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

Control function: VAV-CAV / Open-Loop

Control:
DC 2...10 V / 0...10 V / MP-bus

Integration into
- **DDC controller with MP interface**
- **LONWORKS® systems**
- **EIB-Konnex systems**
- **Fan Optimiser systems**

Service button and LEDs for servicing and commissioning

Diagnostic socket for operating devices

With additional connection facility for sensors or switches (not available for LMV...-RM)

LMV-D2-MFT-RM
LMV-D2-MP

NMV-D2-MP

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.

Pressure measurement
Maintenance-free, dynamic, differential pressure sensor technology, proven in a wide range of applications, suitable for use in offices, hospital wards, alpine hotels or cruise liners.

Actuator
Three versions available, depending on the size of the VAV unit: 5 / 10 Nm.
– Rotary actuator, depending on size

Control function
VAV-CAV or open-loop operation (actuator/ volumetric flow sensor) for integration in an external VAV control circuit. Feedback of damper position for fan optimisation

VAV – variable air volume
For variable air volume applications based on a modulating reference variable, e.g. supplied by a room temperature controller or a DDC or bus system. It facilitates demand-related, power-saving ventilation in individual rooms or in zones of air conditioning systems. The V'min ... V'max wor king range can be subdivided by selecting a mode. The following operating modes are available: DC 2...10 V / 0...10 V / adjustable / bus.

CAV – constant air volume
For constant air volume applications, e.g. in step mode, controlled by means of a switch. The following operating modes are available: CLOSE / Vmin / Vmid / Vmax / OPEN

Bus function
Up to eight Belimo MP devices (VAV / damper actuator / valve) can be connected together over the MP-Bus and integrated into the following systems:
– LONWORKS® applications with Belimo UK24LON interface
– EIB Konnex applications with Belimo UK24EIB interface
– DDC controller with integrated MP-Bus protocol *
– Fan optimiser applications with optimisation COU24-A-MP

A sensor (0...10 V or passive, e.g. a temperature sensor) or a switch can optionally be integrated into the higher-level DDC or bus system via the MP-Bus. (Not available for LMV...-RM)

Test function / test display
The VAV-Compact features an LED with a ready display for commissioning and functional checking as well as a service mode with air shortage, excess air and setpoint = actual value display with LEDs.

Operating and service devices
Belimo PC-Tool, remote control or ZTH-VAV, plugged into the VAV-Compact Via MP-Bus

Assembly and connection
The VAV-Compact, which is assembled on the unit by the OEM, is connected using the prefabri cated 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.

Overview of Types

Type	Torque	Power consumption	For wire sizing	Weight
LMV-D2-MFT-RM	5 Nm	3 W	5 VA (max. 5 A @ 5 ms)	approx. 500 g
LMV-D2-MP	5 Nm	3 W	5 VA (max. 5 A @ 5 ms)	approx. 500 g
NMV-D2-MP	10 Nm	3.5 W	5.5 VA (max. 5 A @ 5 ms)	approx. 700 g

