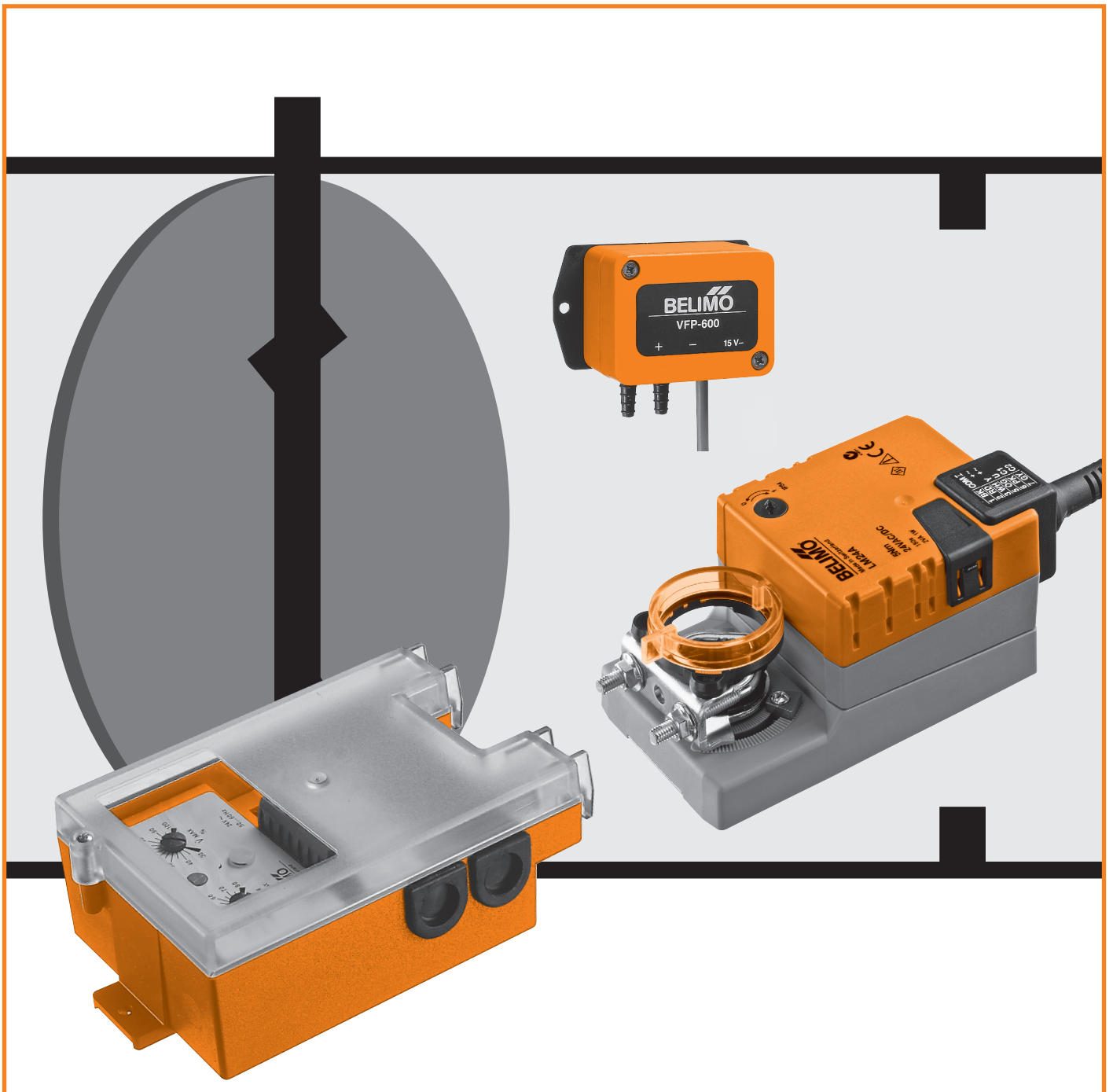
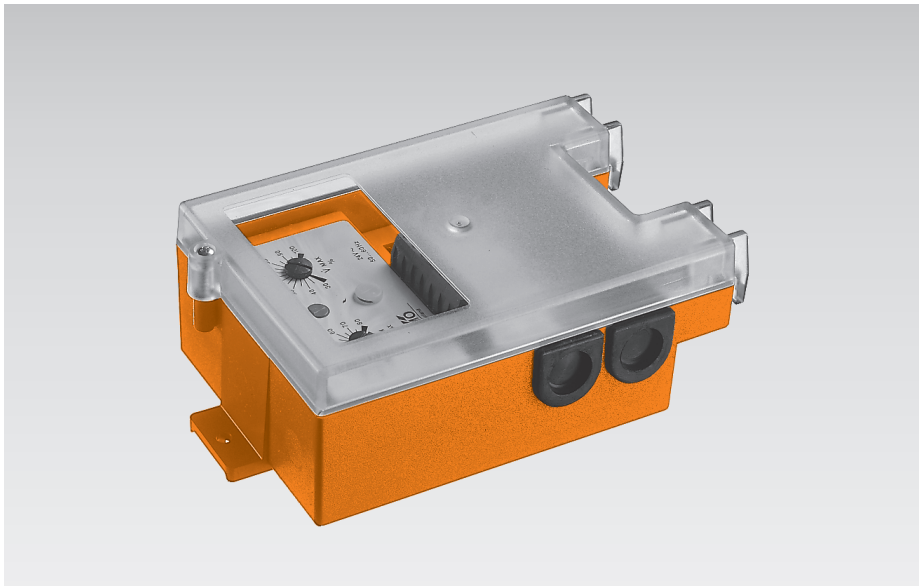


