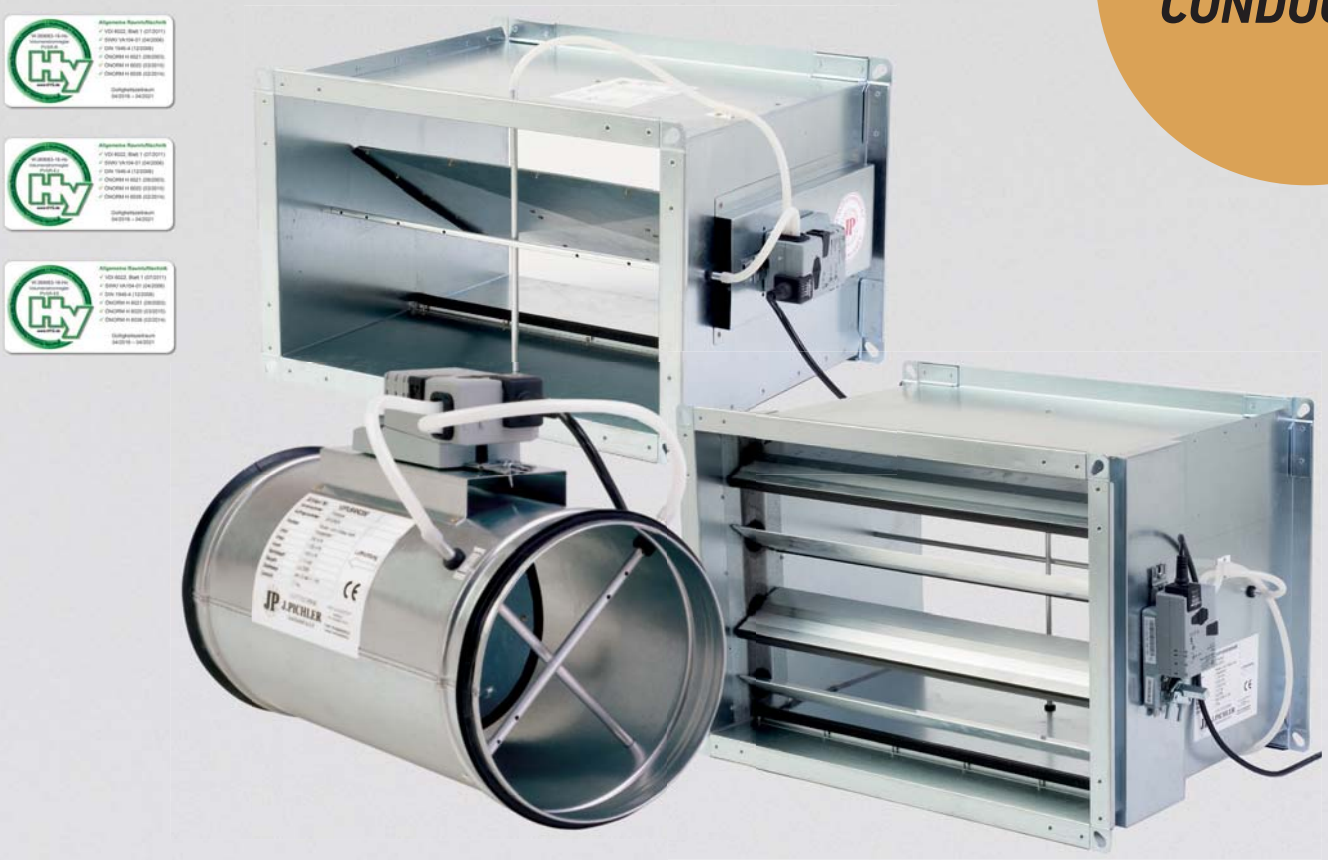
VOLUME FLOW CONTROLLER ROUND / RECTANGULAR

AIR CONDUCTION



for variable volume flow systems
with or without MP bus interface
with or without insulating shell

PICHLER

Systematic ventilation.

Contents

1. Volume flow controller overview — Page 4

1.1 VOLUME FLOW CONTROLLER PVSR RUNDE VERSION — PAGE 4
1.2. VOLUME FLOW CONTROLLER PVSR ECKIGE VERSION — PAGE 4

2. Hygiene – Type Examination — Page 5

3 General — Page 6

3.1 FUNCTIONAL PRINCIPLE — PAGE 6
3.2 BENEFITS AND USES OF VAV SYSTEMS — PAGE 6
3.3. FUNCTION OF VAV COMPACT DRIVES — PAGE 7
3.4. VOLUMETRIC FLOW MEASUREMENT — PAGE 7

PVSR-round

4. Product description — Page 8

5. Versions — Page 8

5.1. PVSR-R VERSION — PAGE 8
5.2 PVSR-RD VERSION - WITH INSULATING SHELL — PAGE 9
5.3 DIFFERENTIAL PRESSURE MEASUREMENT — PAGE 9
5.4 SETTING — PAGE 9
5.5 INSTALLATION — PAGE 9

6. Layout sketch/Technical specifications — Page 10

6.1 DIMENSIONS — PAGE 10
6.2 QUICK SELECTION — PAGE 10
6.3 FLOW NOISE – SOUND POWER LEVEL — PAGE 11
6.4 EMISSIONS NOISE PVSR-R DESIGN WITHOUT INSULATING SHELL – SOUND POWER LEVEL — PAGE 12
6.5 EMISSIONS NOISE PVSR-RD VERSION WITH INSULATING SHELL – SOUND POWER LEVEL — PAGE 13

7. Installation — Page 14

8. Technical data on VAV compact regulators — Page 15

8.1. ELECTRICAL DETAILS FOR L/NMV-D3-MP WITH MP BUS ACTIVATION — PAGE 15
8.2. ELECTRICAL DETAILS FOR L/NMV-D3-MF WITHOUT MP BUS ACTIVATION — PAGE 16
8.3. ELECTRICAL CONNECTION — PAGE 16
8.4. CONNECTION DIAGRAMS - WIRING DIAGRAMS — PAGE 17

9. Specifications — Page 20

9.1. PVSR-R / MP BUS — PAGE 20
9.2. PVSR-RD / MP BUS — PAGE 21
9.3. PVSR-R / MF — PAGE 22
9.4. PVSR-RD / MF — PAGE 23

PVSR-rectangular

10. Product description Page 24

11. Version Page 24

11.1 PVSR-E VERSION PAGE 24
11.2 DIFFERENTIAL PRESSURE MEASUREMENT PAGE 25
11.3 SETTING PAGE 25
11.4 INSTALLATION PAGE 25

12. Layout sketch/Technical specifications Page 26

12.1. DIMENSIONS PAGE 26
12.2 VOLUME FLOW RANGES PAGE 27
12.3 QUICK SELECTION PAGE 32
12.4 ACOUSTIC DATA PAGE 33

13. Installation Page 36

13.1 MINIMUM FLOW PATH PAGE 36

14. Technical data on VAV compact regulators Page 38

14.1 ELECTRICAL DATA ON L/NMV-D3-MP WITH MP BUS ACTUATION PAGE 38
14.2 ELECTRICAL DATA ON L/NMV-D3-MF WITHOUT MP BUS ACTUATION PAGE 39
14.3 ELECTRICAL CONNECTION PAGE 39
14.4 CONNECTION PLANS - CIRCUIT DIAGRAMS PAGE 40

15 Specifications Page 43

15.1. PVSR-EJ / MP-BUS / SHUTTER VALVE VERSION SEITE 43
15.2. PVSR-EJ /D / MP-BUS / SHUTTER VALVE VERSION SEITE 44
15.3. PVSR-EJ / MF / SHUTTER VALVE VERSION SEITE 45
13.4. PVSR-EJ / D / MF / SHUTTER VALVE VERSION SEITE 46
15.5. PVSR-EE / MF / SINGLE VALVE VERSION SEITE 47
15.6. PVSR-EE /MP-BUS / SINGLE VALVE VERSION SEITE 48
15.7. PVSR-EE / D/ MF / SINGLE VALVE VERSION SEITE 49
15.8. PVSR-EE / D/MP-BUS / SINGLE VALVE VERSION SEITE 50

1. Volume flow controller overview

1.1. VOLUME FLOW CONTROLLER PVSR ROUND VERSION

PVSR-R - without insulating shell

PVSR-RD - with insulating shell

1.2. VOLUME FLOW CONTROLLER PVSR RECTANGULAR VERSION

PVSR-EJ - without insulating shell

PVSR-EJD - with insulating shell

PVSR-EE- without insulating shell

PVSR-EED - with insulating shell

For VAV systems, available with or without MP bus interface!
We are happy to answer any queries you may have.

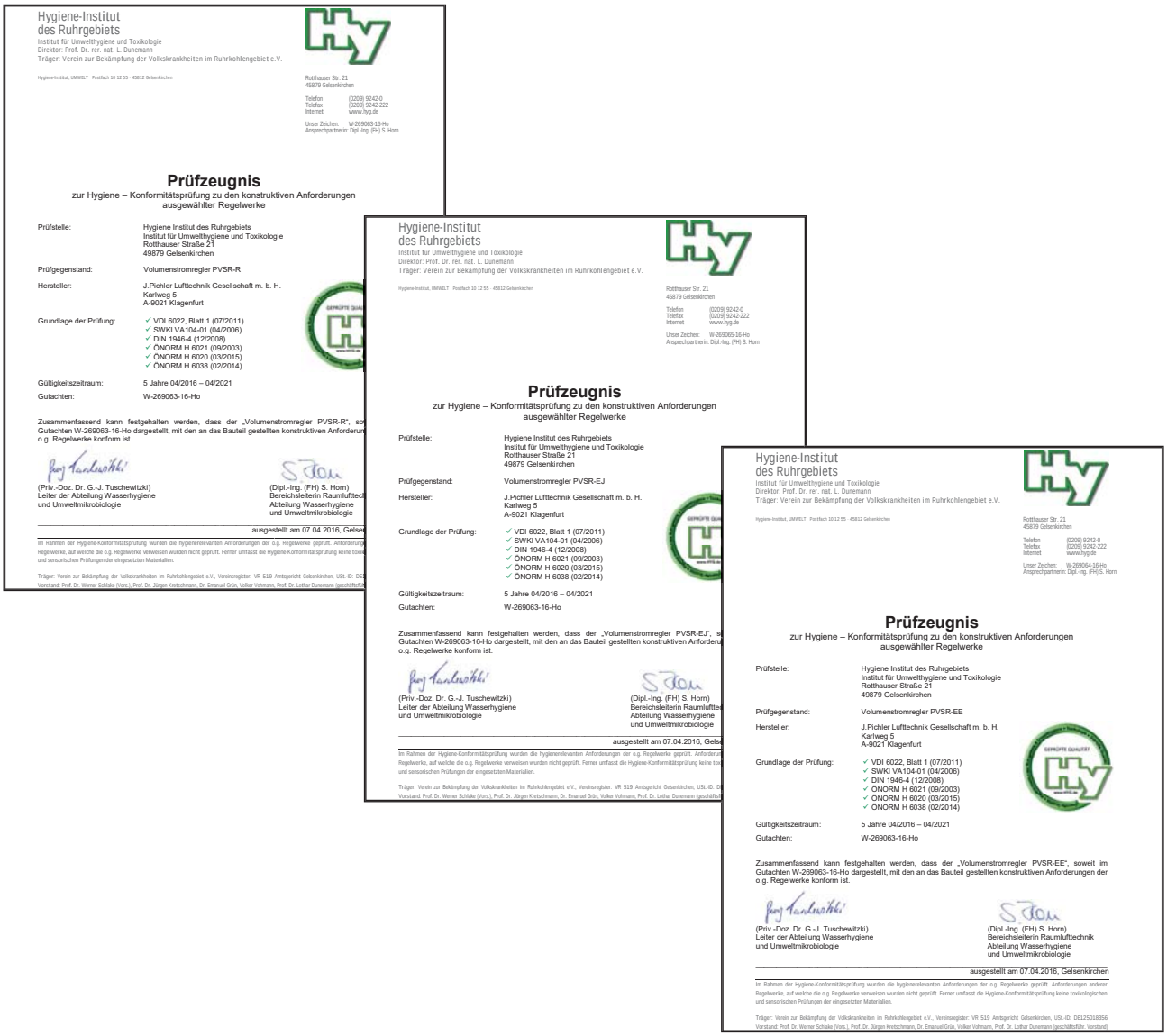
2. Hygiene – Type Examination

TEST INSTITUTE:
Hygiene-Institut des Ruhrgebiets, Institute for Environmental Hygiene and Toxicology

HEAD OFT HE DEPARTMENT OF WATER HYGIENE AND ENVIRONMENTAL MICRO-BIOLOGY:
Priv.-Doz. Dr. G.-J. Tuschewitzki

DEPARTMENT OF WATER HYGIENE AND ENVIRONMENTAL MICROBIOLOGY:
Dipl.-Ing. (FH) S. Horn

EXTRACT FROM THE HYGIENIC REPORT:
[...] In conclusion it can be stated that the volume flow controller, as specified in the test report W-269063-16Ho, is in compliance with the above mentioned regulations. [...]



Hygiene-Institut
des Ruhrgebiets
Institut für Umwelthygiene und Toxikologie
Direktor: Prof. Dr. rer. nat. L. Dunemann
Träger: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V.

Rotthauser Str. 21
45879 Gelsenkirchen

Telefon (0209) 9242-0
Telefax (0209) 9242-222
Internet www.hyg.de

Unser Zeichen: W-269063-16-Ho
Ansprechpartnerin: Dipl.-Ing. (FH) S. Horn

Prüfzeugnis

zur Hygiene – Konformitätsprüfung zu den konstruktiven Anforderungen ausgewählter Regelwerke

Prüfstelle:	Hygiene Institut des Ruhrgebiets Institut für Umwelthygiene und Toxikologie Rotthauser Straße 21 49879 Gelsenkirchen
Prüfgegenstand:	Volumenstromregler PVSR-R
Hersteller:	J.Pichler Lufttechnik Gesellschaft m. b. H. Karlweg 5 A-9021 Klagenfurt
Grundlage der Prüfung:	✓ VDI 6022, Blatt 1 (07/2011) ✓ SWKI VA104-01 (04/2006) ✓ DIN 1946-4 (12/2008) ✓ ÖNORM H 6021 (09/2003) ✓ ÖNORM H 6020 (03/2015) ✓ ÖNORM H 6038 (02/2014)
Gültigkeitszeitraum:	5 Jahre 04/2016 – 04/2021
Gutachten:	W-269063-16-Ho

Zusammenfassend kann festgehalten werden, dass der „Volumenstromregler PVSR-R", so
Gutachten W-269063-16-Ho dargestellt, mit den an das Bauteil gestellten konstruktiven Anforderun
o.g. Regelwerke konform ist.

(Priv.-Doz. Dr. G.-J. Tuschewitzki)
Leiter der Abteilung Wasserhygiene
und Umweltmikrobiologie

(Dipl.-Ing. (FH) S. Horn)
Bereichsleiterin Raumlufttech
Abteilung Wasserhygiene
und Umweltmikrobiologie

ausgestellt am 07.04.2016, Gelse

Im Rahmen der Hygiene-Konformitätsprüfung wurden die hygienerelevanten Anforderungen der o.g. Regelwerke geprüft. Anforderung
Regelwerke, auf welche die o.g. Regelwerke verweisen wurden nicht geprüft. Ferner umfasst die Hygiene-Konformitätsprüfung keine toxik
und sensorischen Prüfungen der eingesetzten Materialien.

Träger: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V., Vereinsregister: VR 519 Amtsgericht Gelsenkirchen, USt.-ID: DE
Vorstand: Prof. Dr. Werner Schlake (Vors.), Prof. Dr. Jürgen Kretschmann, Dr. Emanuel Grün, Volker Vohmann, Prof. Dr. Lothar Dunemann (geschäftsführ

Hygiene-Institut
des Ruhrgebiets
Institut für Umwelthygiene und Toxikologie
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Internet www.hyg.de

Unser Zeichen: W-269063-16-Ho
Ansprechpartnerin: Dipl.-Ing. (FH) S. Horn

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Prüfgegenstand:	Volumenstromregler PVSR-EJ
Hersteller:	J.Pichler Lufttechnik Gesellschaft m. b. H. Karlweg 5 A-9021 Klagenfurt
Grundlage der Prüfung:	✓ VDI 6022, Blatt 1 (07/2011) ✓ SWKI VA104-01 (04/2006) ✓ DIN 1946-4 (12/2008) ✓ ÖNORM H 6021 (09/2003) ✓ ÖNORM H 6020 (03/2015) ✓ ÖNORM H 6038 (02/2014)
Gültigkeitszeitraum:	5 Jahre 04/2016 – 04/2021
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Vorstand: Prof. Dr. Werner Schlake (Vors.), Prof. Dr. Jürgen Kretschmann, Dr. Emanuel Grün, Volker Vohmann, Prof. Dr. Lothar Dunemann (geschäftsfü

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Unser Zeichen: W-269064-16-Ho
Ansprechpartnerin: Dipl.-Ing. (FH) S. Horn

Prüfzeugnis

zur Hygiene – Konformitätsprüfung zu den konstruktiven Anforderungen ausgewählter Regelwerke

Prüfstelle:	Hygiene Institut des Ruhrgebiets Institut für Umwelthygiene und Toxikologie Rotthauser Straße 21 49879 Gelsenkirchen
Prüfgegenstand:	Volumenstromregler PVSR-EE
Hersteller:	J.Pichler Lufttechnik Gesellschaft m. b. H. Karlweg 5 A-9021 Klagenfurt
Grundlage der Prüfung:	✓ VDI 6022, Blatt 1 (07/2011) ✓ SWKI VA104-01 (04/2006) ✓ DIN 1946-4 (12/2008) ✓ ÖNORM H 6021 (09/2003) ✓ ÖNORM H 6020 (03/2015) ✓ ÖNORM H 6038 (02/2014)
Gültigkeitszeitraum:	5 Jahre 04/2016 – 04/2021
Gutachten:	W-269063-16-Ho

Zusammenfassend kann festgehalten werden, dass der „Volumenstromregler PVSR-EE", soweit im Gutachten W-269063-16-Ho dargestellt, mit den an das Bauteil gestellten konstruktiven Anforderungen der o.g. Regelwerke konform ist.

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ausgestellt am 07.04.2016, Gelsenkirchen

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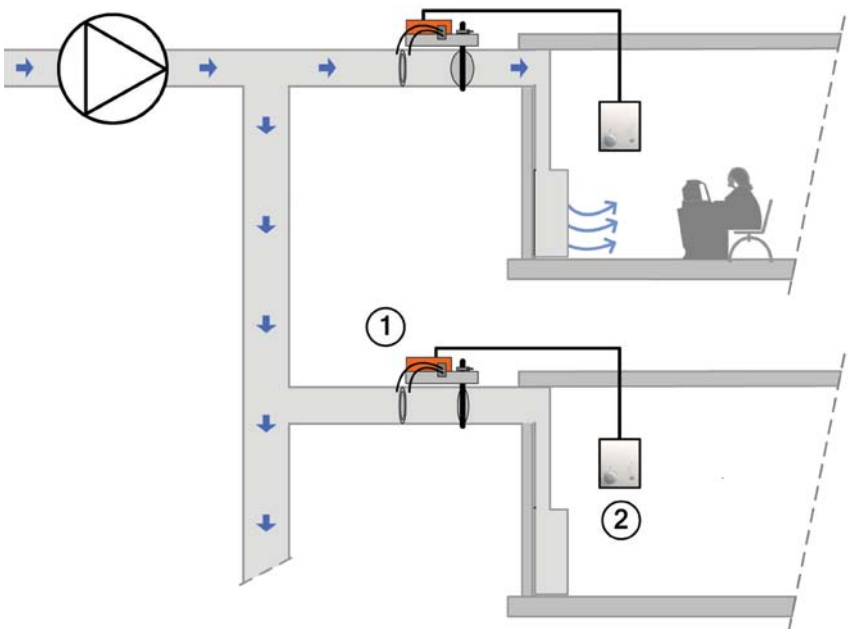
Träger: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V., Vereinsregister: VR 519 Amtsgericht Gelsenkirchen, USt.-ID: DE125018356
Vorstand: Prof. Dr. Werner Schlake (Vors.), Prof. Dr. Jürgen Kretschmann, Dr. Emanuel Grün, Volker Vohmann, Prof. Dr. Lothar Dunemann (geschäftsführ, Vorstand:

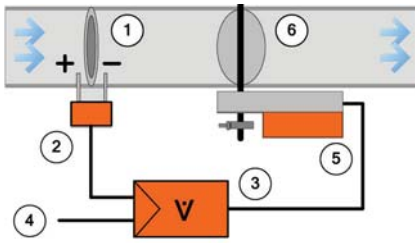
3. General



1 Volume flow controller (Differential pressure sensor, regulator with drive as VAV compact unit)
2 Room temperature regulator

Using variable volume flow systems, the requirements relating to cost-effective and energy-efficient operation, in particular thanks to the new type of needs-based fan regulation via the VAV valve position in combination with drives of the MP bus system generation.