Technical data

Supply	
Nominal voltage	AC 24 V, 50/60 Hz DC 24 V
Power supply range	AC 19.2 ... 28.8 V DC 21.6 ... 28.8 V
Differential pressure sensor	2 ... 300 Pa (OEM-specific)
Operating pressure	max. 1000 Pa
Characterising	OEM-specific Differential pressure sensor Linearisation
Installation position	Any, no reset necessary
Operating medium (see «Materials»)	Supply and exhaust air in the comfort zone and in applications with sensor-compatible media
Materials	PC + ABS to UL94-V0; stainless steel, DIN 1.4301 X10CrNiS1810; PP Santoprene
Measuring air conditions	0 ... +50°C / 5 ... 95% r.h., non-condensing
Control function	– VAV-CAV – Open-loop operation
VAV and CAV applications	– Supply/exhaust air units in stand-alone operation / master-slave / parallel connection for rooms with positive/negative pressure or neutral air pressure – Mixing units
Operating volumetric flow	
$\dot{V}_{nom}$	OEM-specific nominal volumetric flow setting, matches VAV box
$\dot{V}_{max}$	30 ... 100% of $\dot{V}_{nom}$
$\dot{V}_{min}$	0 ... 100% of $\dot{V}_{nom}$ (see page ... «Minimum setting limit»)
$\dot{V}_{mid}$	0 ... 100% of ($\dot{V}_{min}$ ... $\dot{V}_{max}$)
Classic control	
Mode for reference value input w (connection 3)	– DC 2 ... 10 V / (4 ... 20 mA with 500Ω resistance) – DC 0 ... 10 V / (0 ... 20 mA with 500Ω resistance) – Adjustable DC 0 ... 10 V } Input resistance min. 100 k Ohm
Mode for actual volumetric flow signal U5 (connection 5)	– DC 2 ... 10 V – DC 0 ... 10 V – Adjustable DC 0 ... 10 V } max. 0.5 mA
Operating modes for constant air volume	CLOSE / $\dot{V}_{min}$ / $\dot{V}_{mid}$* / $\dot{V}_{max}$ / OPEN * (* only with AC 24 V supply)
MP-Bus function	
Address in bus operation	MP 1 ... 8 (classic control: PP)
LonWorks® / EIB-Konnex	With BELIMO UK24LON / UK24EIB interface, 1 ... 8 BELIMO MP devices (VAV / damper actuator / valve actuator)
DDC controller	DDC controller / PLC, from various manufacturers, with integrated MP interface
Fan optimiser	With BELIMO optimiser COU24-A-MP
Sensor integration (only available for LMV/NMV-D2-MP)	Passive (Pt1000, Ni1000 etc.) and active sensors (0...10 V) e.g. temperature, humidity 2-point signal (switching capacity 16 mA @ 24 V), e.g. switches, occupancy switches
Operation and servicing	Pluggable / PC-Tool (V3.1 or higher) / ZEV hand-operated device
Communication	PP/MP-Bus, max. DC 15 V, 1200 baud
Button	Adaptation / addressing / service function
LED indicator	– 24 V feed – Status / service / bus function
Actuator	Brushless, non-blocking actuator with current reduction
Direction of rotation	ccw/cw or / ↑ ↓
Adaptation	Setting range recording and resolution to control range
Manual disengagement	Pushbutton, self-resetting without affecting functions
Actuator – full-rotation	
Angle of rotation	95° ◁, with adjustable mechanical or electronic limiting
Position indication	Mechanical with pointer
Spindle driver	– Clamp, for round spindles 10 ... 20 mm / square spindles 8 ... 16 mm – Positive fit, wide range of versions, e.g. 8 x 8 mm
Connection	Cable, 4 x 0.75 mm², terminals
Safety	
Protection class	III Safety extra-low voltage
Degree of protection	IP 54
EMC	CE according to 89/336/EEC
Mode of operation	Type 1 (to EN 60730-1)

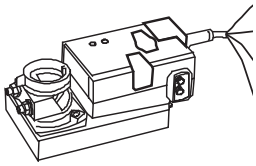
Technical data (continued)

Safety	
Rated impulse voltage	0.5 kV (to EN 60730-1)
Control pollution degree	2 (to EN 60730-1)
Ambient conditions	0 ... +50°C
Non-operating temperature	–20 ... +80°C
Ambient humidity range	5 ... 95%rH, non-condensating (to EN 60730-1)
Maintenance	Maintenance-free

Connection

Connecting cable The connection is established via the connection cable installed on the VAV Compact device.

Note
- Supply via safety isolation transformer!
- Connections 1, 2 (AC/DC 24 V) and 5 (MP signal) must be routed to accessible terminals (room temperature controller, floor distributor, control cabinet,etc.), in order to simplify access with the PC-Tool for diagnostic and service work.

