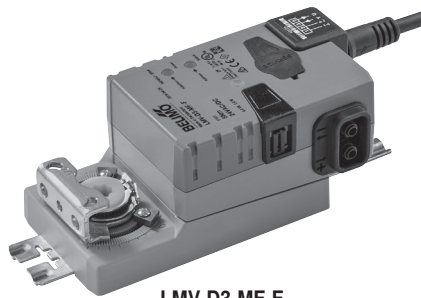


OEM customer-specific VAV-Compact version comprised of pressure sensor, digital VAV controller and damper actuator for pressure-independent VAV and CAV systems in the comfort zone

- Control (0)2...10 V
- Service socket for operating devices



LMV-D3-MF-F
NMV-D3-MF-F

Brief description

Application	The VAV-Compact with its PI control characteristic is used for the pressure-independent control of VAV units in the comfort zone.
Pressure measurement	The integrated D3 differential pressure sensor is also suitable for very small volumetric flows. The maintenance-free sensor technology enables a wide range of applications in the comfort zone: residential construction, office, hospital, hotel, cruise ship, etc.
Actuator	A variety of actuator versions (5 or 10 Nm) are available to the VAV unit manufacturer for the different VAV unit designs.
Control function	Volumetric flow (VAV/CAV) or Open Loop (for integration in external VAV control loop).
VAV (VVS) – Variable volumetric flow	Demand-dependent specification of the volumetric flow $V'_{min}...V'_{max}$ via modulating reference variable (0/2...10 V), e.g. room temperature/CO ₂ controller or DDC, for energy-saving air conditioning of individual rooms or zones.
CAV (KVS) - Constant volumetric flow	Step mode (via switching contacts) for constant volume applications CLOSE / V'_{min} / V'_{mid} / V'_{max} / OPEN.
DCV – Demand Controlled Ventilation	VAV-Compact-MF versions are not Fan Optimiser-capable! Integration in a DCV/Fan Optimiser system requires VAV-Compact versions with integrated Bus interface (MP, KNX or MOD). For more information, see www.belimo.com .

Operating and service devices Service tool ZTH EU, PC-Tool service socket: Local plug-in or via PP connection.

Electrical connection The connection is made using the integrated connecting cable.

Sales, assembly and setting The VAV-Compact is mounted by the VAV unit manufacturer (OEM), and the application is adjusted and calibrated accordingly. The VAV-Compact is sold exclusively via the OEM channel for this reason.

Type overview MF versions	Type	Torque	Power consumption	For wire sizing	Weight
	LMV-D3-MF-F	5 Nm	2 W	3.5 VA (max. 8 A @ 5 ms)	Approx. 500 g
	NMV-D3-MF-F	10 Nm	3 W	5 VA (max. 8 A @ 5 ms)	Approx. 700 g

The two MF versions are specially produced customer versions of the VAV-Compact (OEM version). They have no bus interface are thus not Fan Optimiser-capable. These versions receive OEM-specific adjustment and labelling on the sensors, damper shafts and fastening systems used. See VAV units manufacturer documentation. Designation, e.g. LMV-D3-MF-F ABC (ABC = customer designation)

Other versions The VAV-Compact is also available with built-in interface for direct integration in MP-Bus systems, KNX, Modbus and BACnet. For more information and documentation, see www.belimo.com.

Safety notes

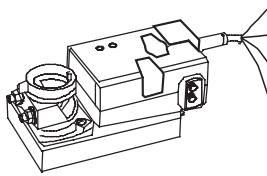


- The device is not allowed to be used outside the specified field of application, especially not in aircraft or in any other airborne means of transport.
- Outdoor applications: Only possible if no (sea) water, snow, ice, solar radiation or aggressive gases act directly on the actuator and it is guaranteed that the ambient conditions are always within the limit values according to the data sheet.
- Only authorised specialists may carry out installation. All applicable legal and government agency regulations must be complied with during use.
- The device may be opened only at the manufacturer's plant. It does not contain any parts that can be replaced or repaired by the user.
- Cables must not be removed from the device.
- When calculating the torque requirement, the specifications supplied by the damper manufacturers (cross-section, construction, installation situation), and the ventilation conditions must be observed.
- The device contains electrical and electronic components and is not permitted to be disposed of as household waste. Local and currently valid legislation must be observed.

