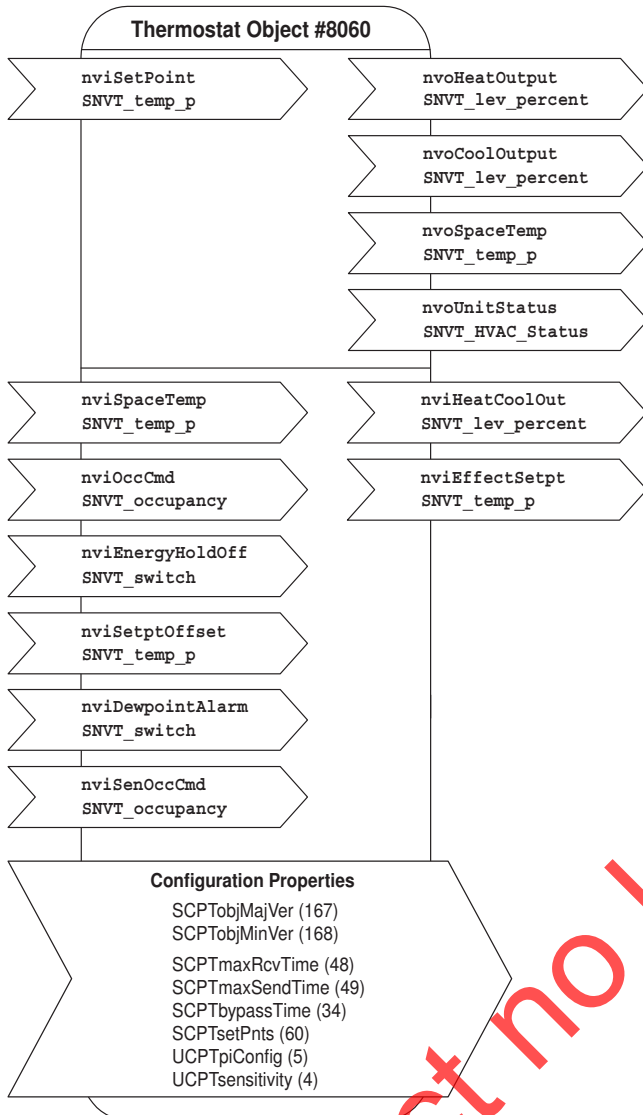
nvoSensorValue: SNVT_xxx
This output variable shows the current sensor value. Depending on the connected sensor, the output variable can be configured via the sensor plug-in and specifically adapted to the system.

The SNVT_.. can be configured as:		
SNVT_temp_p	SNVT_lev_percent	SNVT_lux
SNVT_temp	SNVT_abs_humid	SNVT_press_p
SNVT_switch	SNVT_enthalpy	SNVT_smo_obscur
SNVT_flow	SNVT_ppm	SNVT_power
SNVT_flow_p	SNVT_rpm	SNVT_elec_kwh

Functional profile according to LONMARK®

Individual room control solutions can be implemented with the thermostat object LONMARK® #8060. An LNS plug-in is available for configuring the controller parameters.

Thermostat Object #8060

Inputs	Outputs
nviSetPoint SNVT_temp_p	nvoHeatOutput SNVT_lev_percent
	nvoCoolOutput SNVT_lev_percent
	nvoSpaceTemp SNVT_temp_p
	nvoUnitStatus SNVT_HVAC_Status
nviSpaceTemp SNVT_temp_p	nviHeatCoolOut SNVT_lev_percent
nviOccCmd SNVT_occupancy	nviEffectSetpt SNVT_temp_p
nviEnergyHoldOff SNVT_switch	
nviSetptOffset SNVT_temp_p	
nviDewpointAlarm SNVT_switch	
nviSenOccCmd SNVT_occupancy	

Configuration Properties

SCPTobjMajVer (167)
SCPTobjMinVer (168)

SCPTmaxRcvTime (48)
SCPTmaxSendTime (49)
SCPTbypassTime (34)
SCPTsetPnts (60)
UCPTpiConfig (5)
UCPTsensitivity (4)

Note
A restart is necessary after accessing network variables for the purpose of rewriting them or after deleting links in order to initialise the variables.