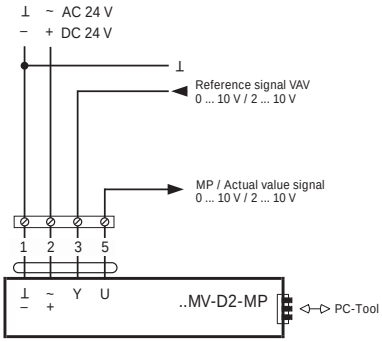


No	Designation	Wire colour	Function
1	BKCOM ⊥	black	⊥ – } Supply AC/DC 24 V
2	RD + ~	red	~ + } Supply AC/DC 24 V
3	WH Y	white	Reference signal VAV / CAV –Actual value signal – MP-Bus connection
5	OG U	orange	

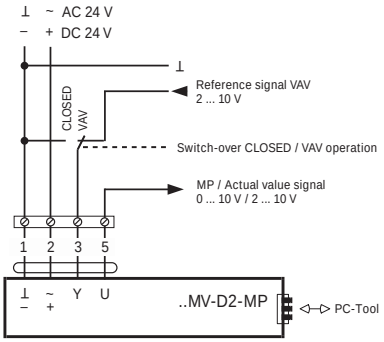
VAV – Variable operation $\dot{V}_{min}$..$\dot{V}_{max}$

Wiring diagrams

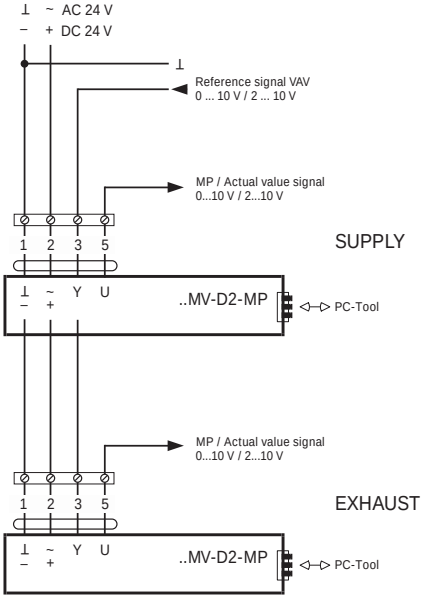
Example 1:
VAV with analogue reference signal



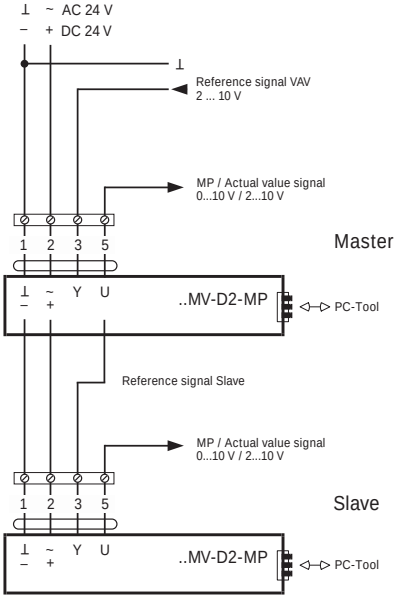
Example 2:
VAV with shut-off (CLOSE), 2...10 V mode



Example 3:
VAV parallel operation with analogue reference signal Supply/exhaust air



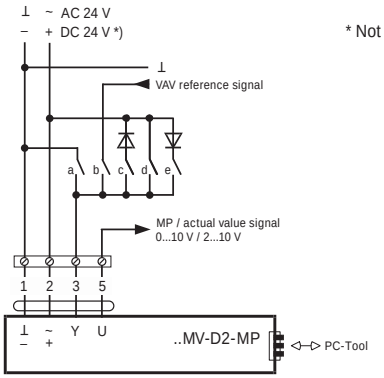
Example 4:
VAV master-slave operation with analogue reference signal



