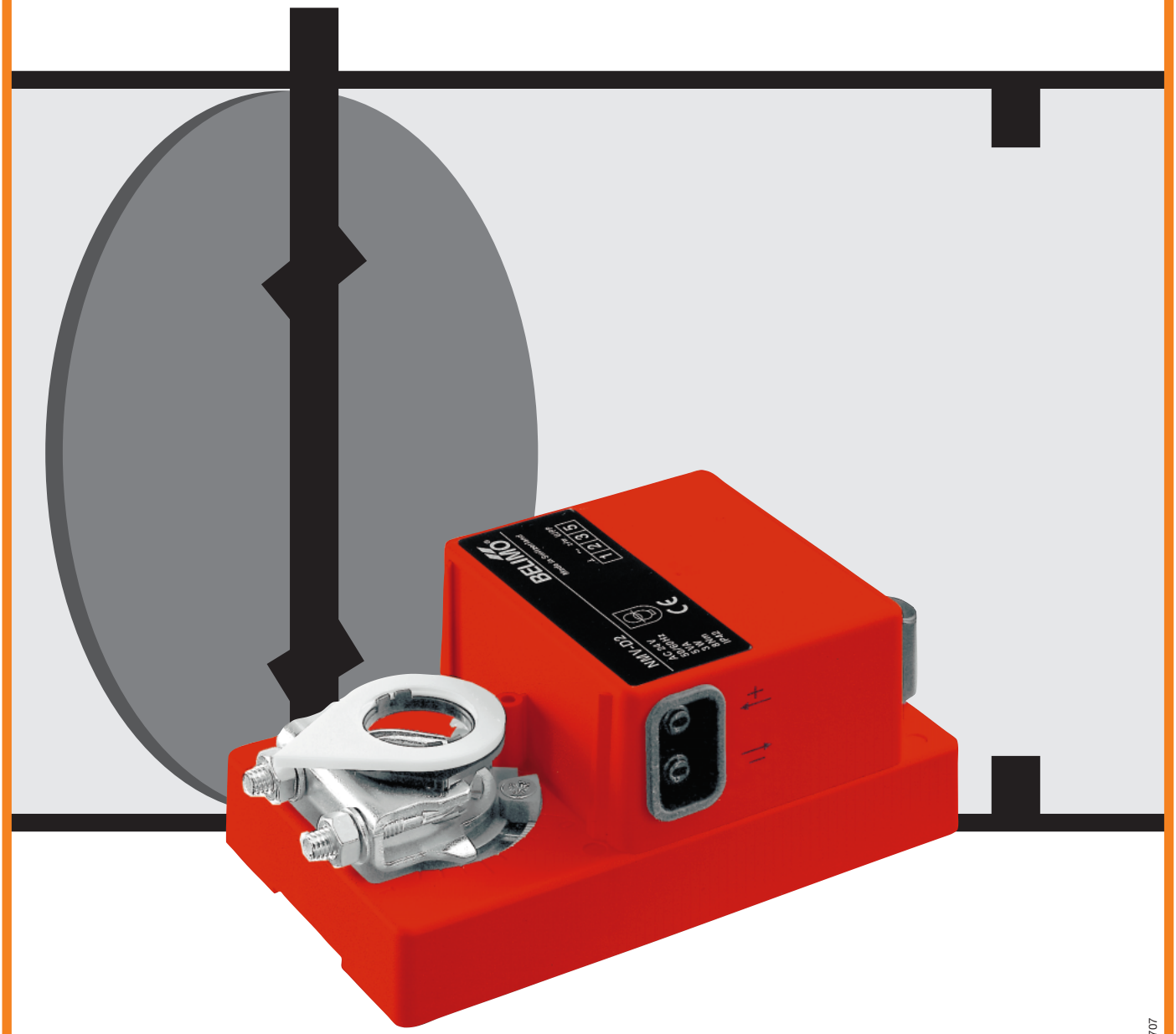
BELIMO

Actuators for heating,
ventilation, air-conditioning

4. VC-3
Product Information
Air-Volume Control

VAV Compact



VAV-Compact NMV-D2

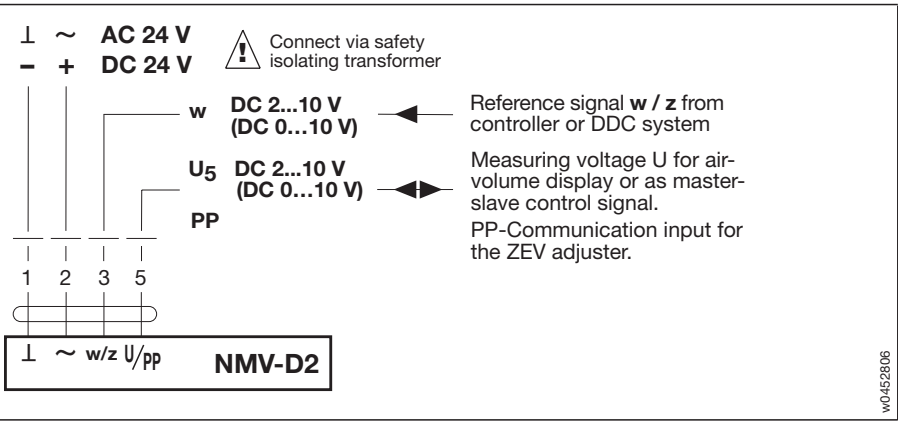
Pressure sensor, controller and 8 Nm damper actuator as a compact unit

Control input modulating: DC 2…10 V, DC 0...10 V

Override control functions: «CLOSE», $\dot{V}_{MIN}$, $\dot{V}_{ZS}$, $\dot{V}_{MAX}$, «OPEN»

Communication capacity (PP)

Wiring diagram



Technical data	NMV-D2
Nominal voltage	AC 24 V 50/60 Hz, DC 24 V
Nominal voltage range	AC 19.2…28.8 V, DC 21.6…26.4 V
Power consumption	3 W
For wire sizing	5.5 VA
Reference value w Input resistance	DC 0…10 V (reference in the range between $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$) min. 50 kΩ
Operating mode control z	Override control for «CLOSE»; $\dot{V}_{MIN}$, $\dot{V}_{ZS}$, $\dot{V}_{MAX}$ and «OPEN» (specific application of AC power signals)
Working range optional	«2…10 V» = DC 2…10 V for $\dot{V}_{MIN}$… $\dot{V}_{MAX}$ «0…10 V» = DC 0…10 V for $\dot{V}_{MIN}$… $\dot{V}_{MAX}$
Actual-value signal for volumetric flow U5	DC 2…10 V @ 0.6 mA (for mode 2…10) DC 0…10 V @ 0.6 mA (for mode 0…10) Signals linear, correspond to 0…100% $\dot{V}_{NOM}$
Sensor range	2… ≈ 300 Pa (OEM dependent)
Connecting cable	1 m, 4×0.75 mm²
Direction of rotation	L/R selected with ZEVO or PC (OEM setting)
Protection class	III (safety extra-low voltage)
Degree of protection	IP42
Angle of rotation	max. 95°, adjustable by mechanical stops
Torque at rated voltage	min. 8 Nm
