



BLC1, VAV-Compact Controller

VAV-Compact controller with integrated pressure sensor, VAV controller and damper actuator for pressure-independent VAV and CAV applications in the comfort zone

- Control: DC 0/2 ... 10V / MP-Bus
- Integration in bus systems
 - DDC controller with MP interface
 - LONWORKS® systems
 - Fan optimiser systems
- With additional switch-on option for sensors and switches
- Diagnostic socket for Service and PC-Tool

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	The integrated maintenance-free Belimo D3 differential pressure sensor is also suitable for very small volumetric flows. It is for this reason that it covers versatile applications in the comfort zone, e.g. in residential construction, offices, hospitals, hotels, cruise ships, etc.
Actuator	Three versions available, depending on the size of the VAV unit: 5 / 10 / 20 Nm. <ul style="list-style-type: none"> – Rotary actuator, depending on the size – Linear actuator 150 N with 100, 200 or 300 mm linear movement
Control function	VAV-CAV or Open-Loop operation for integration in an external VAV control loop.
Feedback	Damper position for fan optimiser systems, current volumetric flow or pressure value.
VAV – variable volumetric flow	For variable volumetric flow applications with a modulating reference variable, e.g. room temperature controller, direct digital control or bus system, it enables demand-related, energy-saving ventilation of individual rooms or zones. The operating range \dot{V}_{min} ... \dot{V}_{max} can be connected via selectable mode. The following are available: DC 2 ... 10V / 0 ... 10V / adjustable range / bus operation
CAV – constant volumetric flow	For constant volumetric flow applications, e.g. in step mode, controlled by means of a switch. The following operating modes can be selected from: CLOSED / \dot{V}_{min} / (\dot{V}_{mid}) / \dot{V}_{max} / OPEN
Bus function	Up to eight Belimo MP devices (VAV / damper actuator / valve actuator) can be connected together over the MP-Bus and integrated into the following systems: <ul style="list-style-type: none"> – LONWORKS® applications with Belimo UK24LON interface – EIB Konnex applications with Belimo UK24EIB interface – MODBUS RTU applications with Belimo UK24MOD interface – BACnet applications with Belimo UK24BAC interface – DDC controller with integrated MP-Bus protocol – Fan optimiser applications with optimiser COU24-A-MP A sensor (0...10V 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.
Operating and service devices	Belimo PC-Tool or service tool ZTH-GEN, can be plugged into the VAV-Compact (PP connection) or via MP-Bus.
Assembly and connection	The VAV-Compact, which is assembled on the unit by the OEM, is connected using the prefabricated connecting cable.
Test function / test display	The VAV-Compact features two LEDs with a functional readiness display for commissioning and functional checking. Extended information with ZTH-GEN.
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	Dimensioning	Weight
LMV-D3-MP	5 Nm	2 W	4 VA (max. 8 A @ 5 ms)	Approx. 500 g
NMV-D3-MP	10 Nm	3 W	5 VA (max. 8 A @ 5 ms)	Approx. 700 g
SMV-D3-MP	20 Nm	3 W	5.5 VA (max. 8 A @ 5 ms)	Approx. 830 g
LHV-D3-MP	150 N	2.5 W	4.5 VA (max. 8 A @ 5 ms)	Approx. 550 g

