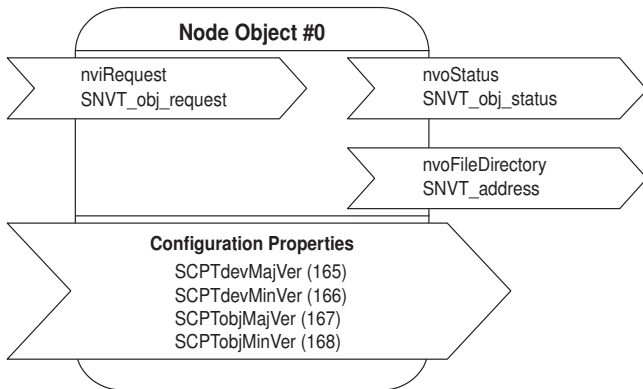


Functional Profile as per LONMARK®

The LON-capable actuator is certified by LONMARK®. The 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

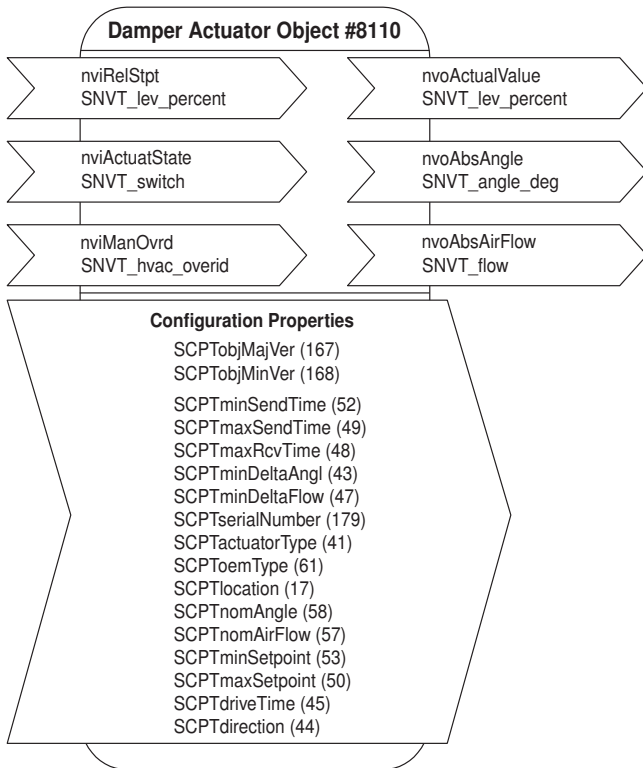
Input variable for requesting the status of a particular object in the node.

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

The nominal position in % (0...100% = Min...Max) 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

See table "Override control with the SNVT nviManOvrd"

nvoActualValue: SNVT_lev_percent

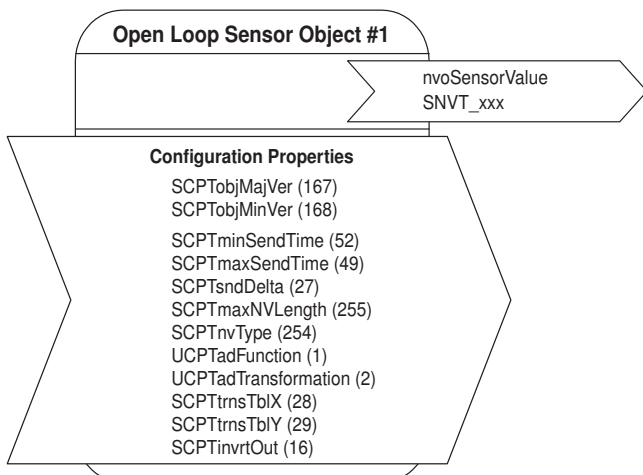
This output variable shows the current volume (in %_{Nom} of the VAV unit) and can be used for control circuit feedback or for displaying positions.

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 shows the current volume flow in l/s (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.

