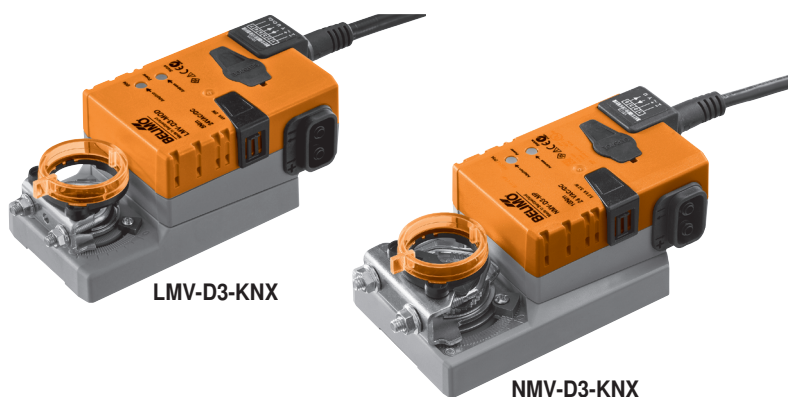


A pressure sensor, digital VAV controller and damper actuator all in one, providing a VAV-Compact solution with a communications capability for pressure-independent VAV systems in the comfort zone

- Control function: VAV
- Communication via KNX (S-Mode)
- Conversion of sensor signals
- Diagnostic socket for operating devices



LMV-D3-KNX

NMV-D3-KNX

Brief description

Application	The digital VAV-Compact has PI control characteristics and is used for pressure-independent control of VAV units in the comfort zone.
Mode of operation	The VAV-Compact is equipped with an integrated interface for KNX (S-Mode). The VAV controller can be connected with all KNX devices that have corresponding data points available.
Converter for sensors	Connection option for a sensor (active sensor or switching contact). In this way, the analogue sensor signal can be easily digitised and passed along to KNX.
Adjustable-parameter actuators	The factory settings cover the most common applications. As desired, individual parameters can be adapted for specific systems or servicing with a service tool (e.g. ZTH EU) or the ETS planning and commissioning tool.
Pressure measurement	Maintenance-free dynamic pressure valve sensor, tested in versatile applications, enables use ranging from office, hospital room mountain hotel to cruise ship.
Actuator	Two versions are available, depending on the size of the VAV unit: 5 or 10 Nm.
VAV – variable volumetric flow	The VAV-Compact is supplied with its modulating setpoint by a room temperature controller via KNX. This facilitates demand-related, power-saving ventilation in individual rooms or zones of air conditioning systems. The operating range (\dot{V}_{\min} and \dot{V}_{\max}) can be set with the PC-Tool, the ZTH EU (locally) or via KNX.
Operating and service devices	Belimo PC-Tool or service tool ZTH EU, pluggable on the VAV-Compact.
Assembly and connection	The VAV-Compact device, which is assembled on the unit by the OEM, is connected using the prefabricated connecting cable.
OEM factory settings	The VAV-Compact is mounted on the VAV unit by the unit manufacturer, who adjusts and tests it according to the application. The VAV-Compact is sold exclusively via the OEM channel for this reason.

Type overview

Type	Torque	Power consumption	For wire sizing	Weight
LMV-D3-KNX	5 Nm	2 W	4 VA (max. 5 A @ 5 ms)	Approx. 500 g
NMV-D3-KNX	10 Nm	3 W	5 VA (max. 5 A @ 5 ms)	Approx. 700 g