Technical data	
Supply	
Nominal voltage	AC 24V, 50/60 Hz, DC 24 V
Operating range	AC 19.2 ... 28.8V, DC 21.6 ... 28.8V
Differential pressure sensor	
Type, principle of operation	Belimo D3 sensor, dynamic response
Operating range	0 ... 600 Pa
Overload capability	±3000 Pa
Installation position	Any, no reset necessary
Materials in contact with medium	Glass, epoxy resin, PA, TPE
Control function	- VAV-CAV - Open-loop operation
Adjustment values	
\dot{V}_{nom}	OEM-specific nominal volumetric flow setting, suitable for the VAV unit
$\Delta p @ \dot{V}_{nom}$	50 ... 450 Pa
\dot{V}_{max}	20 ... 100% of \dot{V}_{nom}
\dot{V}_{min}	0 ... 100% of \dot{V}_{nom}
\dot{V}_{mid}	50% of \dot{V}_{min} to \dot{V}_{max}
Classic control	
VAV mode for reference value input Y (Connection 3)	- DC 2 ... 10V / (4 ... 20 mA with 500 Ω resistance) - DC 0 ... 10V / (0 ... 20 mA with 500 Ω resistance) - Adjustable DC 0 ... 10V
Mode for actual value signal U5 (Connection 5)	- DC 2 ... 10V - DC 0 ... 10V - Adjustable: volumetric flow, damper position or differential pressure
CAV operating modes (constant volumetric flow)	CLOSED / \dot{V}_{min} / (\dot{V}_{mid} *) / \dot{V}_{max} / OPEN * (* only with AC 24V supply)
MP-Bus function	
Address in bus operation	MP1 ... 8 (classic operation: PP)
LONWORKS® / EIB-Konnex / Modbus RTU / BACnet	With BELIMO Interface UK24LON / UK24EIB / UK24MOD / UK24BAC 1 ... 8 BELIMO MP devices (VAV / damper actuator / valve)
DDC controller	DDC controllers/programmable controller with an integrated MP interface from various manufacturers
Fan optimiser (fan control)	With BELIMO Fan Optimiser COU24-A-MP
Sensor integration	Passive (Pt1000, Ni1000, etc.) and active sensors (0...10V), e.g. temperature, humidity 2-point signal (switching capacity 16 mA @ 24V), e.g. switches, occupancy switches
Operating and service	
Communication	Pluggable / PC-Tool (V3.6 or higher) / service tool ZTH-GEN
Push-button	PP/MP-Bus, max. DC 15V, 1200 baud
LED display	Adaption / addressing - 24V supply - Status / bus function
Actuator	
Direction of rotation	Brushless, non-blocking actuator with power-save mode ccw / cw or ↑ / ↓
Adaption	Capture of setting range and resolution to control range
Gear disengagement	Push-button self-resetting without functional impairment
Sound power level	Max. 35 dB (A), SMV-D3-MP max. 45 dB (A)
Actuator - rotating	
Angle of rotation	95°↔, adjustable mechanical or electronic limiting
Position indication	Mechanical with pointer
Spindle driver	- Clamp, spindle round 10 ... 20 mm / spindle square 8 ... 16 mm - Form fit in various versions, e.g. 8 x 8 mm
Actuator - linear	
Stroke	100, 200 or 300 mm, adjustable mechanical or electronic limiting
Connection	Cable, 4 x 0.75 mm ²
Safety	
Protection class	III Safety extra-low voltage
Degree of protection	IP54
Electromagnetic compatibility	CE according to 89/336/EEC

Technical data (continued)

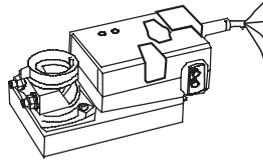
Safety

Mode of operation	Type 1 (in acc. with EN 60730-1)
Rated impulse voltage	0.5 kV (in accordance with EN 60730-1)
Control pollution degree	2 (in accordance with EN 60730-1)
Ambient temperature	0 ... +50°C
Non-operating temperature	-20 ... +80°C
Ambient humidity	5 ... 95% r.h., non-condensing (in accordance with EN 60730-1)
Maintenance	Maintenance-free

Connection

Connecting cable The connection is made using the connecting cable mounted to the VAV-Compact device.

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

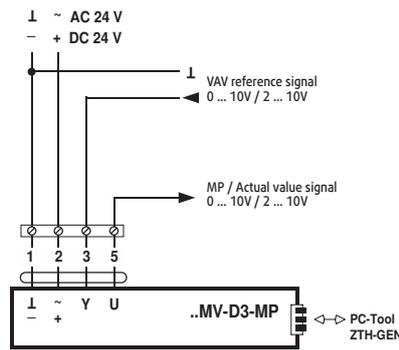


No.	Designation	Wire colour	Function
1	- L	black	AC/DC 24V supply
2	+ ~	red	
3	← Y	white	Reference signal VAV/CAV
5	→ U	orange	- Actual value signal - MP-Bus connection