Position indication	mechanical with pointer
Ambient temperature range Storage temperature range Humidity test	0… + 50 °C –20…+ 80 °C to EN 60335-1
EMC	CE according to 89/336/EEC and 92/31/EEC
Sound power level	max. 35 dB (A)
Maintenance	maintenance-free
Weight	900 g

Application

The VAV-Compact NMV-D2 is used for pressure-independant air flow control of VAV Boxes.

It is controlled by modulating signals from positioners, master controllers or DDC systems. Various modes of operation in the form of overrides can be obtained very simply by the application of AC signals.

Construction

The VAV-Compact NMV-D2 circuit contains a dynamic differential-pressure sensor and a electronic measuring and control unit incorporating a microprocessor. The equipment unit is based on the proven type NM damper actuator.

Operation and adjustment

The gearing can be disengaged by pressing the pushbutton on the actuator housing. The damper can be operated by hand while the button is held depressed. Apart from this release pushbutton there are no other operating controls such as switches or reference potentiometers on the NMV-D2 unit.

The programming of operating modes and operating parameters $\dot{V}_{MIN}$, $\dot{V}_{MAX}$ and $\dot{V}_{NOM}$ is performed with one of the PP accessory devices ZEV, ZEVO.

- ZEV (for checks and adjustments one-site)
- ZEVO (for OEM programming)

The advantages of PP programming are:
- Remote parameter setting and control of actual-value capabilities
- No risk of mistakes by untrained or unauthorized persons.

