

# VAV- VARIABLE AIR VOLUME CONTROL DAMPER



## DESCRIPTION:

Circular and Rectangular VAV terminal unit for use in variable air volume systems at low airflow velocities even under unfavourable upstream conditions

## CONSTRUCTION:

Standard Material Galvanized Sheet Steel. Optional: .304-316 Stainless Steel, Aluminum

## APPLICATION:

- Circular and Rectangular VAV terminal unit for use in room air conditioning systems (HVAC systems)
- Also for unfavourable upstream conditions at low airflow velocities for supply air or exhaust air flow control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- For controlling, restricting, or shutting off the airflow in air conditioning systems

## ACCESSORIES:

### DUCT TYPE ELECTRO- HEATER



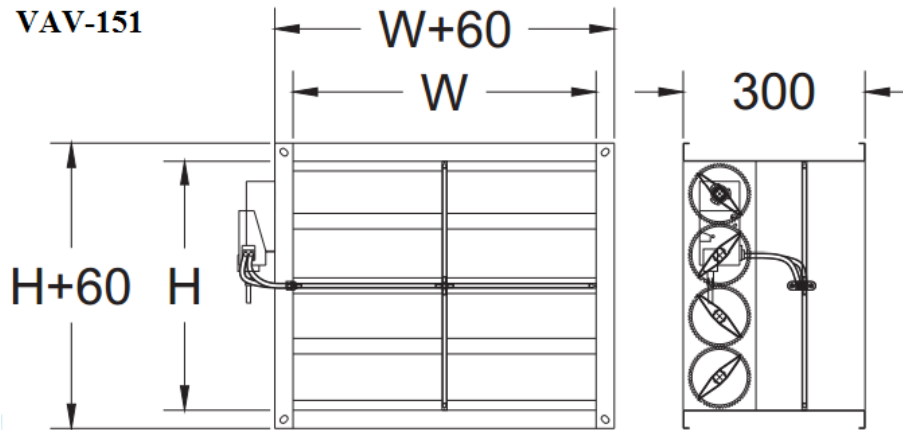
### SOUND ATTENUATOR



- VAV Can be manufactured as insulated.



**STANDARD DIMENSIONS:**



**VAV-151 STANDARD SELECTION TABLE**

Size (WxH) (mm)	u:2m/s	u:10m/s	A <sub>eff.</sub> (m <sup>2</sup> )
	V <sub>min.</sub> (m <sup>3</sup> /h)	V <sub>nom.</sub> (m <sup>3</sup> /h)	
200x205	259	1296	0,036
300x205	396	1980	0,055
400x205	525	2628	0,073
500x205	655	3276	0,091
300x305	568	2844	0,079
400x305	756	3780	0,105
500x305	950	4752	0,132
600x305	1137	5688	0,158
700x305	1332	6660	0,185
800x305	1519	7596	0,211
400x405	993	4968	0,138
500x405	1245	6228	0,173
600x405	1490	7452	0,207
700x405	1742	8712	0,242
800x405	1987	9936	0,276
500x505	1533	7668	0,213
600x505	1843	9216	0,256
700x505	2152	10764	0,299
800x505	2455	12276	0,341

**V<sub>min.</sub>(m<sup>3</sup>/h)** : Air flow rate when air velocity is 2 m/s

**V<sub>nom.</sub>(m<sup>3</sup>/h)** : Air flow rate when air velocity is 10 m/s

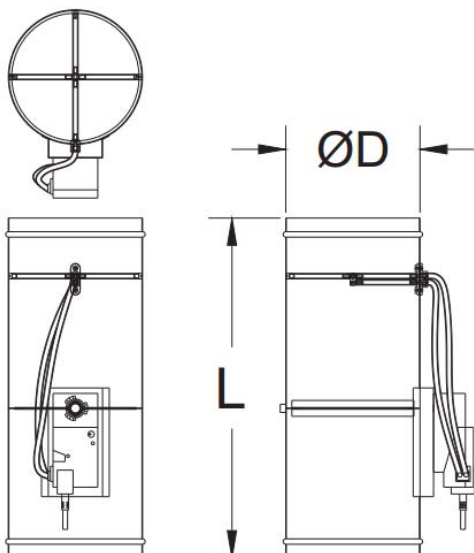
**V<sub>max.</sub>(m<sup>3</sup>/h)** : Air flow rate that customer wants between V<sub>min.</sub> and V<sub>nom.</sub> limit values