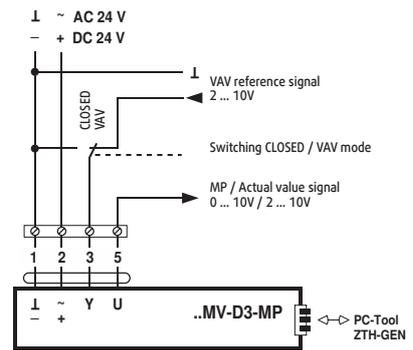
VAV – Variable operation $\dot{V}_{min} \dots \dot{V}_{max}$

Wiring diagrams

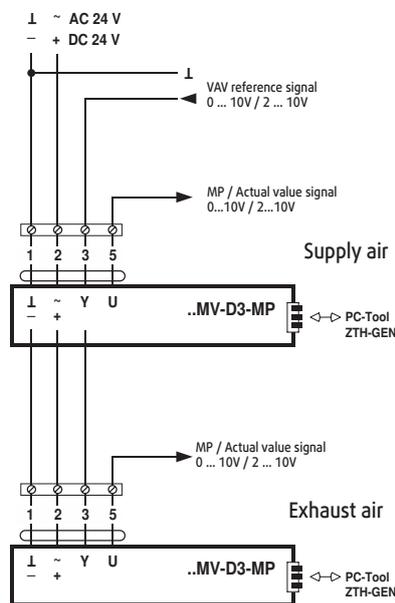
Example 1:
VAV with analogue reference signal



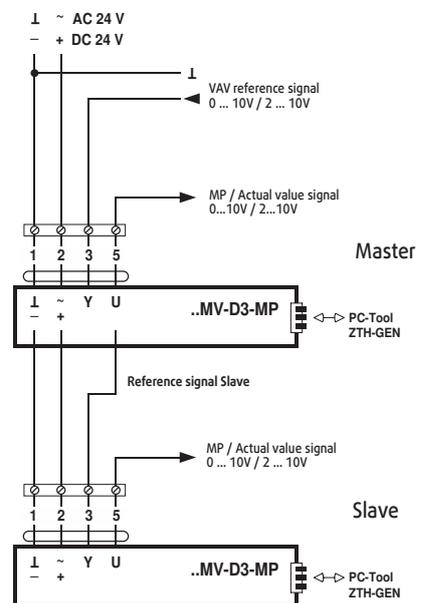
Example 2:
VAV with shut-off (CLOSE), 2 ... 10V mode



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



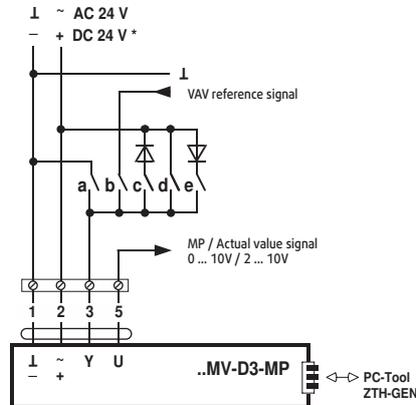
Example 4:
VAV with analogue reference signal, in Master/Slave operation



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

- CAV control** Three options are available for the CAV control:
- Standard 0.1 V shut-off: CLOSED - \dot{V}_{min} - \dot{V}_{max} - OPEN (default setting)
 - Standard 0.5 V shut-off: CLOSED - \dot{V}_{min} - \dot{V}_{max} - OPEN
 - Old Generation (NMV-D2M): CLOSED - \dot{V}_{min} - \dot{V}_{mid} - \dot{V}_{max} - OPEN

Wiring diagrams



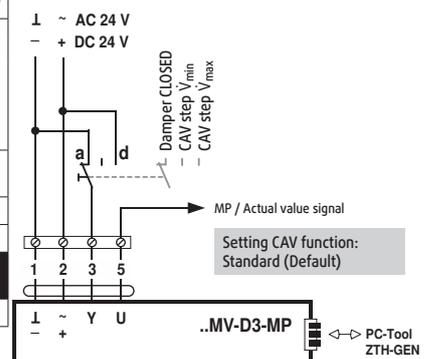
* Not available with DC 24 V supply.