Each zone, each area in a building receives precisely the air volume flow needed to maintain the criteria currently required to supply the exterior air and discharge the waste substances. The room temperature, the air quality or a combination of the two determine the required air volume flow.



1 Pressure sensor - orifice
2 Differential pressure sensor
3 Volume flow (VAV) regulator
4 Reference signal 0.. 10 V
5 Actuator
6 Butterfly valve

3.1 FUNCTIONAL PRINCIPLE

The VAV control functions as a closed control circuit: measure – compare – track. The controller receives the volume flow dependent pressure signal via the differential pressure sensor integrated into the volume flow controller.

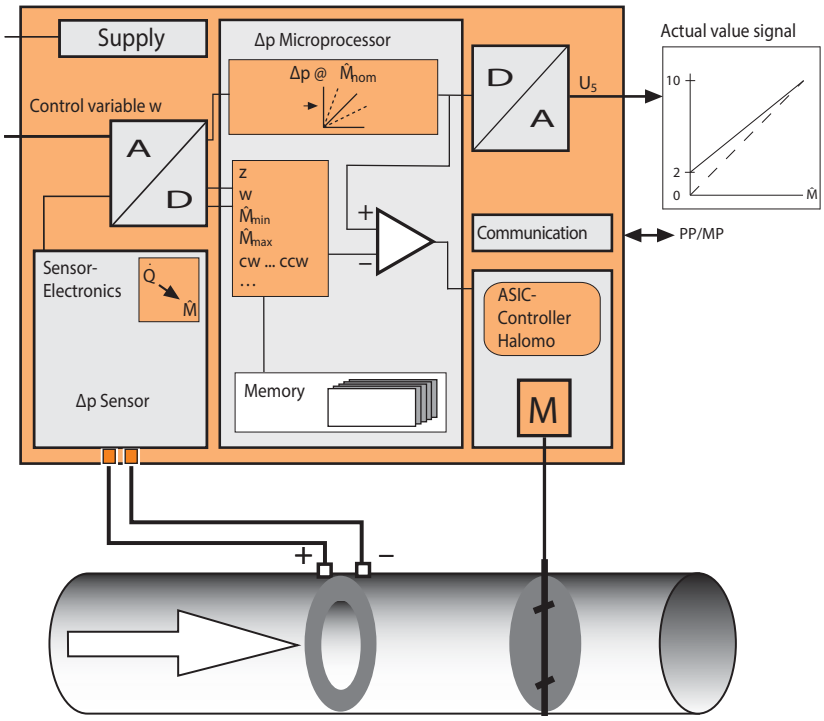
The system functions dependent on system pressure, i.e. pressure fluctuations in the air lines, caused by filters or other zones, are detected and compensated for automatically.

The volume flow controller is modified for the project-specific requirements on the test section.

The nominal volume flow V_{nom} as well as the operating volume flow settings V_{min}, V_{max} are written to the regulator memory. When commissioning the system, this guarantees perfect functioning with minimum effort.

3.2 BENEFITS AND USES OF VAV SYSTEMS

- **Demand-regulated air volume flow**
- **Pre-pressure independent system, simple system integration**
- **Combination with other components and systems such as cooling ceilings**
- **Compatible with energy recovery systems**
- **Low energy consumption, shortens amortisation time**
- **Simple actuation using 0 - 10 V signal or via bus system (MP bus, LonWorks, etc...)**
- **Valve position is used for the energy-efficient regulation of the fans**
- **Permits a saving of up to 50 % of the energy for the fans via the Fan Optimiser**



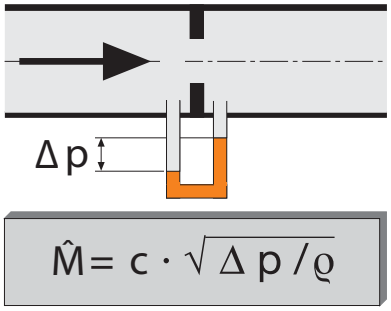
3.3. FUNCTION OF VAV COMPACT DRIVES

In the measurement unit (sensor electronics), the differential pressure signal is converted by the sensor to a signal proportional to the volume flow. Control signal w is conditioned in line with the operational volumetric flow setting $\dot{V}_{min}$ / $\dot{V}_{max}$ as a target value signal.

The instantaneous offset forms the control signal for the drive integrated. The current volumetric flow is available as an actual value signal for the display and control of slave VAV regulators.

The specially designed runtime logic of the VAV compact, in conjunction with an accurate differential pressure recorder, guarantees high control quality of the VAV box equipped with it.

A choice between traditional control signal and MP bus can be made depending on application.



Legend:
$\dot{V}$ = Volumetric flow
c = Geometry-dependent constant of the bluff body
Δp = Differential pressure
ρ = Density of the medium

3.4. VOLUMETRIC FLOW MEASUREMENT

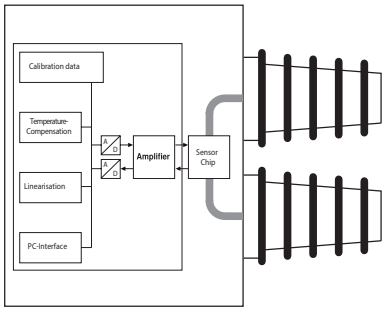
The basis for volumetric flow measurement is a differential pressure pickup, usually fitted into the air duct in the form of an orifice gauge, a venturi nozzle or a differential pressure sensor. Several measurement methods have established themselves on the market for recording volumetric flow.

Reliable and precise differential pressure measurement is the key to accurate volumetric flow regulation
The measurement used by Belimo permits reliable mean value calculation even in unfavourable flow conditions.

Every measurement sensor used for differential pressure recording has its own dynamic behaviour. The effect of this measurement body on the volumetric flow calculation is referred to as device constant "c".

The sensor element comprises a centrally located heating element with two temperature sensors positioned in the flow direction. Formed above the heating element is a temperature bell that is deformed by the air flow in the direction of flow. The resulting temperature difference between the two temperature sensors is a measure of the differential pressure at the sensor.

Features of the Belimo D3 differential pressure sensor:
- Precise, proven heat transport measurement principle
- Lowest flow through the sensor, hence insensitive to dirt
- Zero balance not required for start-up or during operation
- Suitable for any installation position
- Maintenance-free and with long-term stability for a diverse range of applications
- Parallel measurements possible thanks to very low air flow rate
- Display of the current differential pressure, from –600 ... 600 Pa
- The flow-through direction is detected



PVSR-round

4. Product description

Round volume flow controller of types PVSR-R and PVSR-RD are used for variable or constant regulation of the air volume flows in ventilation and air conditioning systems.

The applications for these components are restricted in usage to air conditioning systems at temperatures between + 0 °C and + 50 °C, where the air is free from caustic vapours and wear-inducing substances. The volume flow controller is not suitable for open air installation.

EXTERNAL INSPECTION
The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022 (Blatt 1 07/2011), SWKI VA104-01 (04/2006), DIN 1946-4 (12/2008), ÖNORM H 6021 (09/2003), ÖNORM H 6020 (03/2015) and ÖNORM H 6038 (02/2014), and is in accordance with performed expert appraisals on hygiene.

5. Versions

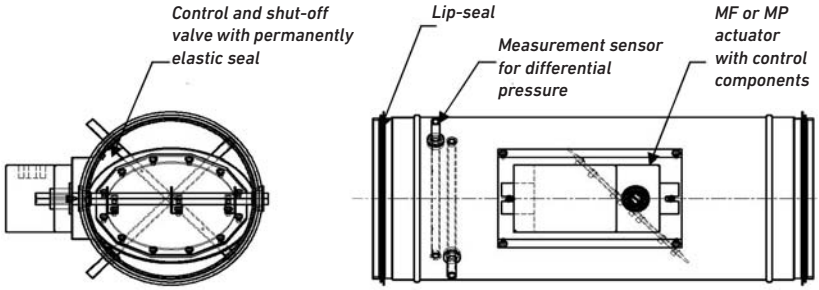
PVSR-R without insulating shell

5.1. PVSR-R VERSION

This volumetric flow controller comprises a zinc-plated sheet steel housing with control and shut-off valve fitted. The control and shut-off valve has an all-round non-ageing and permanently elastic seal. The valve is airtight in the shut-off position in accordance with Class 3 as per EN 1751.

Class C as per EN 1751 is attained for the leakage air volume flow of the housing. The current position of the control and shut-off valve can be seen from outside on the axis using the marker.

The connecting pieces have as standard lip-seal for plug-in fitting on air ducts as per ÖNORM H 6015 and EN 1506.



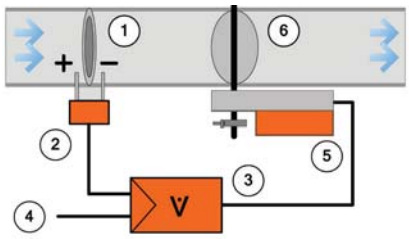
PVSR-RD - with insulating shell

5.2 PVSR-RD VERSION - WITH INSULATING SHELL

The PVSR-RD is the same as type PVSR-R, except the PVSR-RD also has an insulating shell.

The volume flow controller, design with insulating shell, is surrounded with mineral wool and an external sheath made from zinc-plated steel plate to reduce cabinet radiation. The insulating shell cannot be retrofitted.

To maintain the permissible sound pressure level in the room, it can also be necessary to install a sound absorber between the volume flow controller and the room and to insulate the air line.



1 Pressure sensor - orifice
2 Differential pressure sensor
3 Volume flow (VAV) regulator
4 Reference signal 0.. 10 V or 2.. 10 V from room regulator
5 Actuator
6 Butterfly control valve

5.3 DIFFERENTIAL PRESSURE MEASUREMENT

The differential pressure measurement is carried out using a differential pressure sensor made from hollow round pipe profiles on which measurement holes are given on the low pressure and overpressure sides in accordance with the median procedure conforming to ÖNORM EN 12599 for mean value calculation. This achieves a higher level of accuracy in comparison to standard measurement devices with fewer measurement holes or other measuring orifices. This means that on installation the necessary flow path in front of the volume flow controller is kept short (see Installation chapter).
For the proper functioning of the volume flow control unit, measures should be taken to exclude the risk of contamination (e.g. dust ingression) of the control components. This can be achieved by installing suitable air filters in the air pipe system.

For applications with air containing grease (e.g. waste kitchen air), air with sticky components or for heavily contaminated air, or air containing flyings or corrosive air, the volume flow controller is not suitable.

5.4 SETTING

The volume flow controller is pre-assembled in the factory using the control component as a finished unit. The pressure sensor is connected via pipe to the regulator and set to the air volume flows according to customer requirements in line with the settings. The set operating air volume flows V_{min} and V_{max} can also be easily modified on site at any time using a manual adjusting device or software (PC tool), in fully assembled status.

Before delivery, each unit is subjected to a technical functional test on a specially prepared test rig. The factory settings are documented on the nameplate.

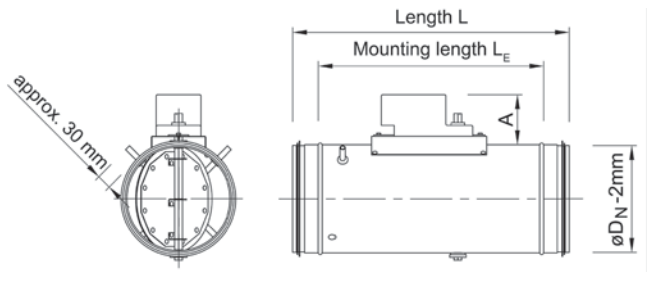
5.5 INSTALLATION

Following the installation instructions and a technical layout conforming to to the relevant flow guidelines, the volume flow controller can be installed in the control system regardless of position.

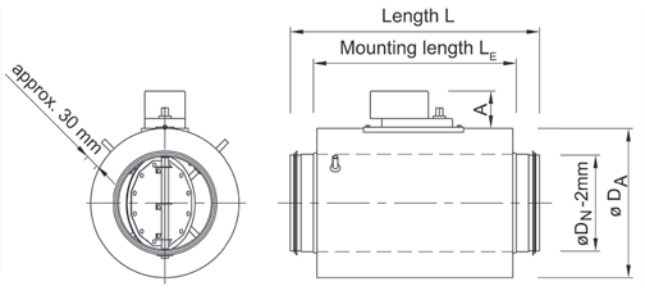
On installation, the installation direction given on the nameplate must be observed. The installation instructions provided by the manufacturer must also be observed.

6. Layout sketch/Technical specifications

6.1 DIMENSIONS



PVSR-R - without insulating shell



PVSR-RD - with insulating shell

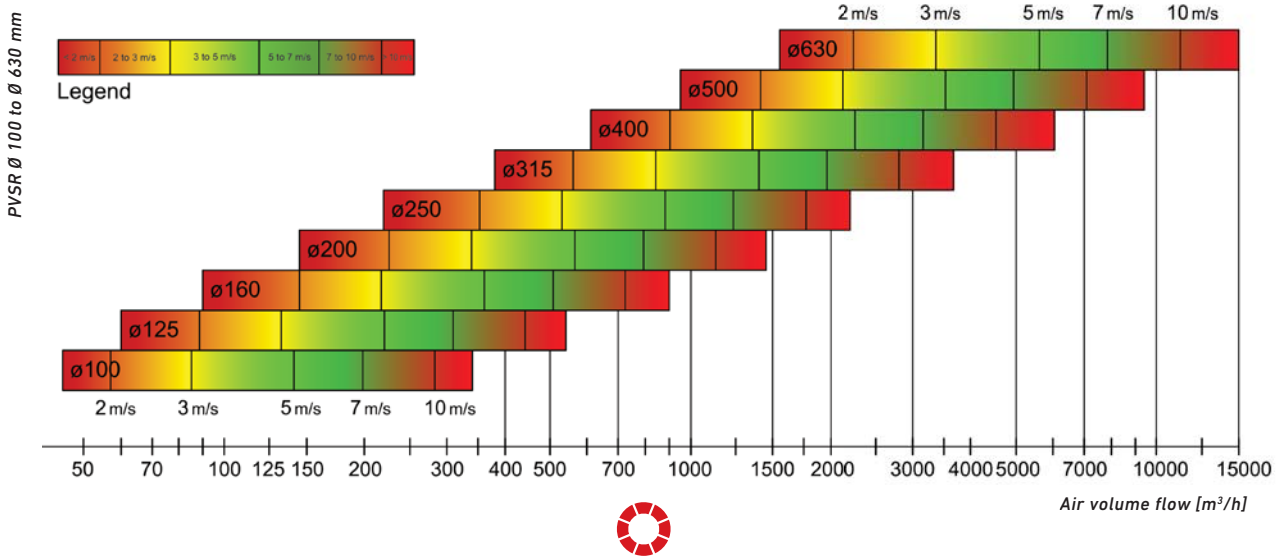
Nominal size D [mm]	V_{min} [m³/h]	permissible range for V_{max} [m³/h]	ø D_N [mm]	ø D_A [mm]	Length L [mm]	Mounting length L_E [mm]	Distance A [mm]	Weight approx. [kg]	
								PVSR-R	PVSR-RD
Ø 100	30	35.....150	100	200	340	260	85	1,5	2,0
Ø 100	40	102.....340	125	225	340	270	85	1,7	2,5
Ø 125	45	50.....250	125	225	340	270	85	1,7	2,5
Ø 125	60	162.....540	125	225	340	270	85	1,7	2,5
Ø 160	65	85.....450	160	260	400	330	85	2,0	2,8
Ø 160	90	270.....900	160	260	400	330	85	2,0	2,8
Ø 200	145	435.....1450	200	300	400	330	85	2,5	3,3
Ø 250	220	663.....2210	250	350	440	330	85	3,0	3,8
Ø 315	380	1104....3680	315	415	540	430	85	5,8	6,8
Ø 400	660	1815...6050	400	500	610	470	85	8,0	9,2
Ø 500	950	2835...9450	500	600	710	570	85	12,5	15,0
Ø 630	1.550	4512...15040	630	730	860	720	85	22,0	25,0

Intermediate dimensions on request!

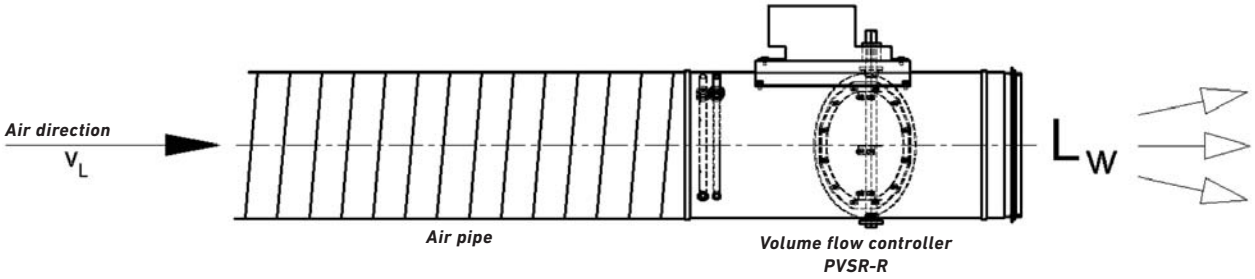
6.2 QUICK SELECTION

The volume flow controller is designed for the optimum application depending on the air volume flow. Air speeds below 2 m/s and over 10 m/s should be avoided due to the response characteristics of the regulator and the acoustics.

The acoustic conditions and specifications must always be observed during the planning work. To maintain the permissible sound pressure level in the room, it can be necessary to install a sound absorber in the room and to insulate the air line.



