

Volume flow rate measuring units Type VMR



Variant with circular spigot



Static differential pressure transducer



Dynamic differential pressure transducer



Tested to VDI 6022



For the measurement of volume flow rates in ducts

Circular volume flow rate measuring units
for the recording or monitoring of volume flow rates

- Manual volume flow rate measuring
- Permanent volume flow rate measuring
- Recording of measured values for other controllers or for the LABCONTROL air management system
- Pressure transducer for the automatic recording of measured values, factory assembled and complete with wiring and tubing
- Casing air leakage to EN 15727, class C

Optional equipment and accessories

- With flanges on both ends
- Lip seal
- Dynamic or static differential pressure transducers

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Variants

Product examples

Volume flow rate measuring unit, variant VMR



Volume flow rate measuring unit, variant VMR, with differential pressure transducer



Description

For detailed information on pressure transducers see chapter K5 – 4.2.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application

- Circular volume flow rate measuring units Type VMR for the manual recording or automatic measuring of volume flow rates
- Simplified commissioning, approval and maintenance
- Suitable for permanent installation because of low differential pressure
- Optional static differential pressure transducer for systems with polluted air

Variants

- VMR: Volume flow rate measuring unit
- VMR-FL: Volume flow rate measuring unit with flanges on both ends

Construction

- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Nominal sizes

- 100, 125, 160, 200, 250, 315, 400

Attachments

- Dynamic differential pressure transducer
- Static differential pressure transducer
- LABCONTROL: Components for air management systems

Accessories

- Lip seals on both ends (factory fitted)
- Matching flanges for both ends

Special characteristics

- Measurement accuracy $\pm 5\%$
- Low differential pressure of only about 10 – 26 % of the measured effective pressure

Parts and characteristics

- Ready-to-commission unit which consists of the mechanical parts and an optional pressure transducer
- Averaging differential pressure sensor for volume flow rate measurement
- Optional factory-assembled pressure transducers complete with wiring and tubing
- High measurement accuracy (even with upstream bend $R = 1D$).

Construction features

- Circular casing
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Connecting nipple for tubes with 6 mm inside diameter
- VMR-FL: Circular flanges to EN 12220

Materials and surfaces

- Galvanised sheet steel construction
- Casing made of galvanised sheet steel
 - Aluminium sensor tubes

Powder-coated construction (P1)

- Casing made of galvanised sheet steel, powder-coated
- Sensor tubes made of aluminium, powder-coated

Stainless steel construction (A2)

- Casing, damper blade and shaft made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

Installation and commissioning

- Any installation orientation (except units with static differential pressure transducer)
- Note the upstream conditions
- Static differential pressure transducer:
Check zero point and correct, if necessary

Standards and guidelines

- Hygiene conforms to VDI 6022
- Casing air leakage to EN 15727, class C

Maintenance

- Maintenance-free as construction and materials are not subject to wear
- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

Attachments: VARYCONTROL differential pressure transducer for Type VMR

Order code detail	Differential pressure transducer	Measurement principle
Universal		
B10	Universal controller with integral differential pressure transducer TROX/Belimo	Dynamic
BB0	Universal controller with separate differential pressure transducer TROX/Belimo	Static

Attachments: LABCONTROL differential pressure transducer for Type VMR

Order code detail	Differential pressure transducer	Measurement principle
EASYPAB		
ELAB	EASYPAB TCU3 (recording of measured values for EASYPAB system)	Static
TCU-LON-II		
TM0	Electronic controller TCU-LON-II with LonWorks interface	Static

Technical data

Nominal sizes	100 – 400 mm
Volume flow rate range	10 – 1680 l/s or 36 – 6048 m ³ /h
Measurement accuracy	± 5 % of the measured value
Effective pressure range	approx. 5 – 250 Pa
Measuring unit differential pressure (pressure loss)	10 – 26 % of the measured effective pressure
Operating temperature	10 – 50 °C

Order code

VARYCONTROL

VMR

VMR – P1 – FL / 160 / G2 / B10 / E0

1 2 3 4 5 6 7

1 Type

VMR Circular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel

P1 Powder-coated (RAL 7001), silver grey

A2 Stainless steel

3 Flange

No entry: none

FL Flanges on both ends

4 Nominal size [mm]

100

125

160

200

250

315

400

5 Accessories

No entry: none

D2 Lip seals on both ends

G2 Matching flanges for both ends

6 Attachments

(differential pressure transducer)