Thermostat Object #8060

nviSetPoint: SNVT_temp_p
Setpoint specification for the controller from the higher-level system or the room control unit. If this variable is not linked, then the local setpoints of the controller object apply (can be adjusted via plug-in). The setpoint specification from the higher-level system influences the setting on the controller as follows:
Example: Comfort setpoint for heating = 21 °C and Comfort setpoint for cooling = 23 °C. The median point between heating and cooling is thus 22 °C. Now, if the external setpoint (nviSetPoint) is 23 °C, then the heating setpoint will shift to 22 °C and the cooling set point to 24 °C. The setpoints for Pre-Comfort heating and cooling will also be shifted accordingly.

nviSpaceTemp: SNVT_temp_p
Room temperature from external room sensor. It is imperative that this variable be linked; typically, it is linked with the variable of the sensor object.

nviOccCmd: SNVT_occupancy
Occupancy specification from the command centre (for the function, see the table entitled «Functions Inputs Occupancy» next page).

nviEnergyHoldOff: SNVT_switch
In the case of active EnergyHoldOff, the controller will be set to the Building Protection setpoints.

nviSetPtOffset: SNVT_temp_p
Shifting of the room control unit. If the nviSetPoint is linked, then this input has an influence on the variable value of nviSetPoint, i.e. it corrects it. Otherwise, the Comfort and Pre-Comfort setpoints for heating and cooling will be adjusted directly by the amount of the shift (compare example with nviSetPoint).

nviDewpointAlarm: SNVT_switch
In the case of active DewpointAlarm, the controller will be set to the Building Protection setpoints. The cooling sequence is deactivated.

nviSenOccCmd: SNVT_occupancy
Occupancy specification from the local occupancy switch (for the function, see the table entitled «Functions Inputs Occupancy» next page).

nvoHeatOutput: SNVT_lev_percent
Control signal for heating.

nvoCoolOutput: SNVT_lev_percent
Control signal for cooling.

nvoSpaceTemp: SNVT_temp_p
Displays the room temperature of the nviSpaceTemp. If nviSpaceTemp is not linked, then the variable will display the value 0x7FFF.

nvoUnitStatus: SNVT_HVAC_Status
Displays the operating mode of the controller (in accordance with Functional Profile #8060).

nvoHeatCoolOut: SNVT_lev_percent
Depicts the heating and cooling sequence for controlling the 6-way characterised control valves (see illustration, next page).
This outlet runs parallel to the nvoCoolOutput or the nvoHeatOutput, respectively.
Cooling = 33 … 0%
Valve closed 33 … 66%
Heating = 66 … 100%

nvoEffectSetpt: SNVT_temp_p
Shows the actual setpoint of the controller.

Functional profile according to LONMARK®

Functions Inputs Occupancy

Note
The function nviOccCmd has a higher priority than the function nviSenOccCmd.

Occupancy specification from nviOccCmd command centre	Occupancy switch nviSenOccCmd	Room operating status	Comfort extension
OC_OCCUPIED	OC_OCCUPIED	Comfort	
	OC_UNOCCUPIED	Comfort	
	OC_NUL (default)	Comfort	
OC_STANDBY	OC_OCCUPIED	Bypass	Occupied time is extended by the amount of the bypass time (comfort time) (can be adjusted in the plug-in)
	OC_UNOCCUPIED	Pre-Comfort	
	OC_NUL (default)	Pre-Comfort	
OC_UNOCCUPIED	OC_OCCUPIED	Building Protection	
	OC_UNOCCUPIED	Building Protection	
	OC_NUL (default)	Building Protection	
OC_NUL (default)	OC_OCCUPIED	Comfort	
	OC_UNOCCUPIED	Pre-Comfort	
	OC_NUL (default)	Comfort	

Funktion nvoHeatCoolOut

Typical application
Heating / cooling with Belimo 6-way characterised control valve.

