



Product manual

Variable air volume damper

RVP-P

Airflow regulation

Version 1.0.7
Date: 29.07.2024.



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RVP-P

RVP-P ensures volume flow control regulation by a given set-point. Set-point can be given as air volume flow or overpressure/underpressure.

Parametrization is carried out in the factory in accordance with clients request. Advantages of variable air volume dampers are high regulation precision and no maintainance required.

DESCRIPTION

VAV dampers are used to control a variable or constant airflow volume in duct ventilation systems. All VAV dampers are equipped with compact VAV actuator, which has in-built pressure differential sensor and PID logic control. Actuator sensor is connected with rubber hoses to the measuring cross which is used for measuring the duct airflow. By having a real time information about the volume airflow in the duct, VAV's can dynamically respond to the changes in the setpoint (temperature, CO2 or humidity) and ensure optimized ventilation with lowest possible energy consumption.

MATERIALS

Casing and damper blade of the VAV damper are produced out of galvanized steel sheet. Sealing gaskets are produced out of EPDM rubber, and measuring cross is made out of aluminium tubes. On special demand, VAV casing can be produced out of stainless steel sheet EN 1.4301/EN 1.4404 (AISI 304/316L), and can also be powdercoated to any standard RAL chart colour.

DIMENSIONS

B [mm]	H [mm]	Aef [m ²]	Vmin [m ³ /h]	Vmax [m ³ /h]
200	100	0,0170	130	720
300		0,0255	190	1080
400		0,0340	255	1440
200	150	0,0255	193	1080
300		0,0382	285	1620
400		0,0510	382	2160
200	200	0,0340	255	1440
300		0,0510	380	2160
400		0,0680	505	2880
500	250	0,0850	630	3600
600		0,1020	755	4320
300		0,0637	475	2700
400	300	0,0850	630	3600
500		0,1062	785	4500
600		0,1275	945	5400
300	350	0,0765	570	3240
400		0,1020	755	4320
500		0,1275	940	5400
600	400	0,1530	1130	6480
700		0,1785	1320	7560
800		0,2040	1505	8640
900	450	0,2295	1695	9720
1000		0,2550	1880	10800
400		0,1190	880	5040
500	500	0,1487	1098	6300
600		0,1785	1318	7560
700		0,2082	1537	8820
800	550	0,2380	1755	10080
900		0,2677	1977	11340
1000		0,2955	2195	12600
400	600	0,1360	1005	5760
500		0,1700	1255	7200
600		0,2040	1505	8640
700	650	0,2380	1755	10080
800		0,2720	2005	11520
900		0,3060	2260	12960
1000	700	0,3401	2510	14400
500		0,2125	1570	9000
600		0,2550	1880	10800
700	750	0,2975	2195	12600
800		0,3400	2510	14400
900		0,3825	2820	16200
1000	800	0,4250	3135	18000
600		0,3060	2260	12960
700		0,3570	2635	15120
800	850	0,4080	3010	17280
900		0,4590	3385	19440
1000		0,5100	3760	21600
700	900	0,4165	3070	17640
800		0,4760	3510	20160
900		0,5355	3950	22680
1000	950	0,5950	4385	25200
800		0,5440	4010	23040
900		0,6120	4515	25920
1000	1000	0,6800	5015	28800
900		0,6885	5075	29160
1000		0,7650	5640	32400
1000	1000	0,8500	6265	36000

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PRODUCT OVERVIEW
Motor drives
 LM 5 Nm NM 10 Nm

* MF 5 Nm actuator version (max dimensions 700 x 600)



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TESTS AND CERTIFICATES

All our dampers are submitted to a number of tests by official test institutes. Reports of these tests form the basis for the approvals of our dampers. Klimaoprema VAV dampers are also suitable for installation in buildings with high hygienic demands such as hospitals, clinics and pharmaceutical areas.

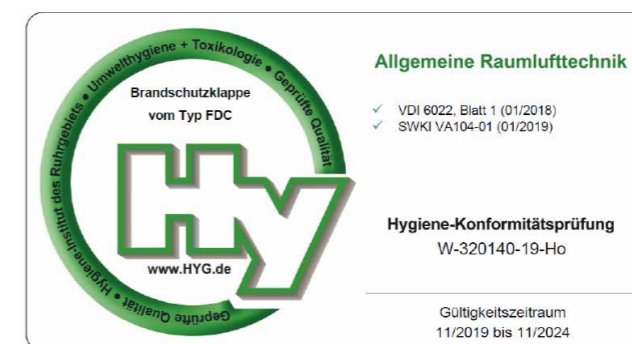
To confirm this, our products are tested by an independent Institute of Hygiene, based in Gelsenkirchen, Ruhr, and comply with directives and guidelines in VDI 6022.

For more information about certificates, visit our website www.klimaoprema.com

Declaration of incorporation:



www.klimaoprema.com/rvp-p/doi



TECHNICAL DATA

VAV damper casing is manufactured from galvanized steel sheet, but on demand can be produced out of:

- Galvanized steel and powder coated
- Stainless steel EN 1.4301/EN 1.4404 (AISI 304/316L)
- Stainless steel EN 1.4301/EN 1.4404 (AISI 304/316L) and powder coated

VAV damper for areas with potentially explosive atmospheres are also available!

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 10430 Samobor
 Hrvatska – Croatia
 www.klimaoprema.comtel: + 385 1 3362 513



1

2	SERIAL NUMBER: 200680900030001	PRODUCTION DATE: 12.07.2021	3
4	TYPE: RVP – P – 300x300 – MP	WORKSHEET: 2006809	5
6	CUSTOMER:	ALT. TYPE:	
7	FACILITY: 2105138/V		
8	POSITION:		
	SETTINGS:	Vmin = m3/h Vmin = NaN%	
		Vmax = m3/h Vmax = NaN%	
		Vnom = m3/h	
9	DRIVE: Motor LMV – D3 – MP	USER MANUAL	
10	CONTROL SIGNAL: 2 – 10 VDC		13
11	REGULATION TYPE: Constant		
12			
	 200680900030001		14



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PRODUCT OVERVIEW

AIRFLOW REGULATION

Product label

- 1 - Company info
- 2 - Serial number
- 3 - Production date
- 4 - Type
- 5 - Worksheet
- 6 - Customer
- 7 - Installation location
- 8 - Parametrization
- 9 - Actuator
- 10 - Control signal
- 11 - Regulation type
- 12 - Air flow direction
- 13 - User manual link
- 14 - Barcode

Product specifications

Nominal sizes RVP-P	200 x 100 - 1000 x 1000 [mm]
Casing length	350 mm
Temperature range	0 °C ... 50 °C
Volume flow rate range	up to 36000 m ³ /h
Differential pressure range	up to 1000 Pa
Casing air leakage	Class C, EN 1751
Closed blade air leakage	Class 0/3, EN 1751
Upstream velocity	< 12 m/s
EC conformity	EN ISO 12100:2010
Declaration of incorporation	Doi 429/2020_03

MODELS

VAV dampers with compact controllers

These regulators are equipped with compact VAV controllers which include actuator, controller and dynamic pressure sensor in the same device. VAV units are called pressure independent when the air flow rate passing through it is maintained constant regardless of variations in the system supply pressure. This level of control is possible with the addition of airflow sensor (measuring cross) and variable air controller that maintains the airflow according to required set-point. The controller is measuring the airflow through the device and modulates the damper blade angle in response to system disturbances. The preset volume can be varied between calibrated airflow limits (V_{min} , V_{max}) via input control signal (analog, communication protocol) provided by room thermostat or HVAC BMS system.



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AIRFLOW REGULATION

Controllers

Pressure independent regulation ensures economical distribution of air volume to the ventilated spaces according to the individual space requirements. A wide range of actuators are available with VAV dampers (Belimo, Gruner and Siemens), and a wide range of communication protocols are supported by them (MPBus, KNX, ModBus, Bacnet).

Dynamic pressure sensors have operating range 0..600Pa, with ± 1 Pa resolution. Maximum operating duct pressure is 1000Pa. Casing can also be additionally insulated with 30mm of mineral wool and double skin galvanized sheet casing for reduction of the casing radiated noise. The damper blade and the connection sleeves are equipped with rubber gaskets.

ATEX rated version is available and equipped with EX rated Schischek actuators and controllers.

Standard airtightness class C0, on request C3!

Analogue communication

Compact VAV controllers controlled via 0(2)..10V analogue signal. All actuators are equipped with feedback signal for common functions like actual flow, pressure drop or damper blade angle.

MP-Bus communication

MP-Bus is a simple sensor/actuator bus, which is used for certain sub-systems of building automation systems. MP-Bus uses a master/slave bus technology where defined number of slave units can be connected to an MP-Master unit.

Communication protocols

Compact controllers are also available with support for most common communication protocols: ModBus, Bacnet and KNX. Communication protocols enable connection of much larger number of units to a common communication network. Network is controlled by a building management system (BMS) controller.

Schischek EX (see page 10.)

ATEX rated VAV dampers are equipped with Schischek ExMax actuators and ExReg volumetric/pressure controllers. Optionally, casing can be produced in EN 1.4301/EN 1.4404 (AISI 304/316L) stainless steel.

ORDERING KEY RVP-P

(1) Model	(2) Dimensions	(3) Communication type	(4) Insulation	(5) Airtightness class
RVP-P	- BxH	- MP	- Z	- C3
(1) RVP-P - VAV damper	(2) BxH	(3) Communication type: MP - Belimo MP MF - Belimo analogue (0..10V) SGB - Siemens analogue (0..10V) MOD-S - Siemens Modbus MOD-BAC - Belimo Modbus / Bacnet MOD-G - Gruner Modbus	(4) Z - mineral wool insulation, 30 mm	(5) C3 - Airtightness class
			KNX-S - Siemens KNX KNX-B - Belimo KNX BAC - Siemens Bacnet PP - Gruner analogue (0..10V)	

RVP-P with Belimo controller

Volume flow control regulation by a given set-point. Factory parametrization in accordance with clients request.

- High regulation precision.
- No maintainance required.
- Airtightness classes according to EN 1751, C0/ C3
- Hygiene certificate according to VDI 6022.