**u (m/s)** : Air velocity at VAV unit inlet

**A<sub>eff.</sub> (m<sup>2</sup>)** : Effective area



## VAV-251

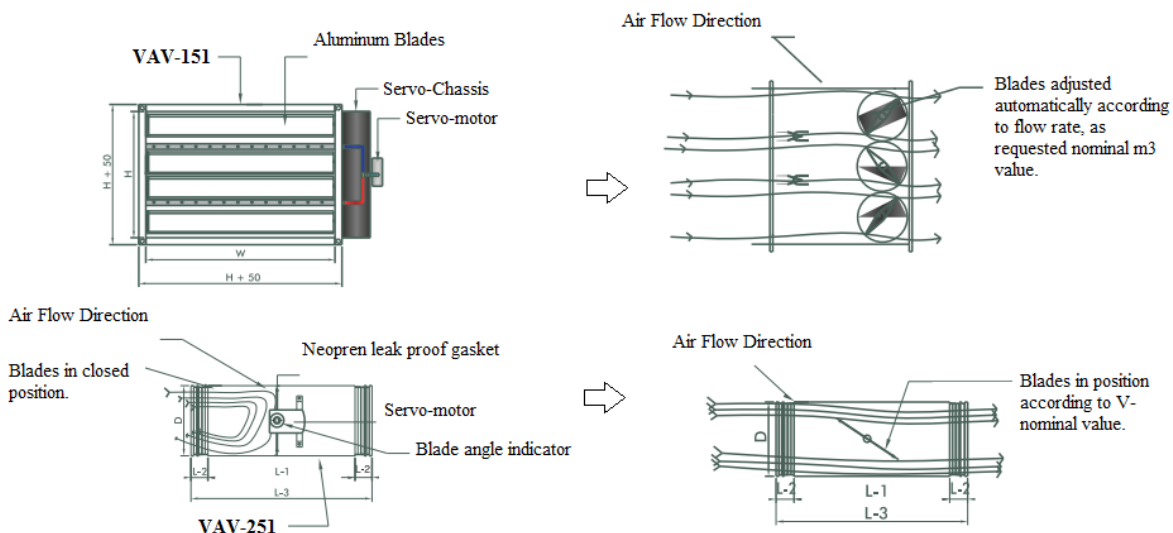


## VAV-251 STANDARD SELECTION TABLE

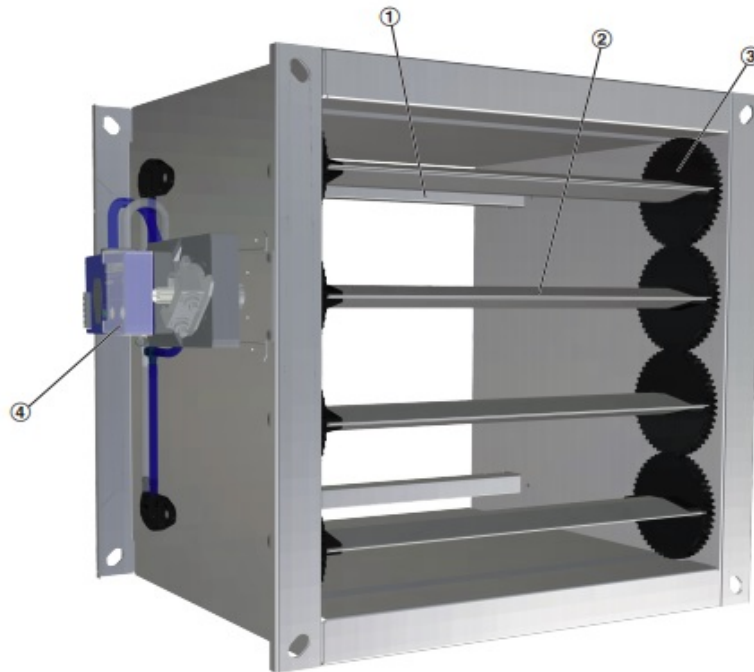
Size	u:2m/s V <sub>min.</sub> (m <sup>3</sup> /h)	u:12m/s V <sub>nom.</sub> (m <sup>3</sup> /h)	ØD (mm)	L (mm)
Ø125	90	520	123	450
Ø160	150	870	158	450
Ø200	230	1360	198	500
Ø250	360	2120	248	500
Ø315	560	3370	313	500
Ø355	710	4280	353	550
Ø400	910	5450	398	550