Note chilled ceiling application
In the case of active DewPointAlarm (nviDewPointAlarm), the controller will be set to the Building Protection setpoints. The cooling sequence is deactivated.
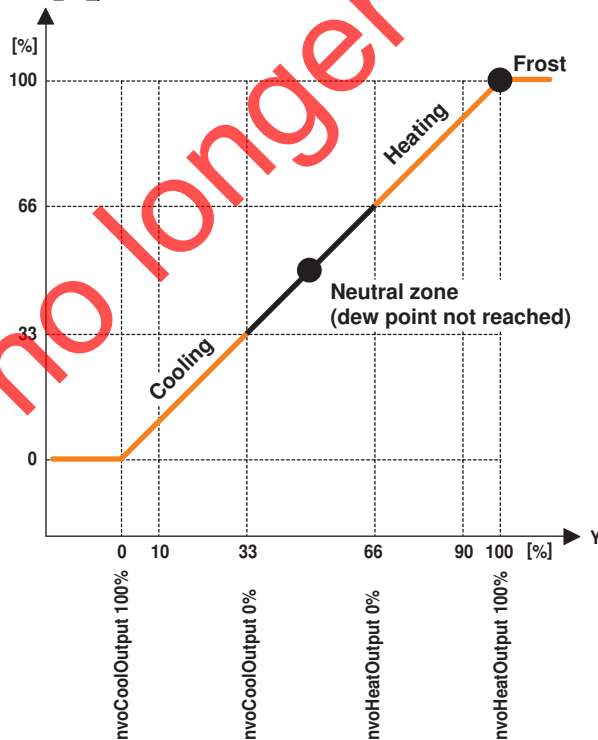
Notes
More detailed information on the Functional Profiles can be found on the website of LONMARK®. (www.lonmark.org).

Parameterisation

Connection of the MFT parameterising devices, e.g. Belimo PC-Tool MFT-P

The actuator can be parameterised as follows:
– Electronic angle of rotation limiting / stroke limiting
– Torque reduction / stroke reduction
– Operation mode
– Running time
– Function test or adaption can be triggered
– Position feedback (measuring voltage U)

Parameterisation of the connected actuator

Notes
• The actuator can be triggered with the PC-Tool under „PP".
• The USB cable is included in the ZIP-USB-MP scope of delivery.
• The connection cable ZK1-GEN has to be ordered separately.
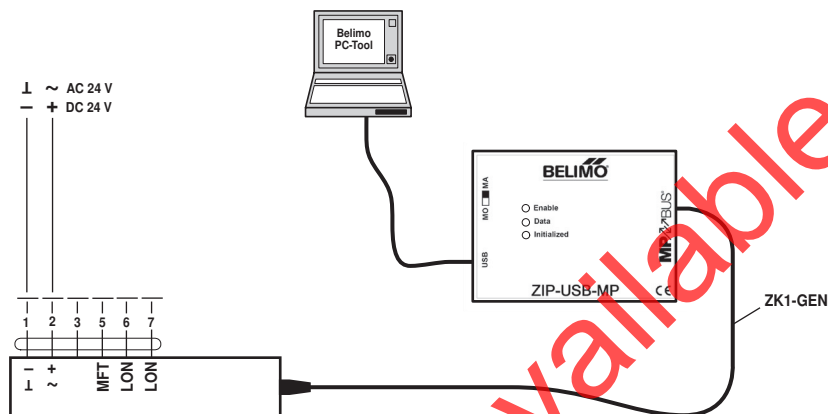
Parameterisation of the actuator, Standalone, without AC/DC 24V supply

Notes
• The actuator can be triggered with the PC-Tool under „PP".
• The RS-232 cable is included in the ZIP232 scope of delivery.
• The power supply unit ZN230-24 has to be ordered separately.
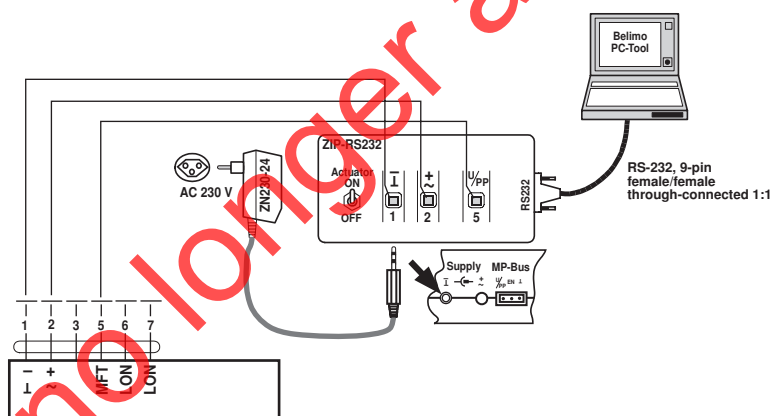
Electrical installation