No entry: none

B10 Dynamic differential pressure transducer

BB0 Static differential pressure transducer

7 Signal voltage range

For the actual value signal

Only for attachment B10

E0 0 – 10 V

E2 2 – 10 V

4

Order example

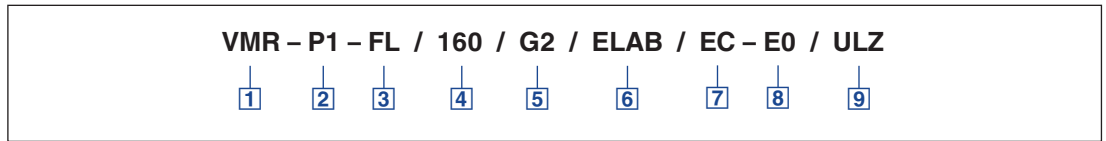
VARYCONTROL

VMR/160/D2/B10/E0

Nominal size	160 mm
Accessories	Lip seals on both ends
Differential pressure transducer	Dynamic
Actual value signal	0 – 10 V

Order code
LABCONTROL
EASYLAB

VMR with EASYLAB for the recording of measured values



1 Type

VMR Circular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel

P1 Powder-coated, silver grey (RAL 7001)

A2 Stainless steel

3 Flange

No entry: none

FL Flanges on both ends

4 Nominal size [mm]

100

125

160

200

250

315

400

5 Accessories

No entry: none

D2 Lip seals on both ends

G2 Matching flanges for both ends

6 Attachments (control component)

ELAB EASYLAB TCU3

7 Equipment function

SC Supply air recording

EC Extract air recording

8 Voltage range for the actual value signal

E0 Voltage signal 0 – 10 V DC

E2 Voltage signal 2 – 10 V DC

9 Module expansions

Option 1: Power supply

No entry: 24 V AC

T EM-TRF for 230 V AC

U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

L EM-LON for LonWorks FTT-10A

B EM-BAC-MOD-01 for BACnet MS/TP

M EM-BAC-MOD-01 for Modbus RTU

I EM-IP for BACnet/IP,

Modbus/IP and webserver

R EM-IP with real time clock

Option 3: Automatic zero point correction

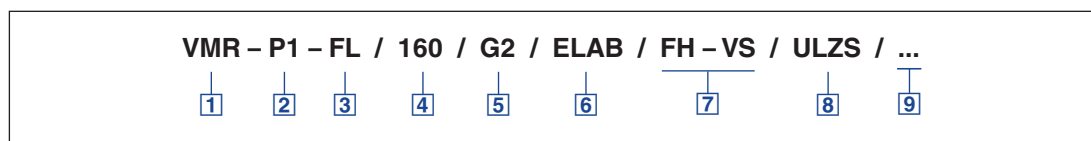
No entry: none

Z EM-AUTOZERO Solenoid valve

for automatic zero point correction

Order code
LABCONTROL
EASYLAB

VMR with EASYLAB for fume cupboard control with external signalling (frequency converter)



1 Type

VMR Circular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel

P1 Powder-coated, silver grey (RAL 7001)