An active sensor (output 0 ... 32V) 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

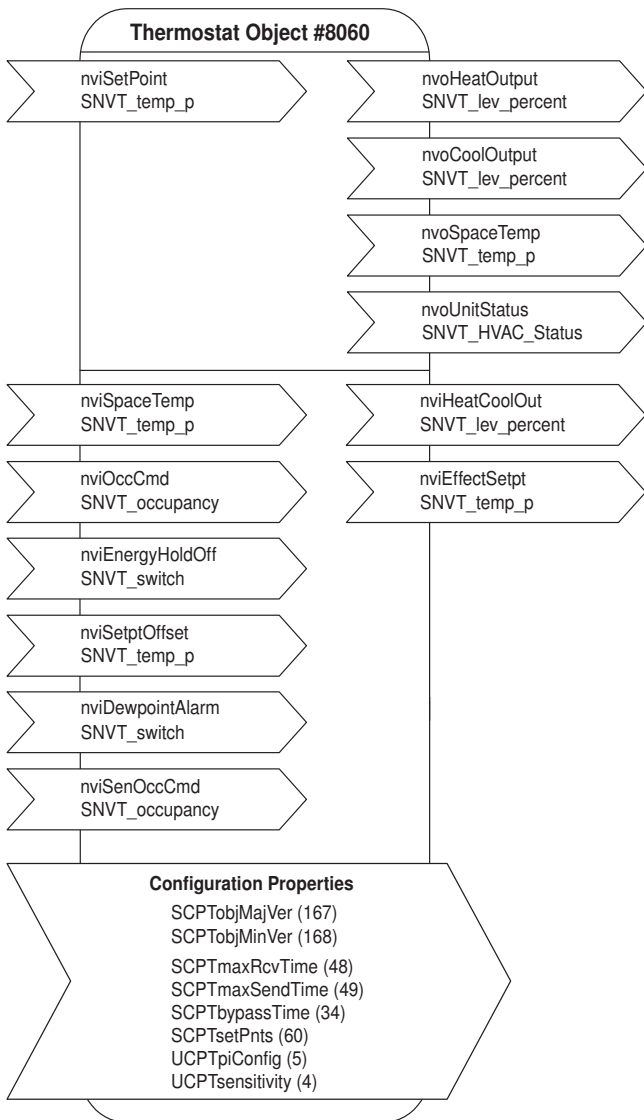
This output variable shows the current sensor value. Depending on the connected sensor, the output variable can be configured via the sensor plug-in and specifically adapted to the system.

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®

With the thermostat object LONMARK® #8060, individual room control can be realised. 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 "Functions Inputs Occupancy" on the 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 "Functions Inputs Occupancy" on the 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

Indicates the heating and cooling sequence for controlling the 6-way characterised control valves (see illustration on the 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 Inlets 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 modified 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	

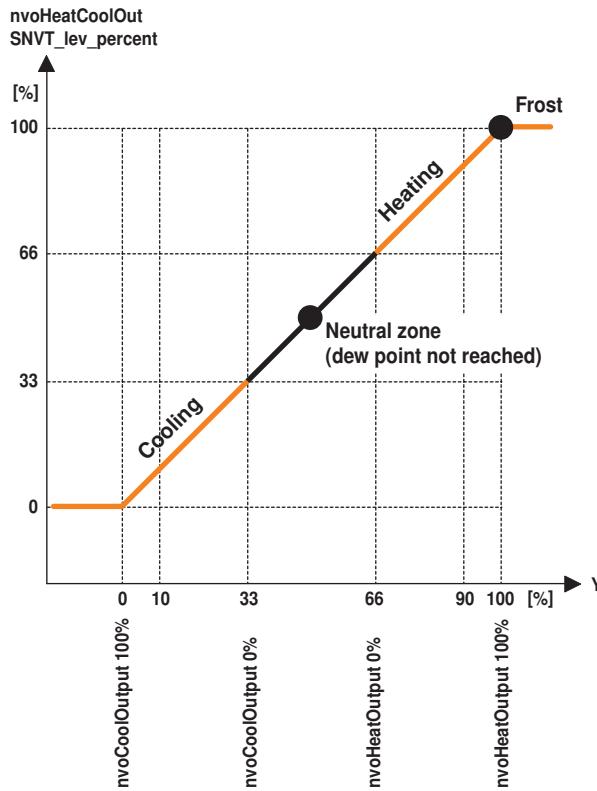
Function nvoHeatCoolOut

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.