4. VU-7

Product information VRP(-STP)

Air-volume and flow-pressure control





Air-volume controller for static differential pressure sensor VFP-..

Control input
DC 2...10 V, 0...20 V phasecut

Application

The VAV-Universal VRP forms together with the static pressure sensor VFP-.. and the ..-24-V actuators a closed control loop for the pressure-independent air flow control of VAV boxes.

Thanks to the static pressure sensor, the unit can also be used for the control of contaminated and slightly aggressive air. Since it can be combined with many different types of actuators, the VRP can be used with different sizes of dampers.

Operation and adjustment

The VRP is controlled with a reference signal of DC 2...10 V (w1) or 0...20 V phasecut (w2). The parameters \dot{V}_{MIN} and \dot{V}_{MAX} are set by means of the appropriate potentiometers.

Static pressure sensors

VFP-100 (0...100 Pa), VFP-300 (0...300 Pa), VFP-600 (0...600 Pa)

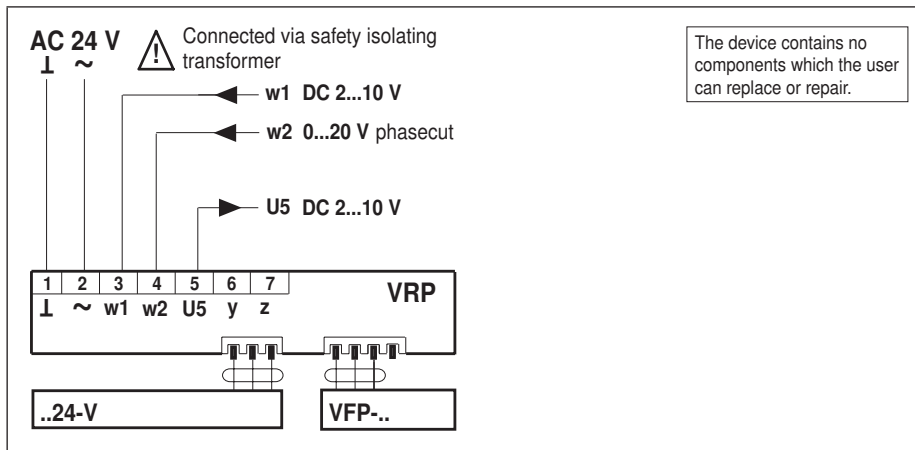
Damper actuators

LM24A-V, NM24A-V, SM24A-V, LF24-V, SF24A-V

Important

The manufacturer of the VAV boxes (i.e. the OEM) is responsible for the proper assembly and correct adjustment of the VRP and the total accuracy of the VAV boxes.