A2 Stainless steel

3 Flange

No entry: none

FL Flanges on both ends

4 Nominal size [mm]

100

125

160

200

250

315

400

5 Accessories

No entry: none

D2 Lip seals on both ends

G2 Matching flanges for both ends

6 Attachments (control component)

ELAB EASYLAB controller TCU3

7 Equipment function

With face velocity transducer

FH-VS Face velocity control

With sash distance sensor

FH-DS Linear control strategy

FH-DV Safety-optimised control strategy

With switching steps
for on-site switch contacts

FH-2P 2 switching steps

FH-3P 3 switching steps

Without signalling

FH-F Volume flow rate constant value

8 Expansion modules

Option 1: Supply voltage

No entry: 24 V AC

T EM-TRF for 230 V AC

U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

L EM-LON for LonWorks FTT-10A

B EM-BAC-MOD-01 for BACnet MS/TP

M EM-BAC-MOD-01 for Modbus RTU

I EM-IP for BACnet/IP,
Modbus/IP and webserver

R EM-IP with real time clock

Option 3: Automatic zero point correction

No entry: none

Z EM-AUTOZERO Solenoid valve
for automatic zero point correction

Option 4: Lighting

No entry: none

S EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

9 Operating values [m³/h or l/s]

Depending on the equipment function

VS: $\dot{V}_{\min} - \dot{V}_{\max}$

DS: $\dot{V}_{\min} - \dot{V}_{\max}$

DV: $\dot{V}_{\min} - \dot{V}_{\max}$

2P: \dot{V}_1 / \dot{V}_2

3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$

F: \dot{V}_1

Useful additions

Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175

BE-SEG-** 2-character display

BE-LCD-01 40-character display

Volume flow rate ranges

Nominal size	\dot{V}_{Nenn}		\dot{V}_{min}		C-Wert		Δp_{st}	$\Delta \dot{V}$
	l/s	m ³ /h	l/s	m ³ /h	l/s	m ³ /h	%	± %
100	95	342	10	36	6.1	22	26	5
125	150	540	15	54	9.7	35	24	5
160	250	900	25	90	15.9	57	22	5
200	405	1458	40	144	25.5	92	19	5
250	615	2214	60	216	39.0	140	17	5
315	1030	3708	105	378	65.0	234	15	5
400	1680	6048	170	612	106.0	382	10	5

K value for air density 1.2 kg/m³, Δp_{st} in relation to the measured effective pressure

Volume flow rate calculation

Calculation conditions

- The volume flow rate is calculated based on the measured effective pressure
- The effective pressure is measured using an electronic manometer or an inclined tube manometer
- Air density $\rho = 1.2 \text{ kg/m}^3$

Volume flow rate calculation for air density 1.2 kg/m³

$$\dot{V} = C \times \sqrt{\Delta p_w}$$

Volume flow rate calculation for other air densities

$$\dot{V} = C \times \sqrt{\Delta p_w} \times \sqrt{\frac{1.2}{\rho}}$$

Calculation example

Given data

- VMR/160
- $\Delta p_w = 100 \text{ Pa}$
(manometer reading of effective pressure)
- Volume flow rate $\dot{V} [\text{m}^3/\text{h}]$

Unit data

- K value from table: $K = 57 \text{ m}^3/\text{h}$ (15.9 l/s)

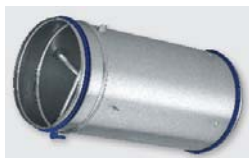
Calculation procedure

$$\dot{V} = 15.9 \times \sqrt{100}$$

$$\dot{V} = 159 \text{ l/s}$$

Description

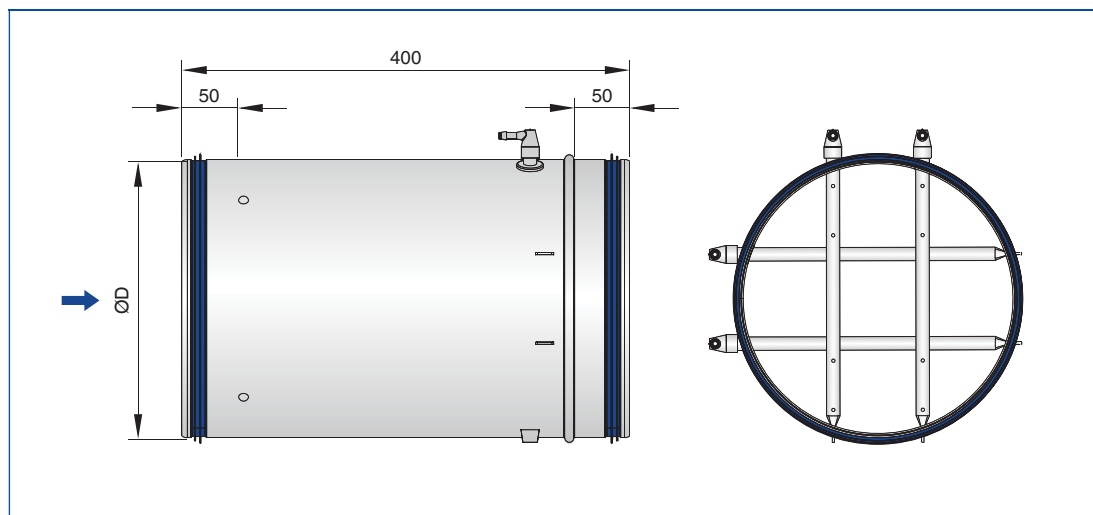
- Volume flow rate measuring unit
- Spigot to make connections to the ducting