## WORKING PRINCIPLE

### FULL-AUTOMATIC PROCESS

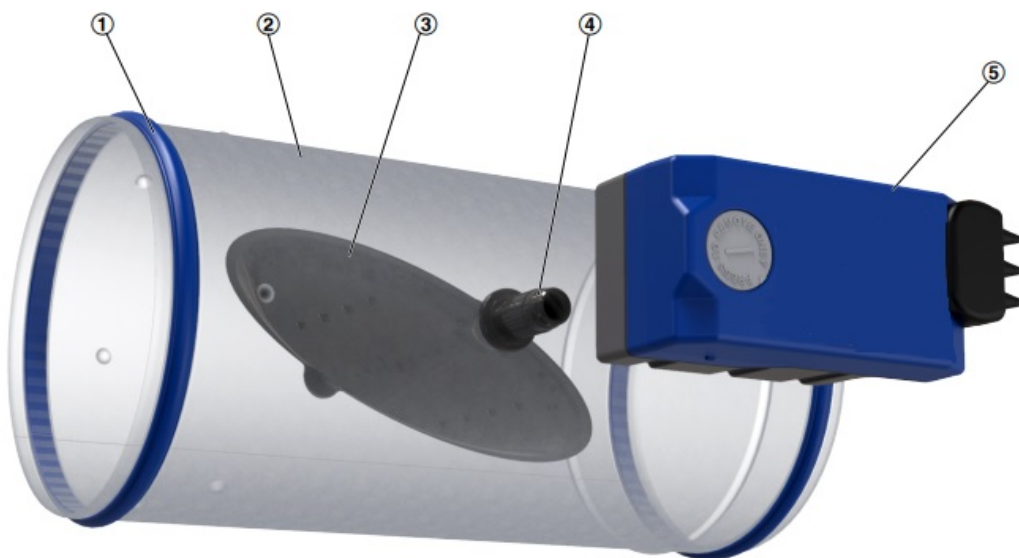


**FUNCTION**



- ① Differential pressure sensor
- ② Damper blade

- ③ Gears
- ④ Control components, e.g. an Easy controller



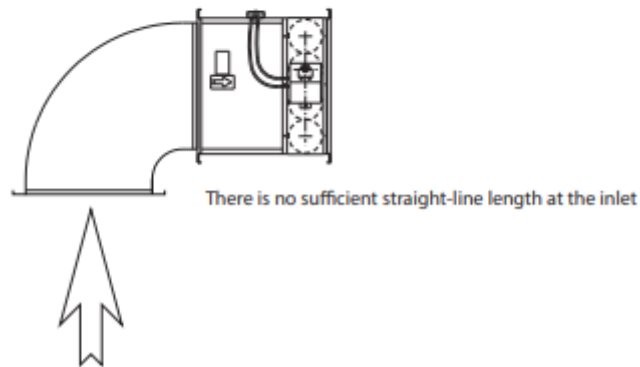
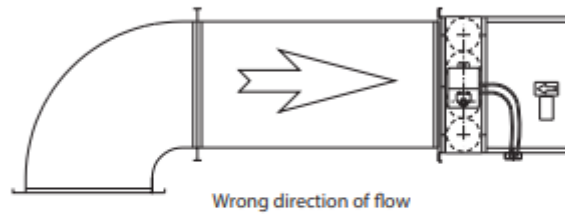
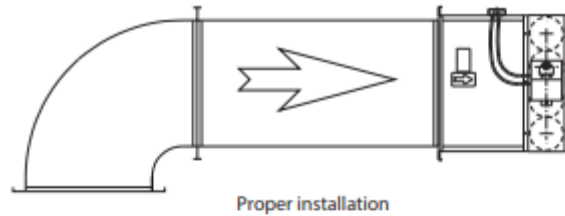
- ① Double lip seal
- ② Casing
- ③ Damper blade including effective pressure sensor