Note

More detailed information on the Functional Profiles can be found on the website of LONMARK® (www.lonmark.org).

Override control with the SNVT nviManOvr

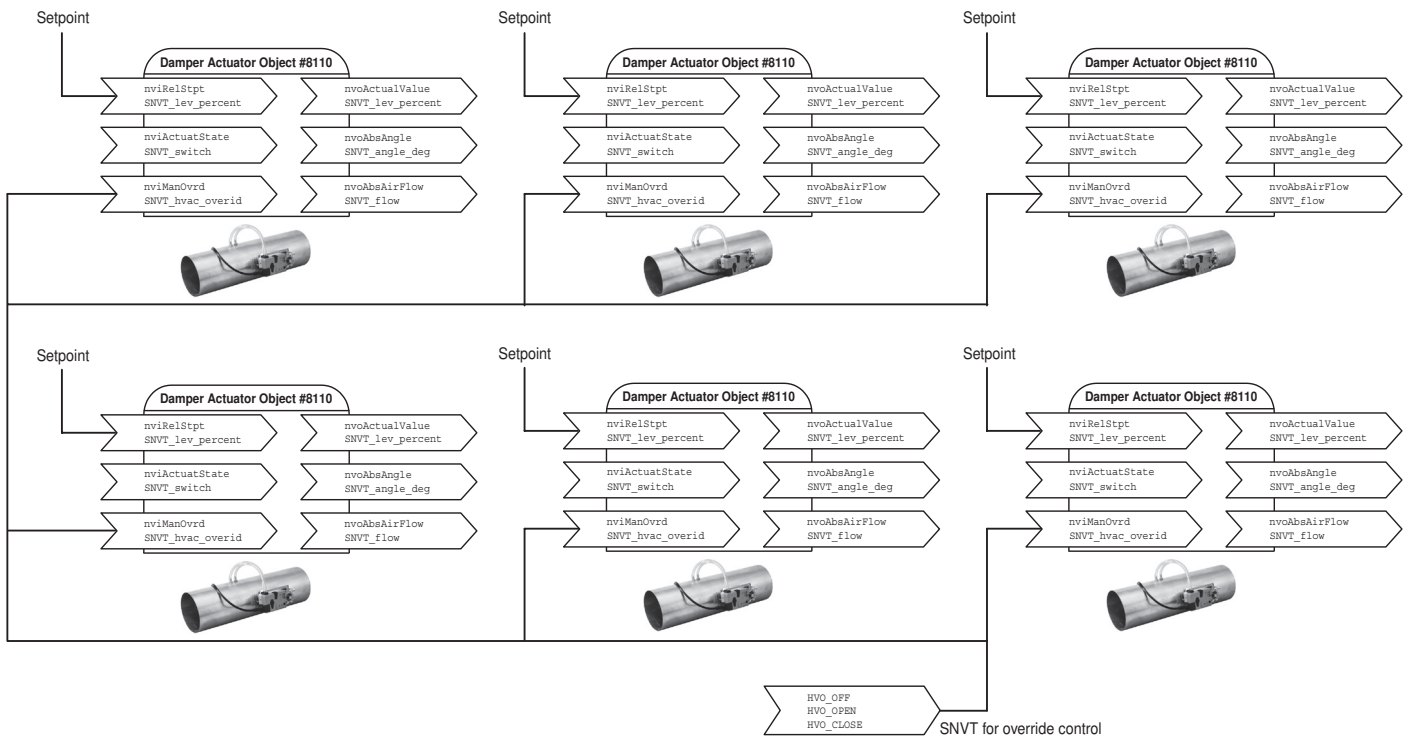
Functions	state	variable used	air flow controller
HVO_OFF	--	--	no reaction
HVO_POSITION	percent	percent	no reaction
HVO_FLOW_VALUE	flow	flow	0...nCiNomAirFlow (liter/sec). The value 0xFFFF represents invalid data.
HVO_FLOW_PERCENT	percent	percent	0%...+100.00% (0.005%). The value 0x7FFF represents invalid data.
HVO_OPEN	--	--	full open
HVO_CLOSE	--	--	full closed
HVO_MINIMUM	--	--	configured flow
HVO_MAXIMUM	--	--	configured flow
all others	--	--	not supported