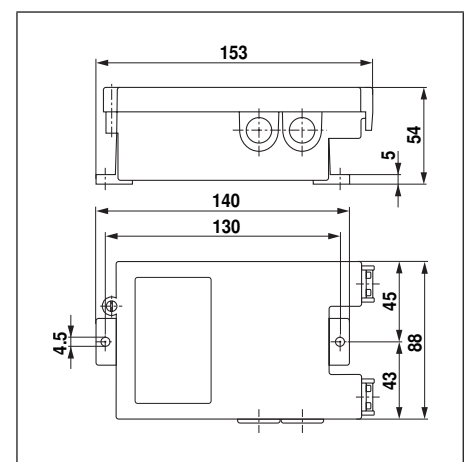
Wiring diagram



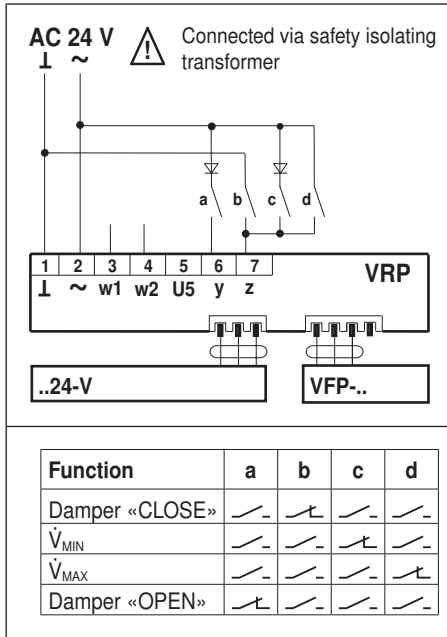
Technical data

Nominal voltage	AC 24 V 50/60 Hz
Nominal voltage range	AC 19.2...28.8 V
Power consumption	1.3 W (incl. Sensor VFP-.., without damper actuator)
For wire sizing	2.6 VA (incl. Sensor VFP-.., without damper actuator)
Reference value w1	DC 2...10 V @ input resistance 100 kΩ
Reference value w2	0...20 V phasecut @ input resistance 8 kΩ (Reference in the range between \dot{V}_{min} and \dot{V}_{max})
Actual-value signal for volumetric flow U5	DC 2...10 V @ 0,5 mA Signal linear, corresponds 0...100% \dot{V}_{NOM}
Adjusting ranges	
• \dot{V}_{max} (max. volumetric flow)	30...100% of adjusted reference value (\dot{V}_{NOM})
• \dot{V}_{min} (min. volumetric flow)	0...80% of adjusted \dot{V}_{max}
Connection	Screw terminals for 2x1.5 mm ²
Protection class	III (safety extra-low voltage)
Degree of protection	IP42
Ambient temperature	0...+50°C
Storage temperature	-20...+80°C
Humidity test	to EN 60335-1
EMC	CE according to 2004/108/EC
Mode of operation	Type 1 (EN 60730-1)
Weight	approx. 400 g (without pressure sensor)

Dimensions



Override control



Control

In order for a ventilation and air-conditioning system to be operated economically, it is important to be able to select the operating modes «MIN», «MAX», «OPEN» or «CLOSE».

In the case of the VRP, these functions can be accessed very easily as shown in the diagrams on the left.

The override control input z or input y overrides all signals from the reference inputs w1 or w2.

Override control commands can also act on several controllers simultaneously.

«CLOSE» damper: For saving energy in unoccupied zones by closing the supply- and exhaust-air dampers.

«OPEN» damper: For smoke extraction or safety purposes. Note: Air volume control is inoperative in this case.

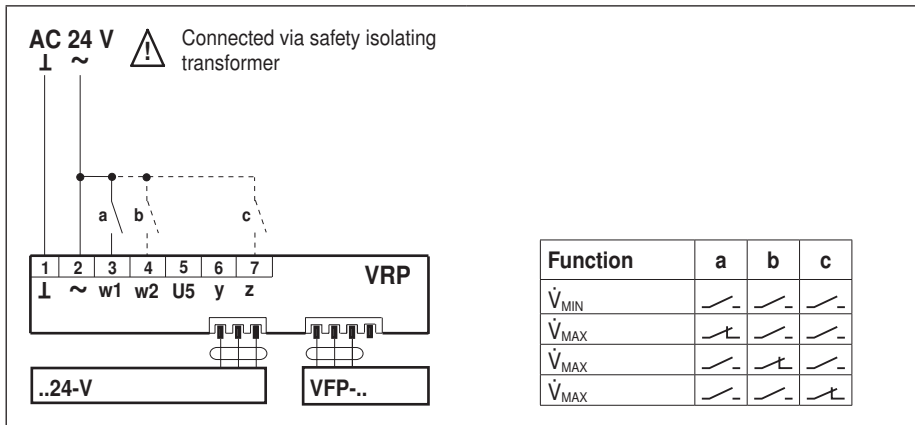
\dot{V}_{MIN} – minimum volumetric flow

When individual zones are unoccupied, they can be switched to the standby mode so that there is minimum air flow through them, and the consumption of energy is substantially reduced.