CAV – Step mode CLOSED / $\dot{V}_{min}$ / $\dot{V}_{mid}$ / $\dot{V}_{max}$ / OPEN

CAV control
Two options are available for CAV control:
– Standard: CLOSED – $\dot{V}_{min}$ – $\dot{V}_{max}$ – OPEN (default setting)
– NMV-D2M-compatible CLOSED – $\dot{V}_{min}$ – $\dot{V}_{mid}$ – $\dot{V}_{max}$ – OPEN
The setting can be changed with the PC-Tool from Version V3.1

Wiring diagrams



* Not available with DC 24 V supply

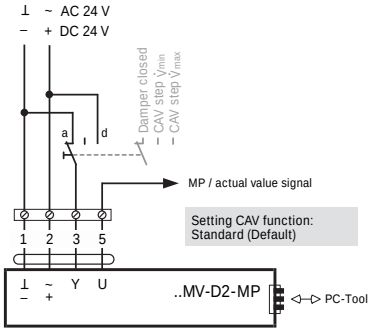
Note
The contacts are mutually interlocking!

CAV function: Standard

Mode setting	---	0...10 V	0...10 V	0...10 V	0...10 V
	2...10 V	2...10 V	2...10 V	2...10 V	2...10 V
Signal	⊥ –	0...10 V 2...10 V	~	~ +	~
Function	3	3	3	3	3
Damper CLOSED	a) CLOSED		c) CLOSED *		
$\dot{V}_{min}$ ... $\dot{V}_{max}$		b) VAV			
CAV – $\dot{V}_{min}$	All open – $\dot{V}_{min}$ active				
Damper OPEN					e) OPEN *
CAV – $\dot{V}_{max}$				d) $\dot{V}_{max}$	

Legend
Contact closed, function active
Contact closed, function active, only in 2 ... 10 V mode
Contact open
* Not available with DC 24 V supply

Example:
CAV application: CLOSED – $\dot{V}_{min}$ – $\dot{V}_{max}$
(2...10 V mode)



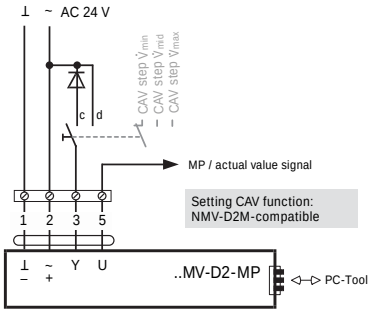
Note
You must set the CAV function to NMV-D2M-compatible in order to use the CAV $\dot{V}_{mid}$ step

CAV function: NMV-D2M-compatible

Mode setting	---	0...10 V	0...10 V	0...10 V	0...10 V
	2...10 V	2...10 V	2...10 V	2...10 V	2...10 V
Signal	⊥ –	0...10 V 2...10 V	~	~ +	~
Function	3	3	3	3	3
Damper CLOSED	a) CLOSED				
$\dot{V}_{min}$ ... $\dot{V}_{max}$		b) VAV			
CAV – $\dot{V}_{min}$	All open – $\dot{V}_{min}$ active				
Damper OPEN					e) OPEN *
CAV – $\dot{V}_{max}$				d) $\dot{V}_{max}$	
CAV – $\dot{V}_{mid}$			c) $\dot{V}_{mid}$ *		

Legend
Contact closed, function active
Contact closed, function active, only in 2 ... 10 V mode
Contact open
* Not available with DC 24 V supply

Example:
CAV application $\dot{V}_{min}$ – $\dot{V}_{mid}$ – $\dot{V}_{max}$
(0...10 or 2...10 V mode)



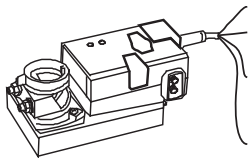
Note
– Supply via safety isolation transformer!
– Connections 1, 2 (AC/DC 24 V) and 5 (MP signal) must be routed to accessible terminals (room temperature controller, floor distributor, control cabinet,etc.), in order to simplify access with the PC-Tool for diagnostic and service work.