Note

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

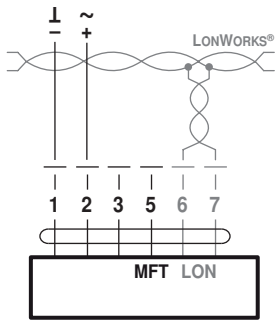
Example

Function	Description
HVO_OFF	Temperature controller setpoints are active
HVO_OPEN	All VAV units are fully open (e.g. flushing operation or night cooling)
HVO_CLOSE	All VAV units are completely closed (dampers close when system is switched off)

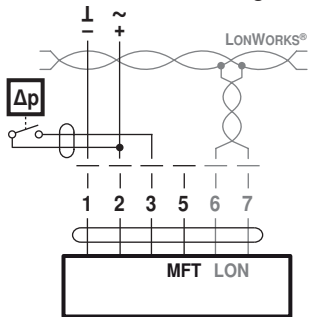


Electrical installation

Connection without sensor

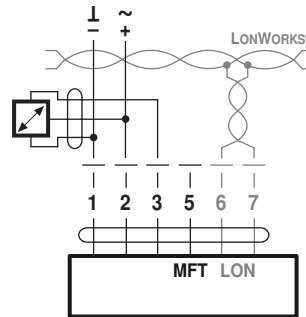


Connection with switching contact, e.g. Δp-monitor



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

Connection of active sensors, e.g. 0...10 V @ 0...50°C



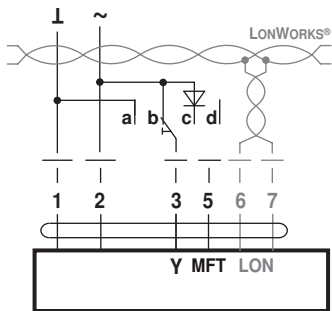
Possible voltage range:
0 ... 32 V (resolution 30 mV)
Sensor scaling:
The sensors can be scaled with the sensor plug-in (sensor table)

Local override control

If no sensor is integrated, then connection 3 (Y) is available for the protective circuit of a local override control.

Options: CLOSED – \dot{V}_{max} – OPEN

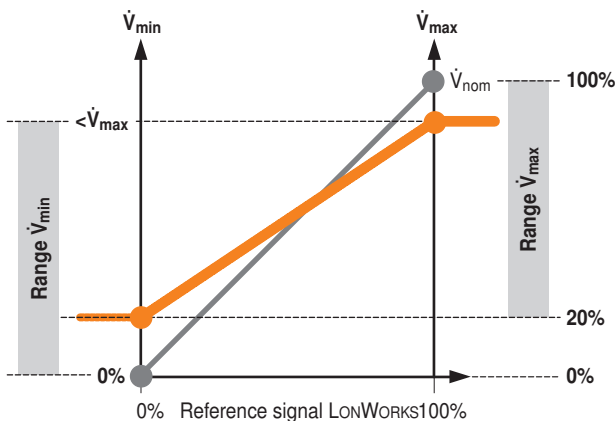
Note: Functions only with AC 24V supply!