Electrical installation

Notes

- Supply via safety isolating transformer!
- It is recommended to run connections 1 to 5 (PP) on accessible terminals (e.g. floor distributors) in order to enable remote access for diagnostics and service tasks.



No.	Designation	Cable colour	Function
1	⊥ -	black	} AC/DC 24 V supply
2	~ +	red	
3	◀ Y	White	Reference signal / Override
5	▶ U	orange	Actual value signal / Tool connection

See separate documentation for description of function and application

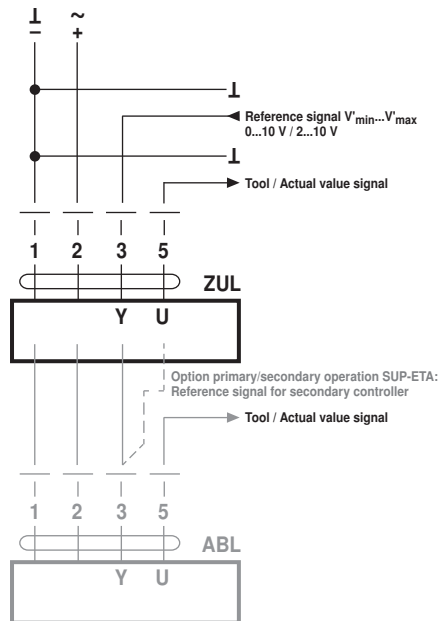
Technical data		
Electrical data	Nominal voltage	AC/DC 24 V, 50/60 Hz
	Operating range	AC 19.2...28.8 V / DC 21.6...28.8 V
	Performance data	See type overview (page 1)
	Connection	Cable, 4 x 0.75 mm ² , prefabricated
Volumetric flow controller	Control function	VAV/CAV and Open Loop
	V'_{nom} ¹⁾	Nominal flow rate setting OEM-specific, matches the VAV unit
	$\Delta p @ V'_{nom}$ ¹⁾	38...450 Pa
	V'_{max}	20...100% of V'_{nom} , adjustable
	V'_{mid}	$>V'_{min}...<V'_{max}$, adjustable
	V'_{min}	0...100% of V'_{nom} , adjustable ($<V'_{max}$)
Analogue control - VAV	Mode (Y)	0...10 V / 2...10 V / (Y and U5 individually) adjustable, Input impedance 100 k Ω (0/4...20 mA with 500 Ω resistance)
	Actual value signal (U)	0...10 V / 2...10 V, max. 0.5 mA Volumetric flow / Damper position / Δp , reversible
Step control - CAV	Operating modes	CLOSE / V'_{min} / V'_{mid} *) / V'_{max} / OPEN *) *) AC 24 V supply required
Operation and service	Service Tool ZTH EU, PC-Tool	Local connector socket / Remote via PP connection
	LED	Supply and status display
	Push-button	Angle-of-rotation adaptation and test function
Actuator	Rotary version	Brushless, blockage-proof actuator with power-save mode
	Direction of rotation ¹⁾	Left/right, adjustable
	Angle of rotation	95°, adjustable mechanical or electrical limitation
	Gear disengaged	Push button, self-resetting without functional limitation
	Position indication	For read-out (tool)
	Shaft holder	Form fit
Volumetric flow measurement	Differential pressure sensor	Belimo D3 sensor, dynamic measurement principle
	Measurement, nominal voltage range	-20...500 Pa, 0...500 Pa
	Overload capacity	± 3000 Pa
	Altitude compensation	Adaptation to system altitude (adjustment range 0...3000 meters above sea level)
	Installation position	Position-independent, no reset necessary
	Materials in contact with measuring materials	Glass, epoxy resin, PA, TPE
	Condition of measuring air	Comfort zone 0...50°C/5...95% RH, non-condensing
Security	Protection class IEC/EN	III Protective extra low voltage (PELV)
	Degree of protection IEC/EN	IP54
	EMC	CE according to 2014/30/EU
	Certification IEC/EN	IEC/EN 60730-1 and IEC/EN 60730-2-14
	Rated impulse voltage	0.8 kV
	Supply / Control	
	Control pollution degree	3
	Ambient temperature	-30...50°C
	Storage temperature	-40...80°C
	Ambient humidity	95% RH, non-condensing
	Maintenance	Maintenance-free. Depending on use, the differential pressure pickup device (measuring cross, disc, etc.) of the VAV unit must be checked now and then and cleaned as needed.