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PRODUCT OVERVIEW

AIRFLOW REGULATION

OPTIONS

- Constant, variable, 3-stage control
- Single, master-slave and parallel modes of operation
- Insulated casing (30mm)

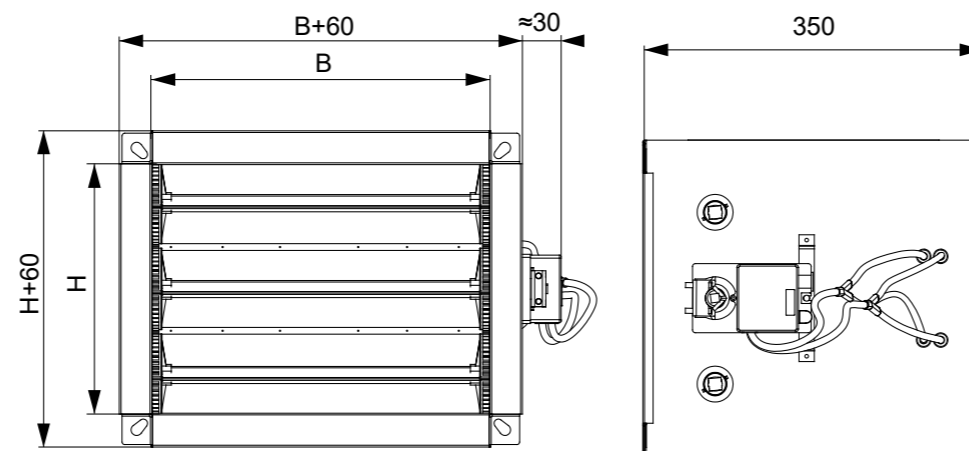
MP - Belimo MP

MF - Belimo analogue (0..10V)

MOD-BAC - Belimo Modbus / Bacnet

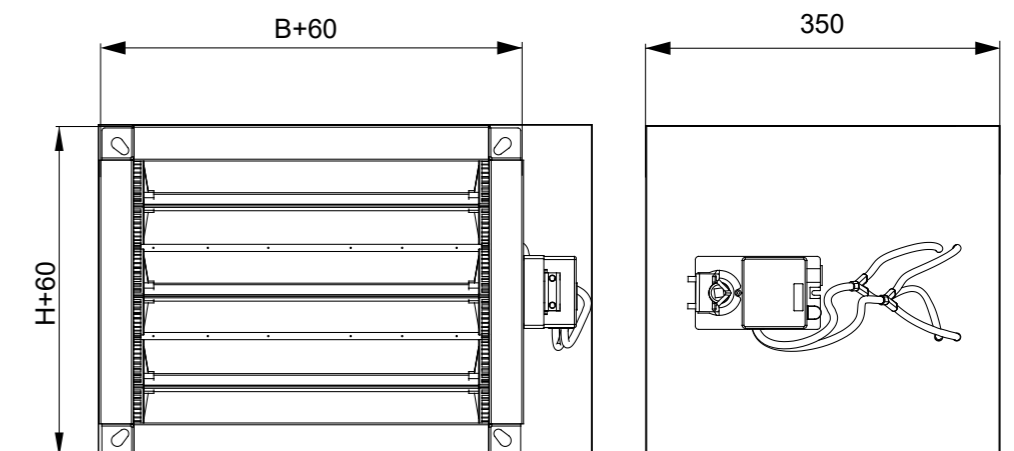
KNX-B - Belimo KNX

RVP-P



RVP-P-Z

(Insulated casing)



RVP-P with Gruner controller

Volume flow control regulation by a given set-point. Factory parametrization in accordance with clients request.

- High regulation precision.
- No maintainance required.
- Airtightness classes according to EN 1751, C0/C3
- Hygiene certificate according to VDI 6022.



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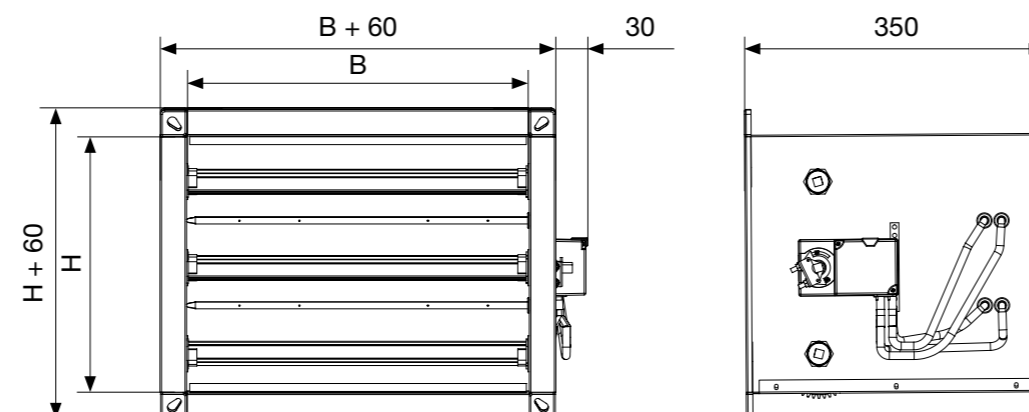
OPTIONS

- Constant, variable, 3-stage control
- Single, master-slave and parallel modes of operation
- Insulated casing (30mm)

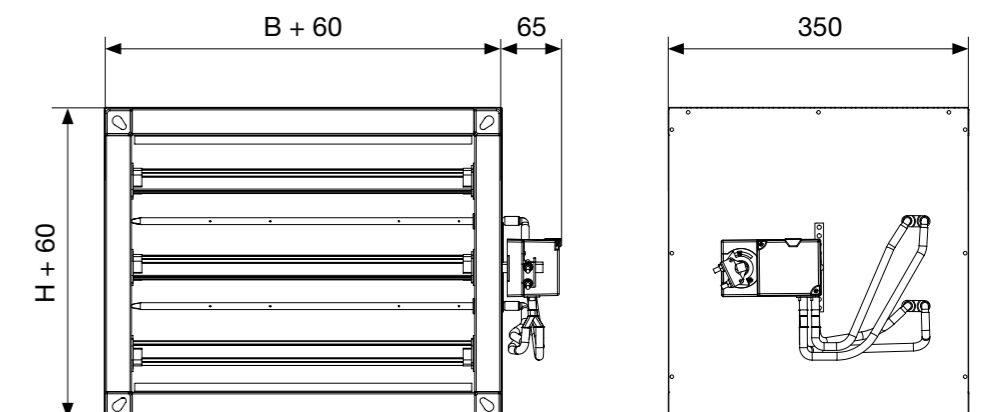
PP - Gruner analogue (0..10V)

MOD-G - Gruner Modbus

RVP-P



RVP-P-Z
(Insulated casing)



RVP-P with Siemens controller

Volume flow control regulation by a given set-point. Factory parametrization in accordance with clients request.

- High regulation precision.
- No maintainance required.
- Airtightness classes according to EN 1751, C0/C3
- Hygiene certificate according to VDI 6022.



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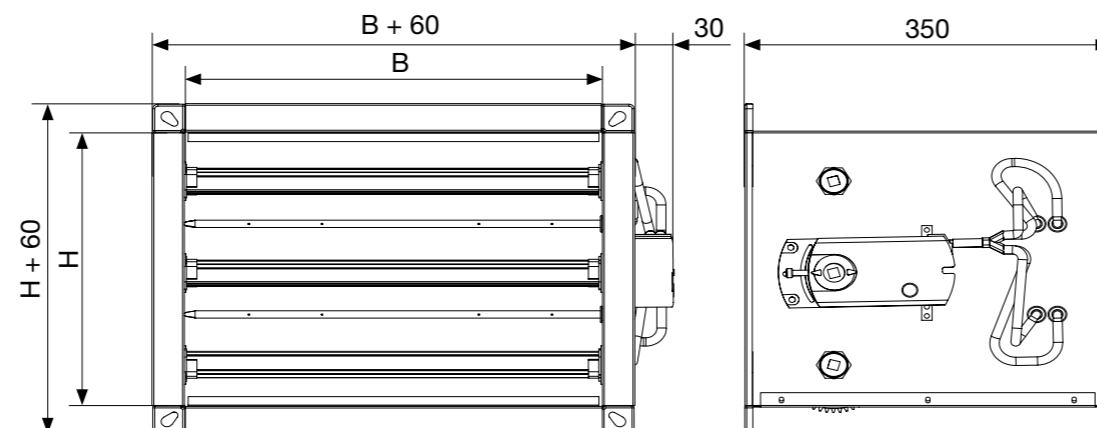
AIRFLOW REGULATION

OPTIONS

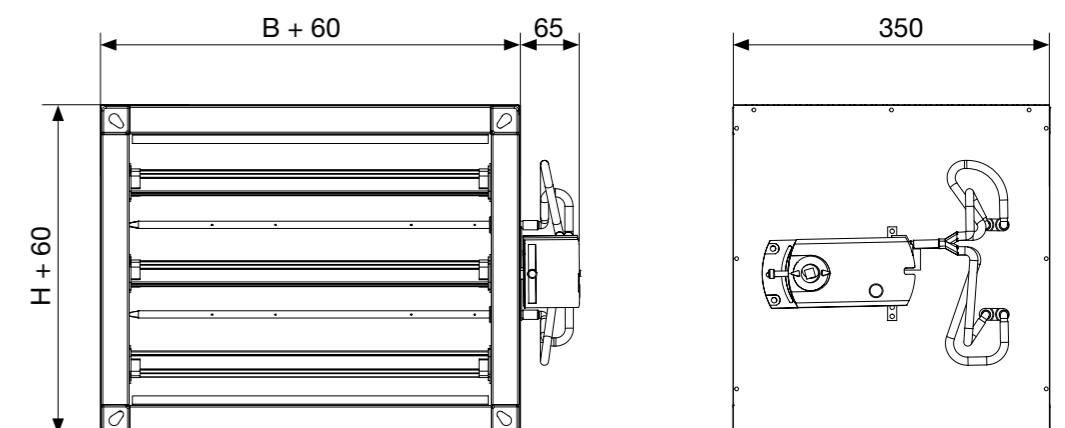
- Constant, variable, 3-stage control
- Single, master-slave and parallel modes of operation
- Insulated casing (30mm)

KNX-S - Siemens KNX
BAC - Siemens Bacnet
SGB - Siemens analogue (0..10V)
MOD-S - Siemens Modbus

RVP-P



RVP-P-Z (Insulated casing)



RVP-P-EX

Volume flow control regulation by a given set-point. Factory parametrization in accordance with clients request.

- High regulation precision
- No maintainance required
- Designed for all gases, mists and vapours in zones 1 and 2, with electronic control additionally for dusts in zones 21 and 22
- Airtightness classes according to EN 1751, C0/C3

For more details:

(1) [Schischek ExMax actuators](#)

(2) [ExReg-V VAV controllers](#)



1

Schischek ExMax spring return actuator



2

ExReg-V VAV controller



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PRODUCT OVERVIEW

AIRFLOW REGULATION

DESCRIPTION

VAV units for potentially explosive atmospheres are equipped with Schischek ExMax spring return actuators (1) and ExReg-V VAV controllers (2).

ExReg-V controllers can be parametered on-site using menu navigation, without any electronic aids. The internal PID control structure is easy to use and can be configured fully automatically for standard applications. The display indicated the current status for actual value, setpoint value and control variable during operation.

Type Examination Certificate Number: FIDI 21 ATEX D060. Equipment complies with the essential health and safety requirements relating to the design and construction of equipment intended to use in potentially explosive atmospheres given in annex VIII of the directive ATEX 2014/34/EU.

MATERIALS

Casing and damper blade of the VAV damper are produced out of galvanized steel sheet. Sealing gaskets are produced out of EPDM rubber, and measuring cross is made out of aluminium tubes. On special demand, VAV casing can be produced out of stainless steel sheet EN 1.4301/EN 1.4404 (AISI 304/316L), and can also be powdercoated to any standard RAL chart colour.