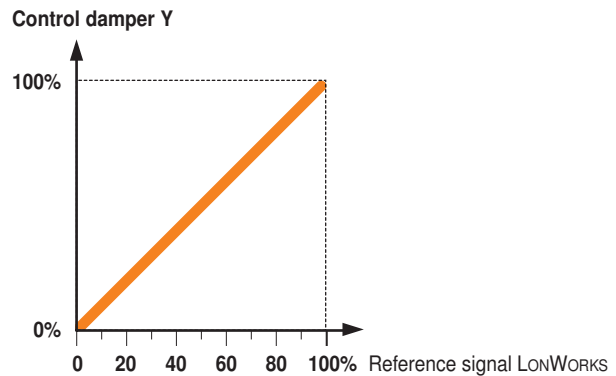
- a Damper CLOSED
- b \dot{V}_{Max}
- c Damper OPEN
- d Bus mode

Control functions - VAV / CAV

VAV-operating volumetric flow – Setting and control



Open-Loop (separate external VAV-Control)



Setting and Tool function

Designation	Adjustment values, limits, explanations	Units	Tools 5)		Remarks
			ZTH EU	PC-Tool	
System specific data					
Position	16 characters e.g.: Office 4 6.OG ZL	Text	r	r/w	
Designation	16 Characters: Unit designation, etc.	Text	r	r/w	
Address (MP)	PP		r/w	r/w	for LONWORKS applications: PP
\dot{V}_{max}	20...100 % [\dot{V}_{nom}]	m ³ /h / l/s / cfm	r/w	r/w	$\geq \dot{V}_{min}$
\dot{V}_{mid}	\dot{V}_{min} ... \dot{V}_{max}	m ³ /h / l/s / cfm	r/w	r/w	
\dot{V}_{min}	0...100 % [\dot{V}_{nom}]	m ³ /h / l/s / cfm	r/w	r/w	$\leq \dot{V}_{max}$
System altitude	0...3000	Meter	r/w	r/w	Adaptation of Δp -Sensor to system altitude (above sea level)
Controller settings					
Controller function	Volumetric flow / open loop		-	r/w	
Mode	0...10 / 2...10	Volt	-	r/w	for LONWORKS applications: 2...10
CAV function 2)	CLOSED/ \dot{V}_{min} / \dot{V}_{max} ; Shut-off level CLOSED 0.1 V CLOSED/ \dot{V}_{min} / \dot{V}_{max} ; Shut-off level CLOSED 0.5 V \dot{V}_{min} / \dot{V}_{mid} / \dot{V}_{max} ; (NMV-D2M comp.)		-	r/w	not relevant for LONWORKS® applications
Positioning signal Y	Start value: 0.6 ... 30; Stop value: 2.6 ... 32	Volt	r	r/w	not relevant for LONWORKS® applications
Feedback U	Volume / damper position / Δp		-	r/w	not relevant for LONWORKS® applications
Feedback U	Start value: 0.0 ... 8.0; Stop value: 2.0 ... 10	Volt	-	r/w	not relevant for LONWORKS® applications
Response when switched on (Power-On) 4)	No action / Adaption / Synchronisation		-	r/w	
Synchronisation behaviour	Y=0 % Y=100 %		-	r/w	Synchronisation to damper position 0 or 100 %
Bus fail position	Last set point / Damper CLOSED \dot{V}_{min} / \dot{V}_{max} / Damper OPEN		-	r/w	
Unit specific settings *) Write function only available for VAV manufacturer					
\dot{V}_{nom}	0 ... 60'000 m ³ /h	m ³ /h / l/s / cfm	r	r/(w*)	Unit specific adjustment value
$\Delta p@ \dot{V}_{nom}$	38 ... 450 Pa	Pa	r	r/(w*)	Unit specific adjustment value
Label print function			-	w	Incl. customer logo
Other settings					
Direction of rotation (for Y = 100%)	cw/ccw		r/w 1)	r/w	
Range of rotation	Adapted 3) / programmed 30...95	°	-	r/w	
Torque	100 / 75 / 50 / 25	%		r/w	% of nominal torque
Operating data					
Setpoint / actual value		m ³ /h / l/s / cfm	r	r	Trend display with print function and data storage on HD
Damper position		Pa / %			
Simulation	Damper CLOSED / OPEN \dot{V}_{min} / \dot{V}_{mid} / \dot{V}_{max} / motor stop		w	w	
Running times	Operating time, running time Ratio	h %	-	r	
Alarm messages	Setting range enlarged, mech. overload, Stop&Go ratio too high		-	r/w	
Series number	Device ID.		r	r	incl. date of manufacture
type	Type designation		r	r	
Version display	Firmware, Config table ID		r	r	
Configuration data					
Print, create PDF			-	Yes	
Save to file			-	Yes	
Log data / book	Activity log		-	Yes	incl. complete setting data