¹⁾ Setting by VAV manufacturer (OEM)

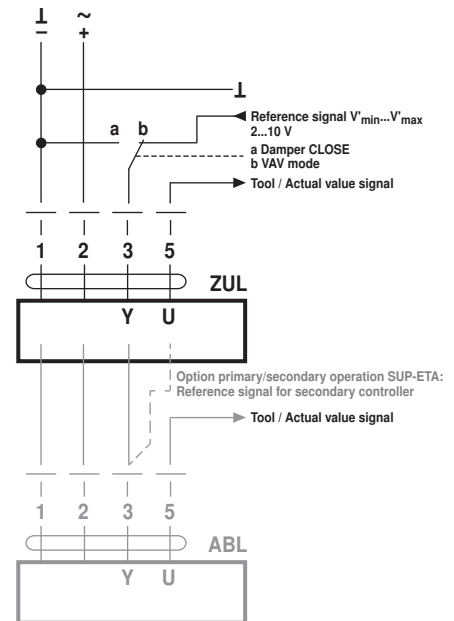
VAV - Variable operation $V'_{min} \dots V'_{max}$

Wiring diagrams

Example 1:
VAV, analogue reference signal



Example 2:
VAV with shut off (CLOSE), 2...10 V mode



Description:
Damper CLOSE via 0...10 V reference signal (Mode 2...10 V)
Setting parameters:
Mode 2...10 V, Shut-off level 0.1 V or 0.5 V
If the necessary switching threshold of 0.1 V cannot be achieved, then the value can be changed to 0.5 V with the PC-Tool.
Function: Default 0.1 V: Shut-off level 0.5 V:
Damper CLOSE <0.1 V <0.5 V
 V'_{min} >0.1...2 V >0.5 V...2 V
 $V'_{min} \dots V'_{max}$ 2...10 V 2...10 V
For CAV applications, the shut-off level must not be set to 0.5 V, because otherwise the open connection 3 will be interpreted as damper CLOSE.

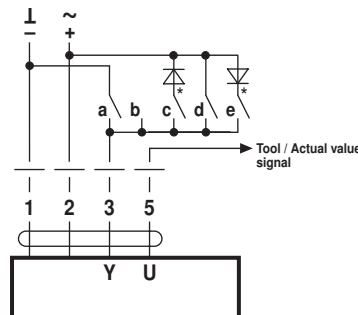
CAV – Step mode CLOSE / V'_{min} / V'_{mid} / V'_{max} / OPEN

CAN control

The VAV-Compact can be adapted for constant volumetric flow applications with the PC-Tool, "CAV function" option on the desired CAV function template:
– Damper CLOSE – V'_{min} – V'_{max} – Damper OPEN (default)
– Damper CLOSE – V'_{min} – V'_{mid} – V'_{max} – Damper OPEN (NMV-D2M-compatible)

Wiring diagrams

Notes
• Note that the contacts are mutually interlocking.
• DC supply: * c and e are not available with DC 24 V.
• Setting parameters for CAV application:
Mode 2...10 V, shut-off level 0.1 V
The shut-off level cannot be set to 0.5 V with CAV applications, because otherwise the open connection 3 will be interpreted as damper CLOSE.