⚠	**Notes**	• Connection via safety isolating transformer. • Direction of stroke switch factory setting: Actuator spindle retracted.

Wiring diagrams

Connection without sensor

LONWORKS®

Terminals: 1 ⊥ −   2 ~ +   3   5 MFT   6 LON   7 LON
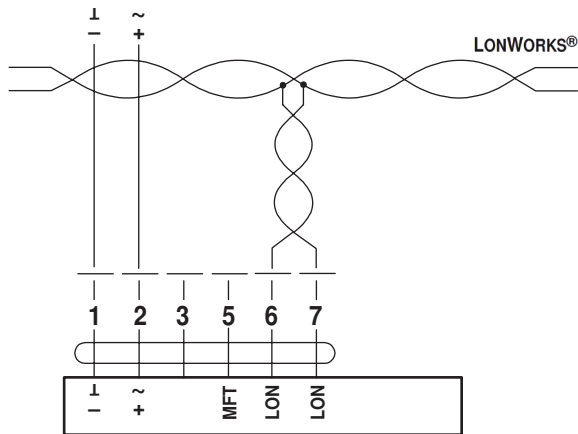
Connection with passive sensor, e.g. Pt1000, Ni1000, NTC

LONWORKS®

Terminals: 1 ⊥ −   2 ~ +   3   5 MFT   6 LON   7 LON

Ni1000	−28 ... +98 °C	850 ... 1600 Ω [2]
PT1000	−35 ... +155 °C	850 ... 1600 Ω [2]
NTC	−10 ... +160 °C [1]	200 Ω ... 50 kΩ [2]
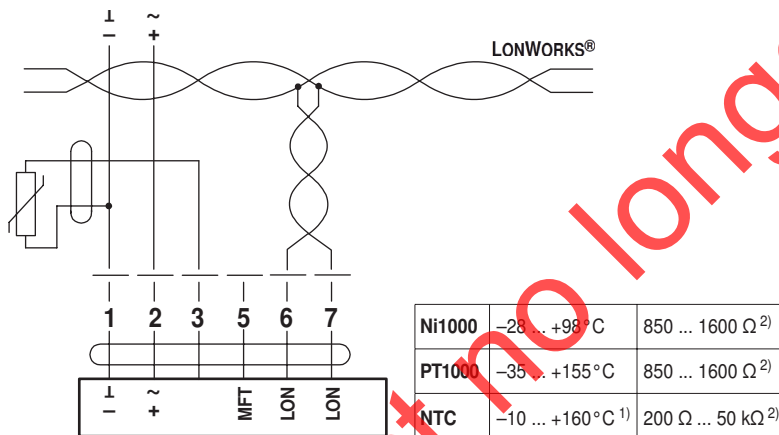
Sensor scaling:
The sensors can be scaled with the sensor plug-in (sensor table).
1) Depending on the type
2) Resolution 1 Ohm

Connection with switching contact, e.g. Δp-monitor

LONWORKS®

Δp

Terminals: 1 ⊥ −   2 ~ +   3   5 MFT   6 LON   7 LON
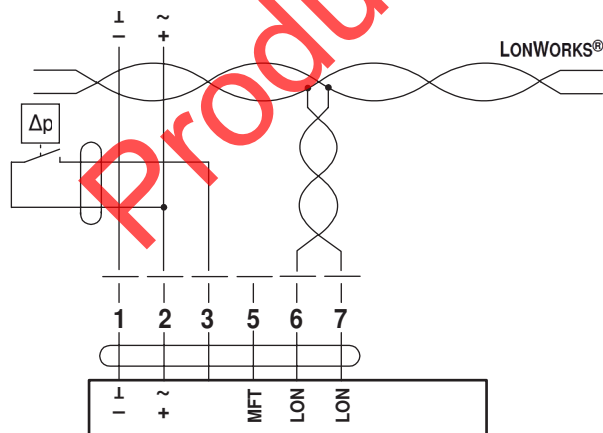
Switching contact requirements:
The switching contact must be able to switch a current of 16 mA at 24V accurately.