Explanations

1) Access only on operating level 2

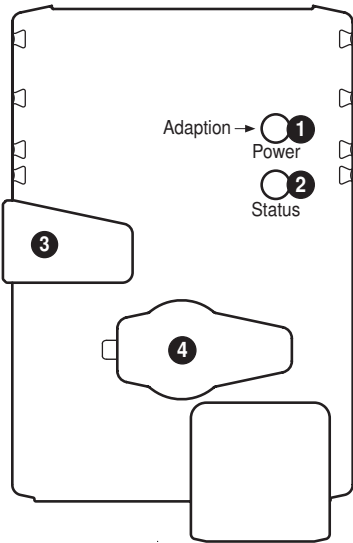
2) CAV setting for MP/MF type

3) within the mechanical limit.

4) 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 required position in order to ensure the volumetric flow defined by the positioning signal.

5) See www.belimo.eu for function and version history.

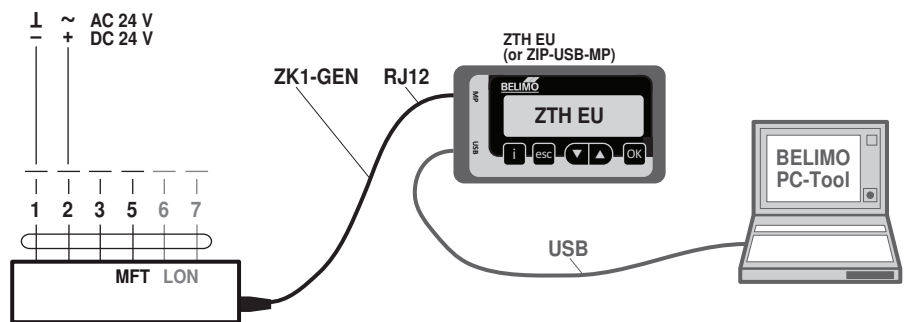
Display and operation



- 1 Push-button and LED display green**
 Off: No power supply or malfunction
 On: In operation
 Press button: Triggers angle of rotation adaptation
- 2 Service button for commissioning with LONWORKS® and LED display yellow for LON status**
 Off: The actuator is integrated ready-for-operation in the LON network
 On: No application software is loaded in the actuator
 Flashing: The actuator is ready-for-operation but not integrated in the LON network (flashing interval 2 s) (unconfigured)
 Other flashing codes: A fault is present in the actuator
 Press key: Service Pin Message is sent to the LONWORKS® network
- 3 Gear disengagement button**
 Press button: Gear disengaged, motor stops, manual override possible
 Release button: Gear engaged, synchronisation starts, followed by standard mode
- 4 Service plug**
 For connecting parameterisation and service tools

