



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

### 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

## 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.  
– 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  $V_{\min} \dots V_{\max}$  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 /  $V_{\min}$  / ( $V_{\text{mid}}$ ) /  $V_{\max}$  / 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:  
– 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.

## Technical data

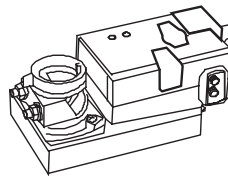
### Safety

Principle of operation	Type 1 (in acc. with EN 60730-1)
Rated current 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

### Please note:

- Supply via safety isolating transformer!
- In conventionally controlled systems it is recommended that the connections 1 to 5 (PP) are led to accessible terminals (e.g. floor distributor) in order to allow remote access for diagnostics and service work.



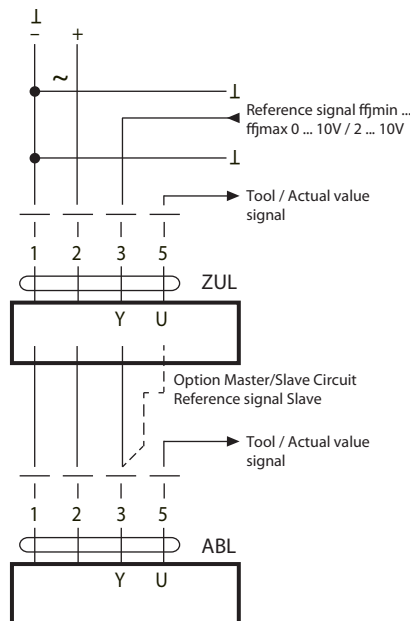
Nr.	Designation	Wire colour	Function
1	-	black	AC/DC 24 V supply
2	~ +	red	
3	Y	white	Reference signal / override / sensor
5	U	orange	- Actual value signal - MP bus connection

## VAV – variable operation $V_{min} \dots V_{max}$

### Wiring diagrams:

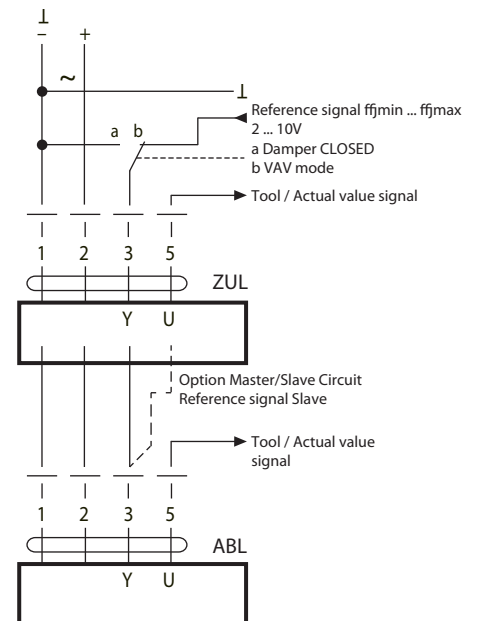
#### Example 1:

VAV, analogue reference signal



#### Example 2:

VAV with shut-off (CLOSED), 2 ... 10V mode



### Description:

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

### Setting parameters:

Mode 2 ... 10V, Shut off level 0.1 V or 0.5 V  
If the required switching threshold of 0.1 V cannot be attained, the value can be switched to 0.5 V with PC-Tool.

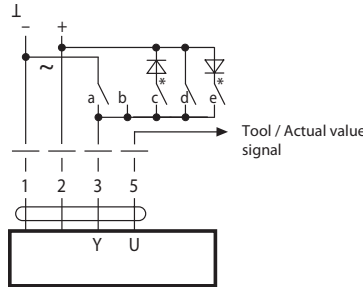
Function:	Standard 0,1 V:	Shut-off level 0,5 V:
Closed	< 0.1 V	< 0.5 V
$U_{min}$	> 0.1 ... 2V	> 0.5 V ... 2V
$U_{min} \dots U_{max}$	2 ... 10V	2 ... 10V

In CAV applications shut-off level must not be set to 0.5 V, otherwise the open connection 3 is interpreted as damper closed

**CAV – step mode CLOSED /  $V_{min}$  /  $V_{mid}$  /  $V_{max}$  / OPEN**

**CAV control:** VAV-Compact can be adapted to the desired CAV function pattern for constant volumetric flow applications with PC-Tool by using the "CAV function":  
 – Damper CLOSED –  $V_{min}$  –  $V_{max}$  – damper OPEN (standard)  
 – Damper CLOSED –  $V_{min}$  –  $V_{mid}$  –  $U_{max}$  – 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 in CAV applications:
- Mode 2 ... 10 V, Shut-off level 0.1 V
- In CAV applications shut-off level must not be set to 0.5 V, otherwise the open connection 3 is interpreted as damper CLOSED.