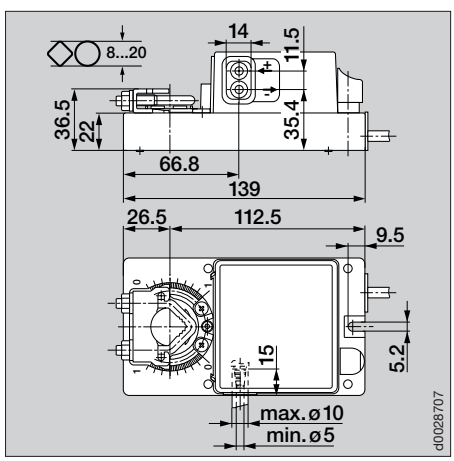
Electrical accessories

ZEV Adjuster
SN1, SN2 Auxiliary switches

Important

The manufacturer of the VAV Boxes (i.e. the OEM) is responsible for the proper assembly and correct adjustment of the NMV-D2 and the total accuracy of the VAV-Boxes. For this reason the NMV-D2 is only supplied directly to VAV-Box manufacturers.

Dimensions



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User-friendly – modulating control and overrides for the NMV-D2

If an HVAC system is to be user-friendly it must be possible to employ multi-step control with constant volumetric flow rates as well as modulating control of the air volume controller by means of DC signals.

In the case of VAV Compact controllers, either method is very easy to employ. The reference variable input w(3) responds both to modulating signals and to override signals derived from the AC power supply. This ensures that several units connected in parallel can also be used in combination with VRD2... controllers.

For technical reasons, «CLOSE» override control is only possible in the 2...10 V DC working range or generally when $\dot{V}_{MIN}$ is set to 0%.

Damper «CLOSE»
Energy can be saved in unoccupied zones or rooms by closing the supply-air and exhaust-air dampers.

Shorting input w to connection 1 in the 2...10 V working range causes the NMV-D2 to move the damper to the closed position.
The actuator is also forced to close the damper when the setpoint for minimum volumetric flow $\dot{V}_{MIN}$ is set to 0% and the control signal corresponds to the $\dot{V}_{MIN}$ value.

$\dot{V}_{MIN}$ – minimum volumetric flow
Specific zones or rooms in a building can be switched to standby mode if they are unoccupied or if this is necessary for some other reason. It produces a substantial reduction in energy consumption thanks to the minimum amount of air supplied to the zones or rooms in question.

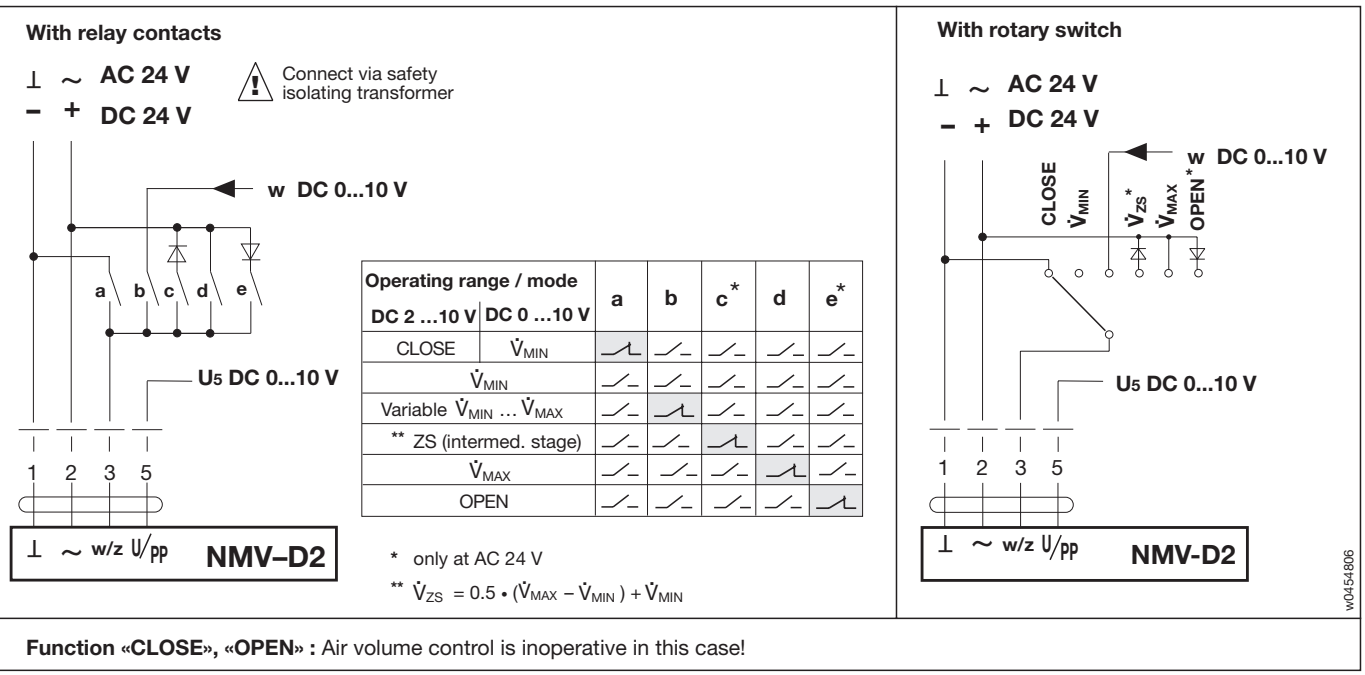
$\dot{V}_{ZS}$ – intermediate stage
In manual or automatic multi-step volumetric flow control, finer adjustments – of, say, air quality – can be achieved by using the mean value of maximum and minimum flow.