\dot{V}_{MAX} – maximum volumetric flow

Maximum air flow can be directed to one or more rooms for short periods in order to provide extra ventilation, night cooling or fast morning warm-up.

Two-stage air volume control



Two-stage air volume control

If no reference signal w1/w2 is being fed to the VRP controller, it will automatically maintain the constant value of volumetric flow that has been set with the \dot{V}_{MIN} potentiometer.

If an AC 24V signal is fed to the reference inputs 3 (w1), 4 (w2) or 7, the VRP will maintain the constant value of volumetric flow that has been set with the \dot{V}_{MAX} potentiometer.

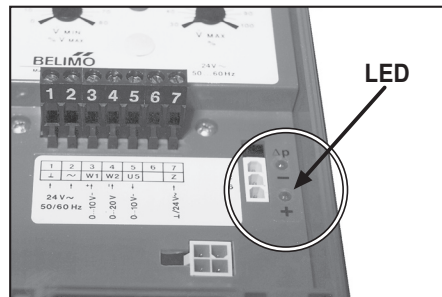
This means that «dual volume control» is possible by means of a switch or contacts in the connecting circuit.

Zero adjustment of VFP-.. static pressure sensors

The pressure sensing part of the device is based on a static pressure measuring capsule. Extra care must be taken with transportation, carrying and installation.

The air volume controllers are adjusted by the OEM at the factory according to their mounting position. If they are eventually mounted in a different position, the zero of the sensor can be re-adjusted by means of the LED display on the VRP-.. device and the adjusting potentiometer on the pressure sensor.

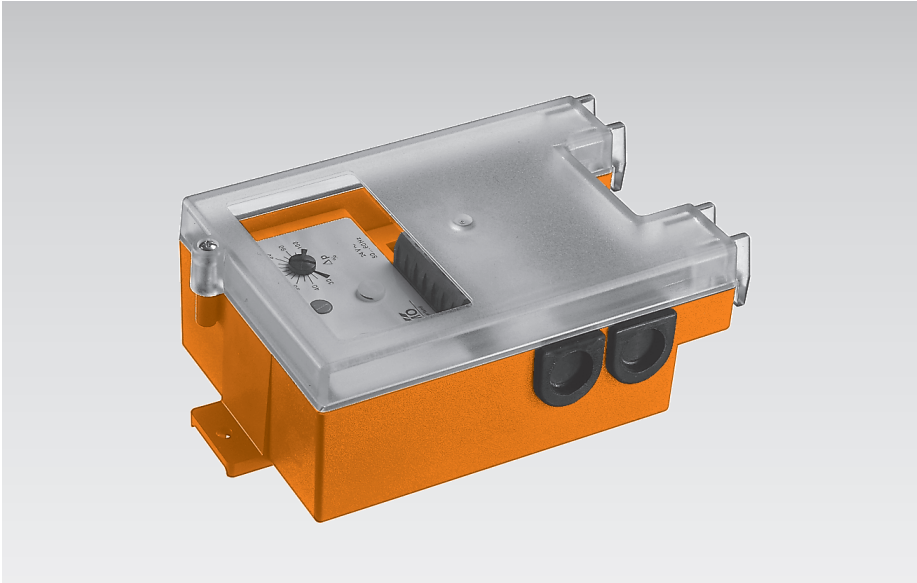
VRP-.. device



Status LED	Information
● +	Positive pressure signal greater than +0,25% FS VFP-..
● ● +	Pressure signal in range ±0,25% FS VFP-.. corresponding to zero (instrument hoses removed)
● ● +	Negative pressure signal less than -0,25% FS VFP-..

VFP-300 and VFP-600 devices





Pressure controller for static differential pressure sensor VFP-..

Application

The VAV-Universal VRP-STP forms together with the static pressure sensor VFP-.. and the ..24-V actuators a closed pressure control loop. The VRP-STP controller is designed for use on variable pressure systems when the pressure is regulated linearly and not as function of volumetric flow.

Thanks to the static pressure sensor, the unit can also be used for the control of contaminated and slightly aggressive air. Since it can be combined with many different types of actuators, the VRP-STP can be used with different sizes of dampers.

Operation

In the VRP-STP controller, the pressure measured by the sensor VFP-.. is compared with the setpoint. If there is any deviation between the two, the damper actuator ..24-V adjusts the position of the damper until the setpoint is reached.