PC-Tool setting "CAV function":
2...10 V, Shut-off level 0.1 V

CAV function CLOSE – V'_{min} – V'_{max} – OPEN (Default)

	a	b	c	d	e
Signal	\perp		\sim	\sim	\sim
	-			+	
Protective circuit terminal 3	$\frac{ }{3}$	$\frac{ }{3}$	$\frac{\text{N}}{3}$	$\frac{ }{3}$	$\frac{\text{N}}{3}$
Mode 2...10 V	CLOSE	V'_{min}	CLOSE *	V'_{max}	OPEN *
Mode 0...10 V	V'_{min}	V'_{min}	CLOSE *	V'_{max}	OPEN *

PC-Tool setting "CAV function":
CLOSE – V'_{min} – V'_{max} . Shut-off level CLOSE: 0.1 V

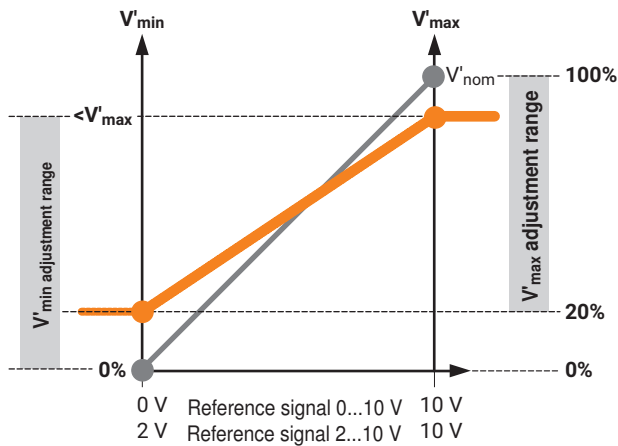
CAV function CLOSE – V'_{min} – V'_{mid} – V'_{max} – OPEN

	a	b	c	d	e
Signal	\perp		\sim	\sim	\sim
	-			+	
Protective circuit terminal 3	$\frac{ }{3}$	$\frac{ }{3}$	$\frac{\text{N}}{3}$	$\frac{ }{3}$	$\frac{\text{N}}{3}$
Mode 2...10 V	CLOSE	V'_{min}	V'_{mid} *	V'_{max}	OPEN *
Mode 0...10 V	V'_{min}	V'_{min}	V'_{mid} *	V'_{max}	OPEN *

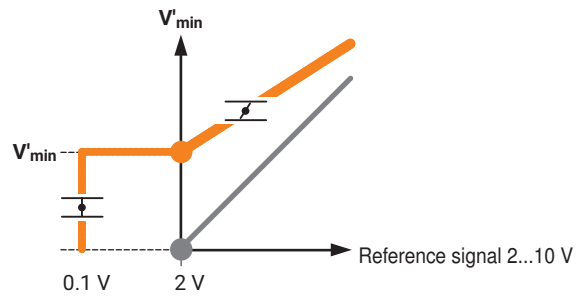
PC-Tool setting "CAV function":
CLOSE – V'_{min} – V'_{mid} – V'_{max} (NMV-D2M-compatible)

Control functions - VAV / CAV

VAV operating volumetric flow - Setting and control



Damper CLOSE via 0...10 V reference signal (Mode 2...10 V)



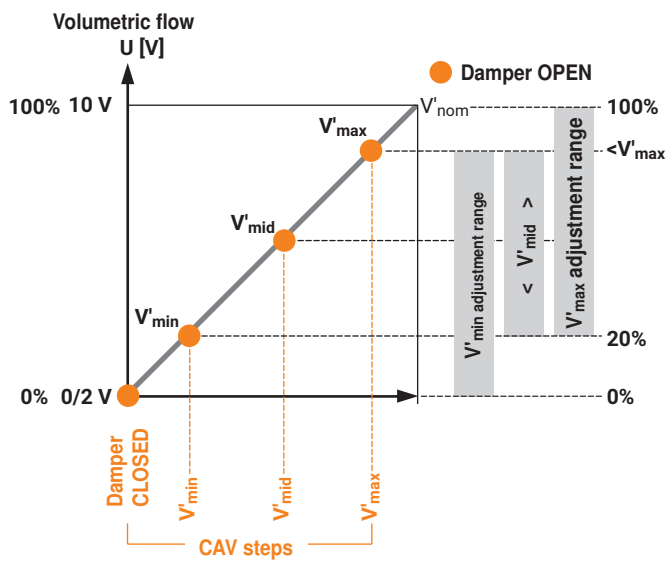
Description:

Setting parameters: Mode 2...10 V, shut-off level 0.1 V or 0.5 V
 If the necessary switching threshold of 0.1 V cannot be achieved, then the value can be changed to 0.5 V with the PC-Tool.