ORDERING KEY RVP-P-EX

(1) Model	(2) Actuator/ controller	(3) Dimensions	(4) Insulation	(5) Airtightness class
RVP-P	EX	BxH	Z	C3
(1) RVP-P - VAV damper	(2) EX - Schischek ExMax + ExReg-V EX-F - Schischek ExMax with spring return + ExReg-V	(3) BxH - Dimensions	(4) Z - 30 mm mineral wool insulation	(5) C3 - Airtightness class

CLASSIFICATION ATEX RATED VAV ACTUATORS

Ex II 2G Ex h IIC T6 Gb

Ex II 2D Ex h IIIC T80°C Db

For more information about Ex classification, visit website: [ATEX classification](#)

Compact VAV solutions



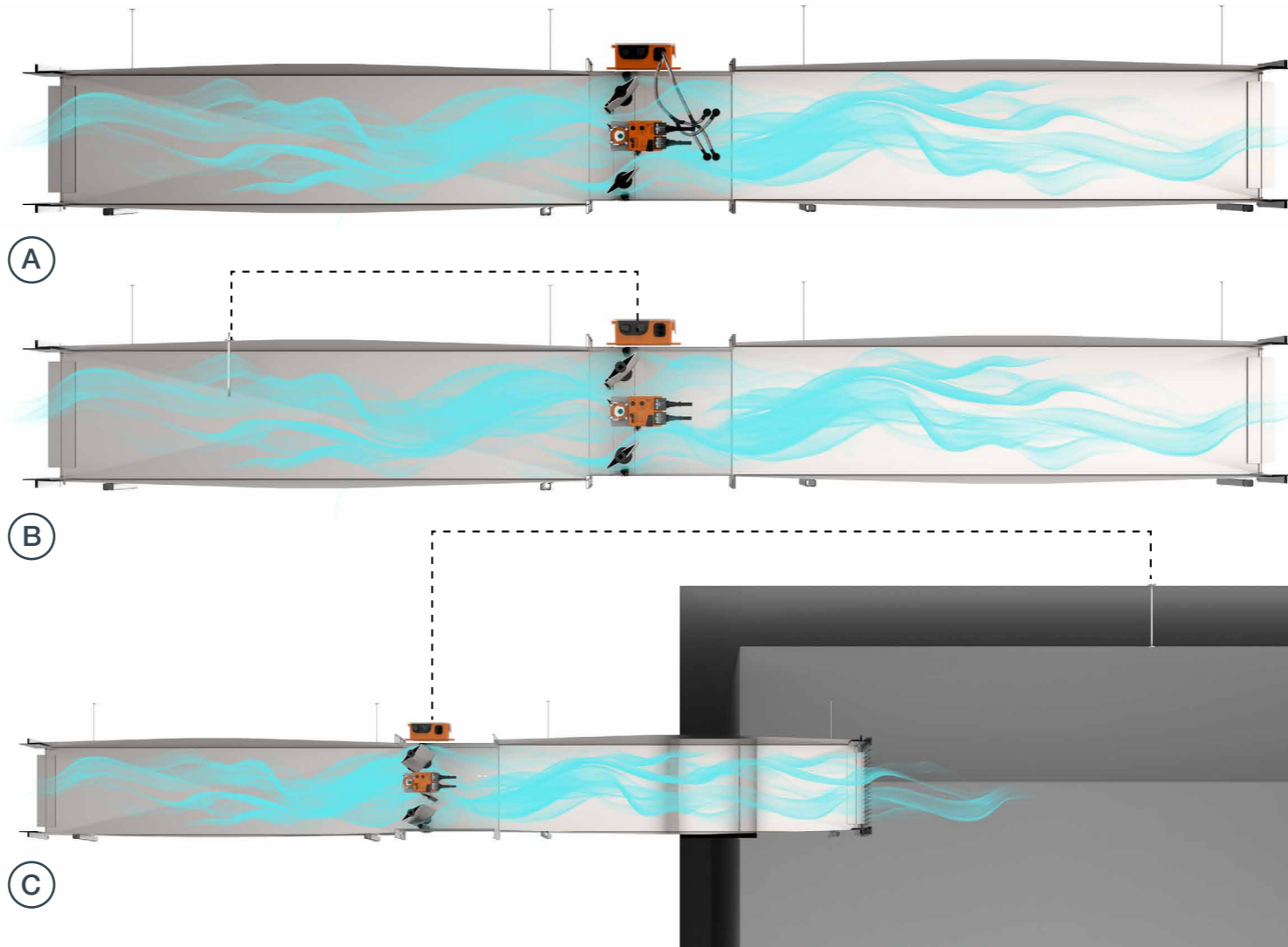
	Belimo L(N)MV-D3-MF	Belimo L(N)MV-D3-MP	Belimo L(N)MV-D3-MOD	Belimo L(N)MV-D3-KNX	Siemens GL(D)B181.1E/3	Siemens GL(D)B181.1E/MO	Siemens GL(D)B181.1E/KN	Siemens GL(D)B181.1E/BA	Gruner 327V-024-05(10)	Gruner 327V-025-05(10)-MB
Applications										
VAV/CAV control	•	•	•	•	•	•	•	•	•	•
Actuators										
Torque	5(10) Nm	5(10) Nm	5(10) Nm	5(10) Nm	5(10) Nm	5(10) Nm	5(10) Nm	5(10) Nm	5(10) Nm	5(10) Nm
Running time	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable
Control										
0/2..10V	•	•	•		•				•	•
Via contacts (CAV)	•	•							•	•
MP-Bus		•								
Modbus RTU			•			•				•
LonWorks										
KNX				•			•			
Bacnet			•					•		
PP Bus									•	•
Pressure sensor										
	0..450Pa	0..450Pa	0..450Pa	0..450Pa	0..300Pa	0..300Pa	0..300Pa	0..300Pa	0..250Pa	0..250Pa
Accessories										
KOER Codis E35-VAV	•	•			•			•	•	•
Room temperature controller / CR24..	•	•								
Fan optimiser / COU24-A-MP	•	•								
MP gateways / UK24xxx	•	•								
PC Tool / MFT-P	•	•	•	•						
Service tool / ZTH-GEN	•	•	•	•						
Siemens software ASC941					•	•	•	•		
AST20					•	•	•	•		
Supply / Inputs										
AC/DC 24V	•	•	•	•	•	•	•	•	•	•
Feedback signal	Airflow / Damper position / Δp	Airflow / Damper position / Δp	Modbus Bacnet / Not relevant	KNX /Not relevant	Airflow	Modbus / Not relevant	KNX /Not relevant	Bacnet / Not relevant	Airflow	Airflow

* if not otherwise specified, regulator is set to standard factory values V_{max} and V_{min} *

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PRODUCT OVERVIEW

VAV universal components



- (A) VOLUMETRIC FLOW CONTROL**
Standard VAV casing equipped with VRU-D3-BAC controller/pressure sensor and standard modulating, fast-acting or spring return actuator. Casing is equipped with measuring cross for airflow measurement and control in the duct.
- (B) DUCT PRESSURE CONTROL**
Damper casing without measuring cross, equipped with duct pressure controller and static sensor VRU-M1-BAC. Static pressure probe is installed on the duct, and static pressure is maintained inside the duct.
- (C) ROOM PRESSURE CONTROL**
Damper casing without measuring cross, equipped with duct pressure controller and static sensor VRU-M1R-BAC. Static pressure probe is installed in the room and in the reference area. Static overpressure or underpressure is maintained in the room.

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VARIANTS

VAV universal components

VAV components offer modular product range capable of volumetric or pressure control in duct or rooms.

Two types of sensors are available, D3 dynamic sensor and M1 diaphragm static pressure sensor. D3 sensor is used in relatively clean ventilation systems whereas diaphragm sensor is used for polluted air systems.

Multiple casing options are therefore available to provide a basis for components and actuators.

There are four types of casings that can be ordered:

- **WA** - RVP casing with measuring cross and damper blade without actuator
- **WMC** - RVP casing without measuring cross and actuator but with damper blade
- **MC** - casing with measuring cross
- **OC** - RVP casing only

Three different sensor and controller types are available:

- VRU-D3-BAC - duct pressure/volume controller with dynamic D3 pressure sensor
- VRU-M1-BAC - duct pressure/volume controller with M1 static pressure sensor for duct pressure control
- VRU-M1R-BAC - pressure controller with M1 static pressure sensor for room pressure control

There types of actuators are available:

- Standard modulating actuator
- Fast acting modulating actuator
- Spring return modulating actuator

Integrated NFC interface for simple commissioning and configuration with a smartphone using the Belimo Assistant App

ORDERING KEY RVP-P

(1) Variable air volume damper	(2) Casing type	(3) Dimensions	(4) Actuator type	(5) Controller type	(6) Insulation	(7) Airtightness class
RVP-P	- WA	- BxH	- M	- D3	- Z	- C3
(1) RVP-P	(2) WA - standard VAV casing WMC - casing without measuring cross MC - only measuring cross OC - only VAV casing	(3) BxH	(4) M - standard VAV actuator MQ - fast acting VAV actuator F - spring return VAV actuator MC-MOD - compact static controller/actuator, ModBus MP-MP - compact static controller/actuator, Mp-Bus	(5) D3 - dynamic pressure controller M1 - static duct pressure controller M1R - static room pressure controller	(6) Z - 50 mm mineral wool casing insulation	(7) C3 - Airtightness class

Pressure VAV system components

Component	Description	Documentation
VRU-D3-BAC	Modbus RTU, Bacnet MS/TP, MP-Bus, dynamic pressure sensor 0....500Pa Volume flow applications	
VRU-M1-BAC	Modbus RTU, Bacnet MS/TP, MP-BUS, static sensor 0....600Pa Duct pressure applications	
VRU-M1R-BAC	Modbus RTU, Bacnet MS/TP, MP-BUS, static sensor -75...+75Pa Room pressure applications	
LM24A-VST	VAV-Universal, ready-to-connect damper actuator for VAV and CAV units in technical building installations <ul style="list-style-type: none"> • Torque motor 5 Nm • Nominal voltage AC/DC 24 V • Control communicative PP 	
NM24A-VST	VAV-Universal, ready-to-connect damper actuator for VAV and CAV units in technical building installations <ul style="list-style-type: none"> • Torque motor 10 Nm • Nominal voltage AC/DC 24 V • Control communicative PP 	
SM24A-VST	VAV-Universal, ready-to-connect damper actuator for VAV and CAV units in technical building installations <ul style="list-style-type: none"> • Torque motor 20 Nm • Nominal voltage AC/DC 24 V • Control communicative PP 	
LMQ24A-VST	VAV-Universal, ready-to-connect damper actuator for VAV and CAV units in technical building installations <ul style="list-style-type: none"> • Torque motor 4 Nm • Nominal voltage AC/DC 24 V • Control communicative PP • Running time motor 2.5 s 	
NMQ24A-VST	VAV-Universal, ready-to-connect damper actuator for VAV and CAV units in technical building installations <ul style="list-style-type: none"> • Torque motor 8 Nm • Nominal voltage AC/DC 24 V • Control communicative PP • Running time motor 4 s 	