Adjustments

Of pressure setpoint at place of use:

The setpoint can be adjusted by means of the potentiometer $\Delta p\%$ within a range from 30 to 100%.

Of pressure setpoint from external:

The setpoint can be adjusted externally with a reference signal w1 of DC 2...10 V from an external setpoint transmitter (e.g. SG..24). Zero adjustment of sensor according to page 7.

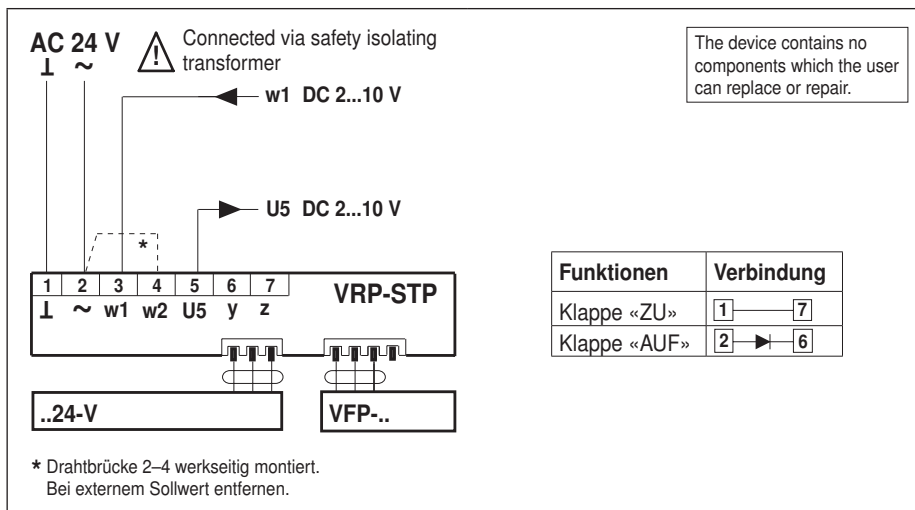
Static pressure sensors

VFP-100 (0...100 Pa), VFP-300 (0...300 Pa)
VFP-600 (0...600 Pa)

Damper actuators

LM24A-V, NM24A-V, SM24A-V, LF24-V,
SF24A-V

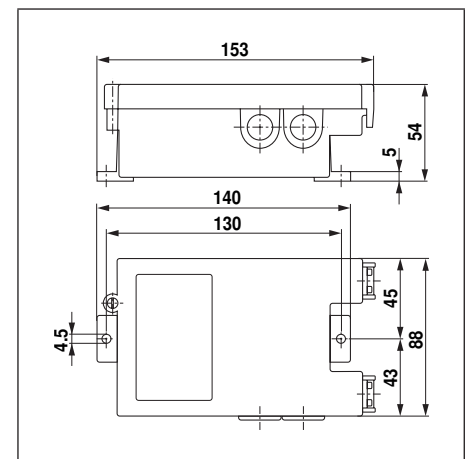
Wiring diagram



Technical data

Nominal voltage	AC 24 V 50/60 Hz
Nominal voltage range	AC 19.2...28.8 V
Power consumption	1.3 W (incl. Sensor VFP-.., without damper actuator ..24-V)
Dimensionierung	2,6 VA (incl. Sensor VFP-.., without damper actuator ..24-V)
Reference value w1	DC 2...10 V @ input resistance 100 k Ω
Actual-value signal U5	DC 2...10 V @ max. 0,5 mA (Signal linear = 0...100% Δp)
Adjusting ranges	
• Reference value	25...100% sensor reference signal (Factory setting =100%. e.g. VFP-300: 100% = 300 Pa)
• Setpoint	30...100% of reference value (Δp)
Connection	Screw terminals for 2 x 1.5 mm ²
Protection class	III (safety extra-low voltage)
Degree of protection	IP42
Ambient temperature	0...+50 °C
Storage temperature	-20...+80 °C
Humidity test	to EN 60335-1
EMC	CE according to 2004/108/EC
Weight	approx. 400 g (without pressure sensor)

Dimensions





Pressure sensors for static measurement in conjunction with controllers VRP and VRP-STP