MP-Bus operation – VAV- / CAV operation

Connecting cable

The connection to the MP-Bus is established via the connection cable installed in the VAV-Compact device.

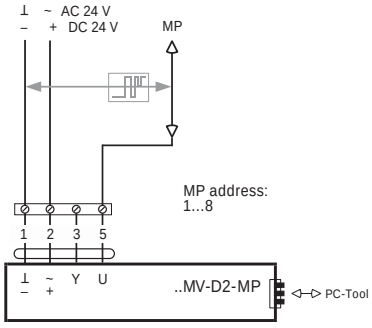
Note
- Supply via safety isolation transformer!
- Connections 1, 2 (AC/DC 24 V) and 5 (MP signal) must be routed to accessible terminals (room temperature controller, floor distributor, control cabinet,etc.), in order to simplify access with the PC-Tool for diagnostic and service work.



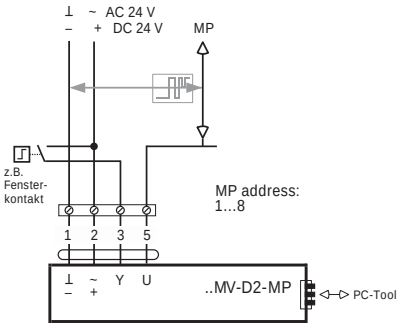
No	Designation	Wire colour	Function
1	BKCOM ⊥	black	⊥ – } Supply AC/DC 24 V
2	RD + ~	red	~ +
3	WH Y	white	Input for – Sensor linking – Override control
5	OG U	orange	MP-Bus connection

Wiring diagrams

Bus operation – VAV function
For detailed information, see section «MP-Bus integration»



Bus operation – VAV function with integrated switch
For detailed information on sensor integration, see section «MP-Bus integration»



Note
- For further information about the connection, override controls, MP-Bus cables, etc., see section «MP-Bus integration»
- This is a connection description. Depending on the application, the terminal allocation may vary. The connection and commissioning must be carried out by trained personnel.

Sizing of feed and connection cables

General

In addition to the actual wire sizing, attention must also be paid to the surrounding area and the cable routing. Signal cables must not be laid in the vicinity of load cables, objects liable to cause EMC interference etc. if possible. Paired or layer stranded cables improve immunity to interference.

24V feed, sizing and wiring

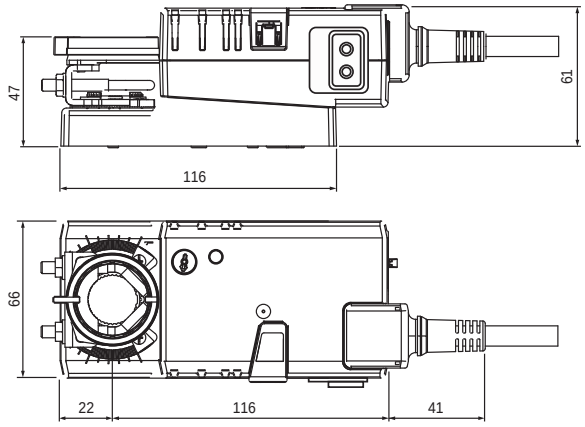
The wire sizing and installation of the AC 24 V supply,the fuse protection, and the cables are dependent on the total operated load and local regulations.Account must be taken of the following performance data, including starting currents of the actuators:
– Sizing values VAV-Compact controller, see Technical Data.
–Sizing values of further controlling elements etc. can be found in the current data sheets and product information.
–other devices which are intended to be connected to the same 24 V feed.
–Reserve capacity for subsequent expansion, if planned.

