BELIMO

Technical data sheet LM24ALON

Communicative damper actuator for adjusting dampers in technical building installations

- **Air damper size up to approx. 1 m²**
- **Torque motor 5 Nm**
- **Nominal voltage AC/DC 24 V**
- **Integrated temperature controller**
- **Communication via LONWORKS® (FTT-10A)**
- **Conversion of sensor signals**

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	2.5 W
	Power consumption in rest position	1.3 W
	Power consumption for wire sizing	5 VA
	Connection supply / control	Cable 1 m, 6 x 0.75 mm²
Data bus communication	Certified	According to LonMark 3.3
	Processor	Neuron 3150
	Transceiver	FTT-10A
	Functional Profile as per LONMARK®	Damper Actuator Object #8110Open Loop Sensor Object #1Thermostat 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	Torque motor	5 Nm
	Torque variable	25%, 50%, 75% reduced
	Position accuracy	±5%
	Direction of motion motor	selectable with switch 0/1
	Direction of motion note	Y = 0 V: At switch position 0 (ccw rotation) / 1 (cw rotation)
	Direction of motion variable	electronically reversible
	Manual override	with push-button, can be locked
	Angle of rotation	Max. 95°
	Angle of rotation note	can be limited on both sides with adjustable mechanical end stops
	Running time motor	150 s / 90°
	Running time motor variable	35...150 s
	Adaptation setting range	manual
	Adaptation setting range variable	No action Adaptation when switched on Adaptation after pushing the gear disengagement button
	Override control, controllable via nviManOvrd	MAX (maximum position) = 100% MIN (minimum position) = 0% ZS (intermediate position) = 50%
	Sound power level, motor	35 dB(A)
	Mechanical interface	Universal shaft clamp 6...20 mm
	Position indication	Mechanically, pluggable
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
	Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14

Technical data

Safety	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
	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
Weight	Weight	0.61 kg

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.
- To calculate the torque required, the specifications supplied by the damper manufacturers concerning the cross-section, the design, the installation site and the ventilation conditions must be observed.
- 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 is equipped with an integrated interface for LONWORKS®. The actuator can be directly connected to the LON network and controlled via the transceiver FTT-10A.

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 device has an integrated temperature controller (Thermostat Object LONMARK® #8060). Other control variants upon request.
The temperature controller can be set using the LNS Plug-In from Belimo.

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

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

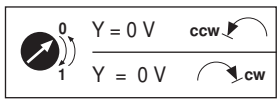
Adjustable angle of rotation
Adjustable angle of rotation with mechanical end stops.

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

Product features

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.



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

Electrical accessories

Description	Type
Auxiliary switch 1 x SPDT add-on	S1A
Auxiliary switch 2 x SPDT add-on	S2A
Auxiliary switch 2 x SPDT add-on, grau	S2A/300 GR
Auxiliary switch 2 x SPDT add-on, grau	S2A/500 GR
Feedback potentiometer 140 Ω add-on	P140A
Feedback potentiometer 140 Ω add-on, grau	P140A GR
Feedback potentiometer 200 Ω add-on	P200A
Feedback potentiometer 500 Ω add-on	P500A
Feedback potentiometer 500 Ω add-on, grau	P500A GR
Feedback potentiometer 1 kΩ add-on	P1000A
Feedback potentiometer 1 kΩ add-on, grau	P1000A GR
Feedback potentiometer 2.8 kΩ add-on	P2800A
Feedback potentiometer 2.8 kΩ add-on, grau	P2800A GR
Feedback potentiometer 5 kΩ add-on	P5000A
Feedback potentiometer 5 kΩ add-on, grau	P5000A GR
Feedback potentiometer 10 kΩ add-on	P10000A
Feedback potentiometer 10 kΩ add-on, grau	P10000A GR
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