Volume flow rate measuring unit, variant VMR

Dimensions

VMR



Weight without attachments

Dimensions [mm] and weight [kg]

Nominal size	VMR	
	ØD	m
	mm	kg
100	99	0.8
125	124	1.0
160	159	1.4
200	199	1.7
250	249	2.1
315	314	2.7
400	399	3.4

Description

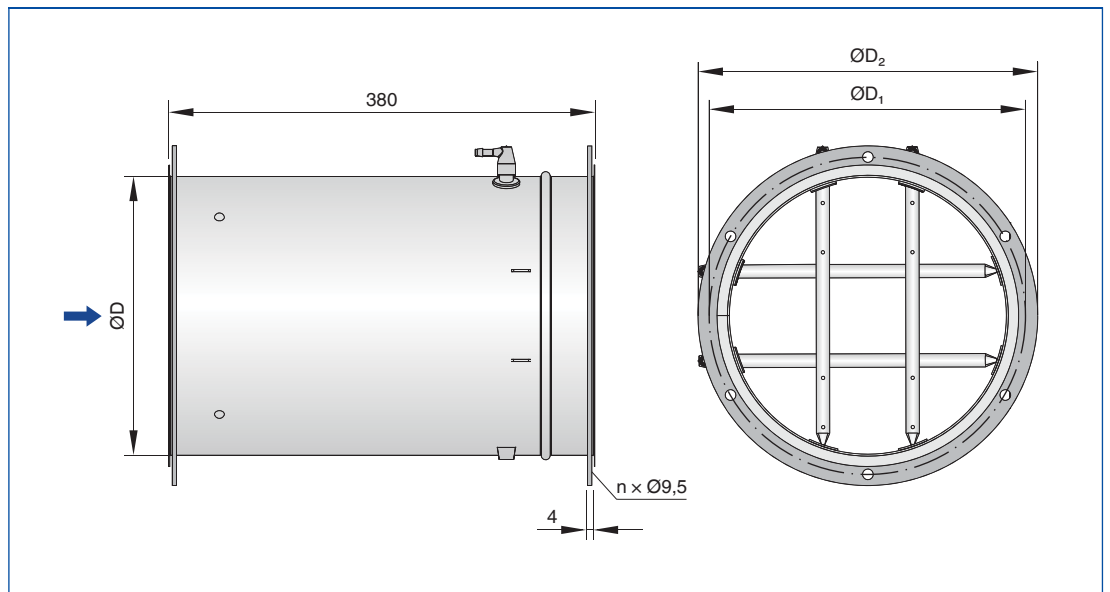
- Volume flow rate measuring unit
- With flanges on both ends to make detachable connections to the ducting



Volume flow rate measuring unit, variant VMR/.../BB0

Dimensions

VMR-FL



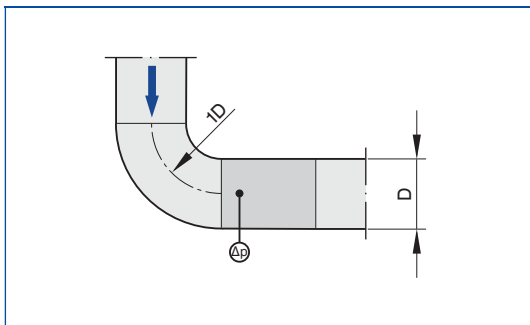
Dimensions [mm] and weight [kg]

Nominal size	ØD	ØD ₁	ØD ₂	n	T	m
	mm				mm	kg
100	99	132	152	4	4	1.2
125	124	157	177	4	4	1.5
160	159	192	212	6	4	2.1
200	199	233	253	6	4	2.7
250	249	283	303	6	4	3.3
315	314	352	378	8	4	4.5
400	399	438	464	8	4	5.7

Upstream conditions

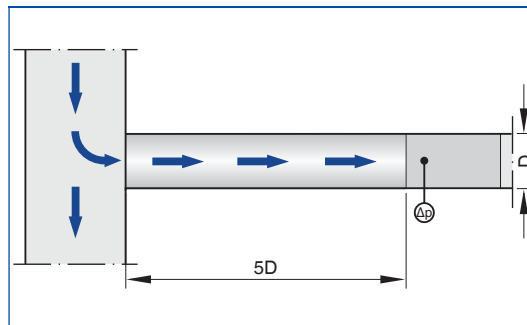
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require straight duct sections upstream.