Technical Data

Supply	
Nominal voltage	AC 24V, 50/60 Hz / DC 24V
Operating range	AC 19.2...28.8 V / DC 21.6...28.8 V
Differential pressure sensor	
	0...600 Pa
Overload capability	±3000 Pa
Installation position	Any, no reset necessary
Fluid medium	Supply and exhaust air in the comfort zone and in applications with sensor-compatible media
Materials in contact with medium	Glass, epoxy resin, PA, TPE
Measuring air conditions	0 ... +50 °C / 5 ... 95% rH, non-condensing
Application	SUP/EXH units VAV, integrated in KNX networks
Operating volumetric flow	
\dot{V}_{nom}	OEM-specific nominal volumetric flow setting, suitable for the VAV unit
\dot{V}_{max}	20...100% of \dot{V}_{nom}
\dot{V}_{min}	0...100% of \dot{V}_{nom}
Data for KNX	
Medium	KNX TP
Number of nodes	max. 64 per line segment, reduce number of nodes with connection cable with short lines
Operating mode	S-Mode
Voltage consumption of KNX-Bus	max. 5 mA
Planning and commissioning tool	ETS4 or higher
Operation and servicing	
	Pluggable / PC-Tool (V3.9 or higher)
Push-button	Adaptation / programming
LED display	– 24V supply – Status
Actuator	
	Brushless, non-blocking actuator with power-save mode
Direction of rotation	ccw / cw
Angle of rotation	95° $\leq \alpha$, adjustable mechanical or electronic limiting
Adaptation	Capture of setting range and resolution to control range
Gear disengagement	Push-button self-resetting without functional impairment
Position Indication	Mechanical with pointer
Sound power level	max. 35 dB(A) @ 90 s
Spindle holder	– Spindle clamp, axis round 10 ... 20 mm / axis square 8 ... 16 mm – Form fit in various versions, e.g. 8 x 8 mm
Connection	Cable, 6 x 0.75 mm ²
Safety	
Protection class	III Safety extra-low voltage
Degree of protection	IP54
EMC	CE according to 2004/108/EU
Mode of operation	Type 1 (as per EN 60730-1)
Rated impulse voltage	0.5 kV (acc. to EN 60730-1)
Control pollution degree	2 (in acc. with EN 60730-1)
Ambient temperature	0...+50 °C
Non-operating temperature	20...+80 °C
Ambient humidity range	5 ... 95% rH, non-condensing (in accordance with EN 60730-1)
Maintenance	Maintenance-free

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.
- It may only be installed by suitably trained personnel. Legal regulations and regulations issued by authorities must be observed 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.
- The cable must not be removed from the device.
- When calculating the torque required, the specifications supplied by the damper manufacturers (cross-section, construction, place of installation), and the ventilation conditions must be observed.
- 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.