$\dot{V}_{MAX}$ – maximum volumetric flow
Individual rooms or groups of rooms can be supplied with maximum air flow for short periods. It is ideal for providing scavenge-ventilation, night-cooling and morning warm-up.

Damper «OPEN»
For additional smoke extraction or as an extra safety position. Volumetric flow control is inoperative in this case and the damper is driven to the «mechanical» open position.

Modulating control
Depending on the modulated reference signal and the selected working range (2...10 V or 0...10 V), the NMV-D2 regulates the flow between the two set values of $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$.

The diagrams show the Belimo standard settings. OEM's can reprogram these settings by PC when necessary.



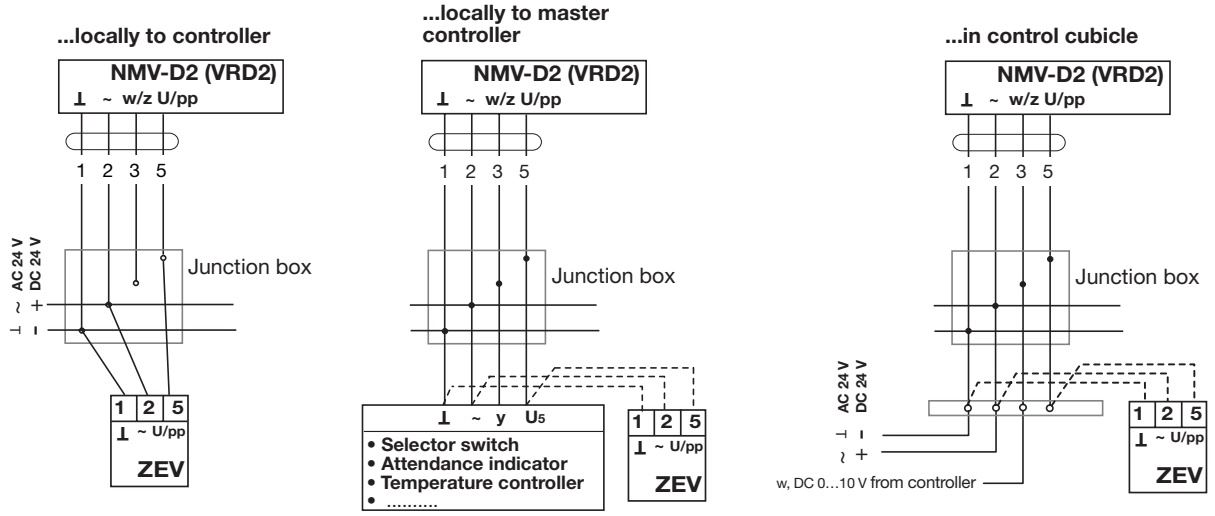
Operating range / mode DC 2 ...10 V	DC 0 ...10 V	a	b	c*	d	e*
CLOSE	$\dot{V}_{MIN}$					
$\dot{V}_{MIN}$						
Variable $\dot{V}_{MIN}$ ... $\dot{V}_{MAX}$						
** ZS (intermed. stage)						
$\dot{V}_{MAX}$						
OPEN						

* only at AC 24 V

** $\dot{V}_{ZS} = 0.5 \cdot (\dot{V}_{MAX} - \dot{V}_{MIN}) + \dot{V}_{MIN}$

Function «CLOSE», «OPEN» : Air volume control is inoperative in this case!