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PRODUCT OVERVIEW

Pressure VAV system components

Component	Description	Documentation
LMV-M1-MP	VAV-Compact unit – with VAV controller, static Δp sensor (membrane) and damper actuator <ul style="list-style-type: none"> • Torque motor 5 Nm • Nominal voltage AC/DC 24 V • Control communicative MP-Bus 	
NMV-M1-MP	VAV-Compact unit – with VAV controller, static Δp sensor (membrane) and damper actuator <ul style="list-style-type: none"> • Torque motor 10 Nm • Nominal voltage AC/DC 24 V • Control communicative MP-Bu 	
LMV-M1-MOD	VAV-Compact unit – with VAV controller, static Δp sensor (membrane) and damper actuator <ul style="list-style-type: none"> • Torque motor 5 Nm • Nominal voltage AC/DC 24 V • Control communicative MP-Bu, BACnet MS/TP, Modbus RTU 	
NMV-M1-MOD	VAV-Compact unit – with VAV controller, static Δp sensor (membrane) and damper actuator <ul style="list-style-type: none"> • Torque motor 10 Nm • Nominal voltage AC/DC 24 V • Control communicative MP-Bu, BACnet MS/TP, Modbus RTU 	
NF24A-VST	Ready-to-connect rotary actuator fail-safe for VAV and CAV units in technical building installations <ul style="list-style-type: none"> • Torque motor 10 Nm • Nominal voltage AC/DC 24 V • Control communicative PP • Spring return 	
SF24A-VST	Ready-to-connect rotary actuator fail-safe for VAV and CAV units in technical building installations <ul style="list-style-type: none"> • Torque motor 20 Nm • Nominal voltage AC/DC 24 V • Control communicative PP • Spring return 	
NKQ24A-VST	Ready-to-connect actuator with fail-safe for VAV and CAV units in technical building installations <ul style="list-style-type: none"> • Torque motor 6 Nm • Nominal voltage AC/DC 24 V • Control communicative PP • Running time motor 4 s 	

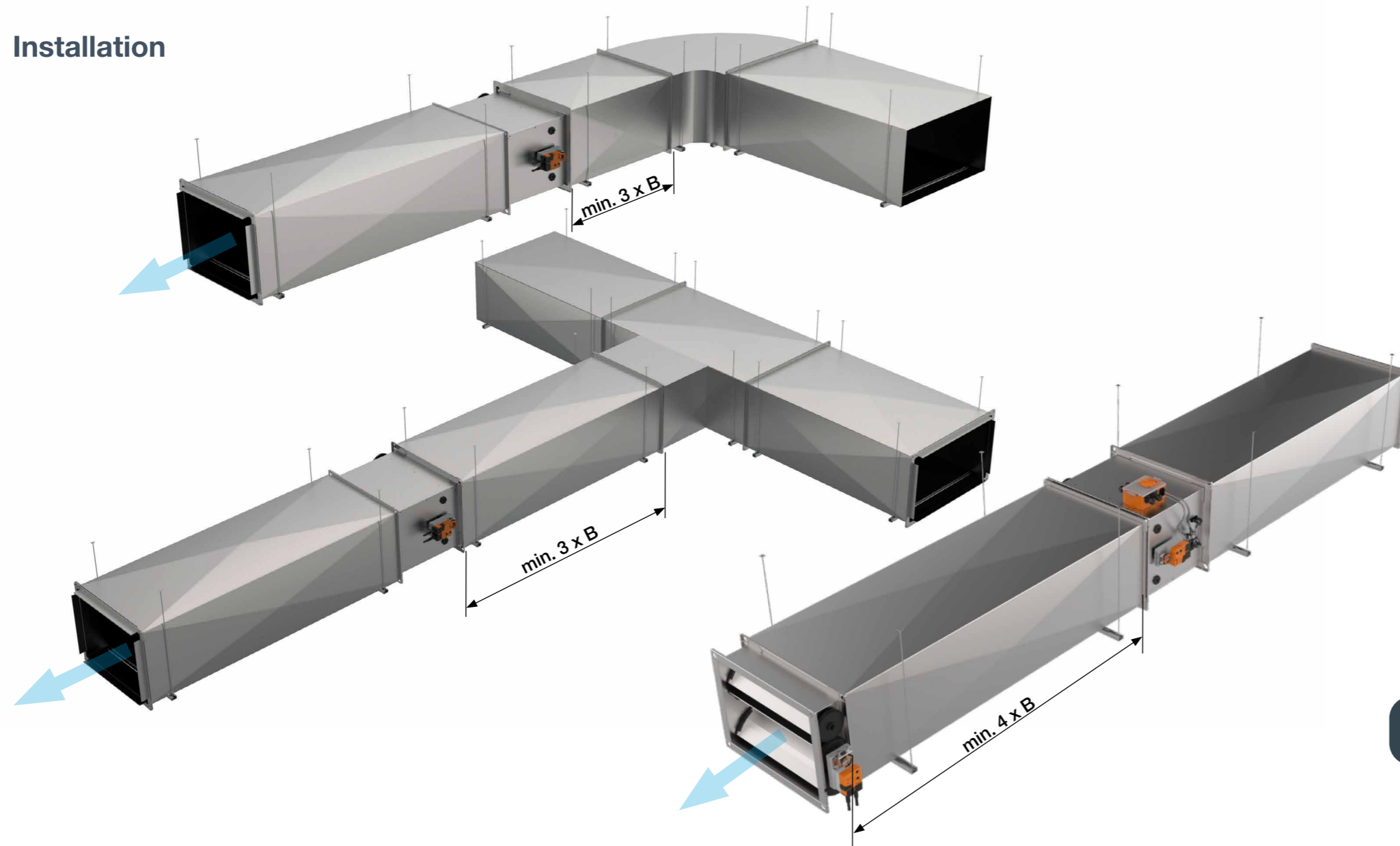
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PRODUCT OVERVIEW

	Application					Sensor	0...10 / 2...10 V	Control			Tool	
	VAV/CAV	Air duct pressure	Room pressure	Comfort zone	Polluted air	Sensor type		MP-Bus®	Modbus RTU	BACnet MS/TP	Belimo App	Belimo PC-Tool
VRU-D3-BAC	•	•	-	•	-	D3, dynamic 0...500 Pa	•	•	•	•	•	•
VRU-M1-BAC	•	•	-	•	•	M1, diaphragm 0...600 Pa	•	•	•	•	•	•
VRU-M1R-BAC	-	-	•	•	•	M1R, diaphragm -75...75 Pa	•	•	•	•	•	•



Installation



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INSTALLATION

The volume control accuracy depends on flow conditions before measuring cross. Other regulating elements may cause turbulence and may affect the measurement. For that reason, when installing damper after a damper, it is necessary to ensure long enough straight section of the duct. Recommendations for the length of the straight section of the duct:

- Damper - 4 x B

Note: All duct fittings (eg. connections, branches etc) should comply with EN 1505.

Installation space is required and should be reserved for installation and maintenance of the VAV dampers. It is necessary to provide access to the inspection openings. Standard RVP-P units come pre-calibrated from the factory. Standard calibration implies V_{nom} values that are equivalent to air duct velocity of 12 m/s. V_{max} and V_{min} values can be found in the table on [page 2](#). V_{min} value can be calibrated in a range from 10% of V_{nom} . V_{max} can be calibrated in the range between

V_{min} and V_{nom} . Input signal regulates the volume flow between V_{min} and V_{max} linearly. Below V_{min} , the volume flow cannot be regulated.

If the dampers are installed according to the recommendations, airflow control accuracy depends on the airflow velocity in the duct.

- for velocities > 3 m/s accuracy is declared to $\pm 5\%$
- for velocities between 1,2 m/s and 3 m/s accuracy is declared to $\pm 10\%$
- for velocities < 1,2 m/s accuracy is declared to $\pm 20\%$

Compact VAV actuators with integrated dynamic pressure sensors are intended for use in ventilation systems with relatively clean air. That means that the ventilation systems should not contain abrasive, chemical or adhesive particles. Temperature range in the place of installation is permitted to 0 °C to 50 °C. For regulation in areas with contaminated media, units with static pressure sensors are used (VRU-M1-BAC and VRU-M1R-BAC). These controllers can be calibrated to regulate airflow or pressure in the duct or room.

Control

Pressure independent VAV's have the following control parameters: V_{min} (minimum airflow), V_{max} (maximum airflow) and V_{nom} (nominal airflow). These parameters are defining the volume airflow range in which the VAV is operating. Nominal airflow range depends on the size of the damper, and is equal to the corresponding duct air velocity of 12 m/s.

V_{min} can be set to any volume airflow between 10% V_{nom} and 100% V_{nom} , and V_{max} can be set to any volume airflow between V_{min} and V_{nom} . The control of the dampers it done via analog signal (0(2)-10V) or some of the supported communication protocols. Most commonly a BMS system is controlling the ventilation system (including the VAV's), but it is possible for the VAV's to work independently with a simple room controller providing it with the needed setpoint.

Except stand-alone operation, VAV's can work in parallel operation and master/slave operation. In parallel operation control signals are allways the same, and control parameters V_{min}/V_{max} can be set independently. In master/slave operation the actual signal from the master unit is controlling the reference air volume in the slave unit. Actuators are overload proof. Compact, standard and high speed actuators will remain at their last position in the event of power shutdown. Spring return actuators will completely close or open the damper, depending on their installation orientation.

Parametrization is made in the factory according to the customer demands or default settings. Subsequently changes to the parametrization can be made on site with ZTH tool or Belimo assistant app.

Belimo motor drive



- motor drives : Belimo (MP, ModBus/Bacnet, MF, KNX)
- power supply - AC 24V, 50/60 Hz
- DC 24V
- diagnostic socket for service and PC-Tool software

Type	Torque	Energy consumption	Dimensioning	Weight
LMV-D3-MP	5Nm	2W	4VA (max- 8A @ 5ms)	≈ 500g
NMV-D3-MP	10Nm	3W	5VA (max- 8A @ 5ms)	≈ 700g
LMV-D3-MOD/BAC	5Nm	2W	4VA (max- 8A @ 5ms)	≈ 500g
NMV-D3-MOD/BAC	10Nm	3W	5VA (max- 8A @ 5ms)	≈ 700g
LMV-D3-MF	5Nm	2W	4VA (max- 8A @ 5ms)	≈ 500g
LMV-D3-KNX	5Nm	2W	4VA (max- 8A @ 5ms)	≈ 500g
NMV-D3-KNX	10Nm	3W	5VA (max- 8A @ 5ms)	≈ 700g

Control variables

Vnom	specific nominal volume flow, suitable for VAV units
$\Delta p @ V_{nom}$	50...450 Pa
Vmax	20...100%
Vmin	0...100%
Vmid	50% od Vmin do Vmax

Classic control

VAV mod for referent variables Y (connection 3)	- DC 2...10V / (4...20mA with 500 Ω impedance) - DC 0...10V / (0...20mA with 500 Ω impedance) } input impedance min. 100 kOhm - Adjustable DC 0...10V
Actual signal value mod U5 (connection 5)	- DC 2...10V - DC 0...10V } max. 0.5 mA - Adjustable : volume flow, damper position or differential pressure
CAV mode (constant volume flow)	CLOSED / Vmin / Vmid / Vmax / OPEN* (*only with AC 24V supply)

Actuator

Connection	Cable, 4 x 0,75 mm ²
Protection	
Safety class	III Safety extra - low voltage
Level of protection	IP54
Electromagnetic compliance	CE according to 89/336/EEC
Mode	Type 1 (according to EN 60730-1)
Rated power	0,5kV (according to EN 60730-1)
Operating temperature	0...+50 °C
Non operating temperature	-20...+80 °C
Relative humidity	5...95% r.h., no condensation (according to EN 60730-1)
Maintainance	Not required

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ACTUATORS

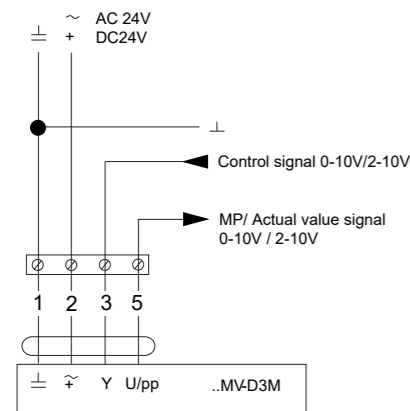
Operation specification:

Rated voltage	DC 15 V (from regulator VRP...)
Voltage range	DC 13,5...16,5 V
Mesuring range	0...100 Pa 0...300 Pa 0...600 Pa
Mesuring principle	Inductive membrane differential presure mesurement
Output signal	DC 0...10 V (proportional pressure for VRP..)
Linearity	±1% from extreme value (FS)
Histeresis	0,1% typ.
Temperature influence	
zero position	±0,1% / K ±0,05% / K ±0,05% / K
Mesuring range	±0,1% / K t = +10...+40°C (referent temperature to = 5 °C)
Installation position	Vertical
Position dependance	Max. ±4,5 Pa za 90° rotation from horizontal
Electric connection	Cable 1 m , with 4 pole connector
Protection class	III (safety extra-low voltage) IP4
Operating temperature	0...+50 °C
Storage temperature	0...+80 °C
Humidity test	to EN 60335-1

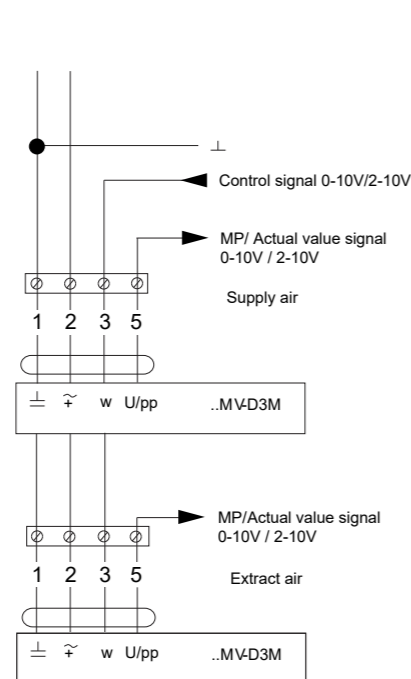
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Wiring diagram

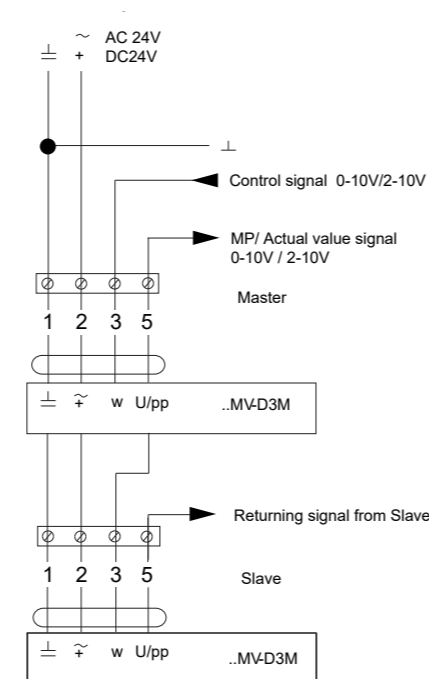
Analoges Steuersignal



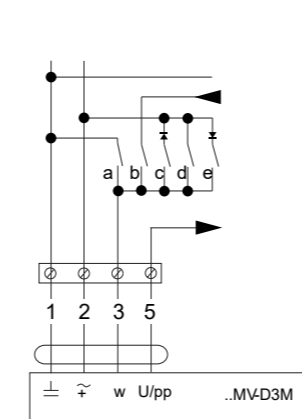
Analoge Steuersignaleinspeisung/ entnahme im Parallellbetrieb



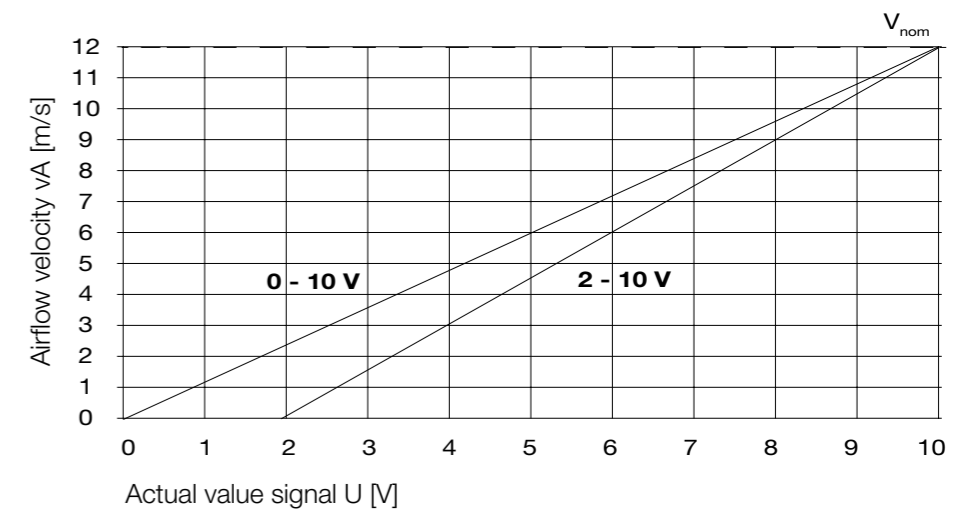
Analoges Steuersignal Master / Slave Modus



Konstanter Modus:
- Standard 0,1V Schließung



ACTUATORS



$$0 - 10 \text{ V} \quad v_{act} = \frac{U_{act} - V_{nom}}{10}$$

$$2 - 10 \text{ V} \quad v_{act} = \frac{U_{act} - 2}{8} * V_{nom}$$



Siemens motor drive

- motor drives : Siemens (KNX, ModBus, Bacnet, Analogue)
- power supply: AC 24 V \pm 20% 50/60 Hz

Type	Torque	Energy consumption	Dimensioning	Weight
GDB181.1E/3	5Nm	2W	4VA (max- 8A @ 5ms)	\approx 500g
GLB181.1E/3	10Nm	3W	5VA (max- 8A @ 5ms)	\approx 700g
GDB181.1E/MO	5Nm	2W	4VA (max- 8A @ 5ms)	\approx 500g
GLB181.1E/MO	10Nm	3W	5VA (max- 8A @ 5ms)	\approx 700g
GDB181.1E/BA	5Nm	2W	4VA (max- 8A @ 5ms)	\approx 500g
GLB181.1E/BA	10Nm	3W	5VA (max- 8A @ 5ms)	\approx 700g
GDB181.1E/KN	5Nm	2W	4VA (max- 8A @ 5ms)	\approx 500g
GLB181.1E/KN	10Nm	3W	5VA (max- 8A @ 5ms)	\approx 700g

Damper actuator

Normal torque	5 Nm (GDB) / 10 Nm (GLB)
Maximum torque	<7 Nm (GDB) / <14 Nm (GLB)
Normal rotation angle / maximum rotation angle	90° / 95° \pm 2°
Running time for normal rotation angle 90°	150 s (50Hz) / 125 s (60Hz)
Direction of rotation (Adjustable with e.g. ACS941)	Clockwise / Counterclockwise
Signal inputs	
Input voltage	DC 0/2 ... 10 V
Max. perm input volume	DC 35 V
Contact Sensing	
Contact open	DC 30 V contact voltage
Contact closed	DC 0 V, 8 mA contact current
Signal outputs	
Output voltage	DC 0/2 ... 10 V limited to DC 12 V
Max. output current	DC \pm 1 mA
Time constant (actual value U)	0,05...5 s
Resolution 0.01 S / factory settin 1 s	
Degree of protection and safety class	
Degree of protection acc. to EN 60529 (cf. mounting instructions)	IP54
Safety class acc. to EN 60730	6 x 0.75 mm ²
Enviromental conditions	
Operation / transport	IEC 721-3-3 / IEC 721-3-2
Temperature	0 ... 50 °C / -25...70 °C
Humidity (non-condensing)	<95% r.h. / <95% r.h.

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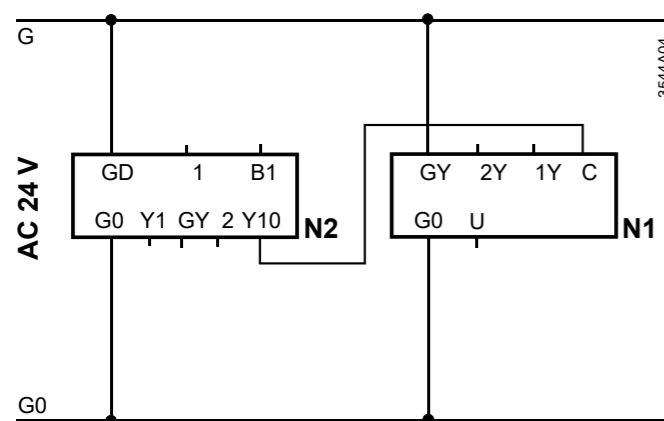
ACTUATORS

Air volume controller	
3-position controller with hysteresis	
V _{max}	20 ... 100%
V _{min}	-20 ... 100%
V _{mid}	0 ... 100%
V _n	1...3.16
Differential pressure sensor	
Connection tubes (inerior diameter)	3 ... 8 mm
Measuring range	0 ... 500 Pa
Operation range	0 ... 300 Pa
Precision at 23°C, 966 mbar and optional mounting position	
Zero point	± 0.2 Pa
Amplitude	± 4.5 of the measured value
Drift	± 0.1 Pa / Year
Max. permissible operation pressure	3000 Pa
Max. permissible overload on one side	3000 Pa
Connection cable	
Cable length	0.9 m
Number of cores and cross-sectional area	6 x 0.75 mm ²

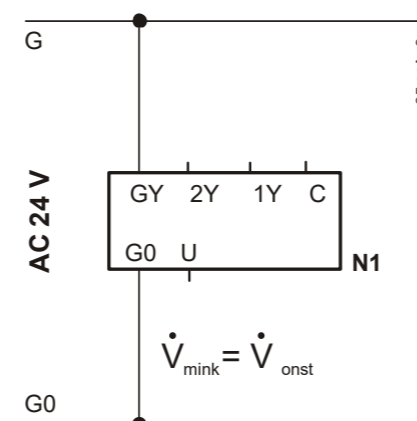
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Wiring diagram

Supply / extract air control in operating mode "con"
 N1 GDB181.1E/3 or GLB181.1E/3
 N2 Supervisory controller, e.g. RCU5.. or RCU6.