Bend



A bend with a curvature radius of at least 1D – without an additional straight duct section upstream of the volume flow rate measuring unit – has only a negligible effect on the volume flow rate accuracy.

Junction

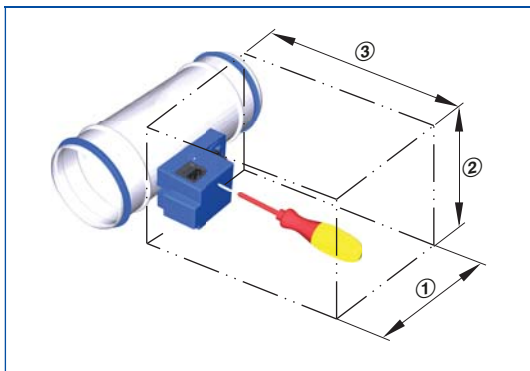


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 5D upstream. Shorter upstream sections require a perforated plate in the branch and before the measuring unit. If there is no straight upstream section at all, the actual value signal may not be stable, even with a perforated plate.

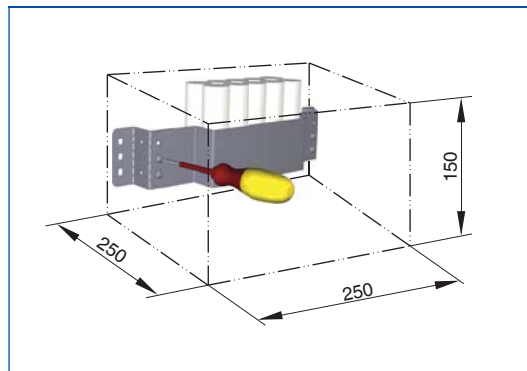
Space requirement for commissioning and maintenance

Sufficient space must be kept clear near any attachments to allow for commissioning and maintenance. It may be necessary to provide sufficiently sized inspection access openings.

Access to attachments



Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Space required

Attachments	①	②	③
	mm		
Without attachments	200	200	200
VARYCONTROL			
Universal controller	250	200	250
LABCONTROL			
EASYLAB	350	350	400

Standard text

This specification text describes the general properties of the product. Texts for variants can be generated with our Easy Product Finder design programme.

Circular volume flow rate measuring unit for the measurement of volume flow rates in air conditioning systems, available in 7 nominal sizes. For the manual volume flow rate measuring or for the permanent monitoring of the actual value signal. Ready-to-commission unit which consists of the casing with an averaging differential pressure sensor. Differential pressure sensor with 3 mm measuring holes, thus resistant to dust and pollution. Both ends spigot with groove for lip seal, suitable for connecting ducts to EN 1506 or EN 13180. Casing air leakage to EN 1751, class C.

Special characteristics

- Measurement accuracy $\pm 5\%$
- Low differential pressure of only about 10 – 26 % of the measured effective pressure

Materials and surfaces

Galvanised sheet steel construction

- Casing made of galvanised sheet steel
- Aluminium sensor tubes

Powder-coated construction (P1)

- Casing made of galvanised sheet steel, powder-coated
- Sensor tubes made of aluminium, powder-coated

Stainless steel construction (A2)

- Casing, damper blade and shaft made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

Construction

- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Technical data

- Nominal sizes: 100 to 400 mm
- Volume flow rate range: 10 to 1680 l/s or 36 to 6048 m³/h
- Effective pressure range: approx. 5 – 250 Pa
- Measuring unit differential pressure (pressure loss): 10 – 26 % of the measured effective pressure
- Operating temperature: 10 to 50 °C

Attachments

Volume flow rate measurement with static differential pressure transducer emitting an actual value signal for integration into the central BMS.

- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC or 2 – 10 V DC
- TCU-LON-II: Integration with LonWorks
- EASYLAB: Integration using either 0 – 10 V DC signals or expansion modules (LonWorks, BACnet MS/TP, Modbus RTU)

Sizing data

- \dot{V} [m³/h]

Order options

VARYCONTROL

1 Type

VMR Circular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel

- P1** Powder-coated (RAL 7001), silver grey
- A2** Stainless steel

3 Flange

No entry: none

- FL** Flanges on both ends

4 Nominal size [mm]

- 100**
- 125**
- 160**
- 200**
- 250**
- 315**
- 400**

5 Accessories

No entry: none

- D2** Lip seals on both ends
- G2** Matching flanges for both ends

6 Attachments (differential pressure transducer)

No entry: none

- B10** Dynamic differential pressure transducer
- BB0** Static differential pressure transducer

7 Signal voltage range

For the actual value signal
Only for attachment B10

- E0** 0 – 10 V
- E2** 2 – 10 V

Order options

LABCONTROL

EASYLAB

1 Type

VMR Circular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel

- P1** Powder-coated, silver grey (RAL 7001)
- A2** Stainless steel

3 Flange

No entry: none

- FL** Flanges on both ends

4 Nominal size [mm]

- 100**
- 125**
- 160**
- 200**
- 250**
- 315**
- 400**

5 Accessories

No entry: none

- D2** Lip seals on both ends
- G2** Matching flanges for both ends

6 Attachments (control component)

ELAB EASYLAB TCU3

7 Equipment function

- SC** Supply air recording
- EC** Extract air recording

8 Voltage range for the actual value signal

- E0** Voltage signal 0 – 10 V DC
- E2** Voltage signal 2 – 10 V DC

9 Module expansions

Option 1: Power supply

No entry: 24 V AC

- T** EM-TRF for 230 V AC
- U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

- L** EM-LON for LonWorks FTT-10A
- B** EM-BAC-MOD-01 for BACnet MS/TP
- M** EM-BAC-MOD-01 for Modbus RTU
- I** EM-IP for BACnet/IP, Modbus/IP and webserver
- R** EM-IP with real time clock

Option 3:

Automatic zero point correction

No entry: none

- Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Order options

LABCONTROL

EASYLAB

1 Type

VMR Circular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel

- P1** Powder-coated, silver grey (RAL 7001)
- A2** Stainless steel

3 Flange

No entry: none

- FL** Flanges on both ends

4 Nominal size [mm]

- 100**
- 125**
- 160**
- 200**
- 250**
- 315**
- 400**

5 Accessories

No entry: none

- D2** Lip seals on both ends
- G2** Matching flanges for both ends

6 Attachments (control component)

ELAB EASYLAB controller TCU3

7 Equipment function

With face velocity transducer

- FH-VS** Face velocity control
With sash distance sensor
- FH-DS** Linear control strategy
- FH-DV** Safety-optimised control strategy
With switching steps
for on-site switch contacts
- FH-2P** 2 switching steps
- FH-3P** 3 switching steps
Without signalling
- FH-F** Volume flow rate constant value

8 Expansion modules

Option 1: Supply voltage

No entry: 24 V AC

- T** EM-TRF for 230 V AC
- U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

- L** EM-LON for LonWorks FTT-10A
- B** EM-BAC-MOD-01 for BACnet MS/TP
- M** EM-BAC-MOD-01 for Modbus RTU
- I** EM-IP for BACnet/IP, Modbus/IP and webserver
- R** EM-IP with real time clock

Option 3:

Automatic zero point correction

No entry: none

- Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting

No entry: none

- S** EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

9 Operating values [m³/h or l/s]

Depending on the equipment function

VS: $\dot{V}_{\min} - \dot{V}_{\max}$

DS: $\dot{V}_{\min} - \dot{V}_{\max}$

DV: $\dot{V}_{\min} - \dot{V}_{\max}$

2P: \dot{V}_1 / \dot{V}_2

3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$

F: \dot{V}_1

Useful additions

Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175

- BE-SEG-**** 2-character display
- BE-LCD-01** 40-character display

Volume flow rate measurement

Basic information and nomenclature



- Product selection
- Principal dimensions
- Nomenclature
- Construction
- Sizing and sizing example