Function	Default 0.1 V	Shut-off level 0.5 V
Damper CLOSED	<0.1 V	<0.5 V
V'_{min}	>0.1...2 V	>0.5...2 V
$V'_{min}...V'_{max}$	2...10 V	2...10 V

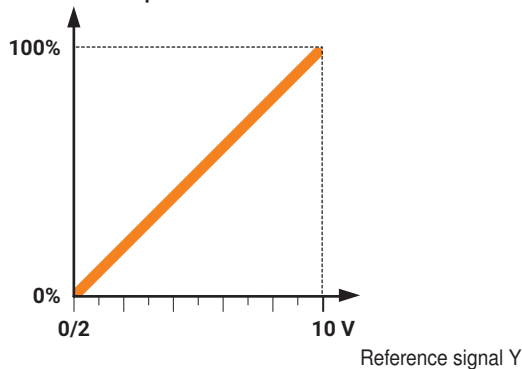
For CAV applications, the shut-off level must not be set to 0.5 V, because otherwise the open connection 3 will be interpreted as damper CLOSE.

CAV Operating volumetric flow setting

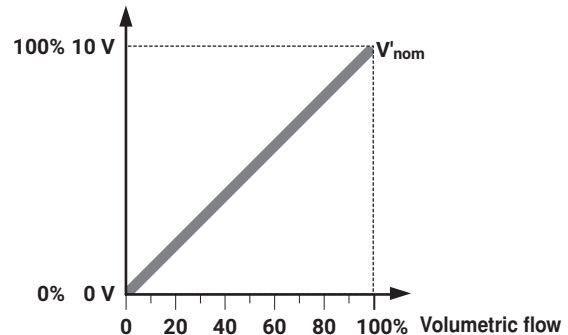


Open Loop (separate external VAV control)

Control of damper Y



Volumetric flow sensor value



Settings and tool functions

Designation	Setting values, limits, explanations	Units	Tools ⁶⁾		Remarks
			ZTH EU	PC-Tool	
System-specific data					
Position	16 characters, e.g. Office 4 6th OG ZL	Text	r	r/w	
Designation	16 characters: Unit designation, etc.	Text	r	r/w	
V'max	20...100% [V'nom]	m ³ /h / l/s / cfm	r/w	r/w	>/= V'min
V'mid	V'min...V'max	m ³ /h / l/s / cfm	r/w	r/w	
V'min	0...100% [V'nom]	m ³ /h / l/s / cfm	r/w	r/w	</= V'max
Altitude of installation	0...3000	Meter	r/w	r/w	Adaptation of Δp sensor to altitude (meters above sea level)
Controller Settings					
Control function	Volumetric flow / Open Loop		-	r/w	
Mode	0...10 / 2...10	Volt	r/w ²⁾	r/w	
CAV function	CLOSE/V'min/V'max; Shut-off level CLOSE 0.1 V CLOSE/V'min/V'max; Shut-off level CLOSE 0.5 V V'min/V'mid/V'max; (NMV-D2M-comp.)		-	r/w	For explanation, see ³⁾
Positioning signal Y	Start value: 0.6...30; Stop value: 2.6...32	Volt	r	r/w	
Feedback U	Volume / Damper position / Δp		-	r/w	Definition of feedback signal
Feedback U	Start value: 0.0...8.0; Stop value: 2.0...10	Volt	-	r/w	
Behaviour when switched on (Power-on) ⁵⁾	No action / Adaption / Synchronisation		-	r/w	
Synchronisation behaviour	Y=0% Y=100%		-	r/w	Synchronisation at damper position 0 or 100%
Unit-specific settings					
V'nom	0...60000 m ³ /h	m ³ /h / l/s / cfm	r	r/(w) ¹⁾	Unit-specific setting value
Δp@V'nom	38...450 Pa	Pa	r	r/(w) ¹⁾	Unit-specific setting value
Print function label			-	w	Incl. customer logo
Other settings					
Direction of rotation (for Y=100%)	cw/ccw or ▲/▼		r/w ²⁾	r/w	
Range of rotation	Adapted ⁴⁾ / programmed 30...95	°	-	r/w	
Torque	100 / 75 / 50 / 25	%		r/w	% of nominal torque
Operating data					
Actual value / Setpoint Damper position		m ³ /h / l/s / cfm Pa/%	r	r	Trend display with print function and data saving to HD
Simulation	Damper OPEN/CLOSE V'min / V'mid / V'max / Motor Stop		w	w	
Running times	Operating time, running time Ratio (relation)	h %	-	r	
Alarm messages	Setting range enlarged, Mech. overload, Stop&Go ratio too high		-	r/w	
Serial number	Device ID		r	r	Incl. production date
Type	Type designation		r	r	
Version display	Firmware, Config. table ID		r	r	
Configuration data					
Print, create PDF			-	yes	
Backup in file			-	yes	
Log data / Logbook	Activities log		-	yes	Incl. complete setting data