ZTH / PC-Tool - local service connection

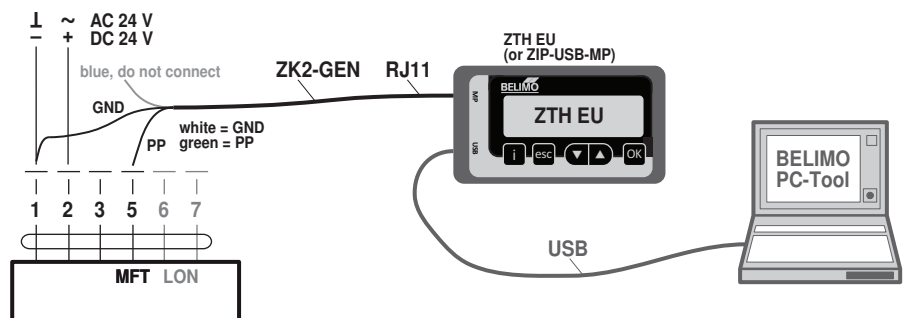
The settings and diagnostics of the VAV-Compact can be performed easily and rapidly with the Belimo PC-Tool or with the ZTH-EU service tool. When using the PC-Tool, the ZTH EU serves as an interface converter.



Download PC-Tool (MFT-P) from www.belimo.eu

ZTH / PC-Tool - remote connection

The VAV-Compact can communicate with the service tools via the PP connection (wire 5). The connection can be made in operating mode in the junction box or the control cabinet terminals. When using the PC-Tool, the ZTH EU serves as an interface converter.



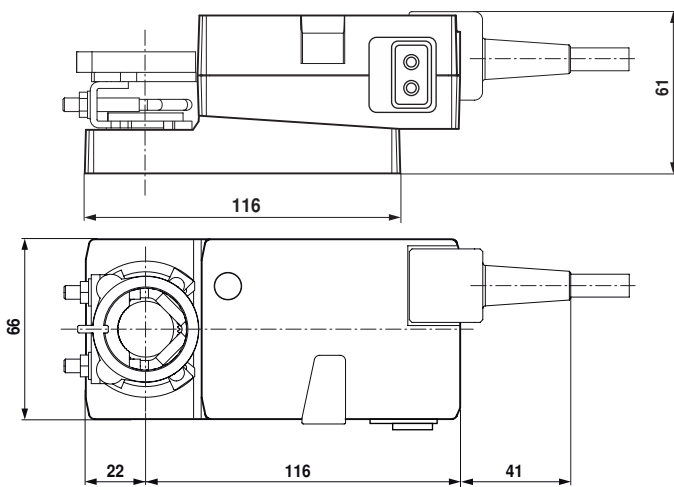
Download PC-Tool (MFT-P) from www.belimo.eu

Accessories

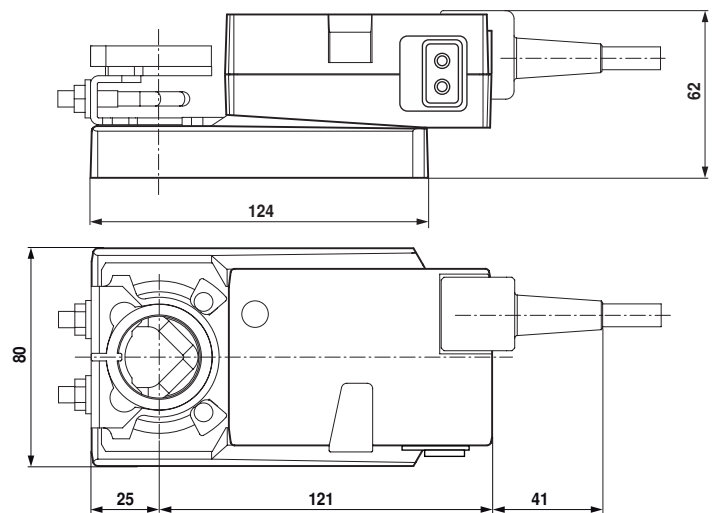
VAV-Compact / VAV-Universal	Description	
	VAV-Compact: version with integrated MP-Bus, Modbus and KNX interface VAV-Universal: VAV pressure controller, Δp sensors, actuator(spring-return, fast runner, etc.) see www.belimo.eu for more information and documentation	
Electrical accessories	Description	Type
	Connection cable 5 m, to ZTH / ZIP-USB-MP (RJ12) with service plug	ZK1-GEN
	Connection cable 5 m, to ZTH / ZIP-USB-MP (RJ11) with free wire ends	ZK2-GEN
Tools	Description	Type
	Service Tool, for MF/MP/Modbus/LonWorks® actuators and VAV controllers	ZTH EU
	Belimo PC-Tool, software for adjustments and diagnostics	MFT-P

