

## Type VMR



### 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



## APPLICATION

### 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

### Special characteristics

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

### Nominal sizes

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

## DESCRIPTION

### 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

### 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  $R = 1D$ ).

### **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

### **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 made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

### **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)

## **TECHNICAL INFORMATION**

Function, Technical data, Specification text, Order code, Produktbeziehungen

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### **FUNCTION**

#### **Functional description**

The measuring unit is fitted with an effective pressure sensor for measuring the volume flow rate.

The effective pressure is either measured and evaluated manually, or transformed into an electric signal by a pressure transducer.

## TECHNICAL DATA

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

## SPECIFICATION TEXT

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 ± 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 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 m<sup>3</sup>/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
- EASYLAB: Integration using either 0 – 10 V DC signals or expansion modules (LonWorks, BACnet MS/TP, Modbus RTU)

### Sizing data

- V \_\_\_\_\_ [m³/h]

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

## ORDER CODE

### Notes on the order code

VMR/.../ELAB/FH-\*

- VMR volume flow rate measuring units with EASYLAB TCU3 controllers are not certified for use with fume cupboards to EN 14175, part 6 (Fume cupboards – Variable air volume fume cupboards)

### Order example: 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

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Nominal size	160 mm
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Differential pressure transducer	Dynamic
Actual value signal	0 – 10 V

### Order example: 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

**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

**VMR – P1 – FL / 160 / G2 / ELAB / EC – E0 / ULZ****1****2****3****4****5****6****7****8****9**

**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

**VMR – P1 – FL / 160 / G2 / ELAB / FH – VS / ULZS / ...****1****2****3****4****5****6****7****8****9**

## 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 [m<sup>3</sup>/h or l/s]

Depending on the equipment function

VS:  $V_{\min} - V_{\max}$

DS:  $V_{\min} - V_{\max}$

DV:  $V_{\min} - V_{\max}$

2P:  $V_1 / V_2$

3P: V<sub>1</sub> / V<sub>2</sub> / V<sub>3</sub>

F: V<sub>1</sub>

#### 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

## Variants, Attachments, Dimensions and weight

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### VARIANTS

#### VMR

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

#### VMR-FL

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

#### Materials

Order code detail	Part	Material	Notes
-	Casing	Galvanised sheet steel	
	Sensor tubes	Aluminium	
P1	Casing	Galvanised sheet steel	
A2	Casing	Stainless steel, material no. 1.4301	

#### Surfaces

Order code detail	Part	Surface	Notes
-	Casing	Untreated	
	Sensor tubes	Untreated	
P1	Casing	Powder-coated, RAL 7001, silver grey	
	Sensor tubes	Powder-coated, RAL 7001, silver grey	
A2	Casing	Untreated	
	Sensor tubes	Powder-coated, RAL 7001, silver grey	

Volume flow rate measuring unit, variant VMR



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



## ATTACHMENTS

### VMR, VARYCONTROL differential pressure transducers

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

### VMR, LABCONTROL differential pressure transducers

Order code detail	Differential pressure transducer	Measurement principle
<b>EASYLAB</b>		
<b>ELAB</b>	EASYLAB TCU3 (recording of measured values for EASYLAB system)	Static

### Anbauteile: VARYCONTROL Regelkomponenten

<input checked="" type="checkbox"/>	Regel- grÖÙe	Schnittstelle	V <sub>min</sub> -/ V <sub>max</sub> - Verstellung	Differenzdruck- transmitter	Stellantrieb	Fabrikat
		Easylabregler		Statisch		
<b>Elab</b>	RS, RE, PC, C	TCU3		Integriert	Schnelllaufender Stellantrieb	
	RS, PC, C	TCU3		Integriert	Schnelllaufender Stellantrieb	
<b>Elab</b>	RE, PC, C	TCU3		Integriert	Schnelllaufender Stellantrieb	
	RS, RE, PC, FH, C	TCU3		Integriert	Schnelllaufender Stellantrieb	