Volume flow rate measurement

Basic information and nomenclature

Product selection

	Type			
	VMR	VME	VMRK	VMLK
Type of system				
Supply air	●	●	●	●
Extract air	●	●	●	●
Duct connection				
Circular	●		●	●
Rectangular		●		
Volume flow rate range				
Up to [m³/h]	6048	36360	6048	1854
Up to [l/s]	1680	10100	1680	515
Air quality				
Filtered	●	●	●	●
Office extract air	●	●	●	●
Polluted	○	○	●	●
Contaminated	○	○	●	●
Volume flow rate measurement				
Manually	●	●	●	
Automatically	○	○	○	●
Special areas				
Labs, clean rooms, operating theatres (EASYPAC, TCU-LON II)	●	●	●	●
●	Possible			
○	Possible under certain conditions: Robust unit variant and/or specific differential pressure transducer			
	Not possible			

4

Volume flow rate measurement

Basic information and nomenclature

Principal dimensions

$\varnothing D$ [mm]

VAV terminal units made of stainless steel:
Outside diameter of the spigot
VAV terminal units made of plastic:
Inside diameter of the connecting spigot

$\varnothing D_1$ [mm]

Pitch circle diameter of flanges

$\varnothing D_2$ [mm]

Outside diameter of flanges

$\varnothing D_4$ [mm]

Inside diameter of the screw holes of flanges

L [mm]

Length of unit including connecting spigot

L_1 [mm]

Length of casing or acoustic cladding

B [mm]

Duct width

B_1 [mm]

Screw hole pitch of flange (horizontal)

B_2 [mm]

Outside dimension of flange (width)

B_3 [mm]

Width of device

H [mm]

Duct height

H_1 [mm]

Screw hole pitch of flange (vertical)

H_2 [mm]

Outside dimension of flange (height)

H_3 [mm]

Unit height

n []

Number of flange screw holes

T [mm]

Flange thickness

m [kg]

Weight including attachments for the automatic differential pressure measurement

Nomenclature

\dot{V}_{nom} [m³/h] and [l/s]

Nominal volume flow rate (100 %)

\dot{V}_{min} [m³/h] and [l/s]

Volume flow rate

$\Delta\dot{V}$ [± %]

Volume flow rate accuracy

K value [m³/h] and [l/s]

Unit-related constant for air density 1.2 kg/m³

Δp_w [Pa]

Effective pressure

Δp_{st} [%]

Static differential pressure in relation to the measured effective pressure

Constructions

Galvanised sheet steel

- Casing made of galvanised sheet steel
- Parts in contact with the airflow as described for the product type
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel

Powder-coated surface (P1)

- Casing made of galvanised sheet steel, powder-coated RAL 7001, silver grey
- Parts in contact with the airflow are powder-coated or made of plastic
- Due to production, some parts that come into contact with the airflow may be stainless steel or aluminium, powder-coated
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel

Stainless steel (A2)

- Casing made of stainless steel 1.4201
- Parts in contact with the airflow are powder-coated or made of stainless steel
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel

Volume flow rate measurement

Basic information and nomenclature

Sizing with the help of this catalogue

This catalogue provides convenient quick sizing tables for volume flow rate measuring unit, based on aerodynamic data. Volume flow rate ranges are provided for all nominal sizes.

Sizing example

Given data

$$\dot{V}_{\max} = 280 \text{ l/s (1010 m}^3\text{/h)}$$

Quick sizing

VMR/200

$$C = 25.5 \text{ l/s (92 m}^3\text{/h)}$$

$$\Delta p_{\text{st}} = 19 \%$$

$$\Delta p_{\text{w}} = 121 \text{ Pa}$$

$$\Delta p_{\text{st}} = 23 \text{ Pa (121 Pa} \times 0,19)$$

Easy Product Finder



The Easy Product Finder allows you to size products using your project-specific data.

You will find the Easy Product Finder on our website.

Seite	Abmessung	V (m³/h)		Preis
		von	bis	
VMR 200		97	1456	115,00
VMR 250		250	2214	135,00
VMR 315		437	3690	145,00
VMR 400		700	6048	148,00