KNX Group Objects

Name	Type	Flags					Data point type				Values range
		C	R	W	T	U	ID	DPT_Name	Format	Unit	
Setpoint	I	C	-	W	-	-	5.001	_Scaling	1 Byte	%	[0...100] Resolution 0.4%
Override control	I	C	-	W	-	-	20.*	_Enum	1 Byte	-	0 = no override 1 = Open 2 = Closed 3 = Min 4 = Mid 5 = Max
Reset	I	C	-	W	-	-	1.015	_Reset	1 Bit	-	0 = no action 1 = reset
Adaptation	I	C	-	W	-	-	1.017	_Trigger	1 Bit	-	0 = no action 1 = adapt
Testrun	I	C	-	W	-	-	1.017	_Trigger	1 Bit	-	0 = no action 1 = Testrun
Min	I/O	C	R	W	-	-	5.001	_Scaling	1 Byte	%	[0...100] Resolution 0.4%
Max	I/O	C	R	W	-	-	5.001	_Scaling	1 Byte	%	[0...100] Resolution 0.4%
Relative position	O	C	R	-	T	-	5.001	_Scaling	1 Byte	%	[0...100] Resolution 0.4%
Absolute position	O	C	R	-	T	-	8.011 7.011	_Rotation_Angle _Length_mm	2 Byte	° mm	[-32,768...32,768] [0...65,535]
Relative volumetric flow	O	C	R	-	T	-	5.001	_Scaling	1 Byte	%	[0...100] Resolution 0.4%
Absolute volumetric flow	O	C	R	-	T	-	14.077	_Value_Volume_Flux	1 Byte	m³/s	Resolution: 1 m³/s
Nominal volumetric flow	O	C	R	-	T	-	14.077	_Value_Volume_Flux	4 Byte	m³/s	Resolution: 1 m³/s
Fault state	O	C	R	-	T	-	1.002	_Bool	1 Bit	-	0 = no fault 1 = fault
Overridden	O	C	R	-	T	-	1.002	_Bool	1 Bit	-	0 = not active 1 = active
Gear disengaged	O	C	R	-	T	-	1.002	_Bool	1 Bit	-	0 = engaged 1 = disengaged
Service information	O	C	R	-	T	-	22.*	_Bitset16	2 Byte	-	Bit 0 (1) Excessive utilisation Bit 1 (2) Mechanical travel increased Bit 2 (4) Mechanical overload Bit 3 (8) – (Not used) Bit 4 (16) – (Not used) Bit 5 (32) – (Not used) Bit 6 (64) – (Not used) Bit 7 (128) – (Not used) Bit 8 (256) Internal activity Bit 9 (512) Bus watchdog triggered
Sensor value	O	C	R	-	T	-					
- Relative humidity							9.007	_Value_Humidity	2 Byte	% rH	[0...670,760]
- Air quality							9.008	_Value_AirQuality	2 Byte	ppm	[0...670,760]
- Voltage mV							9.020	_Value_Voltage	2 Byte	mV	[-670,760...670,760]
- Voltage scaled							7.*	-	2 Byte	-	[0...65,535]
- Voltage scaled %							5.001	_Scaling	1 Byte	%	[0...100]
- Switch							1.001	_Switch	-	-	0/1

KNX Group Objects (Continued)

Setpoint	Specification of set volume or actuator position in % between the parameterised Min and Max limits. The operating mode is set by the manufacturer of the volumetric flow unit.
Override control	Overriding the setpoint with defined override states. As data point type, 1 Byte (unsigned) is recommended (DPT 20.*)
Reset	Resetting the stored service messages (see KNX group object <i>Service information</i>).
Adaptation	Perform the adaptation. The first-time adaptation is performed by the manufacturer of the volumetric flow unit. An active adaptation is signaled in Bit 8 of <i>Service information</i> .
Testrun	Performance of a testrun that checks the entire operating range. An active testrun is signaled in Bit 8 of <i>Service information</i> . After completion, detected faults (mechanical overload, mechanical travel increased) are signaled in <i>Service Information</i> .
Min	Minimum Limit (volumetric flow or position) in % of the nominal volumetric flow V_{nom} Caution: Changing the setting may result in malfunctions.
Max	Maximum Limit (volumetric flow or position) in % of the nominal volumetric flow V_{nom} Caution: Changing the setting may result in malfunctions.
Relative position	Current actuator position in %
Absolute position	Absolute position/stroke The data point type is to be selected depending on the type of movement: [°] DPT 8.011 [mm] DPT 7.011
Relative volumetric flow	Relative volumetric flow in % of the nominal volumetric flow V_{nom}
Absolute volumetric flow	Absolute volumetric flow in m^3/s
Nominal volumetric flow	Nominal volumetric flow in m^3/s The nominal volumetric flow is determined by the manufacturer of the volumetric flow unit.
Fault state	Collective fault based on Bit 0 ... Bit 7 of <i>Service information</i>
Overridden	Signaling of an active override control (OPEN/CLOSED) The device can be commanded via the KNX group object <i>Override control</i> or via the forced switching at the input Y/3. Only the override controls OPEN and CLOSED are signaled.
Gear disengaged	Signaling an active gear disengagement
Service information	Detailed information regarding device status As data point type, Bitset 16-Bit is recommended (DPT 22.*) Status information Bit 0: Motor operation in relation to operating period too high Bit 1: Mechanical travel increased, e.g. defined end position exceeded Bit 2: Mechanical overload, i.e. defined end position not reached Bit 3 ... 7: not used with this device type Bit 8: Internal activity (Synchronisation, Adaptation, Testrun, ...) Bit 9: Bus watchdog triggered Bit 0 ... Bit 7 are stored by the device and can be reset with the KNX group object <i>Reset</i> . As an alternative, they can be read as collective fault state.
Sensor value	The representation of the sensor value is dependent on the parameterization. See section "KNX parameters – Sensor"