Examples of connecting for adjuster ZEV to the NMV-D2



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A service tool for commissioning, maintenance and testing

Application

The ZEV adjuster can be used by commissioning engineers and service mechanics for checking actual values and operating status in HVAC systems and also for making simple adjustments.
The NMV-D2 has no operating controls such as switches or setpoint potentiometers so the microprocessor-controlled ZEV adjuster is essential for programming the operating parameters $\dot{V}_{MAX}$, $\dot{V}_{MIN}$ and the working range.

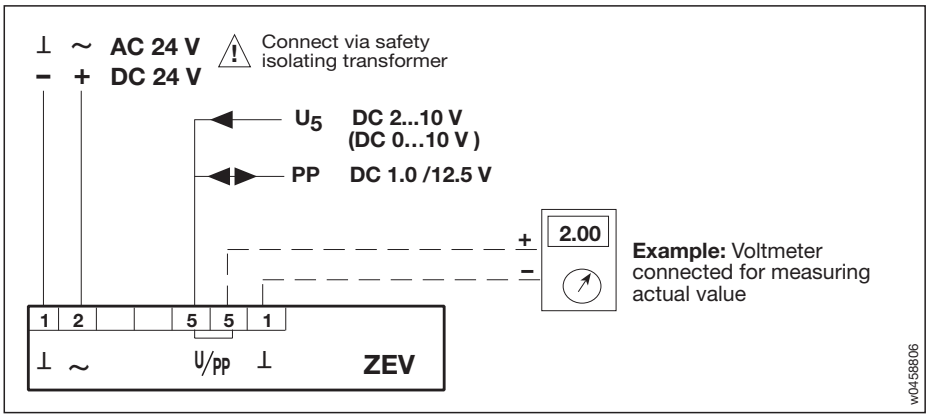
Construction and operation

The ZEV adjuster is easy to use and requires no knowledge of computers. The operating controls are on the front of the device. The settings are entered in the same way as with the VRD controller. The working ranges «2...10», «0...10» and the $\dot{V}_{MAX}$ and $\dot{V}_{MIN}$ values are set by means of individual potentiometers. The controller can be made to accept the settings by briefly pressing the appropriate «set» key after the required values have been entered on the ZEV adjuster. The settings are acknowledged by the lighting-up of the appropriate LED. Pressing the «reset» key returns the controller to the original OEM factory settings for $\dot{V}_{MAX}$ and $\dot{V}_{MIN}$.
A green LED indicates the status of the control circuit. Completed = steady, Uncompleted = flashing.

Connections

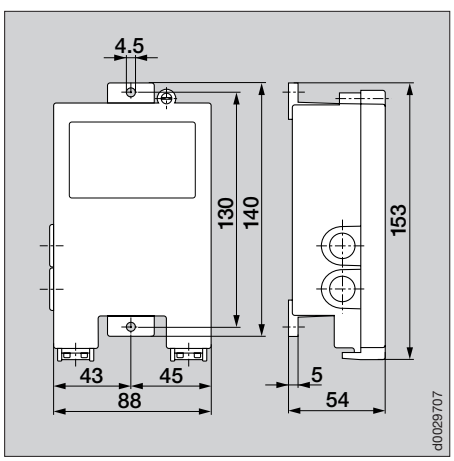
The electrical connections between the ZEV adjuster and the NMV-D2 or the VRD2(-L) unit can be made either locally or remotely, e.g. at the equipment cubicle via the PP connection.
Note: As long as the U/PP connection of the NMV-D2 / VRD2 is connected to the ZEV Adjuster, the output signal U_5 will not represent the current actual value. However, communication can be interrupted through appropriate use of the «mode» key.