MP-Bus integration - supply, sizing and wiring

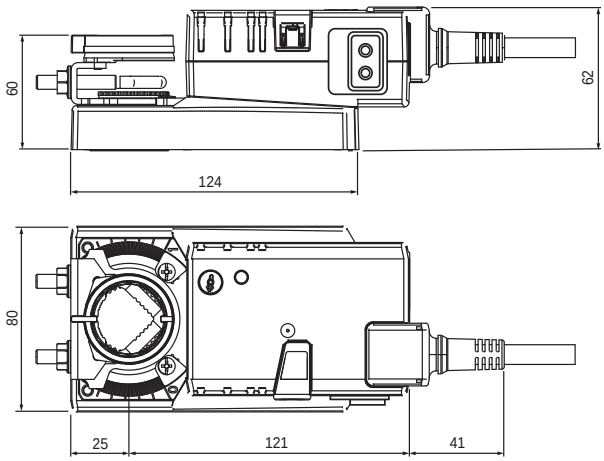
See MP-Bus integration.

Dimensions [mm]

Dimensional drawings LMV-D2-MP / LMV-D2-MFT-RM

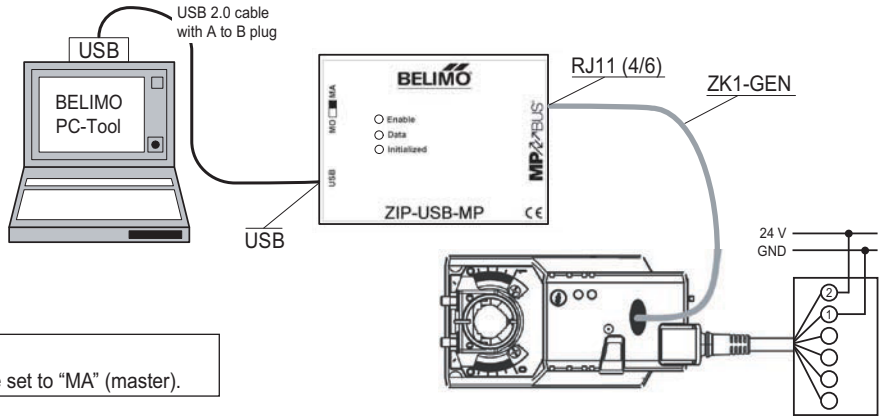


Dimensional drawings NMV-D2-MP



Tool connection 1

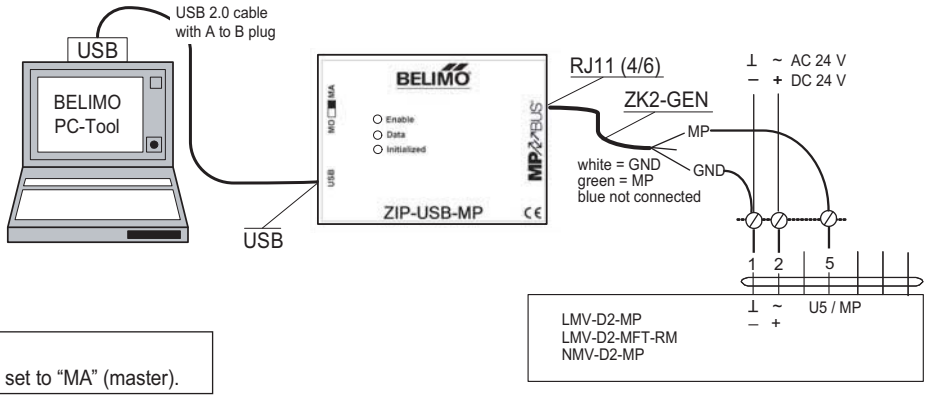
Local connection via the service socket on the MP actuator with ZK1-GEN cable



Note
The mode switch must be set to “MA” (master).

Tool connection 2

Local connection via the service socket on the MP actuator with ZK2-GEN cable



Note
The mode switch must be set to “MA” (master).

For more details informaiton, please refer to tool connection guild.