6.3 FLOW NOISE – SOUND POWER LEVEL



Definition:
L_w in dB (A) Sound power level generated by flow noise
V_L in m/s Flow speed in the air line
Dp_t in Pa Total pressure difference

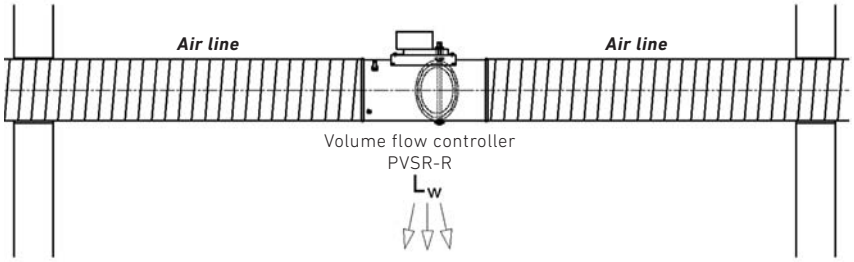
Nominal size	V_L [m/s]	Volume flow		Dp_t = 125 Pa									Dp_t = 250 Pa									Dp_t = 500 Pa								
				L_w [dB/oct]									L_w [dB/oct]									L_w [dB/oct]								
		[m³/h]	[l/s]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_W [dB(A)]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_W [dB(A)]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_W [dB(A)]
100	**3**	85	24	62	60	52	45	39	33	28	22	**49**	66	64	58	52	47	41	36	32	**55**	66	65	62	57	54	50	46	42	**60**
	5	141	39	65	63	56	49	42	36	31	25	**52**	68	66	61	54	49	44	39	35	**57**	68	67	65	60	56	53	48	44	**63**
	7	198	55	67	66	60	53	47	41	35	30	**56**	70	69	65	58	52	47	42	39	**61**	71	72	70	64	59	56	51	48	**67**
	10	283	79	68	67	62	56	49	44	37	32	**58**	71	71	68	61	55	49	44	42	**64**	75	77	76	68	62	58	54	52	**71**
125	**3**	133	37	59	58	52	46	39	34	28	22	**48**	62	63	57	51	45	39	35	29	**54**	64	64	63	59	55	52	48	45	**61**
	5	221	61	62	61	55	49	43	38	32	25	**52**	65	66	60	54	48	43	39	34	**57**	68	68	67	63	58	55	51	47	**65**
	7	309	86	64	63	57	52	47	42	38	31	**54**	68	69	64	58	53	47	43	39	**61**	73	74	72	66	60	57	53	50	**68**
	10	442	123	65	64	59	55	51	46	42	35	**57**	70	71	66	60	56	52	49	45	**63**	76	78	76	70	63	60	56	52	**72**
160	**3**	217	60	59	59	54	47	43	41	33	27	**51**	63	63	58	51	47	45	38	30	**55**	69	69	67	62	60	59	52	47	**66**
	5	362	101	63	63	56	49	46	44	35	29	**54**	67	66	61	55	51	50	43	37	**59**	71	71	70	65	63	62	56	52	**69**
	7	507	141	66	66	60	52	49	47	38	32	**57**	69	69	64	59	54	53	46	40	**62**	74	75	73	67	65	63	58	54	**71**
	10	724	201	68	68	62	55	51	49	41	36	**59**	72	71	67	62	57	55	49	45	**65**	77	78	76	69	66	64	59	56	**73**
200	**3**	339	94	60	60	53	48	45	44	39	30	**52**	68	67	59	53	50	49	48	40	**58**	70	69	65	61	58	58	57	50	**65**
	5	565	157	64	62	56	51	48	47	43	34	**55**	71	70	61	55	53	52	50	42	**61**	72	71	67	63	60	60	60	55	**68**
	7	792	220	66	65	60	55	52	49	45	37	**58**	73	72	65	58	56	54	52	45	**63**	77	77	72	66	63	62	62	58	**71**
	10	1131	314	68	68	63	59	56	52	47	40	**62**	76	76	68	61	59	56	55	47	**66**	82	83	77	69	65	65	65	61	**75**
250	**3**	530	147	60	61	54	47	45	46	42	38	**53**	65	65	56	53	49	50	49	44	**58**	68	68	64	59	56	55	55	56	**64**
	5	884	245	60	62	55	49	49	51	47	41	**56**	67	67	58	55	51	52	52	48	**60**	70	71	66	61	57	56	56	58	**65**
	7	1237	344	64	64	58	53	53	53	48	42	**59**	72	72	63	60	56	55	55	49	**64**	75	76	70	65	60	59	59	61	**69**
	10	1767	491	68	67	63	57	55	54	49	44	**62**	74	74	68	65	60	58	56	50	**67**	80	81	74	68	63	62	62	63	**72**
315	**3**	842	234	62	61	56	49	47	47	45	38	**55**	66	66	57	54	52	53	52	48	**60**	73	73	67	63	61	60	59	59	**68**
	5	1403	390	64	63	58	52	49	49	47	42	**57**	68	69	62	56	55	56	55	50	**63**	75	74	69	64	62	61	60	60	**69**
	7	1964	546	68	67	62	56	52	52	49	44	**60**	71	71	66	61	59	59	57	52	**66**	79	78	73	67	64	63	63	64	**72**
	10	2806	779	71	70	64	59	54	55	52	46	**63**	74	74	70	66	62	62	59	55	**69**	83	82	76	70	66	65	65	67	**75**
400	**3**	1357	377	62	62	57	51	49	48	47	40	**56**	66	67	60	55	54	55	54	49	**62**	71	69	64	61	62	67	61	61	**71**
	5	2262	628	64	64	59	54	51	50	49	44	**58**	69	70	62	57	56	57	56	51	**64**	74	71	66	63	64	69	63	63	**73**
	7	3167	880	69	68	63	57	54	52	51	45	**61**	74	74	66	62	59	60	58	53	**67**	77	75	69	65	65	70	64	64	**74**
	10	4524	1257	73	71	65	60	57	54	52	46	**64**	78	77	69	67	63	62	61	56	**70**	81	79	72	68	67	71	65	65	**76**
500	**3**	2121	589	64	64	59	54	51	50	49	44	**58**	67	68	62	57	55	57	55	49	**63**	74	71	66	62	63	68	62	61	**72**
	5	3534	982	66	66	61	56	53	52	51	46	**60**	71	72	64	59	58	59	58	53	**66**	77	75	69	65	65	70	64	64	**74**
	7	4948	1374	70	71	65	59	56	55	53	48	**64**	73	75	67	62	60	62	60	55	**68**	81	79	72	68	67	71	65	65	**76**
	10	7069	1963	74	73	66	60	58	56	55	50	**65**	76	78	70	65	63	65	62	58	**71**	83	81	75	70	70	73	67	67	**78**
630	**3**	3367	935	65	65	60	56	53	52	51	46	**60**	70	71	63	58	57	59	58	53	**65**	74	71	66	63	64	69	63	63	**73**
	5	5611	1559	68	69	63	59	55	55	53	49	**63**	73	75	67	62	60	62	60	55	**68**	77	76	70	68	66	71	65	65	**75**
	7	7855	2182	71	72	66	60	57	56	54	50	**65**	76	78	70	65	63	65	62	58	**71**	81	79	72	68	67	71	65	65	**76**
	10	11,222	3117	74	75	70	63	60	58	55	51	**67**	79	80	73	68	66	67	64	60	**74**	83	83	75	73	71	73	68	68	**79**

Table 1 - Flow noise

6.4 EMISSIONS NOISE PVSR-R DESIGN WITHOUT INSULATING SHELL – SOUND POWER LEVEL

With the routing of air lines through rooms, sound radiation is carried out via the line surface due to inner sound sources such as fans, flow noise of components installed in the line.

The sound pressure level depends on the sound pressure level in the air line, line surface, line shape (round or rectangular version), wall thickness, room insulation and distance to the air line.



The table below gives radiated noise. These specifications relate solely to the flow noise of the volume flow controller.

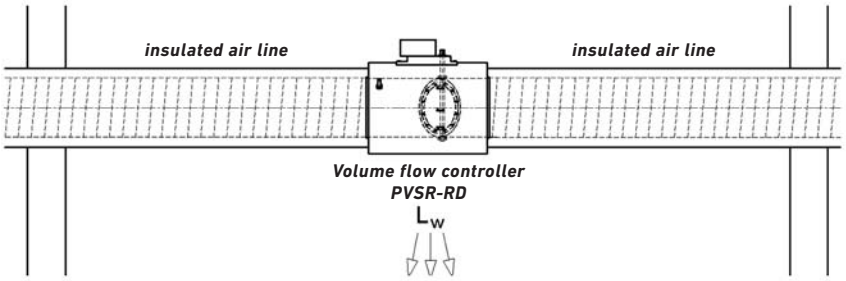
Nominal size	v_L [m/s]	Volume flow [m³/h]	Dp_t = 125 Pa L_w [dB/oct]									Dp_t = 250 Pa L_w [dB/oct]									Dp_t = 500 Pa L_w [dB/oct]								
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_w [dB(A)]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_w [dB(A)]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_w [dB(A)]
100	3	85	31	30	25	24	20	22	17	13	**28**	35	34	31	31	28	30	25	23	**35**	35	35	35	36	35	39	35	33	**43**
	5	141	34	33	29	28	23	25	20	16	**31**	37	36	34	33	30	33	28	26	**38**	37	37	38	39	37	42	37	35	**46**
	7	198	36	36	33	32	28	30	24	21	**35**	39	39	38	37	33	36	31	30	**41**	40	42	43	43	40	45	40	39	**49**
	10	283	37	37	35	35	30	33	26	23	**38**	40	41	41	40	36	38	33	33	**44**	44	47	49	47	43	47	43	43	**52**
125	3	133	29	29	27	25	21	22	16	12	**28**	32	34	32	30	27	27	23	19	**33**	34	35	38	38	37	40	36	35	**45**
	5	221	32	32	30	28	25	26	20	15	**32**	35	37	35	33	30	31	27	24	**37**	38	39	42	42	40	43	39	37	**48**
	7	309	34	34	32	31	29	30	26	21	**36**	38	40	39	37	35	35	31	29	**41**	43	45	47	45	42	45	41	40	**50**
	10	442	35	35	34	34	33	34	30	25	**39**	40	42	41	39	38	40	37	35	**45**	46	49	51	49	45	48	44	42	**53**
160	3	217	29	30	30	26	24	25	19	15	**31**	33	34	34	30	28	29	24	18	**35**	39	40	43	41	41	43	38	35	**48**
	5	362	33	34	32	28	27	28	21	17	**33**	37	37	37	34	32	34	29	25	**39**	41	42	46	44	44	46	42	40	**51**
	7	507	36	37	36	31	30	31	24	20	**36**	39	40	40	38	35	37	32	28	**42**	44	46	49	46	46	47	44	42	**53**
	10	724	38	39	38	34	32	33	27	24	**39**	42	42	43	41	38	39	35	33	**45**	47	49	52	48	47	48	45	44	**54**
200	3	339	31	32	30	26	24	26	23	17	**32**	39	39	36	31	29	31	32	27	**38**	41	41	42	39	37	40	41	37	**46**
	5	565	35	34	33	29	27	29	27	21	**35**	42	42	38	33	32	34	34	29	**40**	43	43	44	41	39	42	44	42	**49**
	7	792	37	37	37	33	31	31	29	24	**38**	44	44	42	36	35	36	36	32	**43**	48	49	49	44	42	44	46	45	**52**
	10	1131	39	40	40	37	35	34	31	27	**41**	47	48	45	39	38	38	39	34	**46**	53	55	54	47	44	47	49	48	**55**
250	3	530	35	37	34	29	29	32	30	27	**37**	40	41	36	35	33	36	37	33	**42**	43	44	44	41	40	41	43	45	**49**
	5	884	35	38	35	31	33	37	35	30	**42**	42	43	38	37	35	38	40	37	**45**	45	47	46	43	41	42	44	47	**51**
	7	1237	39	40	38	35	37	39	36	31	**44**	47	48	43	42	40	41	43	38	**48**	50	52	50	47	44	45	47	50	**54**
	10	1767	43	43	43	39	39	40	37	33	**46**	49	50	48	47	44	44	44	39	**51**	55	57	54	50	47	48	50	52	**57**
315	3	842	40	39	37	32	32	31	34	28	**39**	44	44	38	37	37	37	41	38	**46**	51	51	48	46	46	44	48	49	**54**
	5	1403	42	41	39	35	34	33	36	32	**42**	46	47	43	39	40	40	44	40	**48**	53	52	50	47	47	45	49	50	**55**
	7	1964	46	45	43	39	37	36	38	34	**44**	49	49	47	44	44	43	46	42	**51**	57	56	54	50	49	47	52	54	**58**
	10	2806	49	48	45	42	39	39	41	36	**47**	52	52	51	49	47	46	48	45	**54**	61	60	57	53	51	49	54	57	**61**
400	3	1357	42	43	39	34	34	36	37	30	**42**	46	48	42	38	39	43	44	39	**49**	51	50	46	44	47	55	51	51	**59**
	5	2262	44	45	41	37	36	38	39	34	**45**	49	51	44	40	41	45	46	41	**51**	54	52	48	46	49	57	53	53	**61**
	7	3167	49	49	45	40	39	40	41	35	**47**	54	55	48	45	44	48	48	43	**54**	57	56	51	48	50	58	54	54	**62**
	10	4524	53	52	47	43	42	42	42	36	**49**	58	58	51	50	48	50	51	46	**57**	61	60	54	51	52	59	55	55	**63**
500	3	2121	45	46	42	38	37	39	40	35	**46**	48	50	45	41	41	46	46	40	**51**	55	53	49	46	49	57	53	52	**61**
	5	3534	47	48	44	40	39	41	42	37	**48**	52	54	47	43	44	48	49	44	**54**	58	57	52	49	51	59	55	55	**63**
	7	4948	51	53	48	43	42	44	44	39	**50**	54	57	50	46	46	51	51	46	**56**	62	61	55	52	53	60	56	56	**64**
	10	7069	55	55	49	44	44	45	46	41	**52**	57	60	53	49	49	54	53	49	**59**	64	63	58	54	56	62	58	58	**66**
630	3	3367	47	48	44	41	40	42	42	38	**48**	52	54	47	43	44	49	49	45	**54**	56	54	50	48	51	59	54	55	**63**
	5	5611	50	52	47	44	42	45	44	41	**51**	55	58	51	47	47	52	51	47	**57**	59	59	54	53	53	61	56	57	**65**
	7	7855	53	55	50	45	44	46	45	42	**52**	58	61	54	50	50	55	53	50	**60**	63	62	56	53	54	61	56	57	**65**
	10	11,222	56	58	54	48	47	48	46	43	**54**	61	63	57	53	53	57	55	52	**62**	65	66	59	58	58	63	59	60	**67**

Table 2 - Radiated noise - Sound power level for version without insulating shell

6.5 EMISSIONS NOISE PVSR-RD VERSION WITH INSULATING SHELL – SOUND POWER LEVEL

With the routing of air lines through rooms, sound radiation is carried out via the line surface due to inner sound sources such as fans, flow noise of components installed in the line.

The sound pressure level depends on the sound pressure level in the air line, line surface, line shape (round or rectangular version), wall thickness, room insulation and distance to the air line.



The table below gives radiated noise levels. These specifications relate solely to the flow noise of the volume flow controller.

Nominal size	v_L [m/s]	Volume flow [m³/h]	Dp_t = 125 Pa L_w [dB/oct]									Dp_t = 250 Pa L_w [dB/oct]									Dp_t = 500 Pa L_w [dB/oct]								
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_w [dB(A)]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_w [dB(A)]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_w [dB(A)]
100	**3**	85	29	32	26	19	-	-	-	-	**21**	33	36	32	26	-	-	-	-	**27**	33	37	36	31	20	17	-	-	**32**
	5	141	32	35	30	23	-	-	-	-	**25**	35	38	35	28	15	-	-	-	**30**	35	39	39	34	22	20	-	-	**35**
	7	198	34	38	34	27	-	-	-	-	**29**	37	41	39	32	18	-	-	-	**34**	38	44	44	38	25	23	-	-	**39**
	10	283	35	39	36	30	15	-	-	-	**31**	38	43	42	35	21	16	7	-	**36**	42	49	50	42	28	25	17	21	**44**
125	**3**	133	27	29	28	19	-	-	-	-	**22**	30	34	33	24	-	-	-	-	**27**	32	35	39	32	22	19	-	-	**33**
	5	221	30	32	31	22	-	-	-	-	**25**	33	37	36	27	15	-	-	-	**30**	36	39	43	36	25	22	-	-	**37**
	7	309	32	34	33	25	-	-	-	-	**27**	36	40	40	31	20	-	-	-	**34**	41	45	48	39	27	24	16	18	**42**
	10	442	33	35	35	28	18	-	-	-	**30**	38	42	42	33	23	19	-	-	**36**	44	49	52	43	30	27	19	20	**45**
160	**3**	217	27	27	30	19	-	-	-	-	**23**	31	31	34	23	-	-	-	-	**27**	37	37	43	34	26	21	-	-	**37**
	5	362	31	31	32	21	-	-	-	-	**25**	35	34	37	27	17	-	-	-	**30**	39	39	46	37	29	24	16	18	**40**
	7	507	34	34	36	24	-	-	-	-	**29**	37	37	40	31	20	-	-	-	**34**	42	43	49	39	31	25	18	20	**42**
	10	724	36	36	38	27	17	-	-	-	**31**	40	39	43	34	23	17	-	-	**36**	45	46	52	41	32	26	19	22	**45**
200	**3**	339	29	29	27	15	-	-	-	-	**20**	37	36	33	20	-	-	-	-	**27**	39	38	39	28	19	15	15	15	**32**
	5	565	33	31	30	18	-	-	-	-	**23**	40	39	35	22	15	-	-	-	**29**	41	40	41	30	21	16	17	20	**34**
	7	792	35	34	34	22	-	-	-	-	**27**	42	41	39	25	17	-	-	-	**32**	46	46	46	33	24	18	19	23	**39**
	10	1131	37	37	37	26	17	-	-	-	**30**	45	45	42	28	20	-	-	-	**35**	51	52	51	36	26	21	22	26	**44**
250	**3**	530	33	34	31	18	-	-		-	**25**	38	38	33	24	15	-	-	-	**28**	41	41	41	30	21	15	19	25	**35**
	5	884	33	35	32	20	-	-	-	-	**26**	40	40	35	26	16	-	-	-	**30**	43	44	43	32	22	15	20	27	**37**
	7	1237	37	37	35	24	18	-	-	-	**29**	45	45	40	31	21	13	19	18	**35**	48	49	47	36	25	17	23	30	**41**
	10	1767	41	40	40	28	20	-	-	-	**33**	47	47	45	36	25	16	20	19	**39**	53	54	51	39	28	20	26	32	**45**
315	**3**	842	38	36	33	20	-	-	-	-	**27**	42	41	34	25	18	12	17	19	**30**	49	48	44	34	27	19	24	30	**39**
	5	1403	40	38	35	23	-	-	-	-	**29**	44	44	39	27	21	15	20	21	**34**	51	49	46	35	28	20	25	31	**41**
	7	1964	44	42	39	27	18	-	-	-	**33**	47	46	43	32	25	18	22	23	**37**	55	53	50	38	30	22	28	35	**44**
	10	2806	47	45	41	30	20	16	17	17	**35**	50	49	47	37	28	21	24	26	**41**	59	57	53	41	32	24	30	38	**47**
400	**3**	1357	40	39	35	22	-	-	-	-	**29**	44	44	38	26	19	16	21	20	**33**	49	46	42	32	27	28	28	32	**39**
	5	2262	42	41	37	25	16	-	-	-	**31**	47	47	40	28	21	18	23	22	**36**	52	48	44	34	29	30	30	34	**41**
	7	3167	47	45	41	28	19	-	-	-	**35**	52	51	44	33	24	21	25	24	**39**	55	52	47	36	30	31	31	35	**43**
	10	4524	51	48	43	31	22	16	19	17	**37**	56	54	47	38	28	23	28	27	**43**	59	56	50	39	32	32	32	36	**46**
500	**3**	2121	43	42	38	24	15	-	-	-	**32**	46	46	41	27	19	19	23	20	**36**	53	49	45	32	27	30	30	32	**41**
	5	3534	45	44	40	26	17	16	19	17	**34**	50	50	43	29	22	21	26	24	**38**	56	53	48	35	29	32	32	35	**44**
	7	4948	49	49	44	29	20	17	21	19	**38**	52	53	46	32	24	24	28	26	**41**	60	57	51	38	31	33	33	36	**46**
	10	7069	53	51	45	30	22	18	23	21	**40**	55	56	49	35	27	27	30	29	**44**	62	59	54	40	34	35	35	38	**49**
630	**3**	3367	45	44	40	26	17	15	19	17	**34**	50	50	43	28	21	22	26	24	**38**	54	50	46	33	28	32	31	34	**42**
	5	5611	48	48	43	29	19	18	21	20	**37**	53	54	47	32	24	25	28	26	**42**	57	55	50	38	30	34	33	36	**46**
	7	7855	51	51	46	30	21	19	22	21	**40**	56	57	50	35	27	28	30	29	**45**	61	58	52	38	31	34	33	36	**47**
	10	11,222	54	54	50	33	24	21	23	22	**43**	59	59	53	38	30	30	32	31	**48**	63	62	55	43	35	36	36	39	**51**

Table 3 - Radiated noise - Sound power level for version with 50 mm insulating shell

7. Installation

The volume flow controller is not ready for use as a product and must first be commissioned once it has been installed and connected in the technical ventilation system correctly and in line with the regulations.

It can be installed in any position in the control system with the axes in a horizontal or vertical position. The installation must be carried out according to the flow direction given on the nameplate.

For the correct functioning of the volume flow controller, it is essential that the minimum distances to other installed components are observed during installation. A minimum flow path with the following length must be observed:
L = approx. 2 x diameter.

Minimum flow length	**Distance**
Offsets, arcs	1 x D
Other fittings such as diverters, T-pieces, reductions,	2 x D
Components such as fire dampers, sound absorbers	2 x D
D ... Diameter of the volume flow controller	

The combinations of multiple components, such as shaped parts with or without installed components, e.g. fire dampers, sound absorbers, etc. require greater minimum flow distances. Particular care must be taken in the case of deviations to the favourable technical flow of the measurement sensor (differential pressure sensor) during installation.

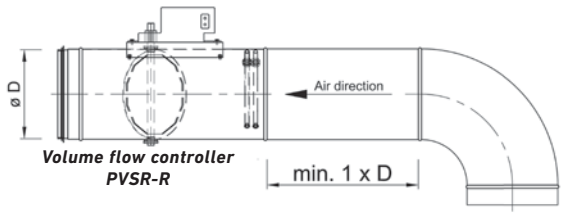
The measurement sensor with the measurement lines (differential pressure sensor) must not be used on site for transport purposes.

Measurement pipes must not be bent! Check for correct seating during installation!

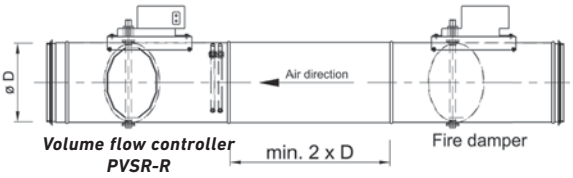
For correct functioning, carry out measures to exclude the risk of contamination of the control components (e.g. due to dust ingression). This can be carried out by installing suitable filter units in the air control system in front of the volume flow controller.