Explanations

1) Write function accessible only for VAV manufacturers

2) Access only via Servicing level 2

3) Shut-off level 0.1/0.5 V - Application: VAV mode, in the mode 2...10 V, "Damper CLOSE" via 0...10 V control signal.

If the necessary switching threshold of 0.1 V cannot be achieved, then the threshold can be changed to 0.5 V.

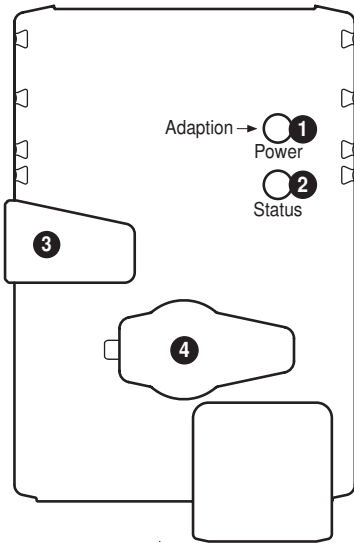
Note on CAV application: The shut-off level must not be set to 0.5 V. When line 3 (Y) is open, "Damper CLOSE" is activated instead of "V'min".

4) Within the mechanical limitation.

5) The first time the supply voltage is switched on, i.e. at the time of initial 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 control signal.

6) For function and version overview, see www.belimo.com.

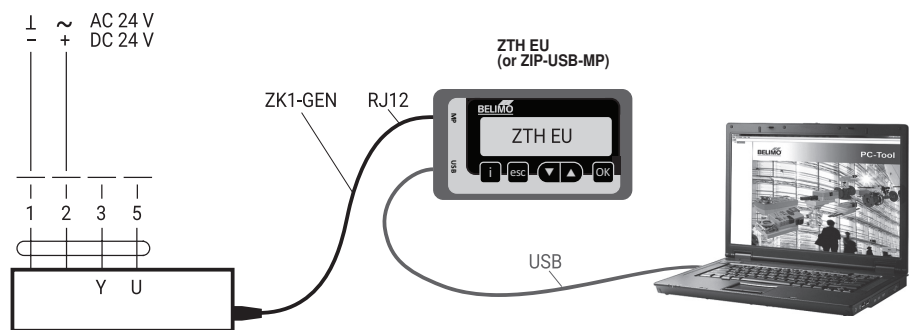
Display and operation



- 1 Push-button and LED display green**
Off: No power supply or fault
On: Operation
Press button: Switches on angle-of-rotation adaptation
- 2 Push-button and LED display yellow**
Off: Standard mode
On: Adaptation or synchronising process active, Confirm addressing
- 3 Gear disengagement button (can be locked)**
Press button: Gear disengaged, motor stops, manual override possible
Release button: Gear engaged, synchronisation starts, followed by standard mode
- 4 Service plug** For connecting the parametrisation and service tools