Mechanical accessories

Description	Type
Shaft extension 170 mm Ø10 mm for damper shaft Ø 6...16 mm	AV6-20
Shaft clamp one-sided, clamping range Ø6...20 mm, Multipack 20 pcs.	K-ELA
Shaft clamp one-sided, clamping range Ø6...10 mm, Multipack 20 pcs.	K-ELA10
Shaft clamp one-sided, clamping range Ø6...13 mm, Multipack 20 pcs.	K-ELA13
Shaft clamp one-sided, clamping range Ø6...16 mm, Multipack 20 pcs.	K-ELA16
Anti-rotation mechanism 180 mm, Multipack 20 pcs.	Z-ARS180
Form fit insert 8x8 mm, Multipack 20 pcs.	ZF8-LMA
Form fit insert 10x10 mm, Multipack 20 pcs.	ZF10-LMA
Form fit insert 12x12 mm, Multipack 20 pcs.	ZF12-LMA
Form fit insert 8x8 mm, with angle of rotation limiter and position indication, Multipack 20 pcs.	ZFRL8-LMA
Form fit insert 10x10 mm, with angle of rotation limiter and position indication, Multipack 20 pcs.	ZFRL10-LMA
Form fit insert 12x12 mm, with angle of rotation limiter and position indication, Multipack 20 pcs.	ZFRL12-LMA
Position indicator, Multipack 20 pcs.	Z-PI

Accessories

	Description	Type
Service Tools	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

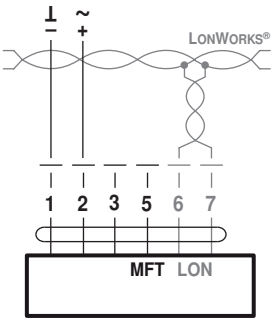
Electrical installation

Notes

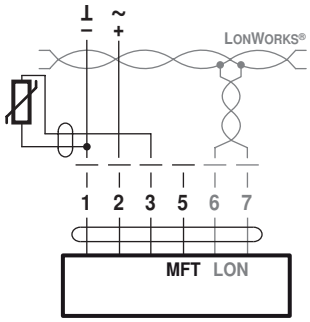
- Connection via safety isolating transformer.

Wiring diagrams

Connection without sensor



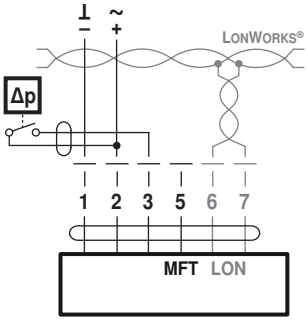
Connection with passive sensor, e.g. Pt1000, Ni1000, NTC



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)

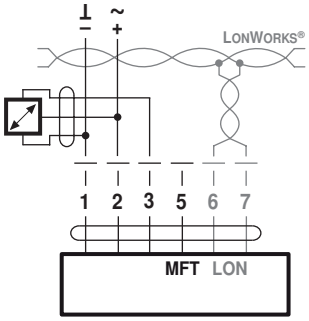
Sensor scaling:
The sensors can be scaled with the sensor plug-in (sensor table).
1) Depending on type
2) Resolution 1 Ohm

Connection with switching contact, e.g. Δp monitor



Switching contact requirements:
The switching contact must be able to switch a current of 16 mA at 24 V accurately.

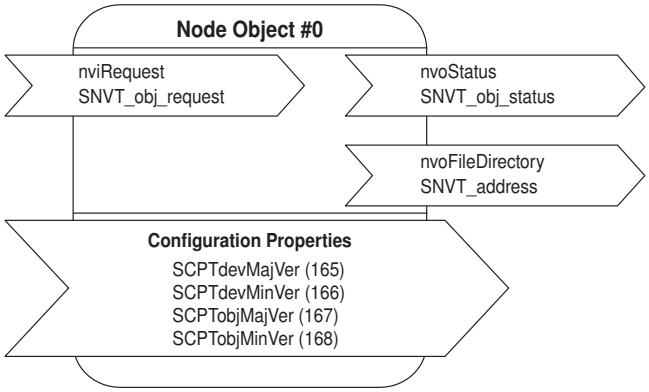
Connection with active sensor, e.g. 0...10 V @ 0...50 °C



Possible voltage range:
0...32V (Resolution 30 mV)
Sensor scaling:
The sensors can be scaled with the sensor plug-in (sensor table)

Functional Profile as per LONMARK®

The LON-capable actuator is certifi ed 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.