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

**CAV Function CLOSED –  $V_{min}$  –  $V_{max}$  – OPEN: (Standard)**

	a	b	c	d	e
Signal	⊥		~	~	~
Switching terminal 3	 1 3	 1 3	⊥ 1 3	 1 3	⊥ 1 3
Mode 2 ... 10 V	ZU	$U_{min}$	$ZU^*$	$U_{max}$	AUF*
Mode 0 ... 10 V	$U_{min}$	$U_{min}$	$ZU^*$	$U_{max}$	AUF*

PC-Tool "CAV Function" setting:  
CLOSED – ffjmin – ffjmax.  
Shut-off level CLOSED: 0.1 V  
Absperrpegel ZU: 0,1 V

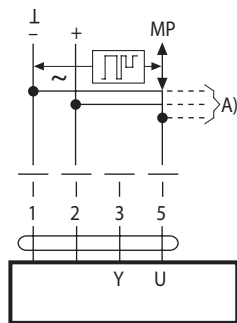
**CAV-Funktion ZU –  $U_{min}$  –  $U_{mid}$  –  $U_{max}$  – AUF:**

	a	b	c	d	e
Signal	⊥		~	~	~
Switching terminal 3	 1 3	 1 3	⊥ 1 3	 1 3	⊥ 1 3
Mode 2 ... 10 V	ZU	$U_{min}$	$U_{mid}$	$U_{max}$	AUF*
Mode 0 ... 10 V	$U_{min}$	$U_{min}$	$U_{mid}$	$U_{max}$	AUF*

PC-Tool "CAV Function" setting:  
CLOSED – Mmin – Mmid – Mmax (NMV-D2M compatible)

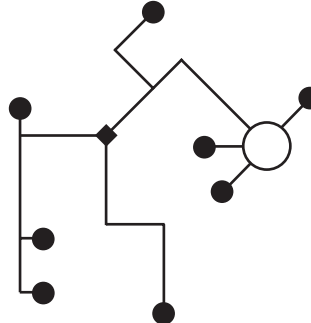
**MP-Bus operation – VAV / CAV function**

**Connection on the MP-Bus**



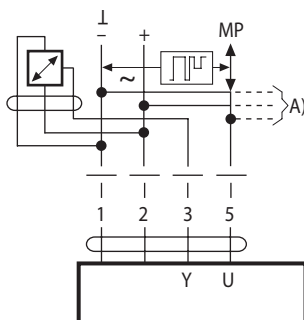
A) Additional actuators and sensors (max. 8)

**Power topology**



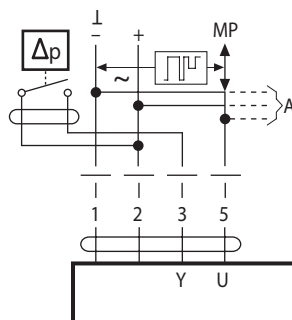
- There are no restrictions for the network topology (star, ring, tree or mixed forms are permitted).
- Supply and communication in one and the same 3-wire cable
- no shielding or twisting necessary • no terminating resistors required

**Connection of active sensors**



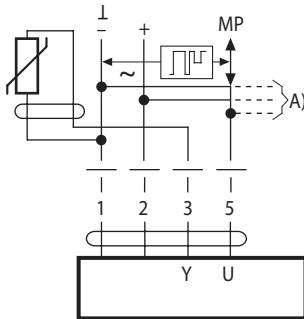
- A) Additional actuators and sensors (max. 8)
- Supply AC/DC 24 V
- Output signal DC 0...10 V
- (max. DC 0...32 V) • Resolution 30 mV

**Connection of external switching contact**



- A) Additional actuators and sensors (max. 8)
- Switching current 16 mA @ 24 V
- Start point of the operating range must
- be parameterised on the MP actuator as  $\geq 0.5 V$

## MP-Bus operation – VAV / CAV function



Ni1000	-28 ... +98 °C	850 ... 1600 Ω <sup>2)</sup>
PT1000	-35 ... +155 °C	850 ... 1600 Ω <sup>2)</sup>
NTC	-10 ... +160 °C <sup>1)</sup>	200 Ω ... 60 kΩ <sup>2)</sup>

A) Additional actuators and sensors (max. 8)

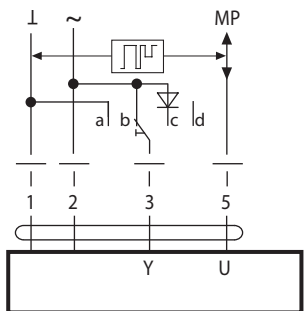
1) Depending on the type

2) Resolution 1 Ohm

### 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 –  $U_{max}$  – OPEN

**Note:** Functions only with AC 24V supply



**a** Damper CLOSED

**b**  $U_{max}$

**c** Damper OPEN

**d** Bus mode

See [www.belimo.eu](http://www.belimo.eu) / Bus and System Integration for detailed information on MP-Bus and installation (max. signal cable lengths, etc).

## Dimensioning of supply and connecting cable

**General** In addition to the actual wire sizing, attention must also be paid to the surrounding environment and the cable routing. If at all possible, signal cables must not be laid in the vicinity of load cables, objects liable to cause EMC interference, etc. Paired or layer-stranded cables enhance interference resistance.

### 24 V supply, dimensioning and cabling

The wire sizing and installation of the 24V AC 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 other final controlling elements, etc. can be found in the current data sheets and product information
- Additional intended devices which are connected to the same 24V supply
- Reserve capacity for subsequent expansion, if planned.