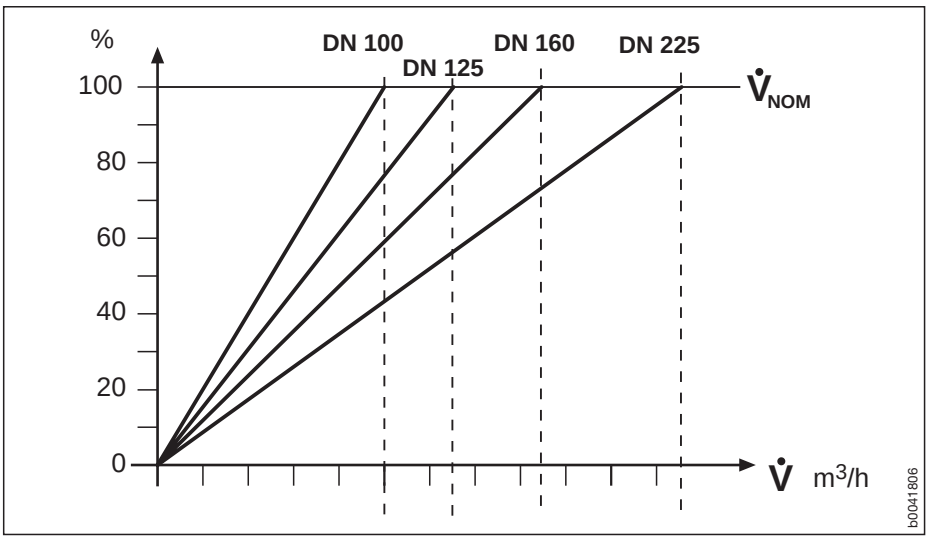
Wiring diagram



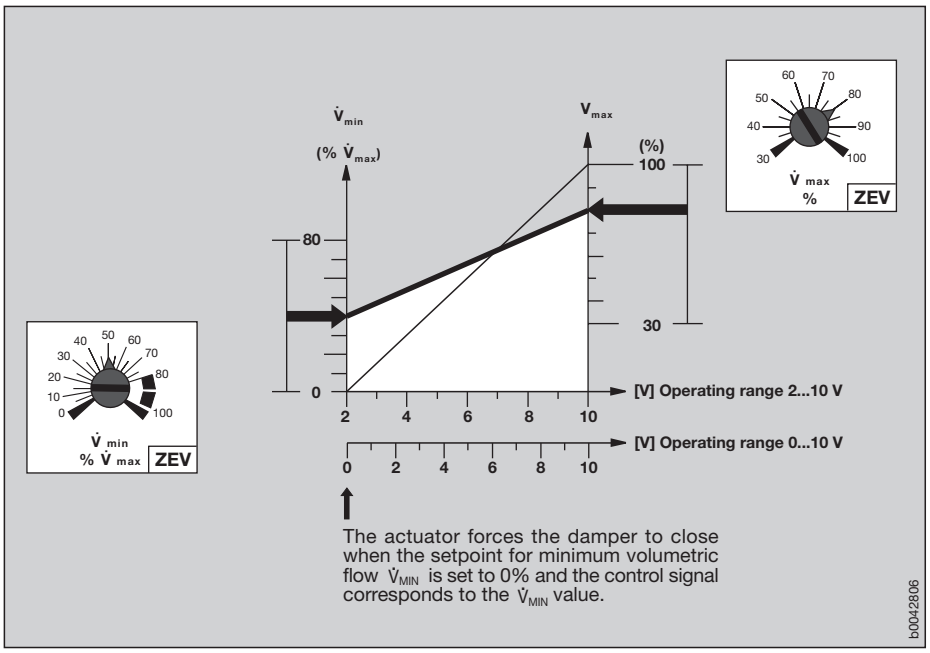
Technical data	ZEV
Nominal voltage	AC 24 V 50/60 Hz, DC 24 V
Nominal voltage range	AC 19.2…28.8 V, DC 21.6…26.4 V
Power consumption	1 W
PP-communication	DC 1.0/12.5 V max. DC 15 V bi-directional 1200 Baud
Actual-value checking	$\dot{V}_{MAX}$, $\dot{V}_{MIN}$, operating modes (in dialogue with yellow LED's)
Control circuit checking	Actual-value ≠ Setpoint (green LED flashing) Actual-value = Setpoint (green LED steady)
OEM original values	$\dot{V}_{MIN}$, $\dot{V}_{MAX}$ (can be reactivated with the reset button)
Adjusting range $\dot{V}_{MAX}$	30…100% $\dot{V}_{NOM}$
Adjusting range $\dot{V}_{MIN}$	0…80% $\dot{V}_{MAX}$ (for constant control…100%)
Working range optional (mode)	2…10 = DC 2…10 V ($\dot{V}_{MIN}$…$\dot{V}_{MAX}$) 0…10 = DC 0…10 V ($\dot{V}_{MIN}$…$\dot{V}_{MAX}$)
Connection	Screw terminals 2×1.5 mm²
Protection class	III (safety extra-low voltage)
Degree of protection	IP42
Ambient temperature range Storage temperature range Humidity test	0… + 50 °C – 20… + 80 °C to EN 60335-1
EMC	CE according to 89/336/EEC and 92/31/EEC
Weight	500 g