Electrical installation

Connection with active sensor, e.g. 0 ... 10V @ 0 ... 50°C
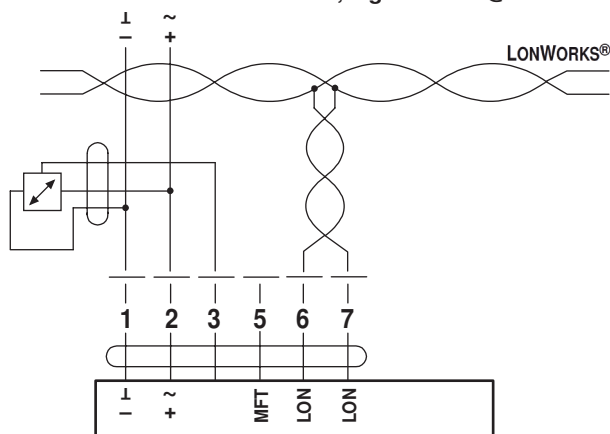
Possible voltage range:
0 ... 32V (Resolution 30 mV)
Sensor scaling: The sensors can
be scaled with the sensor plug-in
(sensor table)

Indicators and operating elements
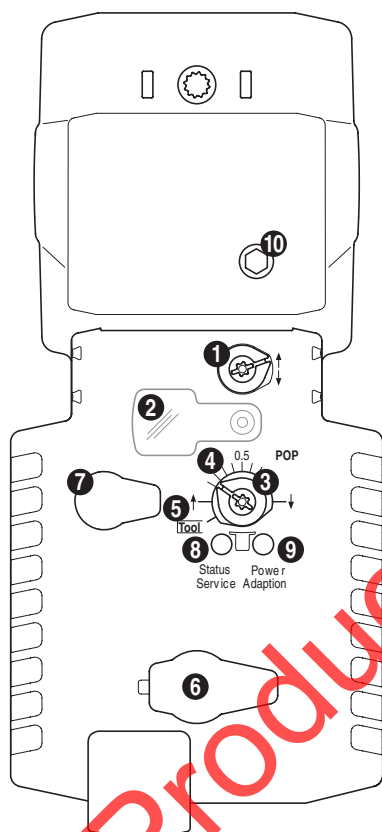
(1) Direction of stroke switch
Switching: Direction of stroke changes

(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, temporary
Press button: Gear disengages, motor stops, manual override possible
Release button: Gear engages, standard mode

(8) Service button for commissioning with LONWORKS®
Press button: Service Pin Message is sent on LONWORKS® network

(9) Push-button
Press button: Switches on stroke adaption, followed by standard mode

(10) Manual override
Clockwise: Actuator spindle extends
Counterclockwise: Actuator spindle retracts