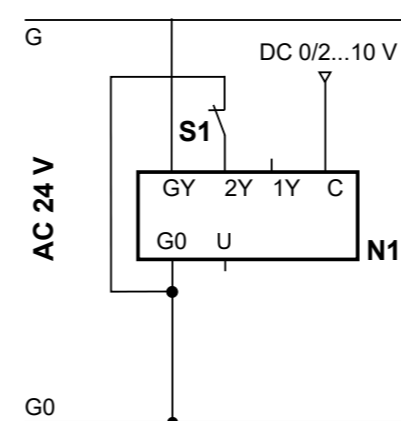


Supply / extract air control in operating mode "con"



$$\dot{V}_{\text{mink}} = \dot{V}_{\text{onst}}$$

Complete shutoff in operating mode "con"
 N1 GDB181.1E/3 or GLB181.1E/3
 S1 Window switch (Window closed – switch open)



ACTUATORS



Gruner motor drive

- motor drives : Gruner (327V)
- Running time 100 s / 90°, 150 s / 90°
- Torque 5 -10 - 15 Nm
- Nominal voltage 24 VAC/DC
- Control 3 (EN 60730-1)
- Sensor 250 Pa (dynamic)
- Option: Communication Modbus RTU

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Damper actuator	
Nominal voltage	24 VAC/DC, 50/60 Hz
Nominal voltage range	19...29 VAC/DC
Power consumption motor (motion)	3 W
Power consumption standby (end position)	2 W
Wire sizing	5,5 VA
Control	Analog / Modbus RTU (option) (0)2...10 VDC / Ri > (100 kΩ) 50 kΩ (0)4...20 mA / Rext. = 500 Ω
Feedback signal	Analog / Modbus RTU (option) (0)2...10 VDC, max. 0,5 mA
Priority control	close / min / btw / max / open / stop
Connection motor	cable 1000 mm, 4 x 0,75 mm ² (halogen free)
Sensor	
Measuring range - dynamic version	500-1500 Pa
Measuring range - static version	400-600-1000 Pa
Burst pressure	1 bar
Nominal value damper manufacturer specific value	damper manufacturer specific value Vmin / Vbtw / Vmax based on Vnom
Media	air -40°C...85°C / 5...95% r.H., non condensing
Mounting position	independent of position
Connection	tube clip Ø 4-6 mm
Functional data	
Torque	5 -10 - 15 Nm
Synchronised speed	±5%
Direction of rotation	adjustable



Manual override	gear de-clutch with pushbutton, lockable
Angle of rotation	0°...max. 95° can be limited with adjustable mechanical end stops
Running time	5 Nm: 100 s / 90° (adjustable 20...120 s / 90°) 10 & 15 Nm: 150 s / 90° (adjustable 70...420 s / 90°)
Sound power level	< 35 dB(A) @ standard running time
Shaft coupling	universal clamp (Ø 20 mm) or form fit □ 8/10/12 mm
Position indication	mechanical with pointer
Service life	> 100 000 cycles (0°...95°...0°) > 1 500 000 partial cycles (max. ±5°)
Safety	
Protection class	III (safety extra-low voltage)
Degree of protection	IP 42 (cable downwards, tube clip connected) IP 20 (with screw terminals)
EMC	CE (2014/30/EU)
LVD	CE (2014/35/EU)
RoHS	CE (2011/65/EU - 2015/863/EU - 2017/2102/EU)
Mode of operation	Typ 1 (EN 60730-1)
Rated impulse voltage	0,5 kV (EN 60730-1)
Control pollution degree	3 (EN 60730-1)
Ambient temperature normal operation	0°C...+50°C
Storage temperature	-20°C...+80°C
Ambient humidity	5...95% r.H., non condensing (EN 60730-1)
Maintenance	maintenance free
Dimensions	
Dimensions	155 x 67 x 66 mm
Weight	5 Nm: 450 g 10/15 Nm: 550 g

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ACTUATORS

Wiring diagram

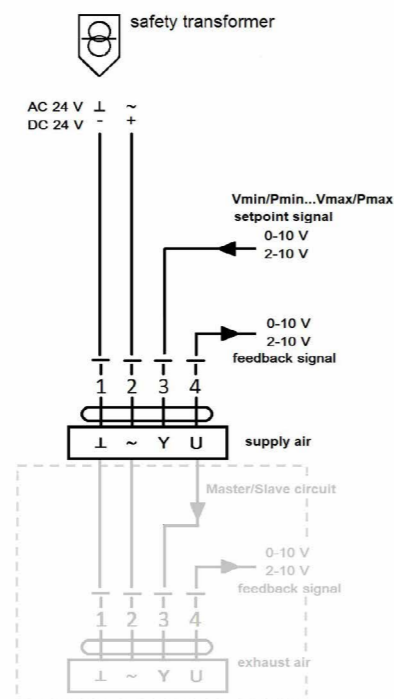
VAV

– variable operation min ... max

-Mode 2-10V:

Damper closed < 0,8 V (adjustable via WIN-VAV2 0,2 V ... 1,8 V)

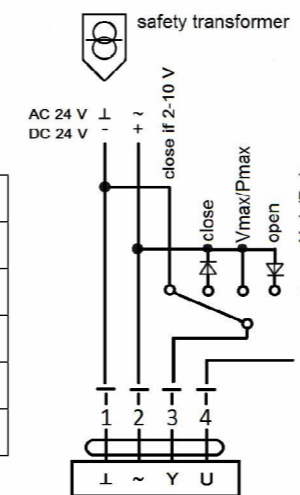
-Master/Slave circuit possible



CAV

– step operation close / min / btw / max / open

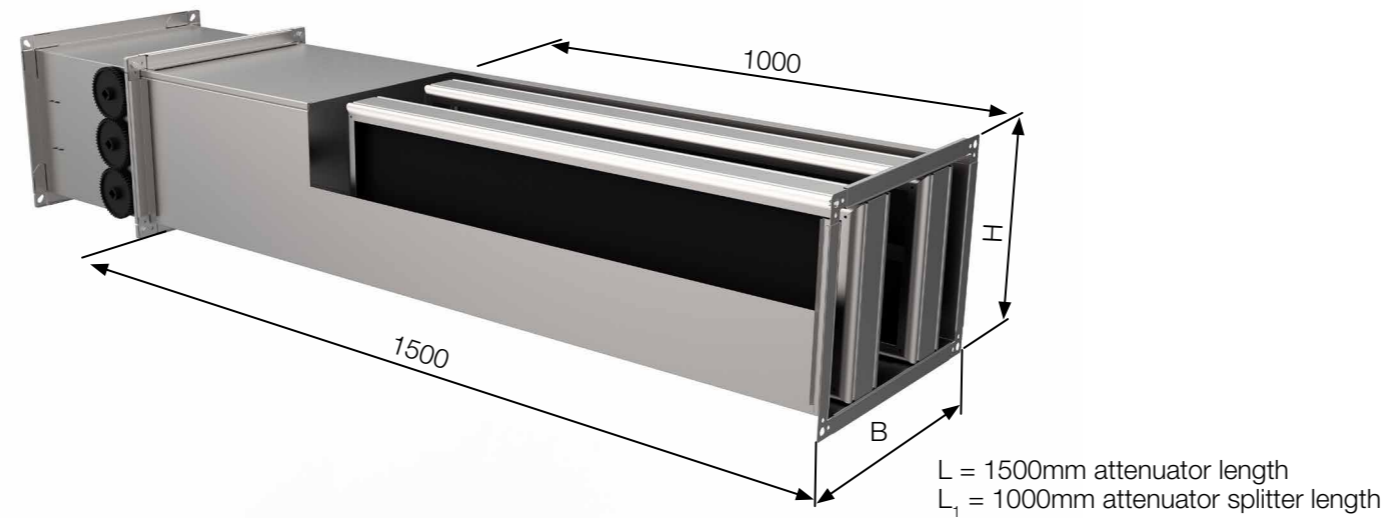
Signal/ Function	Min	Max	Btw	Open	Close
Open line	X				
GND (2.10 V)					X
Full wave		X		X	
Pos. Hal-wave				X	
Neg. Hal-wave					X



Accessories

PZX

PZX unit is an additional silencer for reduction of the air regenerated sound power levels. It is specifically designed for use with RVP-P variable air volume dampers, with 500mm of free space for unaffected operation of RVP-P. Absorption material is non combustable mineral wool. Mineral wool is covered with glass fibre voal to prevent erosion of the particles inside the duct.



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BELIMO Parametrization

Adjustment device ZTH-EU and NFC for VAV terminal units with Belimo volume flow controllers, used to facilitate service and commissioning.

ORDERING KEY: RVPA-ZTH-EU



Gruner GUIV3-M

Adjustment device GUIV3-M for VAV terminal units with Gruner volume flow controllers, used to facilitate service and commissioning.

ORDERING KEY: RVPA-GUIV3-M



Siemens AST20

Adjustment device Type AST20 for VAV terminal units with Siemens volume flow controllers, used to facilitate service and commissioning.

ORDERING KEY: RVPA-AST20



ACCESSORIES

ORDERING KEY PZX

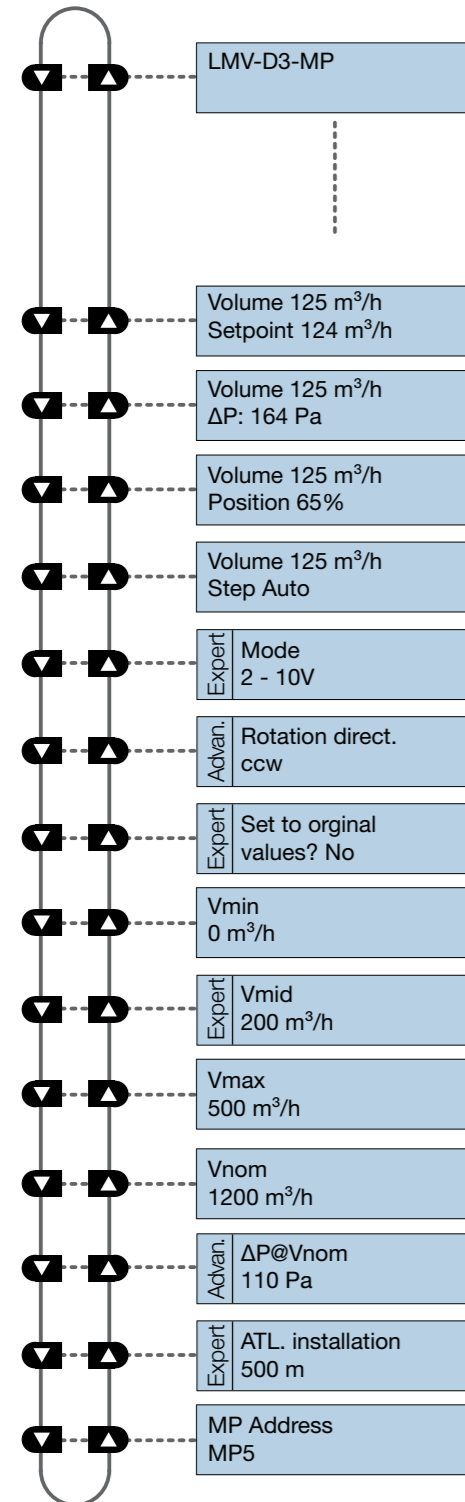
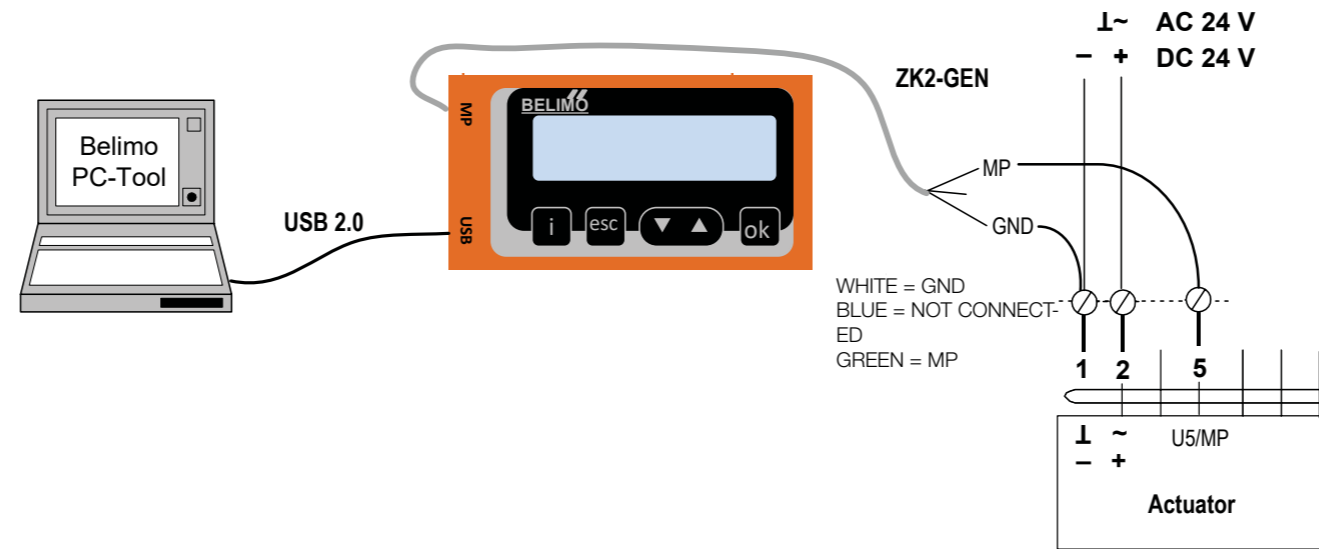
(1) Silencer RVP-P (2) Dimensions