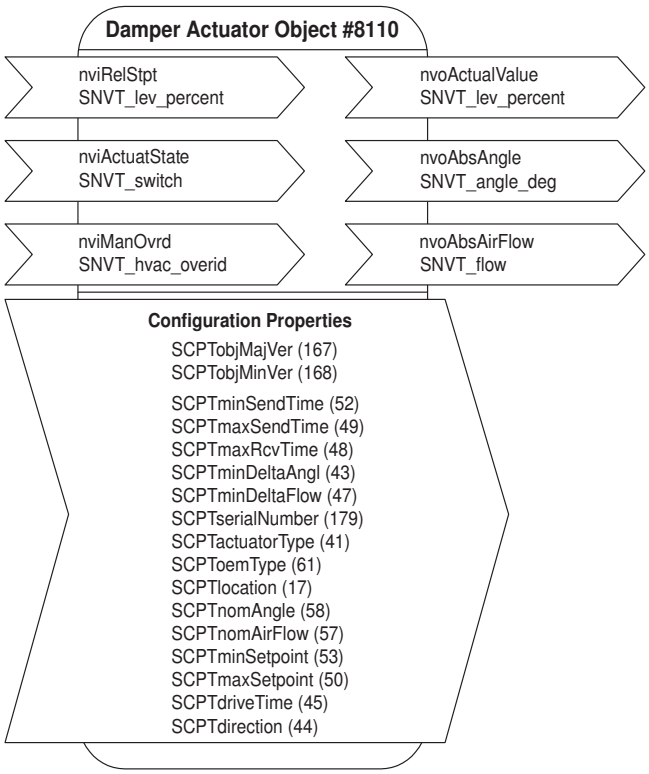
Node Object #0

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
Via this input variable, the setpoint in % for the actuator is specifi ed (0...100% = Min...Max). This variable is normally linked to the output variable of an HVAC controller.

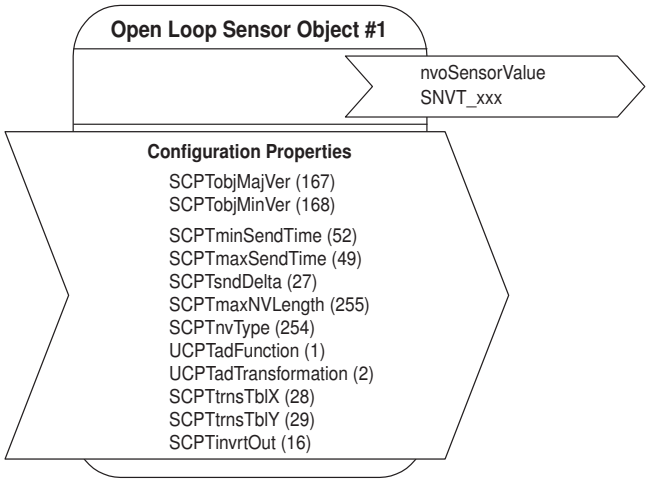
nviActuateState: SNVT_switch
A preset position is assigned to the actuator via this input variable. Note on priority: The variable which was most recently active, either nviActuatorState or nviRelStpt, has priority.

nviManOvrd: SNVT_hvac_overid
see table «Override control with SNVT nviManOvrd»