- ④ Shaft with effective pressure channel
- ⑤ Electronic volume flow controller

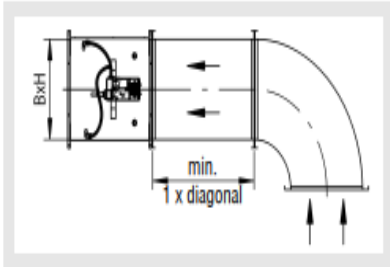


### Installation

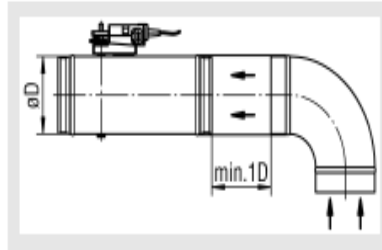
For the correct measuring, the VAV unit requires a 500 mm long straight duct section before the inlet side. The airflow should always cross the measuring probe toward the aluminum damper blades



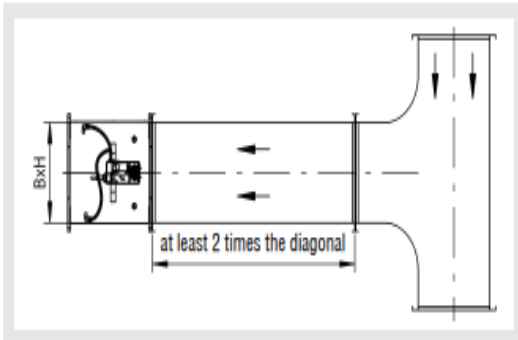
**Distance to a bent connection spigot**



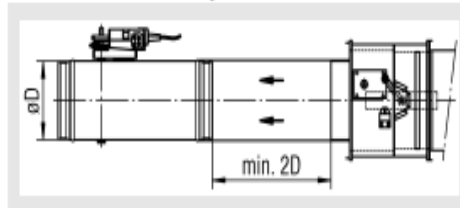
**Distance to a bent connection spigot**



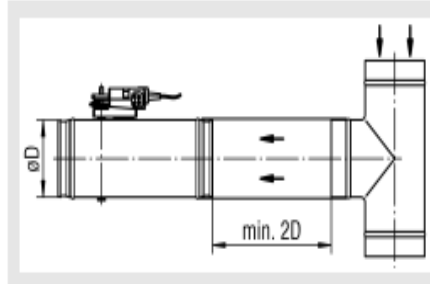
**Distance to other connection pieces**  
(e.g. branching piece, reducing piece, T-junction, etc.)



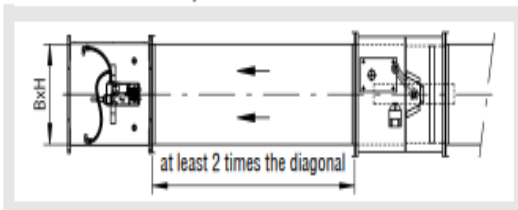
**Distance to a fire damper**



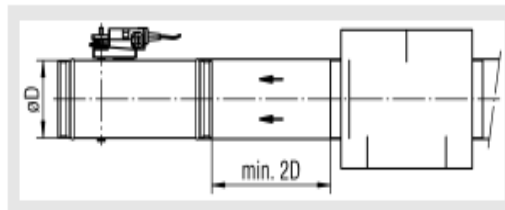
**Distance to other connection pieces**  
(e.g. branching piece, reducing piece, T-junction, etc.)



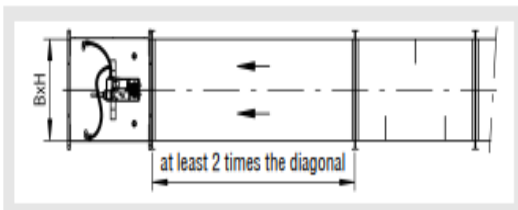
**Distance to a fire damper**



**Distance to a silencer with intermediate baffle**



**Distance to a silencer**



D = Diameter



## Volumetric flow controller

### Technical data for Belimo components Measured value collection and control function

The measured values are collected by two measuring rods favourable to the flow. The measuring openings are distributed over the measuring rods according to the median line method. The pressure differential formed on the measuring rods is determined by means of a dynamic or static measuring sensor. From these measuring results the middle value is formed, which gives a measured variable for the volume flow. The controller compares the actual value signal with the set point and sends a start signal to the electric actuator which adjusts the controller deviation independent of pressure changes in the duct network.