ZTH EU / PC-Tool - Local service connection

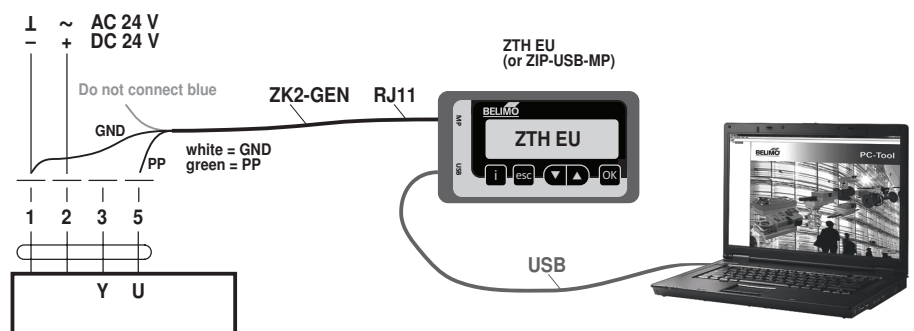
Setting and diagnostics of the VAV-Compact can be carried out quickly and easily with the Belimo PC-Tool or the ZTH EU service tool. When the PC-Tool is used, the ZTH EU acts as the interface converter.



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

ZTH EU/PC-Tool - Remote connection

The VAV-Compacts can communicate with the service tools via the PP connection (wire 5). The connection can be made during operation at the connector socket, at the tool connector socket of the CR24 room controller or at the control cabinet terminals. The ZTH EU is used as interface converter with the PC-Tool is used.



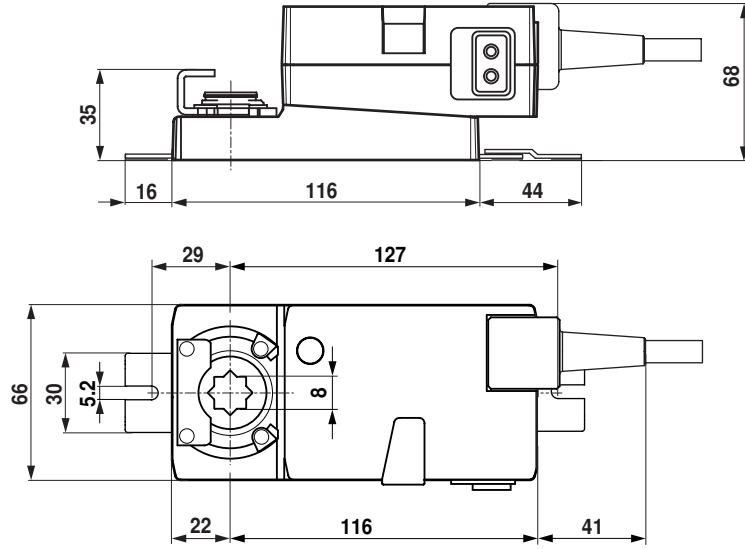
Download PC-Tool (MFT-P)
from www.belimo.com