During installation, check for clear access for inspection and cleaning purposes. The equipment is maintenance-free in terms of its mechanical components. According to the local conditions, it can be necessary to fit access openings in the air lines. If larger volume flow deviations have been determined, check the measuring equipment, the connecting nipple and the connection pipes and if necessary, carefully clean the equipment dry. When using the volume flow controller, condensate can occur in the volume flow controller measurement pipes due to greater temperature differences. The condensate can impair sensor function or damage the sensor. Take precautions to prevent the formation of condensate using suitable measures on site, e.g. by insulating the measurement pipes.

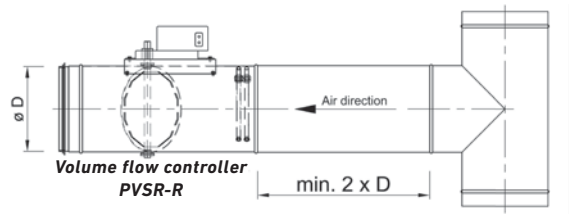
For different application situations, the minimum flow paths are given in the diagrams below.



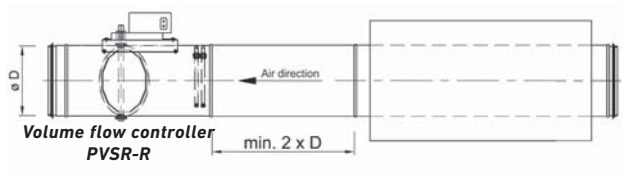
Flow path after bend



Flow path after fire damper



Flow path after shaped part (fork, reduction, etc. ...)



Flow path after sound absorber

8. Technical data on VAV compact regulators

Volume flow controllers PVSR–R and PVSR–RD with VAV compact regulators are all available either with or without MP bus actuation.

Caution: When equipping the volume flow controller with a type MF compact regulator, various applications such as bus connections LONWORKS® / EIB-Konnex or Fan Optimiser cannot be implemented.

8.1. ELECTRICAL DETAILS FOR L/NMV-D3-MP WITH MP BUS ACTIVATION

Electrical connection	
Nominal voltage	AC 24 V, 50 / 60 Hz DC 24 V
Functional range	AC 19.2 V to 28.8 V DC 21.6 V to 28.8 V
Connection cable	4 x 0.75 mm^2
Protection type	IP 54, protection class III safety extra-low voltage
Operating volume flow	
	V_{nom} specific nominal volume flow for VAV component V_{max} between 20% and 100% of V_{nom} V_{min} 0 ... 100% of V_{nom}
Traditional actuation	
Mode for control input Y (connection 3)	DC 2 ... 10 V / (4 ... 20 mA with 500 Ω resistance) DC 0 ... 10 V / (0 ... 20 mA with 500 Ω resistance) adjustable between DC 0 ... 10 V Min. input resistance 100 kΩ
Mode for actual value signal U5 (connection 5)	DC 2 ... 10 V max. 0.5 mA DC 0 ... 10 V max. 0.5 mA Adjustable: volumetric flow or valve position
Operating stages CAV	Closed / V_{min} / V_{mid} * / V_{max} / Open* (* only for 24 V AC supply)
Bus function MP	
Address in bus mode	MP 1 ... 8 (traditional mode: PP)
LONWORKS® / EIB-Konnex	with BELIMO interface UK24LON / UK24EIB/ UK24MOD / UK24BAC
Modbus RTU/BACnet	1 to 8 BELIMO MP devices
DDC regulator	DDC regulator / SPS, with integrated MP bus interface
Fan Optimiser	With BELIMO Optimiser COU24-A-MP
Sensor integration	Passive (Pt1000, Ni1000, etc.) and active sensors (0...10 V) e.g. temperature, moisture, 2-point signal (switching output 16 mA @ 24 V), e.g. switch, motion detector.
Operation and service	Plug-in / PC tool (from V3.6) / ZTH-GEN
Communication	PP / MP bus, max. DC 15 V, 1200 baud
Button	Adaptation / addressing
LED	24V supply and status/bus function
Drive	Brushless, anti-blocking drive with power-save mode
Torque	LMV-D2 5 Nm / NMV-D2 10 Nm
Adaptation	Operating range detection and resolution in control range
Angle of rotation	95°, adjustable mechanically or electronically limiting
Position indicator	Mechanical with indicator
Direction of rotation	left/right or ↑ / ↓
Sound power level	*max. 35 dB (A), SMV-D3-MP max. 45 dB (A)*
Materials	PC + ABS to UL94-V0; stainless steel, DIN 1.4301 X10CrNiS1810; PP Santoprene

8.2. ELECTRICAL DETAILS FOR L/NMV-D3-MF WITHOUT MP BUS ACTIVATION

Electrical connection

Nominal voltage	AC 24 V, 50 / 60 Hz, DC 24 V
Functional range	AC 19.2 V to 28.8 V / DC 21.6 V to 28.8 V
Connecting cable	4 x 0.75 mm^2
Protection type	IP 54, protection class III safety extra-low voltage

Operating volume flow

	V_{nom} specific nominal volume flow for the VAV component
	V_{max} between 20% and 100% of V_{nom}
	V_{min} 0 to 100% of V_{nom}

Traditional activation

Mode for control input Y	DC 2 ... 10 V / (4 ... 20 mA with 500 Ω resistance)
(connector 3)	DC 0 ... 10 V / (0 ... 20 mA with 500 Ω resistance)
	adjustable between DC 0 ... 10 V
	Min input resistance 100 kΩ
Mode for actual value signal U5	DC 2 ... 10 V max. 0.5 mA
(connection 5)	DC 0 ... 10 V max. 0.5 mA
	Adjustable: Volume flow or valve position
Operating stages CAV	Closed / V_{min} / V_{max} / Open

Operation and service	Pluggable / PC tool (from V3.6) / ZTH-GEN
Communication	PP
Button	Adaptation
LED	24 V supply and status function

Drive	Brushless, anti-blocking drive with power-save mode
Torque	LMV-D2 5 Nm / NMV-D2 10 Nm
Adaptation	Operating range detection and resolution in control range
Angle of rotation	95°, adjustable mechanically or electronically limited
Position display	Mechanically with indicator
Direction of rotation	Left/right or ↑ / ↓
Sound power level	*max. 35 dB (A), SMV-D3-MP max. 45 dB (A)*

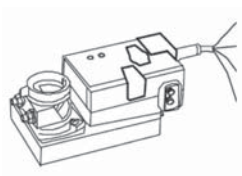
Materials	PC + ABS to UL94-V0; stainless steel, DIN 1.4301 X10CrNiS1810; PP Santoprene

8.3. ELECTRICAL CONNECTION

The electrical connector is via the connector cable on the compact regulator. A safety transformer must be used for the supply.

Connectors 1 and 2 (AC or DC 24 V), 3 and 5 (actual value signal for MF, bus connector for MP) must if possible be routed via a 4-pin connector line to accessible terminals (e.g. room controller, floor panel board, switch cabinet) so as to enable access with the ZTH-VAV or PC tool for diagnostics and servicing work.

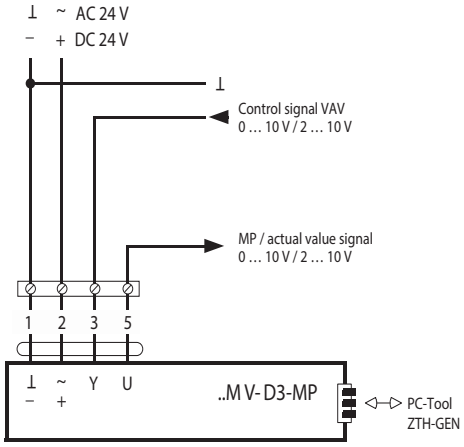
The device does not contain any parts that can be replaced or repaired by the user and may only be opened at the manufacturer's site. Communication via an MP bus system is not possible for model MF contact regulators.



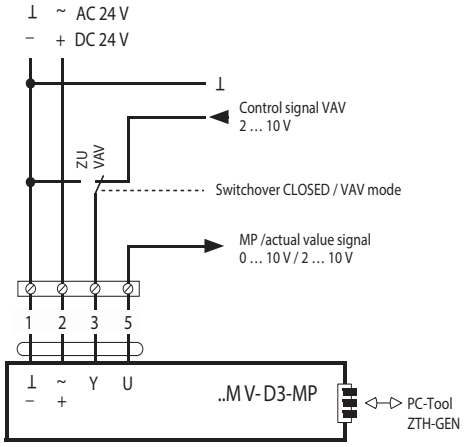
No.	Designation	Core colour	Function
1	– ⊥	black	⊥ – } 24 V AC/DC power supply
2	+ ~	red	~ + }
3	Y	white	Reference signal VAV / CAV
5	U	orange	– Actual value signal – MP bus connection

8.4. CONNECTION DIAGRAMS - WIRING DIAGRAMS

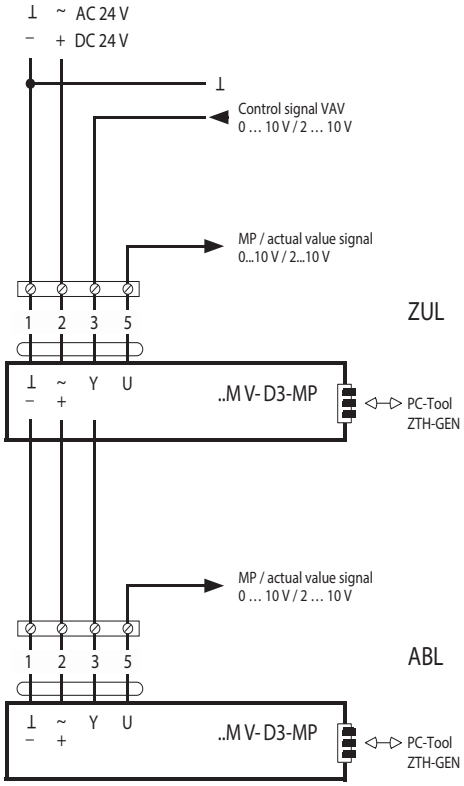
8.4.1. VAV variable mode V_{min} / V_{max} with MP bus and MF compact regulator



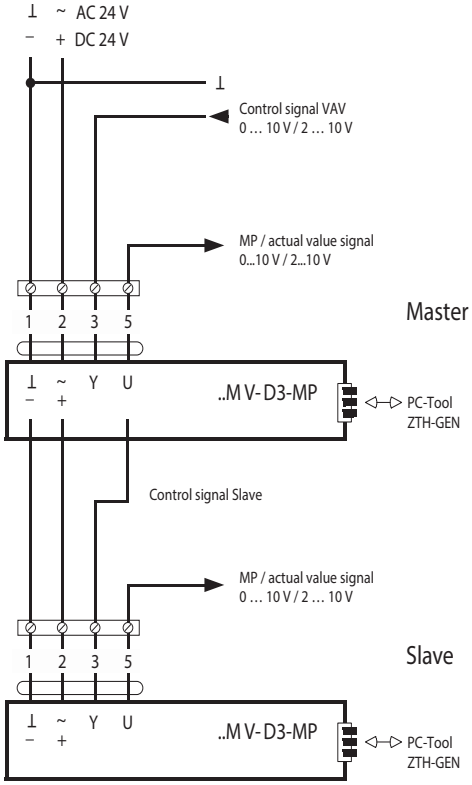
Example 1: VAV with analogue control signal



Example 2: VAV with shut-off (ZU), mode 2 ... 10 V



Example 3: VAV with analogue control signal ZUL/ABL connected in parallel



Example 4: VAV with analogue control signal, Master/Slave configuration

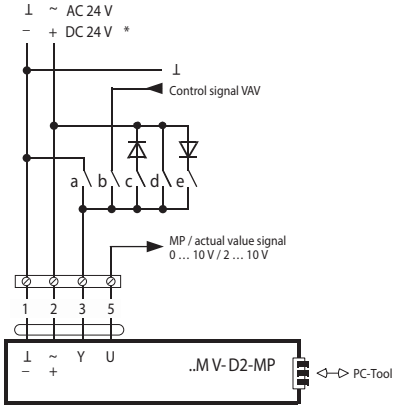
8.4.2 CAV operating stage Closed / V_{min} / V_{mid} / V_{max} / Open with MP bus and MF compact regulator

Three options are available for the CAV controller:

- Standard 0.1 V shut-off:
  Closed – V_{min} – V_{max} – Open
  (default setting)
- Standard 05 V shut-off:
  Closed – V_{min} – V_{max} – Open
- Old generation (NMV-D2M):
  Closed – V_{min} – V_{mid} – V_{max} – Open

Note: Do not use "default 0.5 V shut-off" for:

- Mode 2 ... 10 V and MP bus mode
- Mode 2 ... 10 V and CAV activation



**** Is not available for DC 24 V supply***

Note: Note the mutual disabling of contacts.

Note: To use CAV stage V_{mid} , CAV function Old Generation (NMV-D2M) must be selected.

CAV-Function: Default

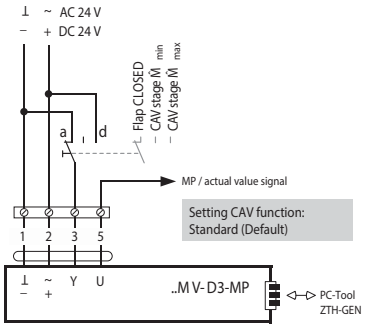
Mode-Setting	–	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V
	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V
Signal	⊥ –	0 ... 10 V 2 ... 10 V	~	~ +	~
Function	3	3	3	3	3
Flap CLOSED	a) CLOSED		c) CLOSED *		
$\hat{M}_{min}$ ... $\hat{M}_{max}$		b) VAV			
CAV – $\hat{M}_{min}$	All open – $\hat{M}_{min}$ active **				
Flap OPEN					e) OPEN *
CAV – $\hat{M}_{max}$				d) $\hat{M}_{max}$	

Legend

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

* Not available for DC 24 V supply
** The flap is closed when using the 0.5 V shut-off level

Example:
CAV application CLOSED – $\hat{M}_{min}$ – $\hat{M}_{max}$
(Mode 2 ... 10 V)



Note:

- Supply via safety transformer.
- Connectors 1 and 2 (AC or DC 24 V), and 5 (MP signal) must be routed to accessible terminals (room controller, floor panel board, switch cabinet, etc.) so as to enable access with the tools for diagnostics and servicing work.

CAV-Function: Old Generation (NMV-D2M)

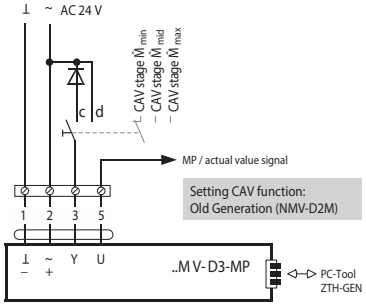
Mode-Setting	–	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V
	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V
Signal	⊥ –	0 ... 10 V 2 ... 10 V	~	~ +	~
Function	3	3	3	3	3
Flap CLOSED	a) CLOSED				
$\hat{M}_{min}$ ... $\hat{M}_{max}$		b) VAV			
CAV – $\hat{M}_{min}$	All open – $\hat{M}_{min}$ active				
Flap OPEN					e) OPEN *
CAV – $\hat{M}_{max}$				d) $\hat{M}_{max}$	
CAV – $\hat{M}_{mid}$			c) $\hat{M}_{mid}$ *		

Legend

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

* Not available for DC 24 V supply

Example:
CAV-application $\hat{M}_{min}$ – $\hat{M}_{mid}$ – $\hat{M}_{max}$
(Mode 0 ... 10 or 2 ... 10 V)



8.4.3. MP bus mode VAV/CAV function only with MP bus compact regulator

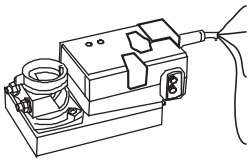
VAV compact regulators can be activated conventionally or via the MP bus. This makes the integration into LONWORKS®, EIB/KNX and DDC systems easy and cost-effective using the MP interface.

The VAV compact regulator can be connected via the integrated communication function to up to 8 MP devices (valve actuators, valve drives, VAV compact regulator) over the MP bus. These slave devices receive their control signal digitally from the bus master over the MP bus and move to the position specified.

The assignment of an MP address means the standard VAV compact regulator becomes a bus-compatible system regulator with an array of additional uses. In bus mode, the VAV compact regulator receives its control signal over the MP bus from the master building automation system and carries out regulation to the volume flow specified. Switchover to MP bus mode is automatic once the VAV compact regulator is assigned an MP address.

An active or passive sensor or switch can be connected to every VAV compact drive. This input value can be used in the master system - for VAV control, room temperature or other applications for example.

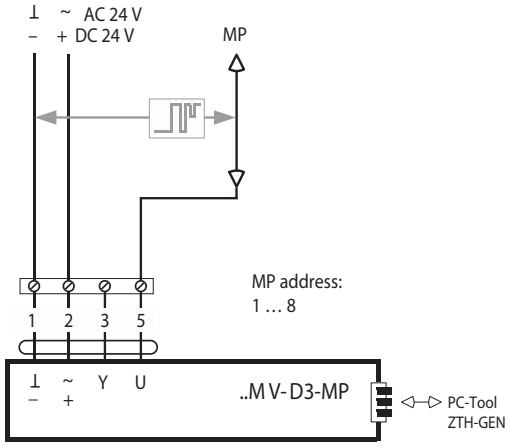
The connector cable fitted to the VAV compact drive is used for the connection to the MP bus.



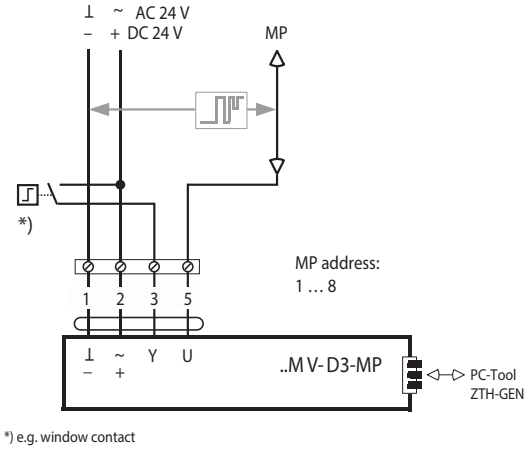
No.	Name	Wire colour	Function
1	– ⊥	Black	⊥ – AC/DC 24 V supply
2	+ ~	Red	~ + AC/DC 24 V supply
3	Y	White	Input for – Sensor connection – Positive control
5	U	Orange	MP bus connection

Notes

- Supply via safety transformer
- Connectors 1 and 2 (AC or DC 24 V), and 5 (MP signal) must be routed to accessible terminals (room controller, floor panel board, switch cabinet, etc.) so as to enable access with the PC tool for diagnostics and servicing work.



Activation via MP bus



*) e.g. window contact

Activation via MP bus with switch integration

Notes

- For further information on connection, positive controllers, MP bus cabling, etc.
- This is a connection description. The terminal assignment can vary depending on application. Connection and start-up must be performed by trained personnel.

9. Specifications

9.1. PVSR-R / MP BUS

Volume flow controller PVSR-R with integrated VAV compact regulator and MP bus interface, for variable or constant air volume flow systems, suitable for normal room air, circular version with shut-off function, sizes from ø 100 mm to ø 630 mm, with airtight control and shut-off valve, readings recorder with mean-value calculating differential pressure sensor and control components, for position-independent installation in air supply and extract air ducts, customer-specific defaults for the control parameters, such as air volume flows V_{min} and V_{max} via factory setting and technical air-related testing of every single device on special test rig, subsequent adjustment of the parameters for commissioning on-site easy to arrange.

Stable cabinet made from zinc-plated steel plate, control and shut-off valve with integrated seal lip made of zinc-plated sheet steel with non-ageing and permanently elastic seal, measuring device with flow-optimised circular pipe profiles with integrated reference holes, resistant to dirt contamination, quality plastic friction bearings, with connecting pieces for plug fitting and integrated lip seal.

By following the installation instructions, the volume flow controller can be installed position-independently in the air duct system. The position of the control valve can be seen from outside on the axis.

Shut-off valve airtight in shut-off position to Class 3 as per ÖNORM EN 1751, housing leakage air volume flow airtight to Class C as per ÖNORM EN 1751, differential pressure range from 20 to 1500 Pa.

VAV compact regulator, pressure sensor, digital regulator and valve actuator as communication-capable VAV compact solution. Brushless, anti-blocking drive with power-save mode. Integrated MP bus interface, connection of active/passive sensors or switches via MP bus. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: 1 m cable, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Direction of rotation: cw / ccw, manual adjustment: with push-button
Push-button: Adaptation / addressing / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Protection class: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on housing for control and adjustment devices

Diameter	..... mm
Length	..... mm
Air volume flow V_{min}, / V_{max}	...../..... m^3 / h
Working range:	 V
VAV compact regulator model	..... *with MP bus interface*
Manufacturer:	PICHLER
Model:	*PVSR-R / MP bus*
	Lo: .....
	SO: .....
ST	EP: .....