KNX parameters – Common

Altitude [m]	<p>The specification of the system altitude increases the precision of the volumetric flow control.</p> <p>Values range: 0 ... 3000 m Factory setting: 500 m</p>
Setpoint at bus failure	<p>A setpoint can be defined for cases of communication interruption.</p> <p>Values range: None (last setpoint) Open Closed Mid Factory setting: None (last setpoint)</p> <p>The monitoring of the communication takes place for the KNX group objects <i>Setpoint</i> and <i>Override control</i>. If none of the objects is written within the parameterised monitoring time, the bus fail position is set and signaled in the <i>Service information</i> (Bit 9).</p>
Bus timeout [min]	<p>Monitoring time for the detection of a communication interruption.</p> <p>Values range: 1 ... 120 min Factory setting: –</p>
Increment for value update [%]	<p>Actual values (position, volumetric flow) are transferred at the time of a value change insofar as these change by the parameterised difference value. If the relative value changes by the difference value, not only the relative actual value but also the absolute actual value are transferred.</p> <p>Values range: 0 ... 100% Factory setting: 5%</p> <p>The transfer is deactivated with 0% in the event of a value change.</p>
Repetition time [s]	<p>Repetition time for all position, volume and sensor actual values. Status objects are not transferred except with a change.</p> <p>Values range: 0 ... 3600 s Factory setting: 0 = no periodic transmission</p>

KNX parameters – Sensor

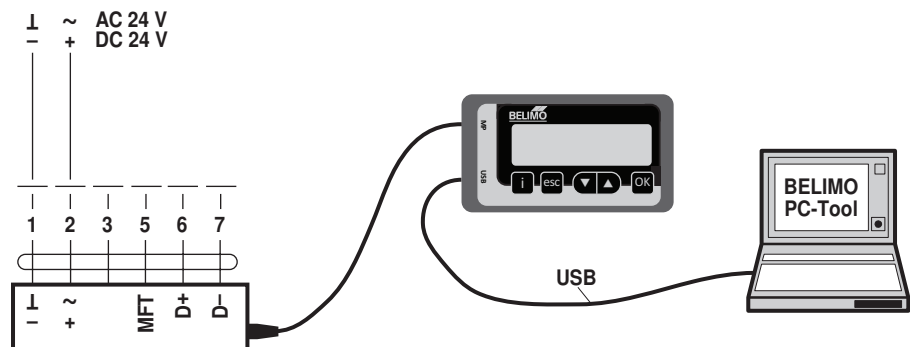
Sensor type	<p>The input Y/3 can be used to connect a sensor. The sensor value is digitised and made available as KNX communication object.</p> <p>Values range: No sensor Active sensor (0 ... 32 V) Switch (0 / 1) Humidity sensor (0-10 V corresponds to 0 – 100%) Air quality sensor CO2 (0-10 V corresponds to 0 – 2000 ppm) Factory setting: No sensor</p> <p>A switching to Y/3 is treated as local override in the absence of sensor parameterization.</p>
Increment for sensor value update	<p>The sensor value is transferred at the time of a value change insofar as this changes by the parameterised difference value.</p> <p>Values range: 0 ... 65,535 Factory setting: 1</p> <p>The transfer is deactivated with 0 in the event of a value change. Without value change, the sensor value is sent because of the repetition time.</p>
Output (for sensor type "Active sensor")	<p>Only for "Active sensor" sensor type</p> <p>Values range: Sensor value mV (DPT 9.020) Sensor value scaled (DPT 7.xxx) Sensor value scaled % (DPT 5.001) Factory setting: –</p> <p>For "Sensor value mV", the measured voltage is made available without processing. In the case of the scaled sensor values, a linear transformation can be defined with two points.</p>
Polarity (for sensor type "Switch")	<p>The polarity can be defined for the sensor type "Switch".</p> <p>Values range: Normal Inverted Factory setting: –</p>