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

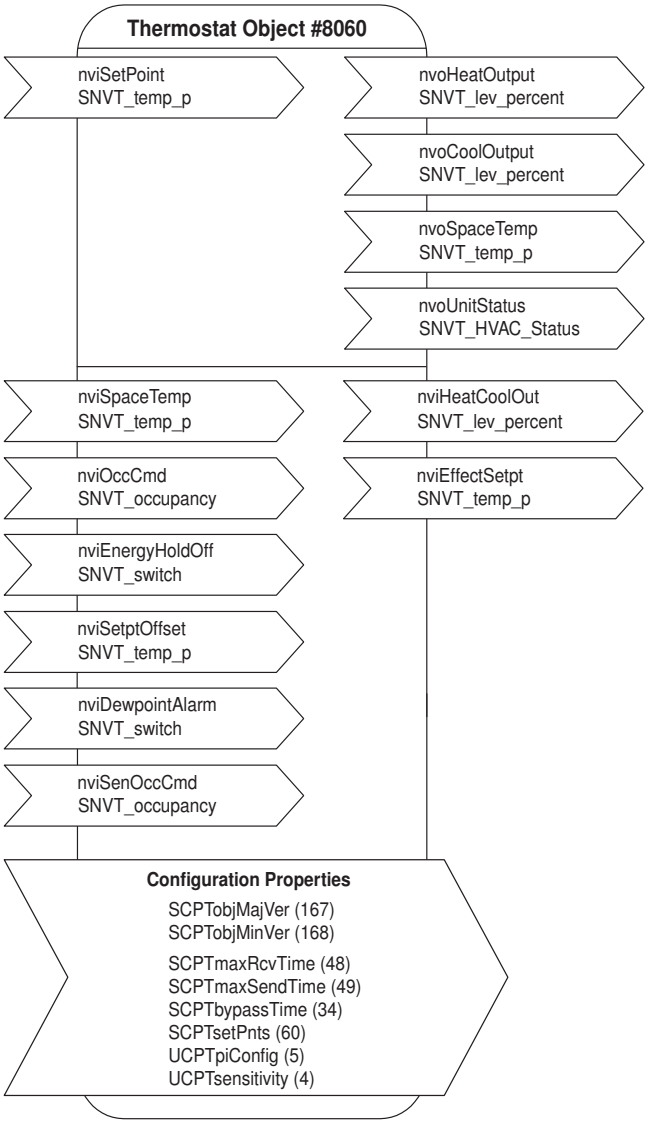
One sensor can be connected to the actuator.
A passive resistance sensor (e.g. Ni1000), an active sensor (output 0...32 V) or a switch (On/Off) can be connected. In the case of the open loop sensor object, the measured sensor values are transferred to the LONWORKS® network.

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 as per 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

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.

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.

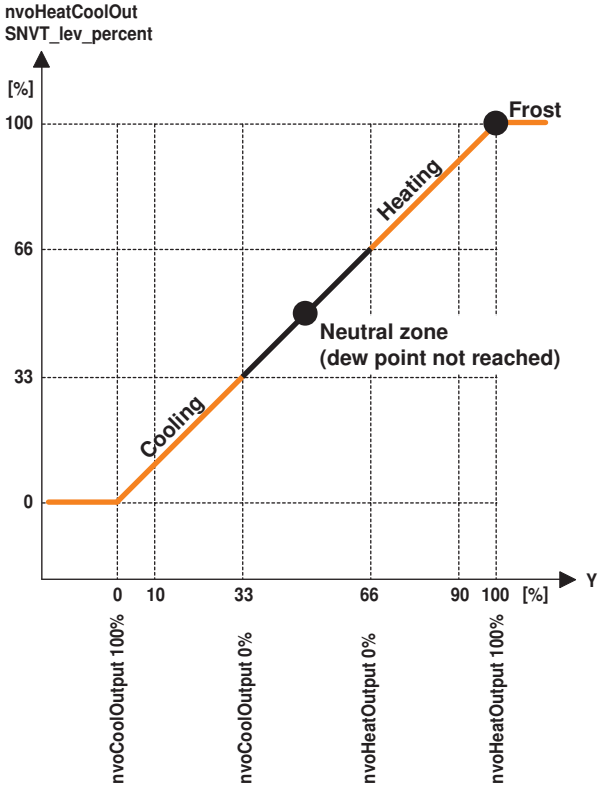
Functional Profile as per LONMARK®

Functions Inputs Occupancy

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	

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

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.

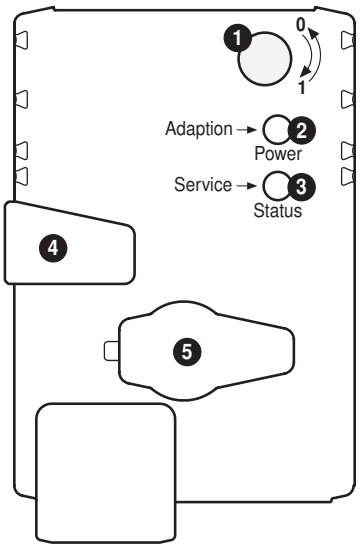
Override control with the SNVT nviManOvrd

State	Value	Actuator
HVO_OFF	–	Override control inactive
HVO_POSITION	percent	Position in % (MIN...MAX)
HVO_FLOW_VALUE	flow	–
HVO_FLOW_PERCENT	percent	–
HVO_OPEN	–	Full open
HVO_CLOSE	–	Full closed
HVO_MINIMUM	–	Minimum position
HVO_MAXIMUM	–	Maximum position

Note
The basic setting is «HVO_OFF».
This value is loaded when the power supply is switched on.