9.2. PVSR-RD / MP BUS

Volume flow controller PVSR-RD with insulating shell, with integrated VAV compact regulator and MP bus interface, for variable or constant air volume flow systems, suitable for normal room air, circular version with shut-off function, sizes from ø 100 mm to ø 630 mm, with airtight control and shut-off valve, readings recorder with mean-value calculating differential pressure sensor and control components, for position-independent installation in air supply and discharge air ducts, customer-specific defaults for the control parameters, such as air volume flows V_{min} and V_{ma} via factory setting and technical air-related testing of every single device on special test rig, subsequent adjustment of the parameters for commissioning on-site easy to arrange.

Stable cabinet made from zinc-plated steel plate, control and shut-off valve with integrated seal lip made of zinc-plated sheet steel with non-ageing and permanently elastic seal, measuring device with flow-optimised circular pipe profiles with integrated reference holes, resistant to dirt contamination, quality plastic friction bearings, with connecting pieces for plug fitting and integrated lip seal.

By following the installation instructions, the volume flow controller can be installed position-independently in the air duct system. The position of the control valve can be seen from outside on the axis.

Shut-off valve airtight in shut-off position to Class 3 as per ÖNORM EN 1751, housing leakage air volume flow airtight to Class C as per ÖNORM EN 1751, differential pressure range from 20 to 1500 Pa.

Variant with 50 mm insulating shell made of mineral wool and outer jacket made of zinc-plated sheet steel to prevent housing radiation. Insulating shell cannot be fitted later.

VAV compact regulator, pressure sensor, digital regulator and valve actuator as communication-capable VAV compact solution. Brushless, anti-blocking drive with power-save mode. Integrated MP bus interface, connection of active/passive sensors or switches via MP bus. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: 1 m cable, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Direction of rotation: cw / ccw, manual adjustment: with push-button
Push-button: Adaptation / addressing / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Protection class: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on housing for control and adjustment devices

Diameter	..... mm
Length	..... mm
with insulating shell 50 mm	
Air volume flow V_{min}, / V_{max}	...../..... m^3/h
Working range:	 V
VAV compact regulator model	..... *with MP bus interface*
Manufacturer:	PICHLER
Model:	*PVSR-RD / MP bus*
	Lo: .....
	SO: .....
ST	EP: .....

9.3. PVSR-R / MF

Volume flow controller PVSR-R with integrated VAV compact regulator without MP bus interface, for variable or constant volume flow systems, suitable for normal room air, circular version with shut-off function, sizes from ø 100 mm to ø 630 mm, with airtight control and shut-off valve, readings recorder with mean-value calculating differential pressure sensor and control components, for position-independent installation in air supply and extract air ducts, customer-specific defaults for the control parameters, such as air volume flows V_{min} and V_{max} via factory setting and technical air-related testing of every single device on special test rig, subsequent adjustment of the parameters for commissioning on-site easy to arrange.

Stable cabinet made from zinc-plated steel plate, control and shut-off valve with integrated seal lip made of zinc-plated sheet steel with non-ageing and permanently elastic seal, measuring device with flow-optimised circular pipe profiles with integrated reference holes, resistant to dirt contamination, quality plastic friction bearings, with connecting pieces for plug fitting and integrated lip seal.

By following the installation instructions, the volume flow controller can be installed position-independently in the air duct system. The position of the control valve can be seen from outside on the axis.

Shut-off valve airtight in shut-off position to Class 3 as per ÖNORM EN 1751, housing leakage air volume flow airtight to Class C as per ÖNORM EN 1751, differential pressure range from 20 to 1500 Pa.

VAV compact regulator, pressure sensor, digital regulator and valve actuator as VAV compact solution. Brushless, anti-blocking drive with power-save mode. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: 1 m cable, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Direction of rotation: cw / ccw, manual adjustment: with push-button
Push-button: Adaptation / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Protection class: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on housing for control and adjustment devices

Diameter	..... mm
Length	..... mm
Air volume flow V_{min} / V_{max}	...../..... m^3/h
Working range:	 V
VAV compact regulator model	..... w*ithout MP bus interface*
Manufacturer:	PICHLER
Model:	*PVSR-R / MF*
	Lo: .....
	SO: .....
ST	EP: .....

9.4. PVSR-RD / MF

Volume flow controller PVSR-RD with insulating shell, integrated VAV compact regulator without MP bus interface, for variable or constant volume flow systems, suitable for normal room air, circular version with shut-off function, sizes from ø 100 mm to ø 630 mm, with airtight control and shut-off valve, readings recorder with mean-value calculating differential pressure sensor and control components, for position-independent installation in air supply and extract air ducts, customer-specific defaults for the control parameters, such as air volume flows V_{min} and V_{max} via factory setting and technical air-related testing of every single device on special test rig, subsequent adjustment of the parameters for commissioning on-site easy to arrange.

Stable cabinet made from zinc-plated steel plate, control and shut-off valve with integrated seal lip made of zinc-plated sheet steel with non-ageing and permanently elastic seal, measuring device with flow-optimised circular pipe profiles with integrated reference holes, resistant to dirt contamination, quality plastic friction bearings, with connecting pieces for plug fitting and integrated lip seal.

By following the installation instructions, the volume flow controller can be installed position-independently in the air duct system. The position of the control valve can be seen from outside on the axis.

Shut-off valve airtight in shut-off position to Class 3 as per ÖNORM EN 1751, housing leakage air volume flow airtight to Class C as per ÖNORM EN 1751, differential pressure range from 20 to 1500 Pa.

Variant with 50mm insulating shell made of mineral wool and outer jacket made of zinc-plated sheet steel to prevent housing radiation. Insulating shell cannot be fitted later.

VAV compact regulator, pressure sensor, digital regulator and valve actuator as VAV compact solution. Brushless, anti-blocking drive with power-save mode. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: 1 m cable, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Direction of rotation: cw / ccw, manual adjustment: with push-button
Push-button: Adaptation / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Protection class: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on housing for control and adjustment devices

Diameter	..... mm
Length	..... mm
with insulating shell (50mm)	
Air volume flow V_{min}, / V_{max}	...../..... m^3/h
Working range:	 V
VAV compact regulator model	..... *without MP bus interface*
Manufacturer:	PICHLER
Model:	*PVSR – RD / MF*
	Lo: .....
	SO: .....
ST	EP: .....

PVSR-rectangular

10. Product description

Rectangular volume flow controller of types PVSR-EE and PVSR-EJ are used for variable or constant regulation of the air volume flows in ventilation and air conditioning systems. The application for these components are restricted in usage to air conditioning systems at temperatures between + 0 °C and + 50 °C, where the air is free from caustic vapours and wear-inducing substances.

The volume flow controller is not suitable for open air installation.

EXTERNAL INSPECTION
The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022 (Blatt 1 07/2011), SWKI VA104-01 (04/2006), DIN 1946-4 (12/2008), ÖNORM H 6021 (09/2003), ÖNORM H 6020 (03/2015) and ÖNORM H 6038 (02/2014), and is in accordance with performed expert appraisals on hygiene.

11. Version

11.1 PVSR-E VERSION
The rectangular volume flow controller is available in two different versions, as airtight shutter valve (EJ) or as single valve (EE) and each version is available with or without insulating shell.

The connecting stubs are fitted with universal connection flanges on both sides, to fit flange connections P20 and P30. In the version with insulating shell, the volume flow controller is surrounded with mineral wool and an external sheath made from zinc-plated steel plate to reduce cabinet radiation.

To maintain the permissible sound pressure level in the room, it can also be necessary to install a sound absorber between the volume flow controller and the room and to insulate the air line. The insulating shell cannot be retrofitted.

11.1.1 Airtight shutter valve EJ version
The volume flow controller comprises a cabinet made from zinc-plated steel plate with integrated control and airtight shut-off valve. The control and shut-off valve is designed as an airtight shutter valve with sealing lips on the blades.

The sealing on the side of the blades to the cabinet is implemented using an all-round, permanently elastic sealing strip.

The blades are driven using anti-static plastic toothed wheels fitted on the outside. The current position of the control and shut-off valve can be seen from outside on the axis via a marker.

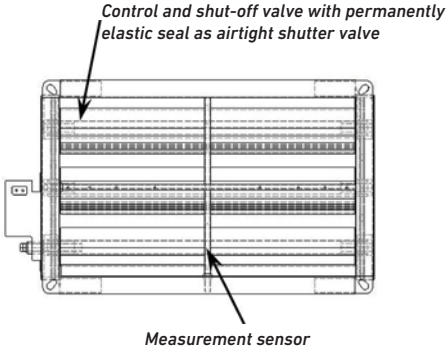
The valve in shut-off position is airtight according to class 4 conforming to ÖNORM EN 1751 For the leaked air volume flow of the cabinet, class C is achieved conforming to ÖNORM EN 1751.

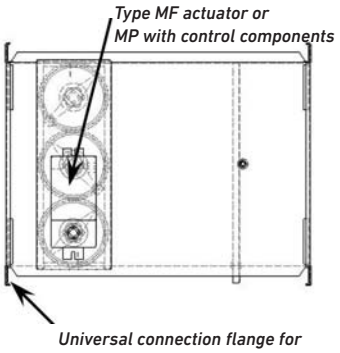
11.1.2 Single valve EE version
The volume flow controller comprises a cabinet made from zinc-plated steel plate with integrated control and shut-off valve. The valve blade is a single rotary valve with an all-round ageing-resistant and permanently elastic seal. The current position of the control and shut-off valve can be seen from outside on the axis via a marker.

The valve in shut-off position is airtight according to class 2 conforming to ÖNORM EN 1751 For the leaked air volume flow of the cabinet, class C is achieved conforming to ÖNORM EN 1751.

Airtight shutter valve EJ version

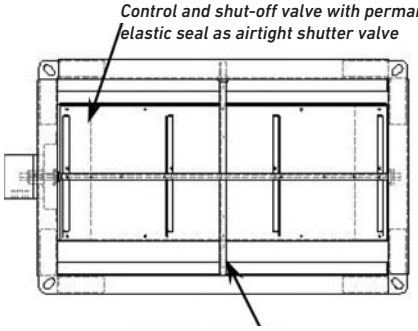
PVSR-EJ - without insulating shell

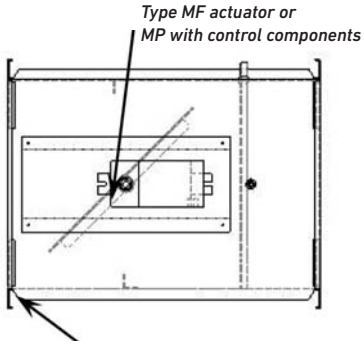


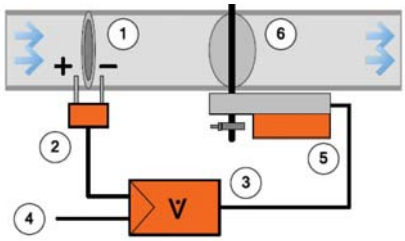


Single valve EE version

PVSR-EE - without insulating shell







1 Pressure sensor - orifice
2 Differential pressure sensor
3 Volume flow (VAV) regulator
4 Reference signal 0.. 10 V or 2.. 10 V
5 Actuator
6 Butterfly control valve

11.2 DIFFERENTIAL PRESSURE MEASUREMENT

The differential pressure measurement is carried out using a differential pressure sensor made from hollow round pipe profiles on which for mean value calculation measurement holes are given on the low pressure and overpressure sides in accordance with the median procedure conforming to ÖNORM EN 12599.

This achieves a higher level of accuracy in comparison to standard measurement devices with fewer measurement holes or other measuring orifices. This means that on installation the necessary flow path in front of the volume flow controller is kept short (see Installation chapter).
For the proper functioning of the volume flow control unit, measures should be taken to exclude the risk of contamination (e.g. dust ingression) of the control components. This can be achieved by installing a suitable air filter in the air line system.

For applications with air containing grease (e.g. waste kitchen air), air with sticky components or for heavily contaminated air, or air containing flyings or corrosive air, the volume flow controller is not suitable.

11.3 SETTING

The volume flow controller is pre-assembled in the factory using the control component as a finished unit. The pressure sensor is connected via pipe to the regulator and set to the air volume flows according to customer requirements in line with the settings. The set operating air volume flows Vmin and Vmax can also be easily modified on site at any time using a manual adjusting device or software (PC tool), in fully assembled status.

Before delivery, each unit is subjected to a technical functional test on a specially prepared test rig. The factory settings are documented on the nameplate.

11.4 INSTALLATION

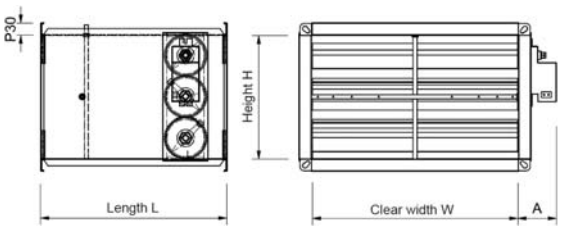
Following the installation instructions and a technical layout conforming to to the relevant flow guidelines, the volume flow controller can be installed in the control system regardless of position.

On installation, the installation directions given on the nameplate must be observed. The installation instructions provided by the manufacturer must also be observed.

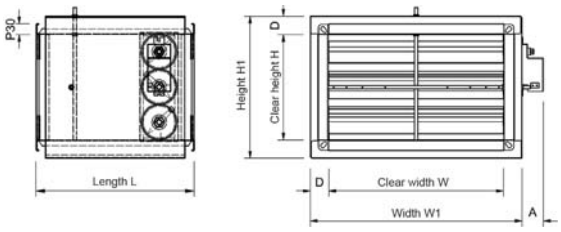
12. Layout sketch/Technical specifications

12.1. DIMENSIONS

12.1.1 Airtight shutter valves PVSR-EJ and PVSR-EJ/D



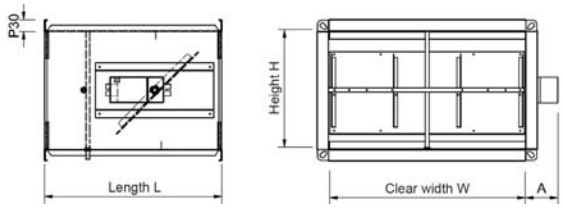
PVSR-EJ - without insulating shell



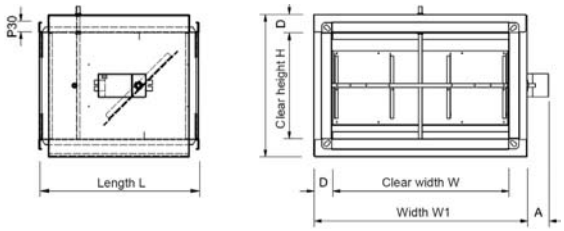
PVSR-EJ/D - with insulating shell

Dimensions							Flange	Weight [kg]	
Clear height H mm	Clear width W mm	Length L mm	Distance A mm	Insulation thickness D mm	Height H1 mm	Width W1 mm		PVSR EJ approx. kg	PVSR EJ/D approx. kg
200	200	400	85	50	300	300	Universal flange to fit P30 / P20 air line connection	5.8	12
	300					400		7.2	15
	400					500		8.6	18
	500					600		10.1	21
	600					700		11.5	24
300	300				400	400		8.6	18
	400					500		10.1	21
	500					600		11.5	24
	600					700		13.5	27
	700					800		14.4	30
	800					900		15.8	33
400	400				500	500		11.5	24
	500					600		13.0	27
	600					700		14.4	30
	700					800		15.8	33
	800					900		17.3	36
	900					1000		18.7	39
	1000					1100		20.2	42
500	500				600	600		14.4	30
	600					700		15.8	33
	700					800		17.3	36
	800					900		18.7	39
	900					1000		20.2	42
	1000					1100		21.6	45
600	600				700	700		17.3	36
	800					900		20.2	42
	1000					1100		23	48
800	800				900	900		23	48
	1000					1100		26	54
1000	1000				1100	1100		29	60

12.1.2 Single valves PVSR-EE and PVSR-EE/D



PVSR-EE - without insulating shell



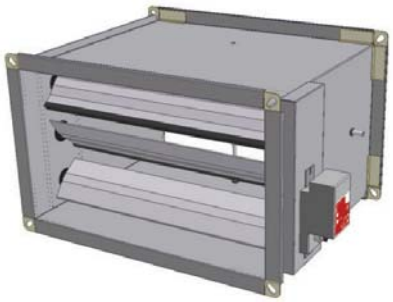
PVSR-EE/D - with insulating shell

Dimensions							Flange	Weight [kg]	
Clear height H mm	Clear width W mm	Length L mm	Distance A mm	Insulating thickness D mm	Height H1 mm	Width W1 mm		PVSR EJ approx. kg	PVSR EJ/D approx. kg
200	200	400	85	50	300	300	Universal flange to fit P30 / P20 air line connection	5.8	12
	300					400		7.2	15
	400					500		8.6	18
	500					600		10.1	21
	600					700		11.5	24
300	300	450			400	400		8.6	18
	400					500		10.1	21
	500					600		11.5	24
	600					700		13.0	27
	700					800		14.4	30
	800					900		15.8	33

12.2 VOLUME FLOW RANGES

12.2.1 Airtight shutter valves PVSR-EJ and PVSR-EJ/D

Installation height 200 and 300 mm



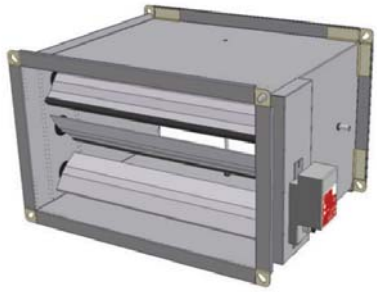
PVSR-EJ - without insulating shell

PVSR-EJ/D - with insulating shell

Size		A	W/H	V_{min}	V_{max}	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
200	**200**	0.04	1.00	288	449 to 1498	2	288	80
						3	432	120
						5	720	200
						7	1008	280
						10	1498	416
	300	0.06	0.67	432	667 to 2225	2	432	120
						3	648	180
						5	1080	300
						7	1512	420
						10	2225	618
	400	0.08	0.50	576	890 to 2966	2	576	160
						3	864	240
						5	1440	400
						7	2016	560
						10	2966	824
	500	0.10	0.40	720	1123 to 3744	2	720	200
						3	1080	300
						5	1800	500
						7	2520	700
						10	3744	1040
	600	0.12	0.33	864	1348 to 4493	2	864	240
						3	1296	360
						5	2160	600
						7	3024	840
						10	4493	1248

Size		A	W/H	V_{min}	V_{max}	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
300	**300**	0.09	1.00	648	1001 to 3337	2	648	180
						3	972	270
						5	1620	450
						7	2268	630
						10	3337	927
	400	0.12	0.75	864	1335 to 4450	2	864	240
						3	1296	360
						5	2160	600
						7	3024	840
						10	4450	1236
	500	0.15	0.60	1080	1669 to 5562	2	1080	300
						3	1620	450
						5	2700	750
						7	3780	1050
						10	5562	1545
	600	0.18	0.50	1296	2002 to 6674	2	1296	360
						3	1944	540
						5	3240	900
						7	4536	1260
						10	6674	1854
	700	0.21	0.43	1512	2347 to 7825	2	1512	420
						3	2268	630
						5	3780	1050
						7	5292	1470
						10	7825	2174
	800	0.24	0.38	1728	2644 to 8813	2	1728	480
						3	2592	720
						5	4320	1200
						7	6048	1680
						10	8813	2448

Installation height 400 and 500 mm



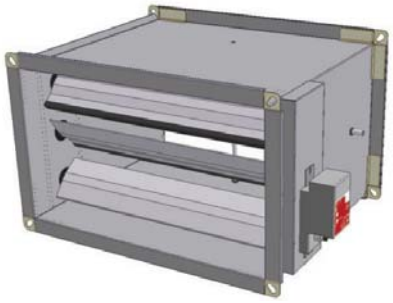
PVSR-EJ - without insulating shell

PVSR-EJ/D - with insulating shell

Size		A	W/H	V_{min}	V_{max}	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
400	**400**	0.16	1.00	1152	1763 to 5875	2	1152	320
						3	1728	480
						5	2880	800
						7	4032	1120
						10	5875	1632
	500	0.20	0.80	1440	2203 to 7344	2	1440	400
						3	2160	600
						5	3600	1000
						7	5040	1400
						10	7344	2040
	600	0.24	0.67	1728	2644 to 8813	2	1728	480
						3	2592	720
						5	4320	1200
						7	6048	1680
						10	8813	2448
	700	0.28	0.57	2016	3084 to 10282	2	2016	560
						3	3024	840
						5	5040	1400
						7	7056	1960
						10	10282	2856
	800	0.32	0.50	2304	3525 to 11750	2	2304	640
						3	3456	960
						5	5760	1600
						7	8064	2240
						10	11750	3264
	900	0.36	0.44	2592	3966 to 13219	2	2592	720
						3	3888	1080
						5	6480	1800
						7	9072	2520
						10	13219	3672
	1000	0.40	0.40	2880	4428 to 14760	2	2880	800
						3	4320	1200
						5	7200	2000
						7	10080	2800
						10	14760	4100