Dimensions

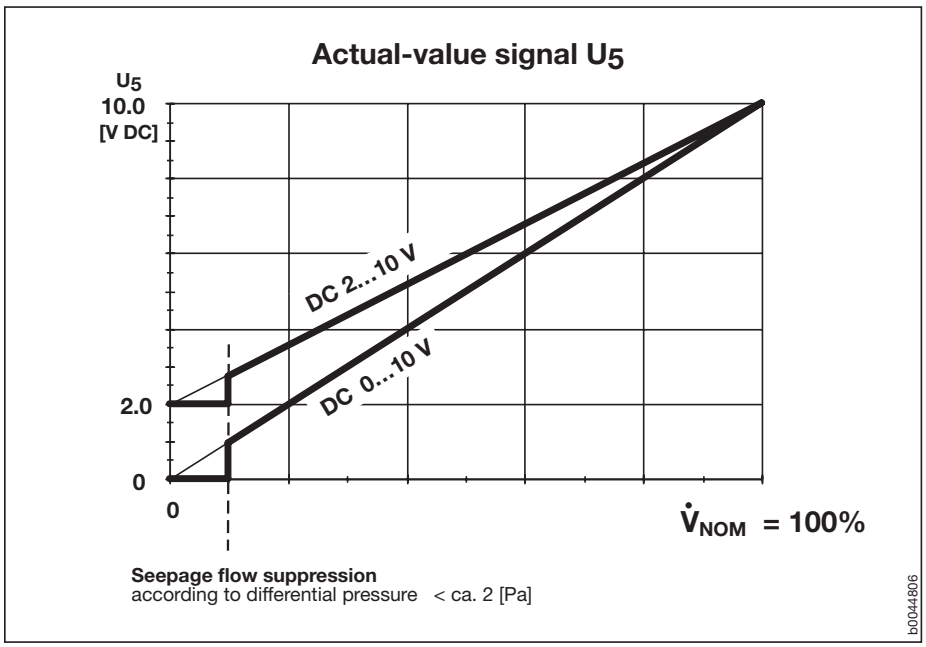




Nominal value of volumetric flow $\dot{V}_{NOM}$
Energy and noise considerations dictate that the specific value of volumetric flow for each diameter of duct must not exceed a given value.
With BELIMO VAV-Control, the manufacturer can calibrate his air volume controllers at the factory to a maximum value of $\dot{V}_{NOM}$. This then produces the very versatile, linear control unit for volumetric flow.
The presetting of units to a uniform value of $\dot{V}_{NOM}$ reduces and simplifies the OEM's work in connection with planning, fabrication, installation and commissioning. Costs are cut substantially as a result.



Operating values of volumetric flow $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$
The linear characteristic of the air volume controller makes for simple setting of the plant-side operating values of volumetric flow by means of two potentiometers. The adjustments can be carried out either at the factory (OEM) or during installation or commissioning.
The $\dot{V}_{MAX}$ value is the upper limit value related to the nominal value of volumetric flow. The $\dot{V}_{MIN}$ value can be adjusted as a percentage of the set value of $\dot{V}_{MAX}$.
The actual-value output U_5 is unaffected by the $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$ settings.
The reference signals w/z allow the set value of volumetric flow to be adjusted either steplessly or in steps between the preset limit values.



Modes of operation

Multistep-constant mode by overrides:
The controller can be set for several different types of operation when necessary by means of simple override control signals. As a result, it either maintains a constant volumetric flow for $\dot{V}_{MIN}$ or $\dot{V}_{MAX}$ or an intermediate value by opening or closing the damper according to the control signal.

Modulating:
The flow can be regulated steplessly between the limit values $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$ by means of the reference signal w (DC 0...10 V). The effective working range DC 2...10 V or DC 0...10 V can be selected as required. The override control functions are also operative in the modulating mode and so can be used in almost any combination.

Operating controls for mode and parameter setting
The NMV-D2 has no operating controls apart from the gearing release push-button.
The specific operating parameters $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$ and the working ranges are set and selected by means of the ZEV adjuster via the PP communications interface U_5.