PZX	-	BxH
(1) PZX		
(2) BxH		

PARAMETRIZATION

ZTH

Adjustment device ZTH-EU for VAV terminal units with Belimo volume flow controllers, used to facilitate service and commissioning. Service tool for parameterisable and communicative actuators / VAV controllers and HVAC performance devices from Belimo. Connection via service socket on the device or MP/PP connection ZIP USB function.



Instructions

Pressing the buttons ,you scroll through the main menu. In order to prepare the selected values (parameters), it is necessary to follow the steps in the picture.

AUTO / OPEN / CLOSE / Min / Mid / Max / Stop

2 - 10V / 0 - 10V (only with MF/MP types)

ccw / cw

No / Yes

0...Vmax

Vmin...Vmax

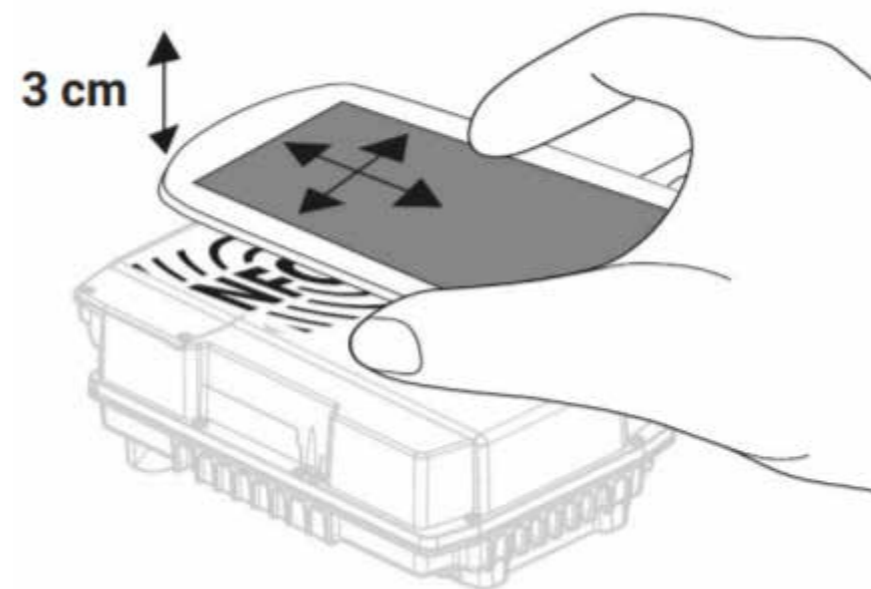
Vmin...Vnom, minimum 20% of Vnom

0...3000 m

PP, MP1...MP8 (on MF types only PP)

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PARAMETRIZATION



BELIMO NFC

The integrated NFC interface (Near Field Communication) of the VAV-Compact and VAV-Universal controllers allows you to use the system with your own smartphone – for simple and efficient commissioning and configuration – wirelessly with the Belimo Assistant App.

The ZIP-BT-NFC is available for connection via Bluetooth. For configuration at the VAV unit manufacturer (OEM) or during commissioning for bus addressing, both also in a de-energised state. Simple operational check thanks to the graphical trend analysis.

GUIV3-M

GUIV will start via on/off switch. If GUIV is connected to an actuator, the data will be read out and shown in the display. The control panel is used to set various operating modes, override controls and parameter settings. The GUIV features a micro USB. This allows to use the GUIV as an interface converter between WINVAV2 software and actuator or for loading a battery pack.

Instructions

To perform parameterization, it is necessary to connect the drive with the adjustment device GUIV3-M.

The adjustment device contains a circular button and a confirmation button. With circular button you scroll through the main menu and you can change the values (parameters).

Menu points GUIV3-M

1.Act / Set

Shows actual value / setpoint (override function).

2.Min

Adjust the desired min value (setpoint Y = 0 / 2 V DC).

3.Max

Adjust the desired max value (setpoint Y = 10 V DC).

4.Diag

Diagnostic menu:

y/u – shows setpoint / feedback signal

off – return to first level

oP – opens the damper

cL – closes the damper

Hi – activates max. value

Lo – activates min. value

bE – activates between value

St – diagnostic mode on, motor off

Adp – adaption drive (only 15 Nm or Modbus version)

123 – software version

5.Mode

0An (0-10 VDC | normal direction of rotation) 2An (2-10 VDC | normal direction of rotation)

2Ai (0-10 VDC | inverse direction of rotation) 2Ai (2-10 VDC | inverse direction of rotation)

6.Com

Setting the Modbus address (1...247) and communication parameters (if Modbus version).

7.Nom

Volumetric air flow: Shows & setting the nominal value depending on the VAV-Box

Pressure: Setting the correction factor

Settings

327 VAV actuators can be set directly on the display. All 327 VAV actuators can communicate via service connector with setting tool GUIV3-M or with setting software WIN-VAV2.

GUIV3-S is used as an interface for setting software WIN-VAV2.

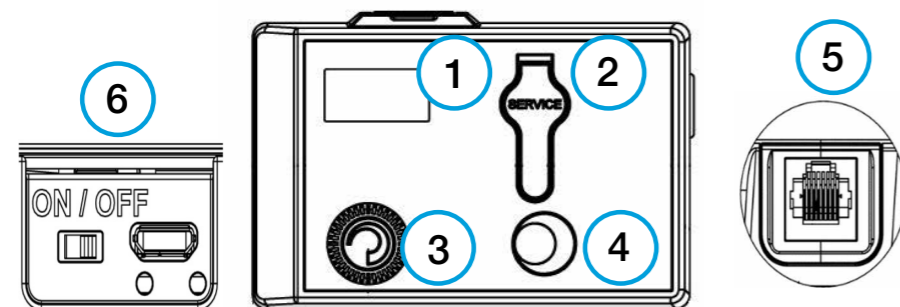
Accessories

GUIV3-M – service connector + handheld tool GUIV3-M

WINVAV2-Bundle – service connector + PC interface GUIV3-S

+

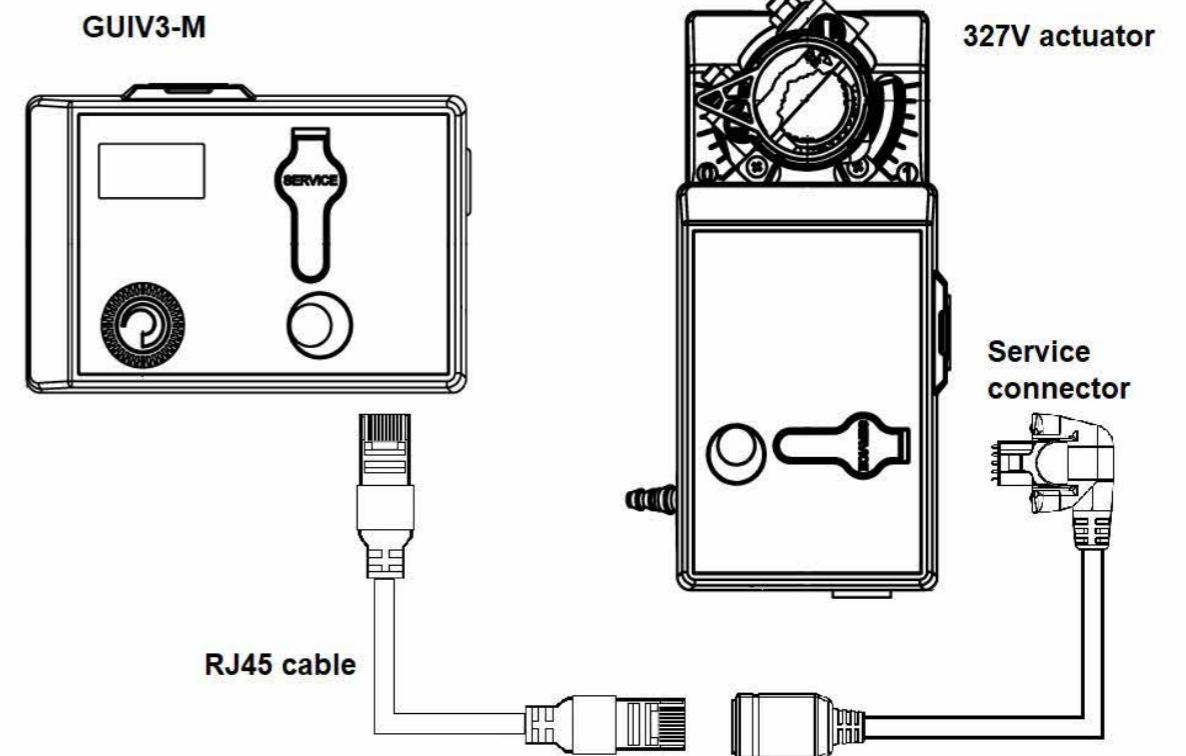
setting software WIN-VAV2.



1. Display
2. Port for service-plug
3. Rotary selector switch
4. LED push button
5. RJ45 socket
6. On/off Switch and Micro-USB Interface

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PARAMETRIZATION



AST20

Instructions

Pressing the UP/DOWN buttons, you scroll through the main menu. Button ENTER opens submenu or allows changing the selected value using UP/DOWN button. The pictures show the way of changing the values (parameters).