CAV function: Standard

Mode setting	-	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V
Signal	1 -	0 ... 10 V 2 ... 10 V	~	~ +	~
Function	3	3	3	3	3
Damper CLOSED	a) CLOSED		c) CLOSED *		
$\dot{V}_{min} \dots \dot{V}_{max}$		b) VAV			
CAV - \dot{V}_{min}	All open - \dot{V}_{min} active **				
Damper OPEN				e) OPEN *	
CAV - \dot{V}_{max}			d) \dot{V}_{max}		

Example:

CAV application CLOSED - \dot{V}_{min} - \dot{V}_{max} (mode 2 ... 10 V)



Legend

- Contact closed, function active
- Contact closed, function active, only in 2 ... 10 V mode
- Contact open

* Not available with DC 24 V supply
 ** The damper is closed when the 0.5 V shut-off level is used.

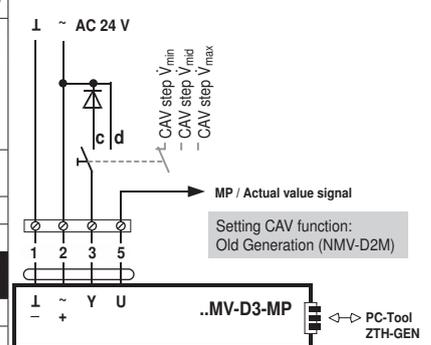
Note
 In order to use the CAV step \dot{V}_{mid} , the Old Generation (NMV-D2M) CAV function must be selected.

CAV function: Old Generation (NMV-D2M)

Mode setting	-	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V
Signal	1 -	0 ... 10 V 2 ... 10 V	~	~ +	~
Function	3	3	3	3	3
Damper CLOSED	a) CLOSED				
$\dot{V}_{min} \dots \dot{V}_{max}$		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} *		

Example:

CAV application \dot{V}_{min} - \dot{V}_{mid} - \dot{V}_{max} (Mode 0 ... 10 or 2 ... 10 V)



Legend

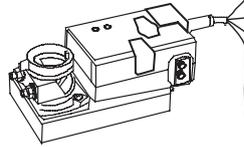
- Contact closed, function active
- Contact closed, function active, only in 2 ... 10 V mode
- Contact open

* Not available with DC 24 V supply

MP-Bus operation – VAV / CAV operation

Connecting cable The connection to the MP-Bus is made using the connecting cable mounted to the VAC-Compact device.

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



No.	Designation	Wire colour	Function
1	- L	black	} AC/DC 24V supply
2	+ ~	red	
3	Y	white	Input for - Sensor interface - Override control
5	U	orange	MP-Bus connection

Wiring diagrams

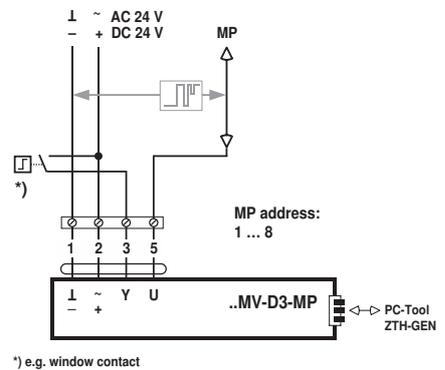
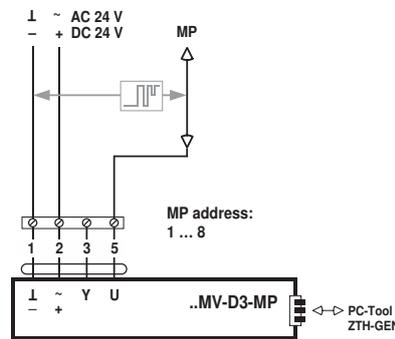
Control via MP-Bus

For detailed information, see section «MP-Bus integration»

MP-Bus control 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.



Dimensioning of supply and connecting cable

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.

24 V supply, dimensioning and cabling

The dimensioning and installation of the AC 24V 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 the starting currents of the actuators:

- Dimensioning values VAV-Compact controller, see Technical data
- Dimensioning 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 supply
- Reserve capacity for subsequent expansion, if planned.

MP-Bus integration – supply, dimensioning and cabling

See S4-VAV-Compact D3, MP-Bus integration