Size		A	W/H	V_{min}	V_{max}	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
500	**500**	0.25	1.00	1800	2754 to 9180	2	1800	500
						3	2700	750
						5	4500	1250
						7	6300	1750
						10	9180	2550
	600	0.30	0.83	2160	3305 to 11016	2	2160	600
						3	3240	900
						5	5400	1500
						7	7560	2100
						10	11016	3060
	700	0.35	0.71	2520	3837 to 12789	2	2520	700
						3	3780	1050
						5	6300	1750
						7	8820	2450
						10	12789	3553
	800	0.40	0.63	2880	4385 to 14616	2	2880	800
						3	4320	1200
						5	7200	2000
						7	10080	2800
						10	14616	4060
	900	0.45	0.56	3240	4957 to 16524	2	3240	900
						3	4860	1350
						5	8100	2250
						7	11340	3150
						10	16524	4590
	1000	0.50	0.50	3600	5508 to 18360	2	3600	1000
						3	5400	1500
						5	9000	2500
						7	12600	3500
						10	18360	5100

Installation heights 600, 800 and 1000 mm



PVSR-EJ - without insulating shell

PVSR-EJ/D - with insulating shell

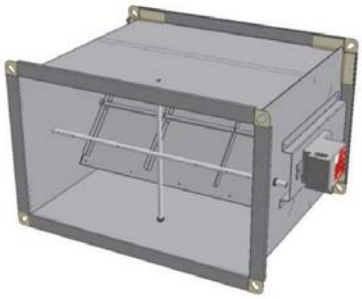
Size		A	W/H	V_{min}	V_{max}	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
600	600	0.36	1.00	2592	3946 to 13154	2	2592	720
						3	3888	1080
						5	6480	1800
						7	9072	2520
						10	13154	3654
	800	0.48	0.75	3456	5236 to 17453	2	3456	960
						3	5184	1440
						5	8640	2400
						7	12096	3360
						10	17453	4848
	1000	0.60	0.60	4320	6610 to 22032	2	4320	1200
						3	6480	1800
						5	10800	3000
						7	15120	4200
						10	22032	6120

Size		A	W/H	V_{min}	V_{max}	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
800	800	0.64	1.00	4608	7050 to 23501	2	4608	1280
						3	6912	1920
						5	11520	3200
						7	16128	4480
						10	23501	6528
	1000	0.80	0.80	5760	8770 to 29232	2	5760	1600
						3	8640	2400
						5	14400	4000
						7	20160	5600
						10	29232	8120

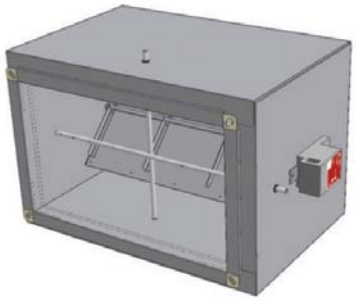
Size		A	W/H	Vmin	Vmax	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
1000	1000	1.00	1.00	7200	10908 to 36360	2	7200	2000
						3	10800	3000
						5	18000	5000
						7	25200	7000
						10	36360	10100

12.2.2 Single valves PVSR-EE and PVSR-EE/D

Installation heights 200 and 300 mm



PVSR-EE - without insulating shell



PVSR-EE/D - with insulating shell

Size		A	W/H	V_{min}	V_{max}	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
200	**200**	0.04	1.00	288	449 to 1498	2	288	80
						3	432	120
						5	720	200
						7	1008	280
						10	1498	416
	300	0.06	0.67	432	667 to 2225	2	432	120
						3	648	180
						5	1080	300
						7	1512	420
						10	2225	618
	400	0.08	0.50	576	890 to 2966	2	576	160
						3	864	240
						5	1440	400
						7	2016	560
						10	2966	824
	500	0.10	0.40	720	1123 to 3744	2	720	200
						3	1080	300
						5	1800	500
						7	2520	700
						10	3744	1040
	600	0.12	0.33	864	1348 to 4493	2	864	240
						3	1296	360
						5	2160	600
						7	3024	840
						10	4493	1248

Size		A	W/H	V_{min}	V_{max}	vK	Volume flow	
H	W	m^2		m^3/h	m^3/h	m/s	m^3/h	l/s
300	**300**	0.09	1.00	648	1001 to 3337	2	648	180
						3	972	270
						5	1620	450
						7	2268	630
						10	3337	927
	400	0.12	0.75	864	1335 to 4450	2	864	240
						3	1296	360
						5	2160	600
						7	3024	840
						10	4450	1236
	500	0.15	0.60	1080	1669 to 5562	2	1080	300
						3	1620	450
						5	2700	750
						7	3780	1050
						10	5562	1545
	600	0.18	0.50	1296	2002 to 6674	2	1296	360
						3	1944	540
						5	3240	900
						7	4536	1260
						10	6674	1854
	700	0.21	0.43	1512	2347 to 7825	2	1512	420
						3	2268	630
						5	3780	1050
						7	5292	1470
						10	7825	2174
	800	0.24	0.38	1728	2644 to 8813	2	1728	480
						3	2592	720
						5	4320	1200
						7	6048	1680
						10	8813	2448

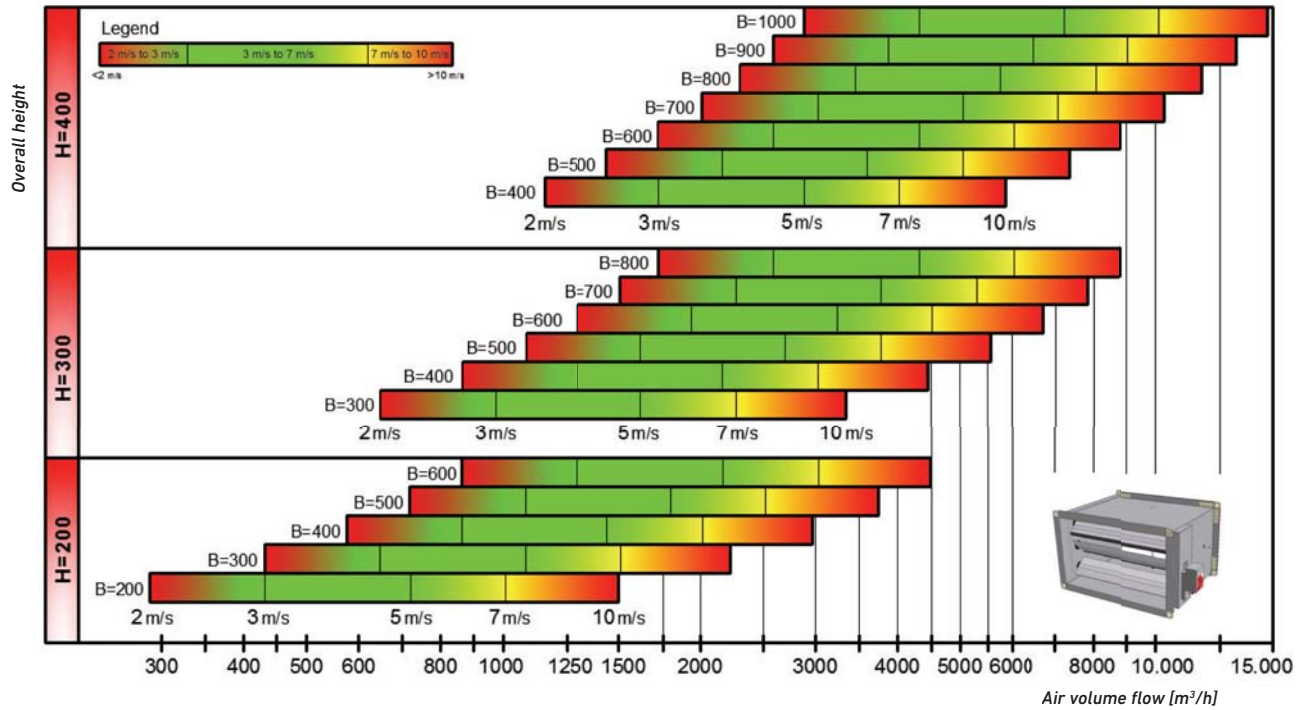
12.3 QUICK SELECTION

The volume flow controller is designed for the optimum application depending on the air volume flow. Air speeds below 2 m/s and over 10 m/s should be avoided due to the response characteristics of the regulator and the acoustics.

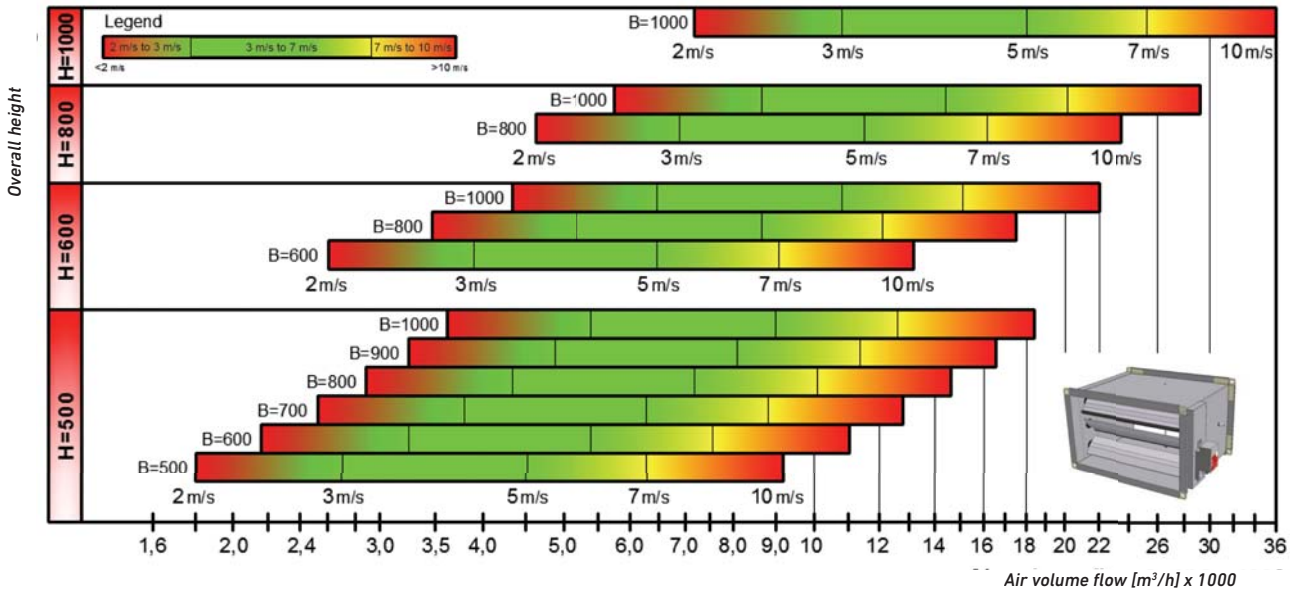
12.3.1 Airtight shutter valve PVSR-EJ

The acoustic conditions and specifications must always be observed during the planning work. To maintain the permissible sound pressure level in the room, it can be necessary to install a sound absorber in the room and to insulate the air line.

Sizes 200 x 200 mm to 400 x 1000 mm



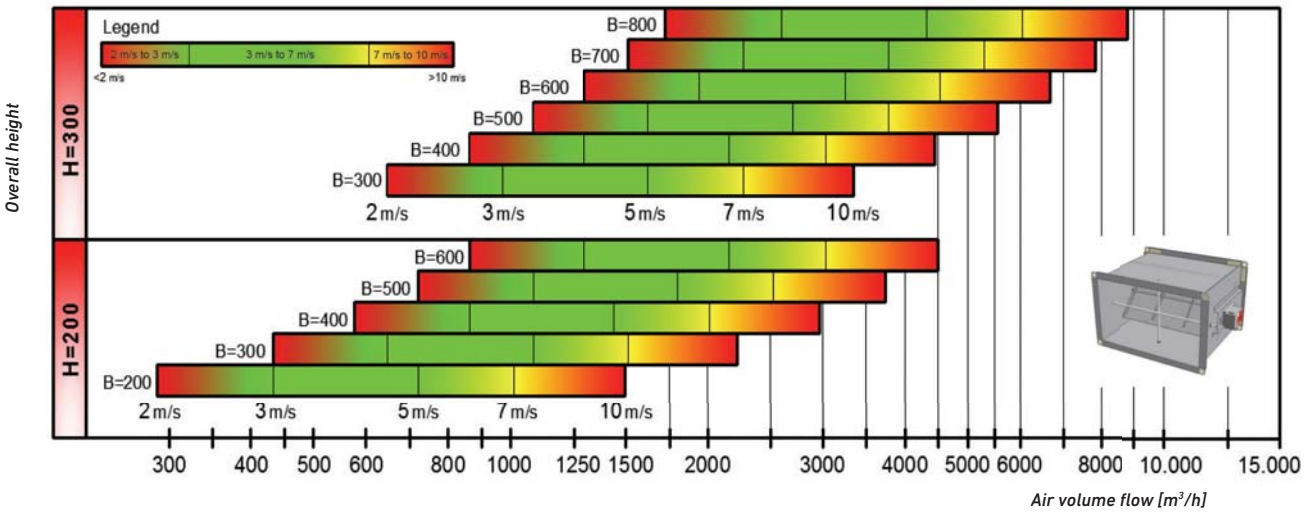
Sizes 500 x 500 mm to 1000 x 1000 mm



12.3.2 Single valve PVSR-EE

The acoustic conditions and specifications must always be observed during the planning work. To maintain the permissible sound pressure level in the room, it can be necessary to install a sound absorber between the volume flow controller and the room and to insulate the air line.

Sizes 200 x 200 mm to 300 x 800 mm

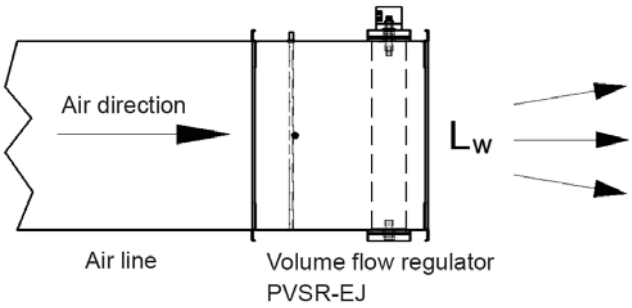


12.4 ACOUSTIC DATA

Height [mm]	Width [mm]								
	200	300	400	500	600	700	800	900	1000
200	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
300	0.06	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.30
400	0.08	0.12	0.16	0.20	0.24	0.28	0.32	0.36	0.40
500	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
600	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60
800	0.16	0.24	0.32	0.40	0.48	0.56	0.64	0.72	0.80
1000	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00

Table 1 - Free flow surfaces A in m^2 depending on the dimensions W x H

12.4.1 Flow noise



free surface A m²	vL m/s	Dpt = 125 Pa Lw [dB/oct]									Dpt = 250 Pa Lw [dB/oct]									Dpt = 500 Pa Lw [dB/oct]								
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_{WA} [dB(A)]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_{WA} [dB(A)]	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	L_{WA} [dB(A)]
Row Z1 0.04	3	49	50	44	46	48	47	42	36	**53**	56	52	47	50	52	55	52	47	**59**	59	56	50	54	60	63	63	59	**68**
	5	56	57	50	48	50	50	46	39	**55**	62	59	53	53	55	56	54	50	**62**	65	64	57	58	62	63	63	61	**69**
	7	62	62	53	51	52	51	48	42	**57**	67	64	57	56	57	58	56	52	**64**	70	69	62	61	63	64	64	62	**70**
	10	66	67	56	53	54	53	50	44	**60**	71	68	61	58	59	59	58	54	**65**	74	75	66	64	64	65	65	63	**72**
Row Z2 0.10	3	55	54	49	47	50	51	45	40	**56**	60	56	53	52	54	58	54	51	**62**	64	60	58	58	62	67	65	62	**71**
	5	63	61	55	50	52	53	49	44	**58**	67	63	58	56	57	60	57	54	**65**	70	68	65	62	64	67	65	64	**72**
	7	68	66	58	52	54	55	51	47	**60**	72	68	63	58	59	61	59	56	**67**	75	73	70	65	65	68	66	65	**74**
	10	72	71	61	54	56	57	53	49	**63**	76	73	67	61	61	63	60	58	**69**	79	79	74	68	67	68	67	66	**75**
Row Z3 0.25	3	62	58	54	49	52	55	48	45	**59**	64	61	58	55	57	61	56	54	**65**	69	64	66	62	65	70	68	64	**74**
	5	69	65	60	52	54	57	51	49	**62**	71	68	64	59	60	63	59	57	**68**	75	72	73	66	67	70	68	66	**75**
	7	74	70	63	54	56	59	54	51	**64**	76	73	68	62	62	64	61	59	**70**	80	77	78	69	68	71	69	67	**77**
	10	78	75	66	56	58	61	56	54	**66**	80	78	72	64	64	66	63	61	**72**	84	83	82	72	70	71	70	68	**79**
Row Z4 0.50	3	66	61	58	50	53	58	51	49	**62**	68	65	62	57	58	64	59	57	**68**	73	67	72	65	66	73	69	67	**76**
	5	74	68	64	53	55	60	54	52	**64**	75	72	68	60	61	66	62	60	**70**	79	75	79	69	68	73	69	69	**78**
	7	79	73	67	55	57	62	57	55	**67**	80	77	72	63	63	67	63	62	**72**	84	80	84	72	69	74	70	70	**80**
	10	83	78	70	57	59	64	59	58	**69**	84	82	76	65	65	69	65	64	**75**	88	86	88	75	71	74	71	71	**83**
Row Z5 1.0	3	71	64	62	52	54	61	53	52	**64**	72	68	67	59	60	67	61	59	**70**	77	70	79	68	68	75	71	69	**79**
	5	78	71	67	54	57	63	57	56	**67**	78	75	72	63	63	69	64	62	**73**	83	78	85	72	70	75	72	71	**82**
	7	83	76	70	56	58	65	60	58	**70**	83	81	76	65	65	70	66	64	**75**	88	84	90	75	71	76	73	72	**84**
	10	88	81	74	58	60	66	62	60	**72**	87	85	80	68	66	71	67	66	**77**	92	89	95	78	72	77	73	73	**88**

Table 2 - Flow noise

Definition

A	*[m²]*	*Free flow cross-section*
L_w	*[dB(A)]*	*Sound power level generated by flow noise*
v_L	*[m/s]*	*Flow speed in the air line*
Dp_t	*[Pa]*	*Total pressure difference*

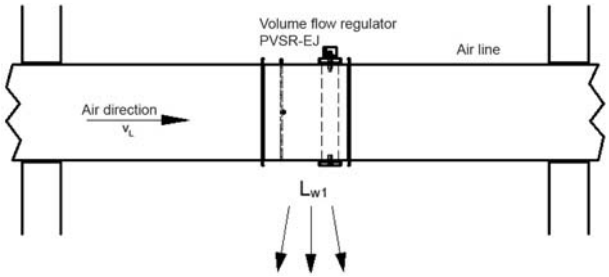
Correction values for conversion to other free surfaces

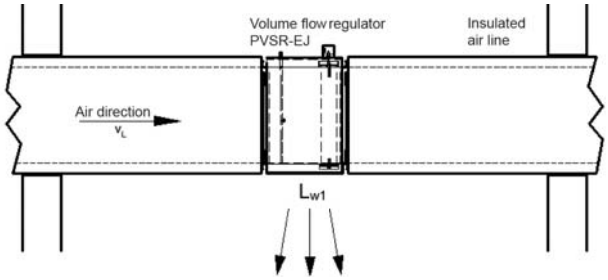
For free surfaces not given in the table, the A-evaluated sound power level is calculated using a correction factor.

Flow surface W x H [m²]	0.04	0.06	0.08	0.10	0.16	0.20	0.25	0.30	0.40	0.50	0.60	0.80	1.0
Reference to row	Z1		Z2		Z3			Z4			Z5		
Correction factor	0	+1	-1	0	-2	-1	0	-2	-1	0	-3	-2	0

12.4.2 Radiation noise

Where lines are laid through rooms, the sound radiation is carried out via the line surface, due to internal sound sources, such as fans, flow noise from installed components in the air line.