Application

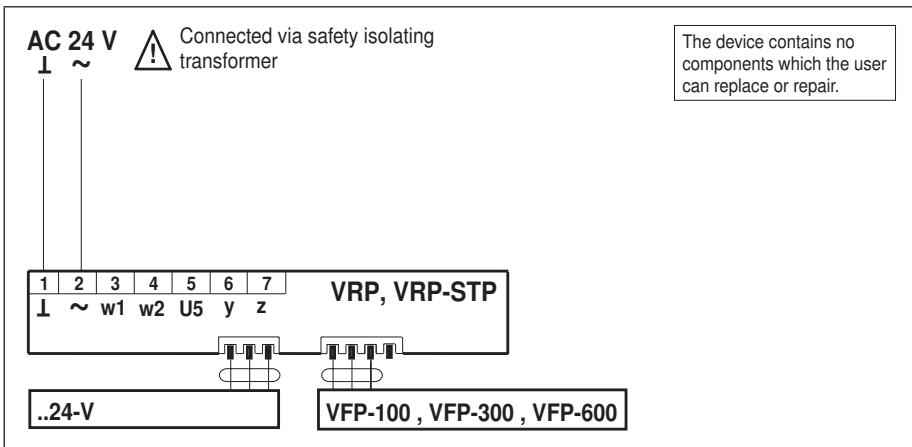
The pressure sensors VFP-.. are used for measurement of static differential pressure. The sensors form together with the controllers VRP or VRP-STP and the Belimo ..24-V actuators a closed control loop for the VAV resp. pressure control in air conditioning systems. The VFP-.. sensors are also suitable for applications where contaminated or slightly aggressive air is present.

Mode of operation

The sensor uses a highly sophisticated metal membrane. The measured pressure produces a movement of the membrane which is detected by a sensing head and then converted into an output signal proportional to the pressure.

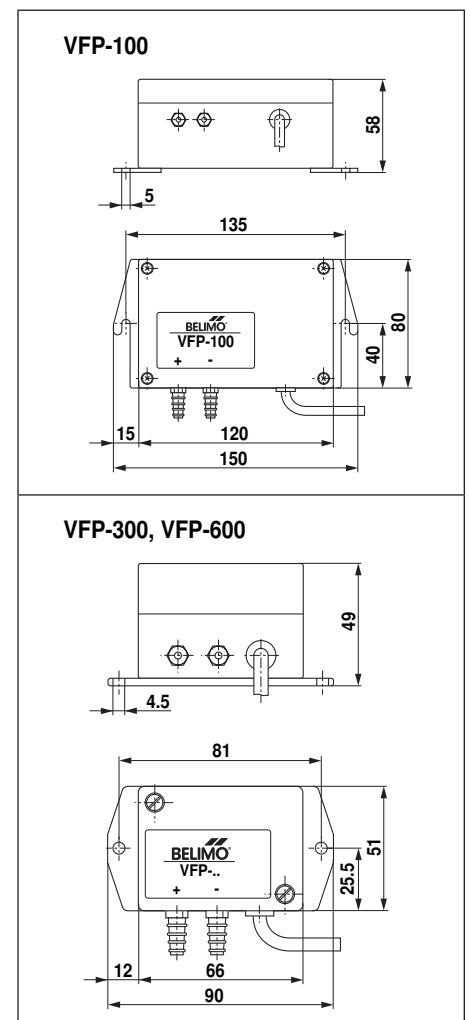
The mounting position has an influence on the measuring signal which is a product of the weight of the membrane. The sensor is calibrated in vertical position (factory-fitted), but it can be readjusted on site if necessary.