#### Attention:

The volumetric flow controllers equipped with the Belimo control type LMV/NMV-D3-MF are delivered as standard with a GMCAIR 2 - 10 V DC drive (w-signal). Upon activation with 2 V DC, the Vmin volume is set. The Vmin volumes can be seen from the Vmin / Vmax tables. When the Vmin volume drops below the values shown in the Vmin / Vmax table, then the control function and the output of the U5 signal is no longer guaranteed for metrology reasons. Airtight sealing to DIN 1751 can be achieved by means of a 0V actuator signal or via a positive control. This positive control "CLOSED" must be implemented on-site via a switch contact.

Upon customer request, the volumetric flow controller equipped with the Belimo control type LMV/NMV-D3-MF can also be delivered with the drive 0-10 V DC. However, please note that in this case the positive control "CLOSED" can be implemented via a diode.

### Operating control Belimo components; Positive control damper "CLOSED"

Energy saving in areas not in use by closing the supply and return air volumetric flow controller. If the input Y is connected to terminal 1 via an on-site switch for the operating range 2-10 V DC, the drive will move the damper to the CLOSED position. The drive will also close the damper if the setpoint value for the minimum volumetric flow Vmin has been set to 0%, and the control signal corresponds to the value Vmin. This function does not correspond to the function of positive control "CLOSED" via the switch contact.

### Positive control damper "OPEN"

Supports smoke extraction or is used as a safety position. The volumetric flow controller is in this case inactive, and the damper is driven to the mechanical open position.

**Vmin control to min. volumetric flow;** Depending on requirement or by not assigning them, individual areas can be set to stand-by operation. In this way, minimum room flushing with greatly reduced energy expenditure is achieved.

**Vmax control to max. volumetric flow;** Individual or several rooms are supplied for a short period with a maximum volumetric flow. This allows airing, night cooling and quick heating to be implemented.

**Continuous operation;** As a function of the continuous command signal and the programmed operating area (2 - 10 V; 0 - 10 V) the LMV/NMV-D3- MF will regulate the volumetric flow between the set values of Vmin and Vmax.

**Constant operation;** If terminal 3 (Y signal) has not been assigned, the air volume set on the Vmin potentiometer will be set to a constant volume.

### VAV-Compact (LMV/NMV-D3-MF)

The operation control is effected via the drive input w/z. The possible functions depend on the selected operating mode "2-10 V" or "0-10 V" The diagrams below show the possible settings.

# VAV- VARIABLE AIR VOLUME CONTROL DAMPER



## Circuit diagrams,

Compact controller Belimo make LMV/NMV-D3-MF - Attention: not MP-bus-capable

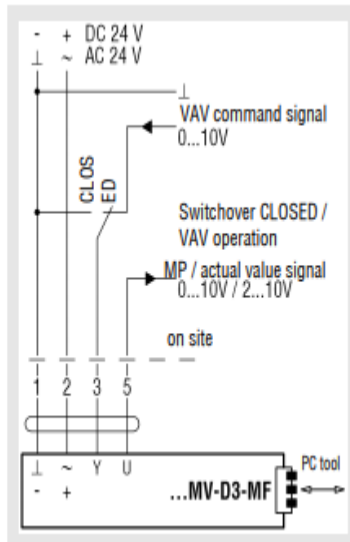
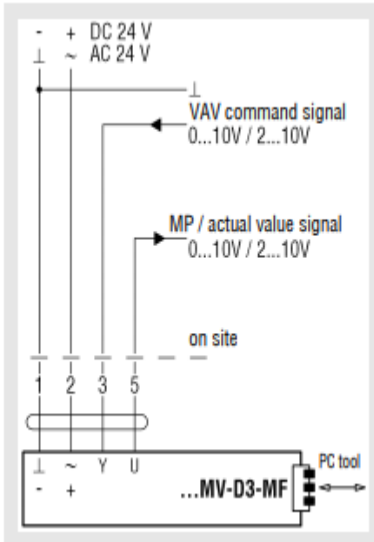
VAV with analogue command signal