		Elektronischer Regler		Statisch	Elektronischer Regler	
<b>TMA</b>	RS, RE, PC	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb	
<b>TMB</b>	RS, RE, PC	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb (bürstenloser Motor)	
<b>TMA</b>	RS, RE,	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb	
<b>TMB</b>	RS, RE,	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb (bürstenloser Motor)	
<b>TMA</b>	RE ,PC	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb	
<b>TMB</b>	RE ,PC	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb (bürstenloser Motor)	
<b>TMA</b>	RS, RE ,PC, FH	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb	
<b>TMB</b>	RS, RE ,PC, FH	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb (bürstenloser Motor)	
<b>XF3</b>	$\Delta p$			Integriert, 600 Pa	Federrücklaufantrieb	③
<b>BB3</b>	V			Separates Bauteil	Stellantrieb	②

① TROX, ② TROX/Belimo, ③ TROX/Gruner, ④ Sauter, ⑤ Siemens

☒ Bestellschlüsseldetail, V Volumenstrom,  $\Delta p$  Differenzdruck

## DIMENSIONS AND WEIGHT

### VMR

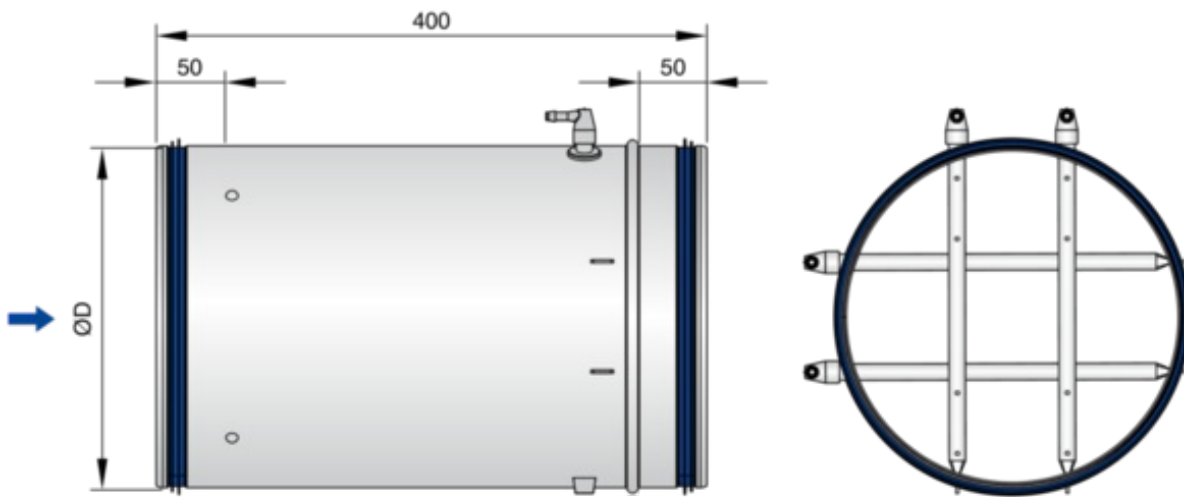
Nominal size	VMR	VMR
	$\varnothing D$ mm	m kg
100	99	0.8
125	124	1.0
160	159	1.4
200	199	1.7
250	249	2.1
315	314	2.7
400	399	3.4