Work procedures

- Product database** The product database for the import in ETS4 or higher is available at the Belimo website www.belimo.eu (Download Center)
- Setting physical address** The programming of the physical address takes place by ETS and the programming button on the device.
If the programming button is not accessible or accessible only with difficulty, then the address can be set using a point-to-point connection: "Overwrite Individual Address: 15.15.255"
As a third possibility, the physical address can be programmed on the basis of the KNX series number (e.g. with Moov'n'Group). The KNX series number is placed on the device in two versions. One sticker can be removed for adhesion on the commissioning journal, for example.
- Firmware upgrade** The KNX firmware of the device is updated automatically with the programming of the application program insofar as the product database has a more recent version.
The first programming procedure takes somewhat longer in such cases (>1 min).
- Resetting to KNX factory settings** If necessary, the device can be reset manually to the KNX factory settings (physical address, group address, KNX parameters).
For the reset, the programming button on the device must be pressed down for at least 5 s during start-up.

Tool connection

- Settings and diagnostics** The settings and diagnostics of the connected VAV-Compact controller can be checked and adjusted easily and rapidly with the Belimo PC-Tool or with the ZTH EU service tool.
- On-board service connection** The service connection integrated in the VAV-Compact enables a rapid connection of the operating device used.



Electrical installation

Wiring diagrams

Note

Connection via safety isolating transformer.

Note

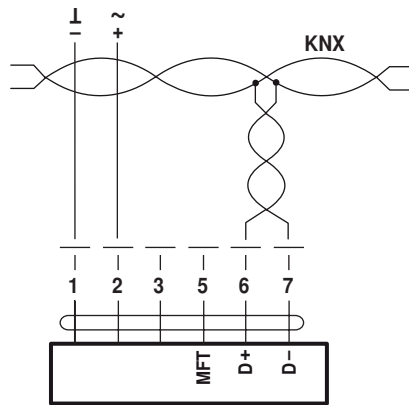
Signal assignment KNX:

D+ = KNX+ (pink → red)

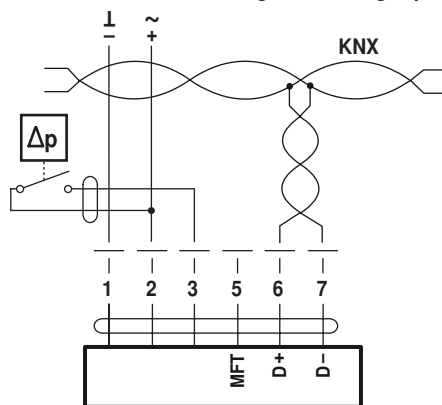
D- = KNX- (grey → black)

The connection to the KNX line should take place via WAGO connecting clamp 222/221.

Connection without sensor



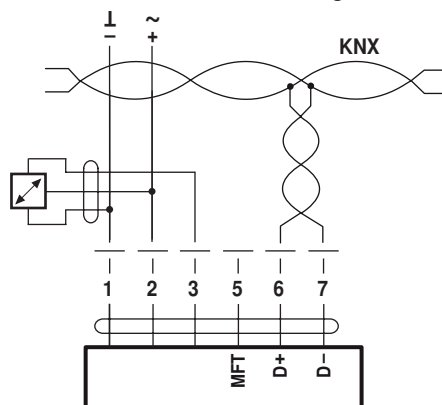
Connection with switching contact, e.g. Δp -monitor



Requirements for switching contact:

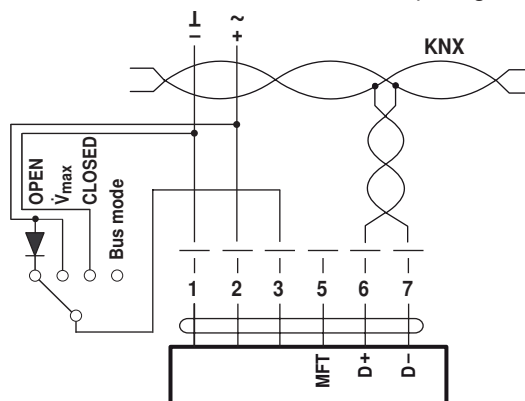
The switching contact must be able to accurately switch a current of 16 mA at 24 V.

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



Possible input voltage range:
0...32 V (resolution 30 mV)

VAV controller with local override control (analogue override)



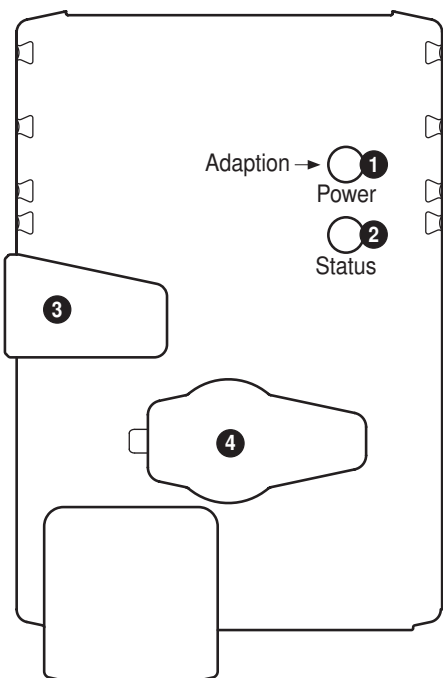
Note

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.

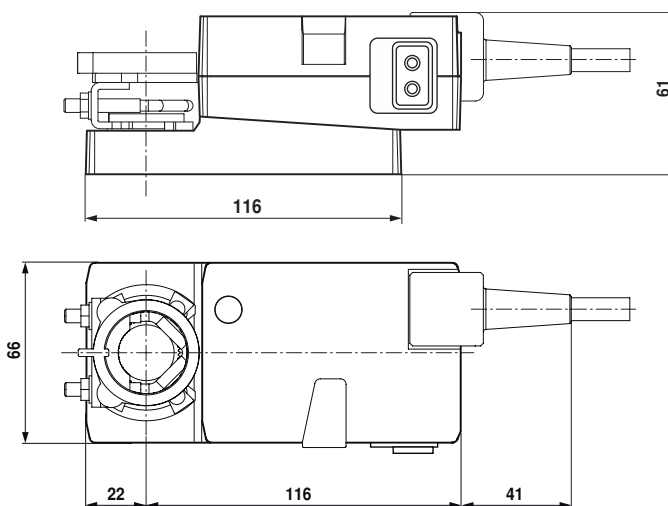
Operating controls and indicators



- ① **Push-button and LED display green**
 Off: No power supply or fault
 On: Operation
 Press button: Triggering the angle of rotation adaptation
- ② **Push-button and LED display yellow**
 Off: The actuator is ready
 On: Adaptation or synchronising process active or actuator in programming mode (KNX)
 Flashing: Connection test (KNX) active
 Press button: in operation (>1 s): Switch the programming mode On and Off (KNX) when starting (>5 s): Reset to factory setting (KNX)
- ③ **Gear disengagement button**
 Press button: Gear disengaged, motor stops, manual override possible
 Release button: Gear engaged, synchronisation starts, followed by standard operation
- ④ **Service plug**
 For connecting parameterising and service tools

Dimensions [mm]

Dimensional drawings LMV-D3-KNX



Dimensional drawings NMV-D3-KNX