VAV with lock (CLOSED)

Lock mode (CLOSED)

In the 2 - 10 V mode, the following function

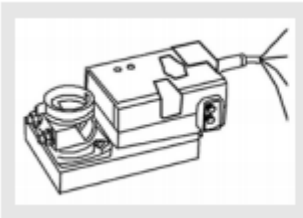
can be carried out with a 0 - 10 V signal:



Com- mand sig- nal Y	Volumetric flow	Function
< 0.1 V **	0	Damper CLOSED, VAV control inac- tive
0.2...2 V	$V_{min}$	$V_{min}$ operating stage active
2...10 V	$V_{min} \dots V_{max}$	Continuous opera- tion $V_{min} \dots V_{max}$

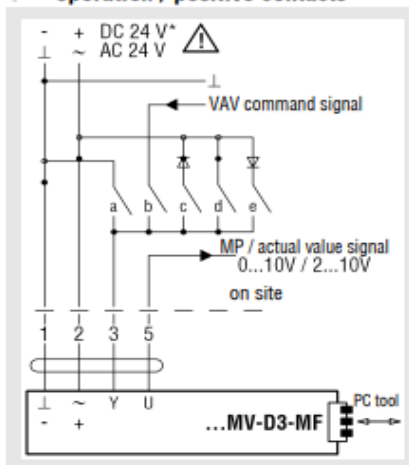
\*\*Attention: Controller/DDC must be able to pull the command signal to 0 V.

## Cable designations



No.	Designation	Wire colour	Function
1	— — — — — ⊥	black	} Feed AC/DC 24 V
2	— — — — — + ~	red	
3	← — — — — — Y	white	VAV / CAV command signal
5	→ — — — — — U	orange	- Actual value signal

### operation / positive contacts



**Note:** Please ensure mutual locking of the contacts!

### function for LMV/NMV-D3-MF

Mode setting	---	0...10 V	0...10 V	0...10 V	0...10 V
Signal	2...10 V	2...10 V	2...10 V	2...10 V	2...10 V
Signal	⊥ -	0...10 V 2...10 V	-	-	-
Function					
Damper CLOSED	a) CLOSED		c) CLOSED*		
$V_{min} \dots V_{max}$		b) VAV			
Damper OPEN					e) OPEN*
$-V_{max}$			d) $V_{max}$		

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

\* not available for DC 24 V supply




**LED table of functions for LMV-D3-MF**

Application	Function	Description / action	LED Sample	Adaptation Address	⊕ LED 1 power ⊕ LED 2 status
N1 operation	Status display	- 24V power supply o.k. - VAV-Compact ready for operation	LED 1 LED 2		
S1 service function	Synchronisation	Synchronisation started by: a) Operating / service unit b) Manual trigger device at the VAV-Compact c) Power ON behaviour	LED 1 LED 2		
S2 service function	Adaptation	Adaptation started by: a) Operating / service unit b) Key on the VAV-Compact	LED 1 LED 2		
V1 VAV service	VAV service active	a) Press both keys «Adaptation» & «Address» simultaneously b) VAV service will be activated: - until 24V supply is switched off - until both keys are pressed again - after 2 hours have passed	LED 1 LED 2		
	Lack of air	Damper opens as actual volume is too low	LED 1 LED 2		
	Target volume reached	Control circuit balanced	LED 1 LED 2		
	Air excess	Damper closes as actual volume is too high	LED 1 LED 2		

green LED (power) is lit  
 yellow LED (status) is lit

# VAV- VARIABLE AIR VOLUME CONTROL DAMPER



## ORDER CODE

<b>VAV-151</b>	<b>G</b>	<b>01</b>	<b>L1000</b>	<b>-</b>	<b>N 1000X700</b>
<p>VAV-151: Rectangular VAV-251: Circular</p> <p>G: Galvanised Chasis P: Stainless Steel A: Aluminum</p> <p>00: No Insulation 01: Heat Insulation 02: Sound Insulation 03: Heat + Sound Insulation</p>					<p>N: Neck Size D: Neck Diameter</p> <p>Standard Servo-Operated</p> <p>L: Requested Product Length</p>