Dimensions [mm]

Dimensional drawings LMV-D3LON



Dimensional drawings NMV-D3LON



Further documentation

- Applications with integrated temperature controller
- LON actuator with CO₂ control
- Description Actuator Plug-in
- Description Sensor Plug-in
- Description Controller Plug-in
- Tool connections
- LonWorks®: Glossary

	-MF	-MP	-KNX	LON	-MOD
Field of application: Supply and exhaust air in the comfort zone and sensor-compatible media	X	X	X	X	X
AC/DC 24 V supply	X	X	X	X	X
Integrated Δp sensor, dynamic D3, measuring range:	-20 ... 500 Pa	-20 ... 500 Pa	-20 ... 500 Pa	-20 ... 500 Pa	-20 ... 500 Pa
Actuator variants:					
– Rotary actuator	5 / 10 Nm	5 / 10 / 20 Nm	5 / 10 / 20* Nm	5 / 10 / 20* Nm	5 / 10 / 20* Nm
– Linear actuator	–	150 / 200 / 300 mm	150* / 200* / 300* mm	150* / 200* / 300* mm	150* / 200* / 300* mm
VAV function \dot{V}_{min} ... \dot{V}_{max}	X	X	X	X	X
CAV stages \dot{V}_{min} / \dot{V}_{mid} / \dot{V}_{max}	X	X	–	–	–
Open Loop (external V control)	X	X	X	X	X
DCV (Optimiser function)	–	DDC MP Partners Belimo fan optimiser	Yes, programmable	Yes, programmable	Yes, programmable
Analogue control	0/2 ... 10 V	0/2 ... 10 V	–	–	–
With bus control	–	X	X	X	X
Bus specification	–	Belimo MP bus	KNX S mode	LONWORKS FTT-10A	Modbus RTU RS485
Direct integration DDC MP Partners	–	X	–	–	–
Integration via Gateway	–		–	–	–
– BACnet		X			
– KNX		X			
– LONWORKS		X			
– Modbus RTU		cX			
Number of bus devices	–	8 per strand	64 per line segment	64 per bus segment	32 per strand
Sensor integration	–				
– passive (resistance)		X	–	–	–
– active (0...10 V)		X	X	X	X
– Switching contact		X	X	X	X
Optional control function	–	–	–	Temperature / CO ₂	–
Local forced (override)	–	CLOSED / \dot{V}_{max} / OPEN	CLOSED / \dot{V}_{max} / OPEN	CLOSED / \dot{V}_{max} / OPEN	CLOSED / \dot{V}_{max} / OPEN
Aids	–	MP-Bus Tester MP Monitor	ETS Product database	–	–
Integration tools	–	PC-Tool	ETS	LNS Tool + Plug-in	...
TypeList function (Retrofit, OEM)	–	X	(–)	(–)	(–)
Tool connection (U – PP/MP)	PP	PP/MP	PP	PP	PP
Service socket ZTH / PC-Tool	X	X	X	X	X
NFC interface	–	X	–	–	–
Assistant App	–	X	–	–	–
Service tool ZTH EU	X	X	X	X	X
PC-Tool	X	X	X	X	X
– Parameter					
– Save data					
– Trend, Logbook					
– Label Print					

* on request