Accessories

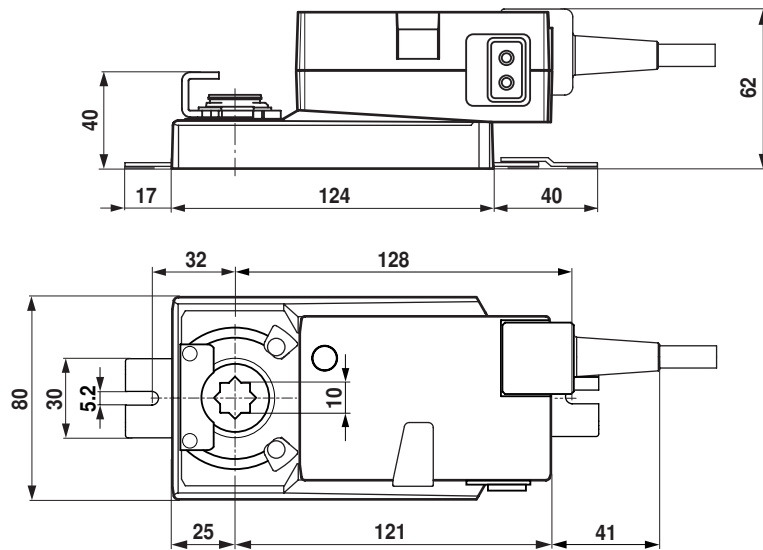
Room controller (2...10 V control)	Description	Type
	Room temperature controller, AO: VAV; DI: Standby/EHO/C-O	CR24-B1
	Room temperature controller, AO: VAV/HZ 3-point; DI: Standby/EHO/Ventilation	CR24-B2
	Room temperature controller, AO: VAV/HZ EI-LE; DI: Standby/EHO/Boost	CR24-B2E
	Room temperature controller, AO: VAV/HZ 3-point; H/K 0...10 V; DI: Standby/EHO/C-O/Boost	CR24-B3
	Apartment ventilation controller, AO: 2 x VAV/HZ valve; DI: EHO/override Kitchen+Bath	CRA24-B3
	Step control, 3-step (Min/COMF/Max)	CRA24-B1P
	Positioner, 0...100%	CRP24-B1
Electrical accessories	Description	Type
	Connection cable 5 m, to ZTH EU/ZIP-USB-MP (RJ12) with service plug	ZK1-GEN
	Connection cable 5 m, to ZTH EU/ZIP-USB-MP (RJ11) with free wire ends	ZK2-GEN
Service tools	Description	Type
	Service tool, with ZIP-USB function, for parametrisable and communicative actuators, VAV controllers and HVAC performance devices from Belimo	ZTH EU
	Belimo PC-Tool, software for adjustments and diagnostics	MFT-P



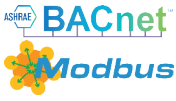
Dimensions [mm]

Dimensional drawings LMV-D3-MF-F



Dimensional drawings NMV-D3-MF-F



	-MF	-MP	-KNX	-MOD
				
Field of application: Supply air/extract air in the comfort zone and in sensor-compatible media	X	X	X	X
AC/DC 24 V supply	X	X	X	X
Δp Sensor installed, dynamic D3, measuring range:	-20...500 Pa	-20...500 Pa	-20...500 Pa	-20...500 Pa
Actuator variants: – Rotary actuator – Linear actuator	5 / 10 Nm –	5 / 10 / 20 Nm 150 / 200 / 300 mm	5 / 10 / 20* Nm 150* / 200* / 300* mm	5 / 10 / 20* Nm 150* / 200* / 300* mm
VAV-Function Close, $V'_{min} \dots V'_{max}$	X	X	X	X
CAV steps $V'_{min} / V'_{mid} / V'_{max} / \text{Close}$	X	X	–	–
Position Control (Open Loop / External V control)	X	X	X	X
DCV (Optimiser function)	–	DDC MP Partner	Yes, programmable	Yes, programmable
Analogue control	0/2...10 V	0/2...10 V	–	0/2...10 V
Bus actuation	–	X	X	X
Bus specification	–	Belimo MP-Bus	KNX S-Mode	Modbus RTU/ BACnet MS/TP/ RS485
Direct integration DDC MP-Partner	–	X	–	–
Integration via Gateway – BACnet – KNX – Modbus RTU	–	X X X	–	–
Number of bus subscribers	–	8 per string	64 per line segment	32 per string
Sensor integration – Passive (resistance) – Active (0...10 V) – Switching contact	–	X X X	– X X	– X X
Optional control function	–	–	–	–
Local override	–	CLOSE / V'_{max} / OPEN	CLOSE / V'_{max} / OPEN	CLOSE / V'_{max} / OPEN
Aids	–	MP-Bus tester MP monitor	ETS Product database	–
Integration tool	PC-Tool	PC-Tool	ETS	...
TypeList function (Retrofit, OEM)	–	X	(–)	(–)
Tool connection (U – PP/MP)	PP	PP/MP	PP	PP
Service socket ZTH EU/PC-Tool	X	X	X	X
NFC interface	–	X	–	–
Assistant app	–	X	–	–
Service tool ZTH EU	X	X	X	X
PC-Tool – Parameters – Save data – Trend, Logbook – Label Print	X	X	X	X

* on request