The sound pressure level depends on the sound pressure level in the air line, line surface, line shape (round or rectangular version), wall thickness, room insulation and distance to the air line. In the table given below, radiation noise specifications are shown relating solely to the flow noise of the volume flow controller.

free surface A m^2	vL [m/s]	Total sound output level L_{W1} in dB(A)					
		without insulating shell, pressure difference Dp_t			with 50 mm insulating shell, pressure difference Dp_t		
		125 Pa	250 Pa	500 Pa	125 Pa	250 Pa	500 Pa
0.04	3	32	36	42	19	22	26
	5	37	41	46	26	28	33
	7	42	45	50	31	33	38
	10	46	49	55	36	37	44
0.10	3	36	40	46	23	26	30
	5	41	45	50	30	33	37
	7	46	49	55	35	37	42
	10	50	53	59	40	42	48
0.25	3	40	44	50	27	31	35
	5	45	49	56	34	37	42
	7	50	53	60	39	42	47
	10	54	58	65	44	47	52
0.50	3	43	47	54	31	35	39
	5	49	53	60	38	41	46
	7	53	57	65	43	46	51
	10	58	62	69	48	51	56
1.0	3	53	59	68	44	49	57
	5	58	63	73	50	54	63
	7	61	66	76	55	59	68
	10	65	70	81	59	63	73

Table 3 - radiated noise - sound power level with or without insulating shell. For free surfaces between the values given, the sound power levels are calculated via interpolation.

Definitions:

A	***[m^2]***	***Free flow cross-section***
L_{w1}	***[dB(A)]***	***Sound power level radiation noise***
v_L	***[m/s]***	***Flow speed***
D_{pt}	***[Pa]***	***Total pressure difference***

13. Installation

The volume flow controller is not ready for use as a product and must first be commissioned once it has been installed and connected in the technical ventilation system, and the electrics connected correctly and in line with the regulations. The volume flow controller is not suitable for open air installation. The installation must only be carried out by trained, specialist personnel, observing both the legal and official regulations and standards. The device must not be used outside the specified area of application. Depending on the position, the volume flow controller can be installed in the control system with the axes in a horizontal or vertical position. The installation must be carried out according to the flow direction given on the nameplate.

Measurement pipes must not be bent! Check for correct seating during installation! The measurement sensor with the measurement lines (differential pressure sensor) must not be used on site for transport purposes.

For proper functioning, measures should be taken to exclude the risk of contamination (e.g. dust ingression) of the control components. This can be carried out by installing suitable filter units in the air control system in front of the volume flow controller.

During installation, check for clear access for inspection and cleaning purposes. The equipment is maintenance-free in terms of its mechanical components. According to the local conditions, however, it can be necessary to fit access openings in the air lines.

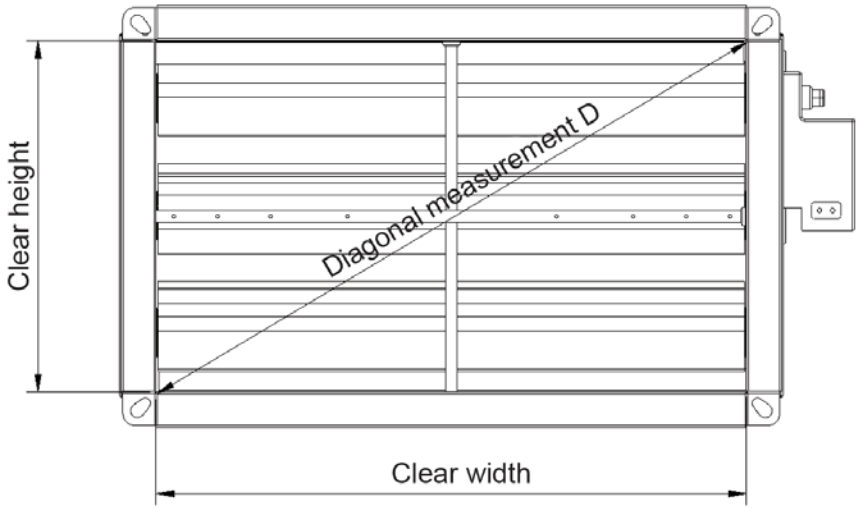
If larger volume flow deviations have been determined, check the measuring equipment, the connecting nipple and the connection pipes and if necessary, clean the equipment dry. When using the volume flow controller, e.g. in roof control centres, condensate can occur in the volume flow controller measurement pipes due to greater temperature differences.

The condensate can impair the sensor function or damage it. Take precautions to prevent the formation of condensate using suitable measures on site, e.g. by insulating the measurement pipes.

13.1 MINIMUM FLOW PATH

For the correct functioning of the volume flow controller, it is essential that the minimum distances to other installed components are observed during installation.

A minimum flow path with the following length must be observed: L = approx. 2 x measure the diagonal measurement and implement.

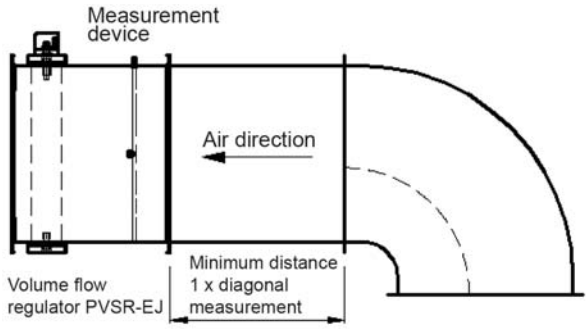


The combinations of multiple components, such as shaped parts with or without installed components, e.g. fire dampers, sound absorbers, etc. require greater minimum flow distances.

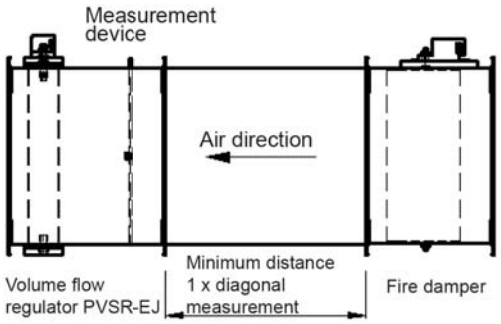
Particular care must be taken in the case of deviations to the favourable technical flow of the measurement sensor (differential pressure sensor) during installation.

Minimum flow length	Distance
Offsets, arcs	1 x diagonal measurement
Other fittings such as diverters, T-pieces, reductions,	2 x diagonal measurement
Components such as fire dampers, sound absorbers	2 x diagonal measurement
D ... Diagonal measurement of the volume flow controller	

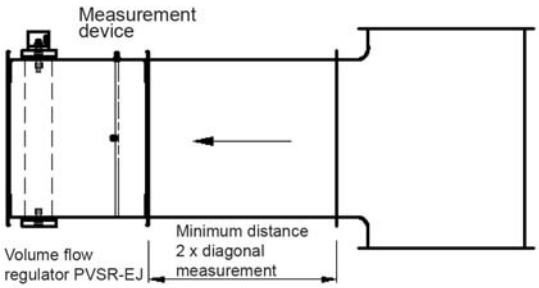
For different application situations, the minimum flow paths are given in the diagrams below.



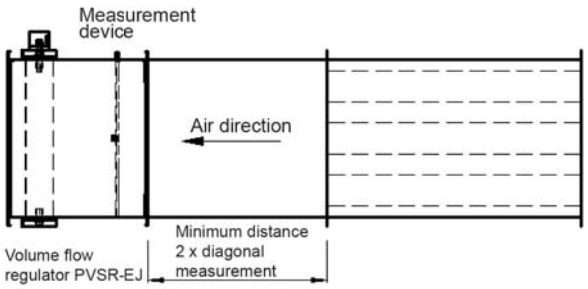
Flow path after bend



Flow path after fire damper



Flow path after shaped part (fork, reduction, etc. ...)



Flow path after sound absorber

14. Technical data on VAV compact regulators

Volume flow controllers PVSR–R and PVSR–RD with VAV compact regulators are all available either with or without MP bus actuation.

Caution: In the version of the volume flow controller with the compact regulator of type MF, it is not possible to implement a number of applications such as LONWORKS® / EIB-Konnex bus connections or Fan Optimiser.

14.1 ELECTRICAL DATA ON L/NMV-D3-MP WITH MP BUS ACTUATION

Electrical connection	
Nominal voltage	24 V AC, 50 / 60 Hz 24 V DC
Functional range	19.2 V to 28.8 V AC 21.6 V bis 28.8 V DC
Connection cable	4 x 0.75 mm²
Protection rating	IP 54, safety class III safety extra-low voltage
Operating volume flow	V_{nom} specific nominal volume flow for the VAV component V_{max} between 20 % and 100 % of V_{nom} V_{min} 0 to 100 % of V_{nom} V_{mid} 50 % of (V_{min} to V_{max})
Traditional actuation	
Mode for control input Y (connection 3)	2 ... 10 V DC / (4 ... 20 mA with 500 Ω resistance) 0 ... 10 V DC / (0 ... 20 mA with 500 Ω resistance) adjustable 0 ... 10 V DC Min. input resistance 100 kΩ
Mode for actual value signal U5 (connection 5)	2 ... 10 V DC max. 0.5 mA 0 ... 10 V DC max. 0.5 mA adjustable: Volume flow or valve position
Operating stages CAV	off / V_{min} / V_{mid} * / V_{max} / on * (* only with 24 V AC supply)
Bus function MP	
Address in bus mode	MP 1 ... 8 (traditional operation: PP)
LONWORKS® / EIB-Konnex	with BELIMO Interface UK24LON / UK24EIB/ UK24MOD / UK24BAC
Modbus RTU/BACnet	1 to 8 BELIMO MP devices (VAV / valve drive / valve)
DDC regulator	DDC regulator / SPC, with integrated MP bus interface
Fan Optimiser	with BELIMO Optimiser COU24-A-MP
Sensor integration	passive (Pt1000, Ni1000, etc.) and active sensors (0...10 V) e.g. temperature, humidity, 2 point signal (switching output 16 mA @ 24 V), e.g. switch, attendance sensor, etc.
Operation and service	plug-in / PC tool (from V3.6) / ZTH-GEN
Communication	PP / MP bus, max. 15 V DC, 1200 Baud
Pushbutton	Adaptation / addressing
LED indicator	24 V supply and status, bus function
Drive	Brushless, anti-blocking drive with power-save mode
Torque	LMV-D2 5 Nm / NMV-D2 10 Nm
Adaptation	Operating range detection and resolution in control range
Angle of rotation	95°, adjustable mechanical or electronic limiting
Position indication	mechanical with indicator, direction of rotation left / right or □ / □
Sound power level	*max. 35 dB (A), SMV-D3-MP max. 45 dB (A)*
Materials	PC + ABS conforming to UL94-V0; stainless steel, DIN 1.4301 X10CrNiS1810; PP Santoprene

14.2 ELECTRICAL DATA ON L/NMV-D3-MF WITHOUT MP BUS ACTUATION

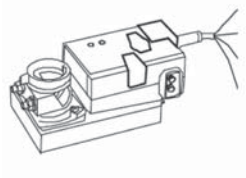
Electrical connection	
Nominal voltage	24 V, 50 / 60 Hz AC, 24 V DC
Functional range	19.2 V to 28.8 V AC / 21.6 V to 28.8 V DC
Connection cable	4 x 0.75 mm^2
Protection rating	IP 54, safety class III safety extra-low voltage
Operating volume flow	V_{nom} specific nominal volume flow for the VAV component V_{max} between 20 % and 100 % of V_{nom} V_{min} 0 to 100 % of V_{nom}
Traditional actuation	
Mode for control input Y (connection 3)	2 ... 10 V DC / (4 ... 20 mA with 500 Ω resistance) 0 ... 10 V DC / (0 ... 20 mA with 500 Ω resistance) adjustable 0 ... 10 V DC Min. input resistance 100 kΩ
Mode for actual value signal U5 (connection 5)	2 ... 10 V DC max. 0.5 mA 0 ... 10 V DC max. 0.5 mA adjustable: Volume flow or valve position
Operating stages CAV	off / V_{min} / V_{mid} * / V_{max} / on * (* only with 24 V AC supply)
Operation and service	plug-in / PC tool (from V3.1) / ZTH-GEN
Communication	PP
Pushbutton	Adaptation
LED indicator	24 V supply and status function
Drive	Brushless, anti-blocking drive with power-save mode
Torque	LMV-D2 5 Nm / NMV-D2 10 Nm
Adaption	Operating range detection and resolution in control range
Angle of rotation	95°, adjustable mechanical or electronic limiting
Position indication	mechanical with indicator, direction of rotation left / right or ↑ / ↓
Sound power level	*max. 35 dB (A), SMV-D3-MP max. 45 dB (A)*
Materials	PC + ABS conforming to UL94-V0; stainless steel, DIN 1.4301 X10CrNiS1810; PP Santoprene

14.3 ELECTRICAL CONNECTION

The electrical connection is implemented via the connection cable on the compact regulator. The supply must be provided via a safety transformer.

Connections 1 and 2 (24 V AC or DC), 3 and 5 (actual value signal with MF, bus connections with MP) should if possible via a 4-pole connection line laid on accessible terminals (e.g. room controller, floor panelboard, control cabinet) to permit access with the ZTH-VAV or PC tool for diagnostics and servicing work.

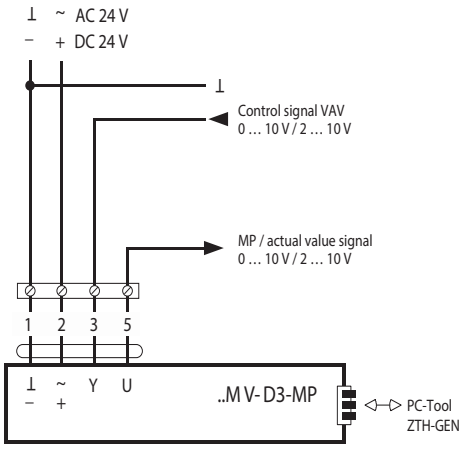
The device does not contain any parts that can be replaced or repaired by the user and must only be opened in the manufacturer's factory. The communication via an MP bus system is not possible with a compact regulator of type MF!



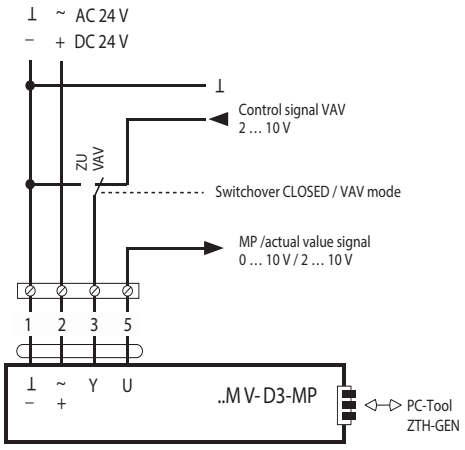
No.	Designation	Core colour	Function
1	– ⊥	black	⊥ – } 24 V AC/DC power supply
2	+ ~	red	~ + }
3	Y	white	Reference signal VAV / CAV
5	U	orange	– Actual value signal – MP bus connection

14.4 CONNECTION PLANS - CIRCUIT DIAGRAMS

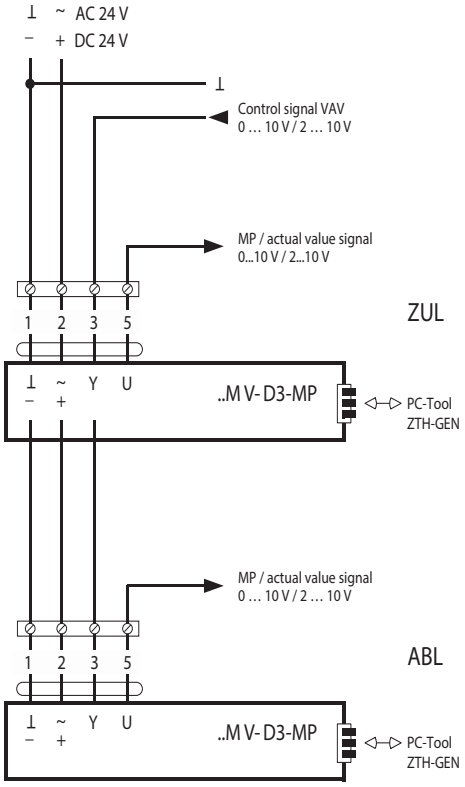
14.4.1 VAV variable operation V_{min} / V_{max} with MP bus and MF compact regulator



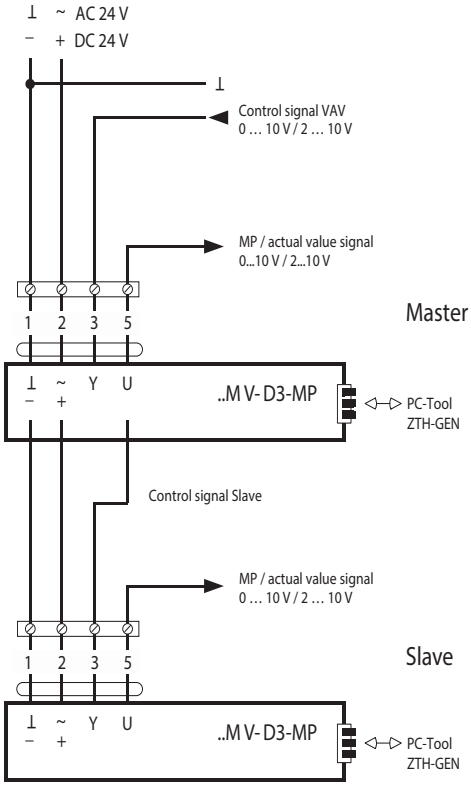
Example 1: VAV with analogue control signal



Example 2: VAV with shut-off (ZU), mode 2 ... 10 V



Example 3: VAV with analogue control signal ZUL/ABL connected in parallel



Example 4: VAV with analogue control signal, Master/Slave configuration

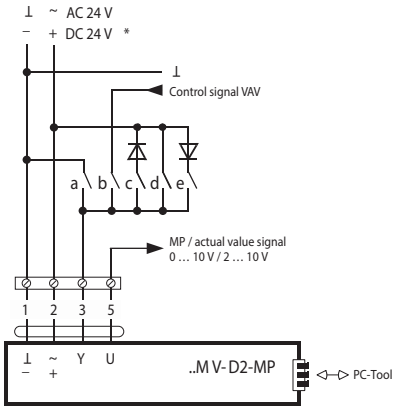
14.4.2 CAV stepped operation off / V_{min} / V_{mid} / V_{max} / on with MP bus and MF compact regulator

For CAV control, there are Three options available:

- Standard 0.1 V shut-off:
  Closed – V_{min} – V_{max} – Open
  (default setting)
- Standard 05 V shut-off:
  Closed – V_{min} – V_{max} – Open
- Old generation (NMV-D2M):
  Closed – V_{min} – V_{mid} – V_{max} – Open

Note: Do not use "default 0.5 V shut-off" for:

- Mode 2 ... 10 V and MP bus mode
- Mode 2 ... 10 V and CAV activation



**** Is not available for DC 24 V supply***

Note: Note the mutual disabling of contacts.

Note: To use CAV stage V_{mid} , CAV function Old Generation (NMV-D2M) must be selected.

CAV-Function: Default

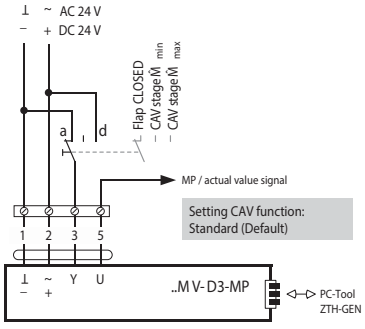
Mode-Setting	–	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V
	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V
Signal	⊥ –	0 ... 10 V 2 ... 10 V	~	~ +	~
Function	3	3	3	3	3
Flap CLOSED	a) CLOSED		c) CLOSED *		
$\hat{M}_{min}$ ... $\hat{M}_{max}$		b) VAV			
CAV – $\hat{M}_{min}$	All open – $\hat{M}_{min}$ active **				
Flap OPEN					e) OPEN *
CAV – $\hat{M}_{max}$				d) $\hat{M}_{max}$	

Legend

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

* Not available for DC 24 V supply
** The flap is closed when using the 0.5 V shut-off level

Example:
CAV application CLOSED – $\hat{M}_{min}$ – $\hat{M}_{max}$
(Mode 2 ... 10 V)



Note:

- Supply via safety transformer.
- Connectors 1 and 2 (AC or DC 24 V), and 5 (MP signal) must be routed to accessible terminals (room controller, floor panel board, switch cabinet, etc.) so as to enable access with the tools for diagnostics and servicing work.