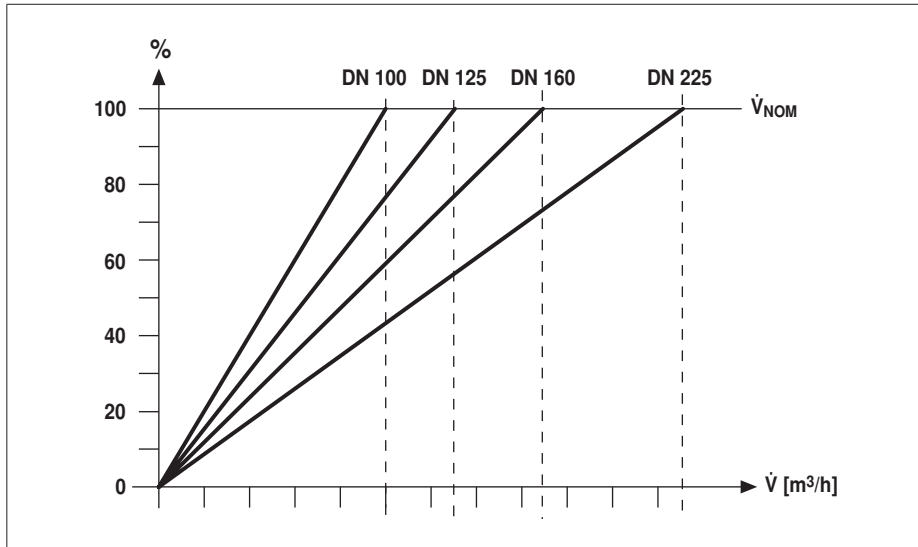
Wiring diagram



Technical data	VFP-100	VFP-300	VFP-600
Nominal voltage	DC 15 V (vom Regler VRP...)		
Nominal voltage range	DC 13,5...16,5 V		
Measuring range	0...100 Pa	0...300 Pa	0...600 Pa
	(zero points adjustable)		
Measuring principle	Measurement of differential pressure by membrane (induktive)		
Output signal	DC 0...10 V (proportional to pressure for controllers VRP..)		
Linearity	±1% of end value (FS)		
Hysteresis	0.1% typ.		
Temperature dependence	±0.1% / K		
• Zero point	±0.1% / K		
• Measuring range	t = +10...+40 °C (reference temperature t ₀ = 25 °C)		
Mounting position	Vertical (i.e. connection nozzles up, sideways or down)		
Position dependence	Max. ±4,5 Pa at 90° rotation on horizontal spindle		
Pressure connection	Connection nozzles for pipe with internal Ø 4...6 mm		
Electrical connection	Cable 1 m long, fitted with 4 pole connectors for VRP..		
Protection class	III (safety extra-low voltage)		
Degree of protection	IP42		
Ambient temperature	0...+50 °C		
Storage temperature	-20...+80 °C		
Humidity test	to EN 60335-1		
EMC	CE according to 2004/108/EC		
Weight	approx. 500 g	approx. 280 g	approx. 280 g

Dimensions



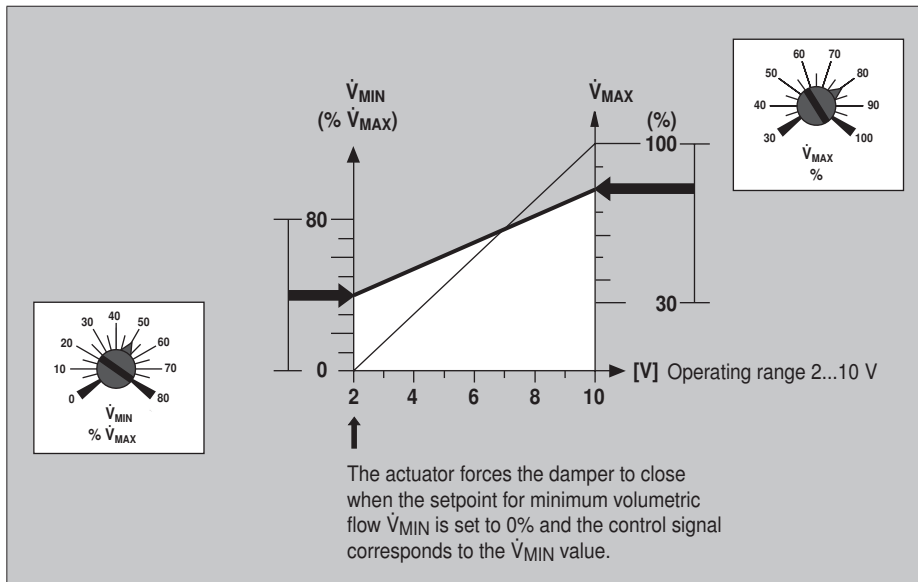


Nominal value of volumetric flow \dot{V}_{NOM}

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 plantside 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 U5 is unaffected by the \dot{V}_{MIN} and \dot{V}_{MAX} settings.

The reference value signals w1/w2 allow the set value of volumetric flow to be moved continuously within the preset limit values.