AST20 <> VAV Modbus	1/1 SVC
Online view	▶
Field device configuration	▶
Bus configuration	▶
Diagnostics and maintenance	▶
AST20 settings	▶
Mass configuration	▶

Field device configuration	1/2 SVC
Operating mode	VAV mode
Opening dir	CW
Adaptive pos	On
Vn value	2.04
Vmin	10%
Vmax	90%
Vnom	450 m3/h

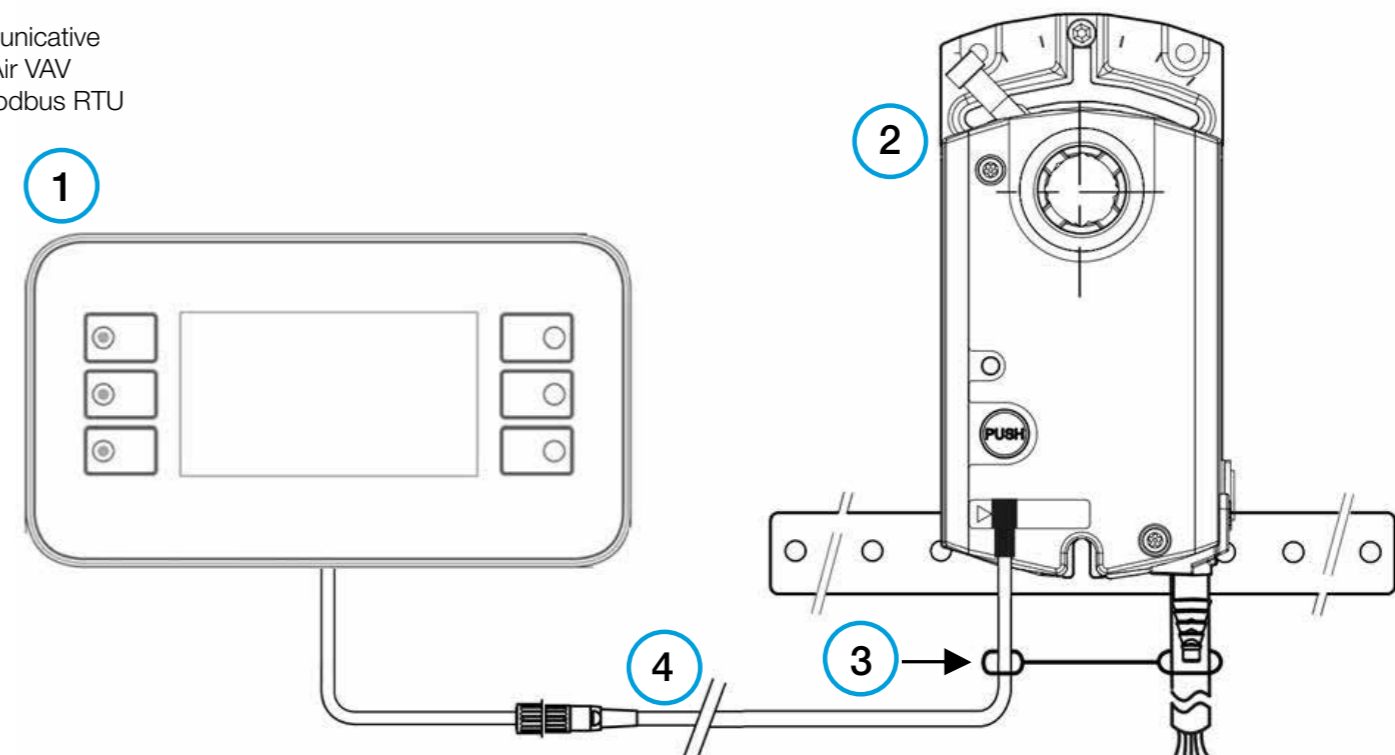
Field device configuration	1/2 SVC
Operating mode	VAV mode
Opening dir	CW
Adaptive pos	On
Vn value	2.04
Vmin	10%
Vmax	90%
Vnom	450 m3/h

Field device configuration	1/2 SVC
Operating mode	VAV mode
Opening dir	CW
Adaptive pos	On
Vn value	2.04
Vmin	10%
Vmax	90%
Vnom	450 m3/h

AST20

1. AST20
2. G..B181.1E/.. , ASV181.1E/3, or G..B111../MO
3. Strain release strip
4. Connection cable (7-pin or 6-pin)

Handheld Tool for VAV Compact Controllers and Communicative Actuators. For configuration and maintenance of OpenAir VAV compact and modular controllers and actuators with Modbus RTU communication



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PARAMETRIZATION

Sound and pressure drop

A [m²]	Pressure drop	Sound power level L _{wa} [dB]	Effective velocity v _{ef} [m/s]			
			3	6	9	12
1	ps=125 Pa	63	66	76	83	88
		125	57	67	75	80
		250	58	64	69	73
		500	48	51	54	55
		1000	51	54	56	58
		2000	58	61	63	65
		4000	49	54	58	60
		8000	48	53	57	59
1	ps=250 Pa	63	66	75	82	86
		125	64	72	80	84
		250	61	68	73	77
		500	55	60	63	66
		1000	57	61	64	65
		2000	64	67	69	70
		4000	57	61	64	66
		8000	55	59	62	64
1	ps=500 Pa	63	72	81	88	92
		125	65	75	84	89
		250	74	83	90	95
		500	65	71	75	78
		1000	66	69	71	72
		2000	74	75	76	77
		4000	70	72	73	73
		8000	68	70	72	73

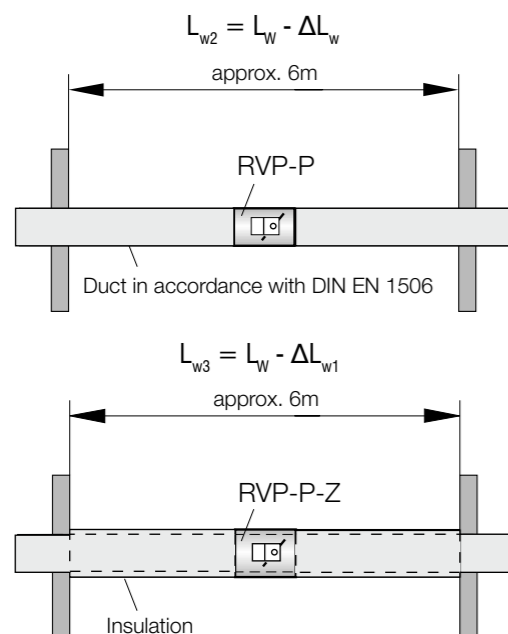
Correction factor	
A [m²]	F
0.04	-10
0.06	-8
0.08	-7
0.1	-6
0.12	-6
0.16	-5
0.2	-4
0.25	-4
0.3	-3
0.4	-3
0.5	-2
0.6	-1
0.8	-1
1	0

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DIAGRAMS



ΔLw/ΔLw1	ΔLw/ΔLw1 u dB, in relation to fm u Hz							
	63	125	250	500	1000	2000	4000	8000
ΔLw [dB(A)]	3	3	6	9	12	14	15	14

ΔLw/ΔLw1	ΔLw/ΔLw1 u dB, in relation to fm u Hz							
	63	125	250	500	1000	2000	4000	8000
ΔLw1 [dB(A)]	7	7	14	21	25	28	28	25

Sound pressure level calculation

Given:

RVP-P 500x300-Z
v = 6 m/s
Δp_s = 500 Pa

fm [Hz]	63	125	250	500	1000	2000	4000	8000	Overall [dB (A)]
L _{wa} [dB]	81	75	83	71	69	75	72	70	
Correction factor 500x300	-5	-5	-5	-5	-5	-5	-5	-5	
A-weighting	-26	-16	-9	-3	0	1	1	-1	
Air regenerated sound power level	50	54	69	63	64	71	68	64	75
ΔLw/ΔLw1	7	7	14	21	25	28	28	25	
Case radiated sound power	43	47	55	42	39	43	40	39	57

RVP-P regulation accuracy

Size		Velocity	1,2 - 3 m/s	3+ m/s
		Air flow [m³/h]		
B [mm]	H [mm]	Maximal ΔV	10%	5%
200	100		130 - 216	216 - 720
300			190 - 324	324 - 1080
400			255 - 432	432 - 1440
200	200		173 - 432	432 - 1008
300			259 - 648	648 - 1512
400			346 - 864	864 - 2016
500			432 - 1080	1080 - 2520
600	300		518 - 1296	1296 - 3024
300			389 - 972	972 - 2268
400			518 - 1296	1296 - 3024
500			648 - 1620	1620 - 3780
600			778 - 1944	1944 - 4536
700			907 - 2268	2268 - 5292
800			1037 - 2592	2592 - 6048
900	400		1166 - 2916	2916 - 6804
1000			1296 - 3240	3240 - 7560
400			691 - 1728	1728 - 4032
500			864 - 2160	2160 - 5040
600			1037 - 2592	2592 - 6048
700			1210 - 3024	3024 - 7056
800			1382 - 3456	3456 - 8064
900	500		1555 - 3888	3888 - 9072
1000			1728 - 4320	4320 - 10080
500			1080 - 2700	2700 - 6300
600			1296 - 3240	3240 - 7560
700	600		1512 - 3780	3780 - 8820
800			1728 - 4320	4320 - 10080
900			1944 - 4860	4860 - 11340
1000	700		2160 - 5400	5400 - 12600
600			1555 - 3888	3888 - 9072
700			1814 - 4536	4536 - 10584
800	800		2074 - 5184	5184 - 12096
900			2333 - 5832	5832 - 13608
1000	900		2592 - 6480	6480 - 15120
700			2117 - 5292	5292 - 12348
800			2419 - 6048	6048 - 14112
900	1000		2722 - 6804	6804 - 15876
1000			3024 - 7560	7560 - 17640
800	1000		2765 - 6912	6912 - 16128
900			3110 - 7776	7776 - 18144
1000	1000		3456 - 8640	8640 - 20160
900			3499 - 8748	8748 - 20412
1000	1000		3888 - 9720	9720 - 22680
1000	1000		4320 - 10800	10800 - 25200

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TRANSPORT

After arrival, check the VAV damper for transport damage and shortcomings. In case of any damage or shortcomings, immediately contact your supplier.

STORAGE

If the damper is not installed immediately:

- Remove any wrapping.
- Protect fire damper from dust and contamination.
- Do not expose the VAV damper to the effects of weather - store the damper in a dry place.
- Do not store the unit below -20 °C or above 50 °C.

Please properly dispose of packaging material!

MAINTENANCE AND OPERATION

Klimaoprema VAV dampers are designed with fully enclosed drive mechanism outside of the duct and as such do not require cleaning and regular maintenance.

However, activation mechanism should be inspected for proper operation on regular basis.

- Provide at least one annual check of the damper
- After each intervention, provide a systematic cleaning of dust and especially the solenoid and its movable plate
- Check the if the electrical terminals are tightened
- Cleaning instruction: clean with a sponge, with water or a mild detergent
- Disinfection instruction: spray disinfectant (disinfectant may contain alcohol which is flammable, take precaution to avoid ignition)

It is not permitted to alter the dampers in any way nor perform any changes to their structure (except for the service procedures described in this manual) without the manufacturer's consent.

Provide at least one annual check of the damper. The functional test must be carried out in compliance with the basic maintenance principles of the European norms EN 13306, EN 15423 and EN15650.

COMMISSIONING

- Carefully unpack RVP-P - be careful of sharp edges and do not use excessive force for unpacking
- Inspect the product - check the volume flow damper for damage
- Installation of the volume flow damper - according to the installation instructions ([page 13.](#))
- Before commissioning: check the product functions


FUNCTIONS

Electric actuator: Signal testing - the damper blade must close/open



AIRFLOW REGULATION

Projektiranje, proizvodnja i održavanje opreme za klimatizaciju, ventilaciju i čiste prostore.
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