CAV-Function: Old Generation (NMV-D2M)

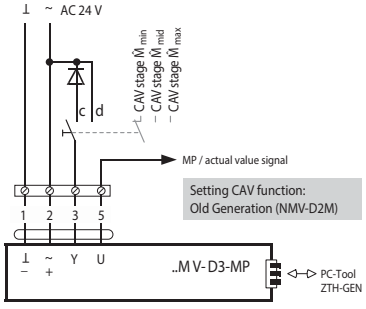
Mode-Setting	–	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V
	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V
Signal	⊥ –	0 ... 10 V 2 ... 10 V	~	~ +	~
Function	3	3	3	3	3
Flap CLOSED	a) CLOSED				
$\hat{M}_{min}$ ... $\hat{M}_{max}$		b) VAV			
CAV – $\hat{M}_{min}$	All open – $\hat{M}_{min}$ active				
Flap OPEN					e) OPEN *
CAV – $\hat{M}_{max}$				d) $\hat{M}_{max}$	
CAV – $\hat{M}_{mid}$			c) $\hat{M}_{mid}$ *		

Legend

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

* Not available for DC 24 V supply

Example:
CAV-application $\hat{M}_{min}$ – $\hat{M}_{mid}$ – $\hat{M}_{max}$
(Mode 0 ... 10 or 2 ... 10 V)



14,4.3 MP bus mode VAV / CAV function only with MP bus compact regulator

VAV compact regulators can be actuated conventionally or via MP bus. Integration into LONWORKS®, EIB / KNX or DDC systems with MP interface can therefore be implemented easily and cost-effectively.

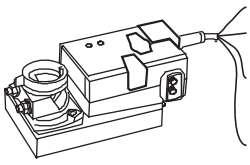
The VAV compact regulator can be connected via integrated communication with up to 8 MP devices (valve adjusting, valve drives, VAV compact regulator, via MP bus.

These slave devices receive their control signal digitally from the higher level bus master via the MP bus and move to the set position.

Due to the allocation of an MP address, the standard VAV compact regulator to the bus-compatible system regulator with a wide variety of additional uses. In bus mode, the VAV compact regulator receives its control signal via the MP bus from the higher level building automation system and is regulated to the specified volume flow.

The changeover to MP bus mode is carried out automatically once the VAV compact regulator is assigned an MP address. An active or passive sensor or switch can be connected to every VAV compact drive. This input value can be used in the higher level system, e.g. for the VAV control, room temperature or other applications.

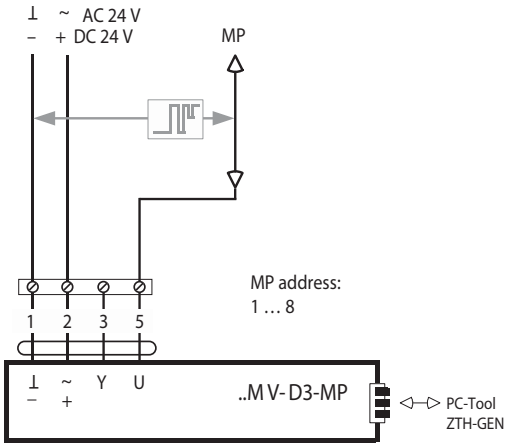
The connection to the MP bus is carried out via the connection cable fitted on the VAV compact drive.



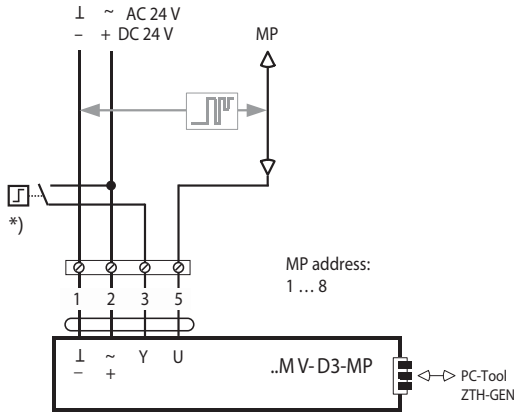
No.	Name	Wire colour	Function	
1	– ⊥	Black	⊥ –	AC/DC 24 V supply
2	+ ~	Red	~ +	
3	Y	White	Input for – Sensor connection – Positive control	
5	U	Orange	MP bus connection	

Notes

- Supply via safety transformer
- Connectors 1 and 2 (AC or DC 24 V), and 5 (MP signal) must be routed to accessible terminals (room controller, floor panel board, switch cabinet, etc.) so as to enable access with the PC tool for diagnostics and servicing work.



Activation via MP bus



*) e.g. window contact

Activation via MP bus with switch integration

Notes

- For further information on connection, positive controllers, MP bus cabling, etc.
- This is a connection description. The terminal assignment can vary depending on application. Connection and start-up must be performed by trained personnel.

15. Specifications

15.1 PVSR-EJ / MP BUS / SHUTTER VALVE VERSION

PVSR-EJ volume flow controller with attached VAV compact regulator without MP bus interface, for variable or constant volume flow systems, suitable for normal room air, in rectangular, stable design, with airtight control and shut-off valves, measured value sensor with mean value calculation differential pressure sensor and control components, for installation into supply and waste air lines in any position, customised presets of the control parameters such as air volume flows V_{min} and V_{max} via factory setting and technical testing of every individual device on a special test rig, subsequent adjustment of the parameters with on-site commissioning can be easily achieved.

Stable cabinet made from zinc-plated steel plate, airtight control and shut-off valves designed as shutter valve with integrated sealing lips on the blades, side permanently elastic seal between the anti-static plastic toothed wheels fitted on the outside, measurement device made from easy-flow aluminium profiles with integrated measurement holes, resistant to dirt contamination, with P20 / P30 universal connection flange on both sides for the air line connection.

Following the installation instructions, the volume flow controller can be installed in the control system in any position. The position of the control valve can be viewed from outside on the axis.

Shut-off valve in shut-off position airtight according to Class 4 conforming to ÖNORM EN 1751, cabinet leaked air volume flow airtight according to Class C conforming to ÖNORM EN 1751, differential pressure range 20 to 1500 Pa.

VAV compact regulator, pressure sensor, digital controller and valve adjustment drive as communication-compatible VAV compact solution. Brushless, anti-blocking drive with power-save mode Integrated MP bus interface, connection of active / passive sensors or switches via MP bus. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: Cable 1 m, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Rotational direction: cw / ccw, manual adjustment: with pushbutton
Pushbutton: Adaptation / addressing / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Type of protection: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on cabinet for control and setting devices

Width	..... mm
Height	..... mm
Length	..... mm
Air volume flow V_{min}, / V_{max}	...../..... m^3/h
Working range:	 V

Type VAV compact regulator ..... *with MP bus interface*

Manufacturer: PICHLER
Type: *PVSR-EJ / MP bus*

ST Lo: .....
So: .....
EP: .....

15.2 PVSR-EJ/D / MP BUS / VERSION AS SHUTTER VALVE

PVSR-EJ/D volume flow controller with insulating shell, ***attached VAV compact regulator without MP bus interface,*** for variable or constant volume flow systems, suitable for normal room air, in rectangular, stable design, with airtight control and shut-off valves, measured value sensor with mean value calculation differential pressure sensor and control components, for installation into supply and waste air lines in any position, customised presets of the control parameters such as air volume flows V_{min} and V_{max} via factory setting and technical testing of every individual device on a special test rig, subsequent adjustment of the parameters with on-site commissioning can be easily achieved.

Stable cabinet made from zinc-plated steel plate, airtight control and shut-off valves designed as shutter valve with integrated sealing lips on the blades, side permanently elastic seal between the anti-static plastic toothed wheels fitted on the outside, measurement device made from easy-flow aluminium profiles with integrated measurement holes, resistant to dirt contamination, with P20 / P30 universal connection flange on both sides for the air line connection.

Following the installation instructions, the volume flow controller can be installed in the control system regardless of position. The position of the control valve can be viewed from outside on the axis.

Shut-off valve in shut-off position airtight according to Class 4 conforming to ÖNORM EN 1751, cabinet leaked air volume flow airtight according to Class C conforming to ÖNORM EN 1751, differential pressure range 20 to 1500 Pa.

Version with 50 mm insulating shell, design with mineral wool and external panel made from zinc-plated steel plate for reducing cabinet radiation, insulating sheel cannot be retrofitted.

VAV compact regulator, pressure sensor, digital controller and valve adjustment drive as communication-compatible VAV compact solution. Brushless, anti-blocking drive with power-save mode Integrated MP bus interface, connection of active / passive sensors or switches via MP bus. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: Cable 1 m, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Rotational direction: cw / ccw, manual adjustment: with pushbutton
Pushbutton: Adaptation / addressing / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Type of protection: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on cabinet for control and setting devices

Width	..... mm
Height	..... mm
Length	..... mm
with 50 mm insulating shell	
Air volume flow V_{min} / V_{max}	...../..... m^3/h
Working range:	 V

Type VAV compact regulator ..... *with MP bus interface*

Manufacturer: PICHLER
Type: *PVSR-EJ/D / MP bus*

Lo: .....
So: .....
ST EP: .....

15.3 PVSR-EJ / MF / SHUTTER VALVE VERSION

PVSR-EJ volume flow controller with attached VAV compact regulator without MP bus interface, for variable or constant volume flow systems, suitable for normal room air, in rectangular, stable design, with airtight control and shut-off valves, measured value sensor with mean value calculation differential pressure sensor and control components, for installation into supply and waste air lines in any position, customised presets of the control parameters such as air volume flows V_{min} and V_{max} via factory setting and technical testing of every individual device on a special test rig, subsequent adjustment of the parameters with on-site commissioning can be easily achieved.

Stable cabinet made from zinc-plated steel plate, airtight control and shut-off valves designed as shutter valve with integrated sealing lips on the blades, side permanently elastic seal between the anti-static plastic toothed wheels fitted on the outside, measurement device made from easy-flow aluminium profiles with integrated measurement holes, resistant to dirt contamination, with P20 / P30 universal connection flange on both sides for the air line connection.

Following the installation instructions, the volume flow controller can be installed in the control system in any position. The position of the control valve can be viewed from outside on the axis.

Shut-off valve in shut-off position airtight according to Class 4 conforming to ÖNORM EN 1751, cabinet leaked air volume flow airtight according to Class C conforming to ÖNORM EN 1751, differential pressure range 20 to 1500 Pa.

VAV compact regulator, pressure sensor, digital controller and valve adjustment drive as VAV compact solution.
Brushless, anti-blocking drive with power-save mode. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: Cable 1 m, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Rotational direction: cw / ccw, manual adjustment: with pushbutton
Pushbutton: Adaptation / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Type of protection: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on cabinet for control and setting devices

Width	..... mm
Height	..... mm
Length	..... mm
Air volume flow V_{min}, / V_{max}	...../..... m^3/h
Working range:	 V

Type VAV compact regulator ..... *without MP bus interface*

Manufacturer:	PICHLER
Type:	*PVSR-EJ / MF*

	Lo:	.....
	So:	.....
ST	EP:	.....

15.4 PVSR-EJ/D / MF / SHUTTER VALVE VERSION

PVSR-EJ/D volume flow controller with insulating shell, ***attached VAV compact regulator without MP bus interface,*** for variable or constant volume flow systems, suitable for normal room air, in rectangular, stable design, with airtight control and shut-off valves, measured value sensor with mean value calculation differential pressure sensor and control components, for installation into supply and waste air lines in any position, customised presets of the control parameters such as air volume flows V_{min} and V_{max} via factory setting and technical testing of every individual device on a special test rig, subsequent adjustment of the parameters with on-site commissioning can be easily achieved.

Stable cabinet made from zinc-plated steel plate, airtight control and shut-off valves designed as shutter valve with integrated sealing lips on the blades, side permanently elastic seal between the anti-static plastic toothed wheels fitted on the outside, measurement device made from easy-flow aluminium profiles with integrated measurement holes, resistant to dirt contamination, with P20 / P30 universal connection flange on both sides for the air line connection.

Following the installation instructions, the volume flow controller can be installed in the control system in any position. The position of the control valve can be viewed from outside on the axis.

Shut-off valve in shut-off position airtight according to Class 4 conforming to ÖNORM EN 1751, cabinet leaked air volume flow airtight according to Class C conforming to ÖNORM EN 1751, differential pressure range 20 to 1500 Pa.

Version with 50 mm insulating shell, design with mineral wool and external panel made from zinc-plated steel plate for reducing cabinet radiation, insulating sheel cannot be retrofitted.

VAV compact regulator, pressure sensor, digital controller and valve adjustment drive as VAV compact solution.
Brushless, anti-blocking drive with power-save mode. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: Cable 1 m, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Rotational direction: cw / ccw, manual adjustment: with pushbutton
Pushbutton: Adaptation / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Type of protection: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on cabinet for control and setting devices

Width	..... mm
Height	..... mm
Length	..... mm
with 50 mm insulating shell	
Air volume flow V_{min}, / V_{max}	...../..... m^3/h
Working range:	 V

Type VAV compact regulator ..... ***without MP bus interface***

Manufacturer:	PICHLER
Type:	*PVSR-EJ/D / MF*

	Lo:	.....
	So:	.....
ST	EP:	.....

15.5. PVSR-EE / MF / SINGLE VALVE VERSION

PVSR-EE volume flow controller with *attached VAV compact regulator without MP bus interface*, for variable or constant volume flow systems, suitable for normal room air, in rectangular, stable design, with single valve, measured value sensor with mean value calculation differential pressure sensor and control components, for installation into supply and waste air lines in any position, customised presets of the control parameters such as air volume flows V_{min} and V_{max} via factory setting and technical testing of every individual device on a special test rig, subsequent adjustment of the parameters with on-site commissioning can be easily achieved.

Stable cabinet made from zinc-plated steel plate, airtight control and shut-off valves designed as single valve. Measurement device made from easy-flow aluminium profiles with integrated measurement holes, resistant to dirt contamination, with P20 / P30 universal connection flange on both sides for the air line connection.

Following the installation instructions, the volume flow controller can be installed in the control system in any position. The position of the control valve can be viewed from outside on the axis.

VAV compact regulator, pressure sensor, digital controller and valve adjustment drive as VAV compact solution. Brushless, anti-blocking drive with power-save mode. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: Cable 1 m, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Rotational direction: cw / ccw, manual adjustment: with pushbutton
Pushbutton: Adaptation / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Type of protection: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on cabinet for control and setting devices

Width	..... mm
Height	..... mm
Length	..... mm
Air volume flow V_{min}, / V_{max}	...../..... m^3/h
Working range:	 V

Type VAV compact regulator ..... *without MP bus interface*

Manufacturer: PICHLER
Type: *PVSR-EE/ MF*

Lo: .....
So: .....
ST EP: .....

15.6. PVSR-EE / MP-BUS / SINGLE VALVE VERSION

PVSR-EE volume flow controller, attached ***VAV compact regulator without MP bus interface,*** for variable or constant volume flow systems, suitable for normal room air, in rectangular, stable design, with single valve, measured value sensor with mean value calculation differential pressure sensor and control components, for installation into supply and waste air lines in any position, customised presets of the control parameters such as air volume flows Vmin and Vmax via factory setting and technical testing of every individual device on a special test rig, subsequent adjustment of the parameters with on-site commissioning can be easily achieved.

Stable cabinet made from zinc-plated steel plate, airtight control and shut-off valves designed as single valve. Measurement device made from easy-flow aluminium profiles with integrated measurement holes, resistant to dirt contamination, with P20 / P30 universal connection flange on both sides for the air line connection.

Following the installation instructions, the volume flow controller can be installed in the control system regardless of position. The position of the control valve can be viewed from outside on the axis.

VAV compact regulator, pressure sensor, digital controller and valve adjustment drive as VAV compact solution. Brushless, anti-blocking drive with power-save mode. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: Cable 1 m, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Rotational direction: cw / ccw, manual adjustment: with pushbutton
Pushbutton: Adaptation / addressing / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Type of protection: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on cabinet for control and setting devices

Width	..... mm
Height	..... mm
Length	..... mm
Air volume flow V_{min}, / V_{max}	...../..... m^3/h
Working range:	 V

Type VAV compact regulator ..... ***with MP bus interface***

Manufacturer: PICHLER
Type: ***PVSR-EE/ MP-Bus***

Lo: .....
So: .....
ST EP: .....

15.7. PVSR-EE / D / MF / SINGLE VALVE VERSION

PVSR-EE volume flow controller with instaling shell ***attached VAV compact regulator without MP bus interface***, for variable or constant volume flow systems, suitable for normal room air, in rectangular, stable design, with single valve, measured value sensor with mean value calculation differential pressure sensor and control components, for installation into supply and waste air lines in any position, customised presets of the control parameters such as air volume flows V_{min} and V_{max} via factory setting and technical testing of every individual device on a special test rig, subsequent adjustment of the parameters with on-site commissioning can be easily achieved.

Stable cabinet made from zinc-plated steel plate, airtight control and shut-off valves designed as single valve. Measurement device made from easy-flow aluminium profiles with integrated measurement holes, resistant to dirt contamination, with P20 / P30 universal connection flange on both sides for the air line connection.

Following the installation instructions, the volume flow controller can be installed in the control system in any position. The position of the control valve can be viewed from outside on the axis.

Shut-off valve in shut-off position airtight according to Class 4 conforming to ÖNORM EN 1751, cabinet leaked air volume flow airtight according to Class C conforming to ÖNORM EN 1751, differential pressure range 20 to 1500 Pa.

Version with 50 mm insulating shell, design with mineral wool and external panel made from zinc-plated steel plate for reducing cabinet radiation, insulating sheel cannot be retrofitted.

VAV compact regulator, pressure sensor, digital controller and valve adjustment drive as VAV compact solution.
Brushless, anti-blocking drive with power-save mode. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: Cable 1 m, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Rotational direction: cw / ccw, manual adjustment: with pushbutton
Pushbutton: Adaptation / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Type of protection: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on cabinet for control and setting devices

Width	..... mm
Height	..... mm
Length	..... mm
Air volume flow Vmin, / Vmax	...../..... m^3/h
Working range:	 V

Type VAV compact regulator ..... without MP bus interface

Manufacturer: PICHLER
Type: PVSR-EE/D / MF

Lo: .....
So: .....
ST EP: .....

15.8. PVSR-EE / D / MP-BUS / SINGLE VALVE VERSION

PVSR-EE/D volume flow controller with insulating shell, *attached VAV compact regulator with MP,* for variable or constant volume flow systems, suitable for normal room air, in rectangular, stable design, with single valve, measured value sensor with mean value calculation differential pressure sensor and control components, for installation into supply and waste air lines in any position, customised presets of the control parameters such as air volume flows Vmin and Vmax via factory setting and technical testing of every individual device on a special test rig, subsequent adjustment of the parameters with on-site commissioning can be easily achieved.

Stable cabinet made from zinc-plated steel plate, airtight control and shut-off valves designed as single valve. Measurement device made from easy-flow aluminium profiles with integrated measurement holes, resistant to dirt contamina-tion, with P20 / P30 universal connection flange on both sides for the air line connection.

Following the installation instructions, the volume flow controller can be installed in the control system regardless of position. The position of the control valve can be viewed from outside on the axis.

Shut-off valve in shut-off position airtight according to Class 4 conforming to ÖNORM EN 1751, cabinet leaked air volume flow airtight according to Class C conforming to ÖNORM EN 1751, differential pressure range 20 to 1500 Pa.

Version with 50 mm insulating shell, design with mineral wool and external panel made from zinc-plated steel plate for reducing cabinet radiation, insulating sheel cannot be retrofitted.

VAV compact regulator, pressure sensor, digital controller and valve adjustment drive as VAV compact solution.
Brushless, anti-blocking drive with power-save mode. Diagnostics socket for controllers and rotational direction adaptation.

The construction design complies with hygiene requirements as stipulated in the guidelines contained in VDI 6022, SWKI VA104-01, DIN 1946-4, ÖNORM H 6021, ÖNORM H 6020 and ÖNORM H 6038, and is in accordance with performed expert appraisals on hygiene.

Nominal voltage: 24 V AC, 50 / 60 Hz / 24 V DC
Actuation: continuous 0 - 10 V DC
Working range: 2 - 10 V DC
Repeater: 2 - 10 V DC
Power consumption: 3 W
Connection: Cable 1 m, 4 x 0.75 mm^2
Torque: 5 or 10 Nm
Rotational direction: cw / ccw, manual adjustment: with pushbutton
Pushbutton: Adaptation / addressing / service
LED indicator: 24 V supply and status/service function
Angle of rotation: 95 degrees, mechanical or electronic adjustment
Type of protection: III safety extra-low voltage, protection rating: IP54
Operating temperature: + 0 °C to + 50 °C
including diagnostics socket on cabinet for control and setting devices

Width	..... mm
Height	..... mm
Length	..... mm
Air volume flow V_{min}, / V_{max}	...../..... m^3/h
Working range:	 V

Type VAV compact regulator ..... *with MP bus interface*

Manufacturer: PICHLER
Type: *PVSR-EE / D / MP-Bus*

Lo: .....
So: .....
ST EP: .....

PICHLER

Systematic ventilation.

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