Modes of operation

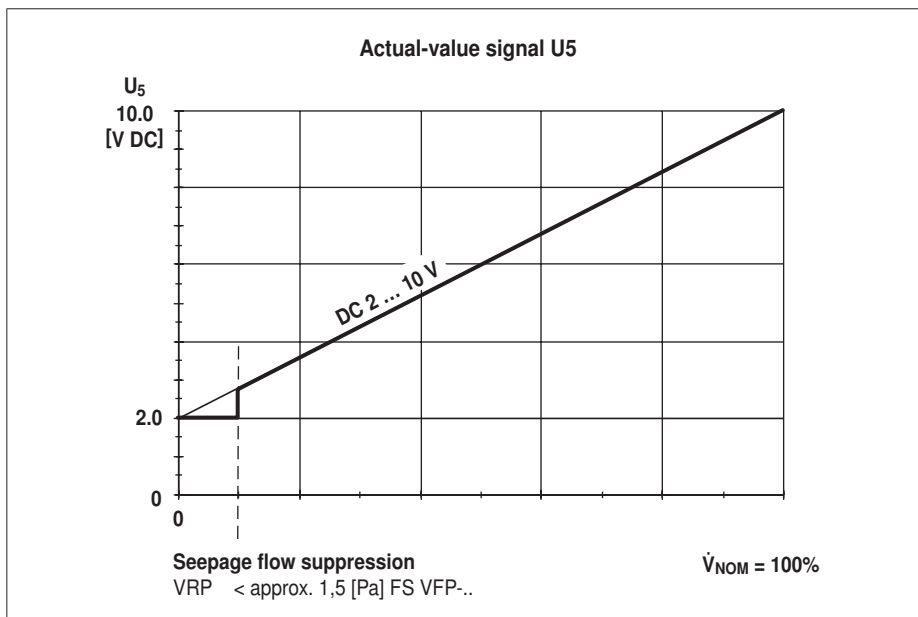
Modulating:

The volumetric flow can be varied infinitely between the limit values \dot{V}_{MIN} and \dot{V}_{MAX} by means of the reference signal w1 (DC 2...10 V).


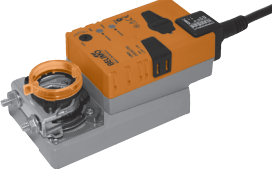
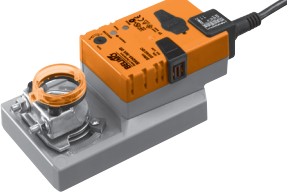


Operating controls for mode and parameter setting

The adjusting potentiometers for \dot{V}_{MIN} and \dot{V}_{MAX} are on the front of the unit.

The «Multi-Stage Air Volume Control» mode can be obtained by appropriate wiring of the reference signals w1 and/or z.



Actuator variants (standard actuators)

Type	Actuator	Features
Rotary actuators 0 ... 90°↵	LM24A-V 	<ul style="list-style-type: none"> - Damper actuator for VAV-Universal - AC/DC 24 V, modulating, 5 Nm - Control DC 6.0 ±4 V from VRP controller - Motor running time 110 ... 150 s - Connection: cable with plug - Angle of rotation 90°↵ - For dimensions see data sheet LM24A-MF
	NM24A-V 	<ul style="list-style-type: none"> - Damper actuator for VAV-Universal - AC/DC 24 V, modulating, 10 Nm - Control DC 6.0 ±4 V from VRP controller - Motor running time 120 s - Connection: cable with plug - Angle of rotation 90°↵ - For dimensions see data sheet NM24A-MF
	SM24A-V 	<ul style="list-style-type: none"> - Damper actuator for VAV-Universal - AC/DC 24 V, modulating, 20 Nm - Control DC 6.0 ±4 V from VRP controller - Motor running time 120 s - Connection: cable with plug - Angle of rotation 90°↵ - For dimensions see data sheet SM24A-MF
Spring-return actuators 0 ... 90°↵	LF24-V 	<ul style="list-style-type: none"> - Spring-return actuator for VAV-Universal - AC/DC 24 V, modulating, 4 Nm - Control DC 6.0 ±4 V from VRP controller - Running time motor 120...300 s - Running time spring-return approximately 20 s - Connection: cable with plug - Angle of rotation 95°↵ - For dimensions see data sheet LF24
	SF24A-V 	<ul style="list-style-type: none"> - Spring-return actuator for VAV-Universal - AC/DC 24 V, modulating, 20 Nm - Control DC 6.0 ±4 V from VRP controller - Running time motor 150 s - Running time spring-return approximately 20 s - Connection: cable with plug - Angle of rotation 95°↵ - For dimensions see data sheet SF24A

Hinweis

For fast-running solutions or bus applications refer to VAV-Universal VRP-M or VAV-Compact, www.belimo.eu.

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