LED displays (8, yellow) and (9, green)
yellow: Off; green: Illuminated; The actuator is linked to the LONWORKS® network and ready for operation
yellow: Illuminated; green: Illuminated; No application software is loaded in the actuator
yellow: Blinking (flashing interval 2 s); green: Illuminated; The actuator is ready for operation, but not linked to the LONWORKS® network (unconfigured)
yellow: Off; green: Blinking; POP functions active
yellow: Illuminated; green: Off; Pre-charging time SuperCap / Fault SuperCap / Wiring error in supply
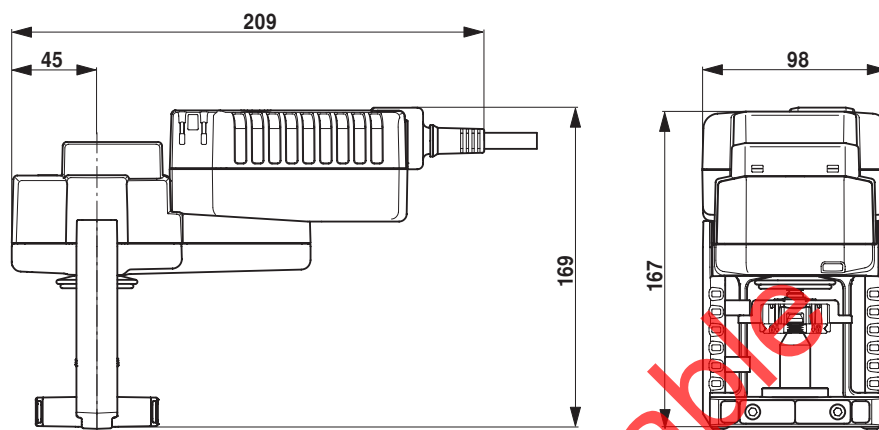yellow: Off; green: Off; Not in operation

Indicators and operating elements
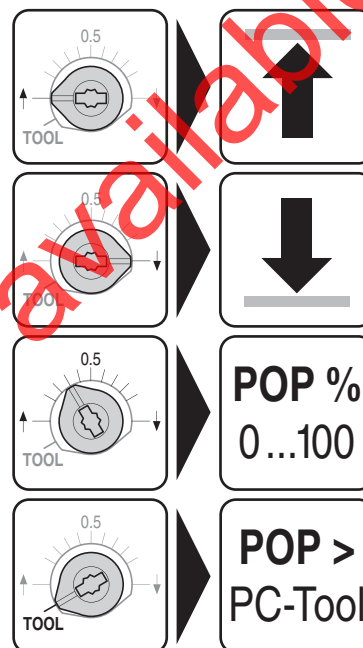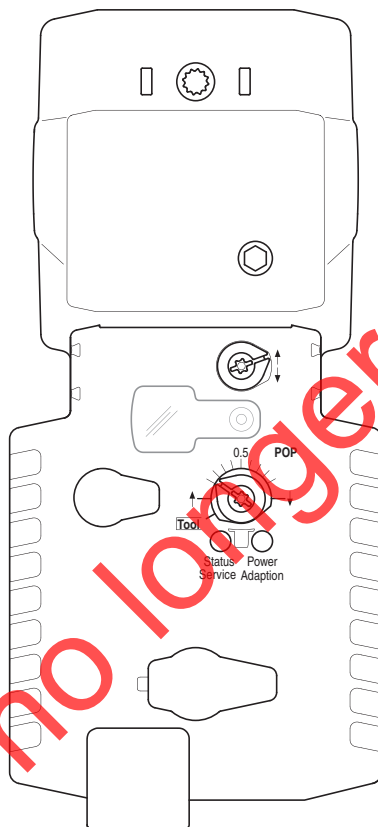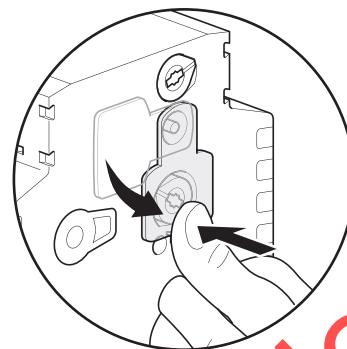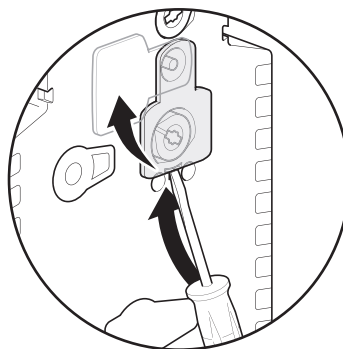
Dimensions [mm]

Dimensional drawings

Further documentation

- Data sheets for globe valves
- Installation instructions for actuators and/or globe valves, respectively
- Notes for project planning, 2-way and 3-way globe valves
- Overview Valve-actuator combinations
- Description Belimo Plug-Ins