Note
More detailed information on the functional profiles can be found on the website of LONMARK®. (www.lonmark.org).

Operating controls and indicators



1 Direction of rotation switch

Switch over:	Direction of rotation changes

2 Push-button and LED display green

Off:	No power supply or malfuntion
On:	In operation
Press button:	Triggers angle of rotation adaptation, followed by standard mode

3 Service button for commissioning at LONWORKS® and LED display yellow for LON status

Off:	The actuator is linked to the LONWORKS® and ready for operation
On:	No application software is loaded in the actuator
Flashing, interval 2 s:	The actuator is ready for operation, but not linked to the LONWORKS®
Other flashing codes:	There is a malfunction in the actuator
Press button:	Service Pin Message is sent to the LONWORKS®

4 Gear disengagement button

Press button:	Gear disengages, motor stops, manual override possible
Release button:	Gear engages, synchronisation starts, followed by standard mode

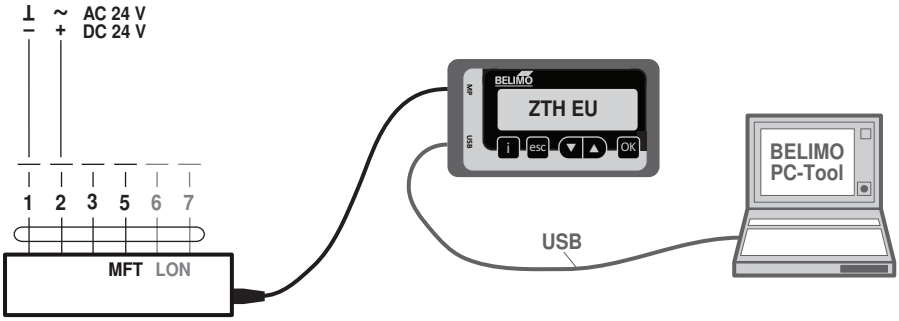
5 Service plug

For connecting parameterisation and service tools

Service

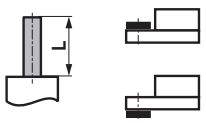
Service Tools connection

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



Dimensions [mm]

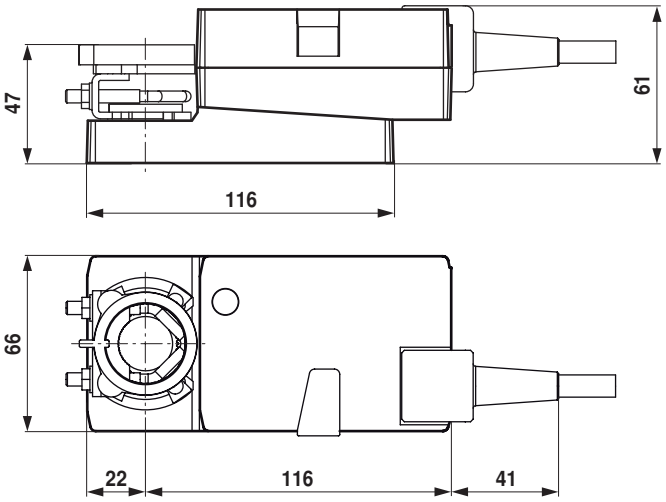
Spindle length

	Min. 37
	-

Clamping range

6...20	≥6	≤20

Dimensional drawings



Further documentation

- Applications with integrated temp. controller
- LON actuators with CO_2 control
- Actuator Plug-in description
- Sensor Plug-in description
- Controller Plug-in description
- Tool connections
- LonWorks® Glossary