### VMR-FL

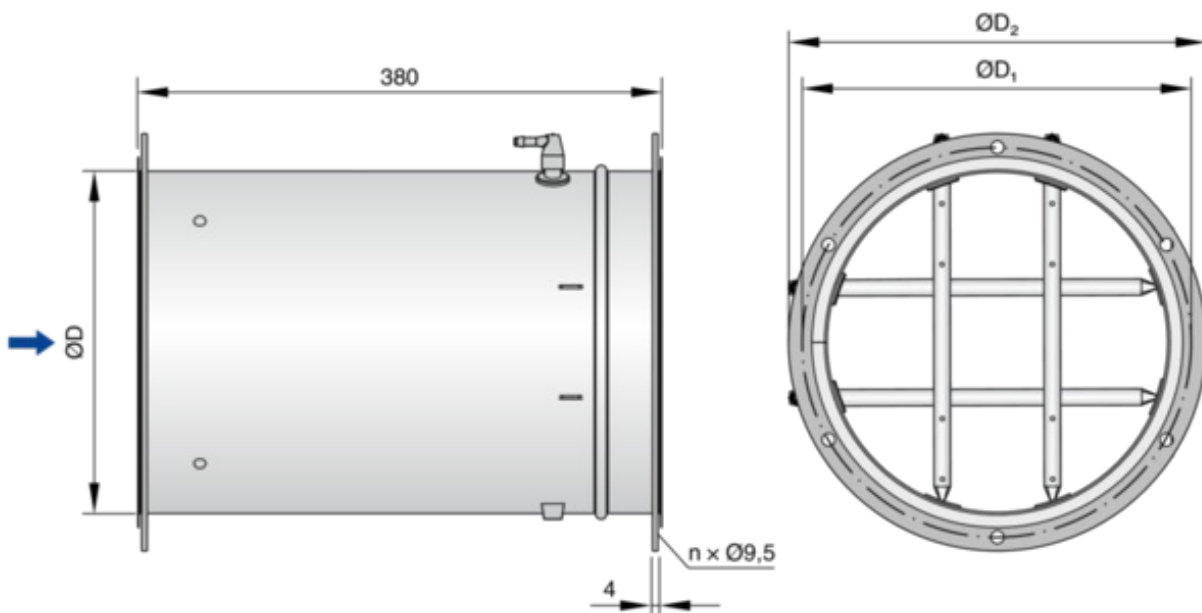
Nominal size	$\varnothing D$ mm	$\varnothing D_1$ mm	$\varnothing D_2$ mm	n	T mm	m kg
100	99	132	152	4	4	1.2
125	124	157	177	4	4	1.5
160	159	192	212	6	4	2.1
200	199	233	253	6	4	2.7
250	249	283	303	6	4	3.3
315	314	352	378	8	4	4.5
400	399	438	464	8	4	5.7

### VMR





VMR-FL



### INSTALLATION DETAILS

#### 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

#### Upstream conditions

The volume flow rate accuracy  $\Delta V$  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.

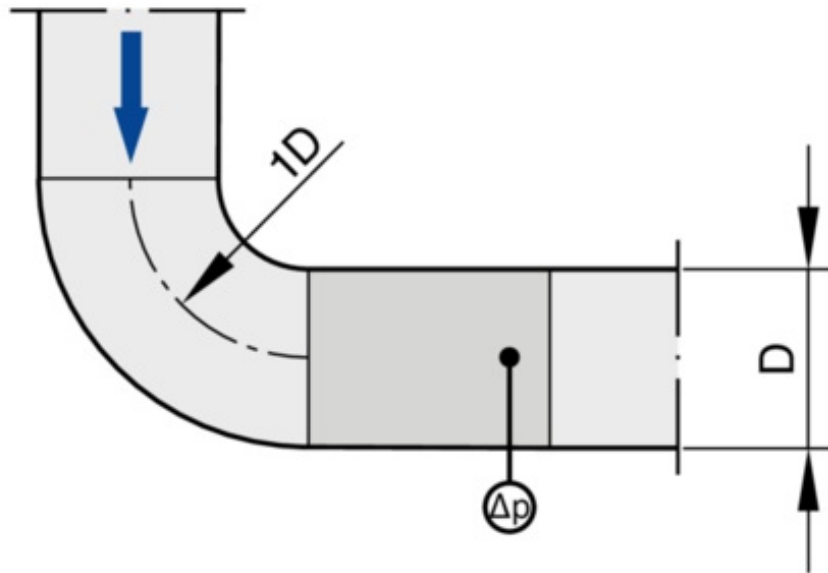
#### Space required for commissioning and maintenance

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.

#### Space required

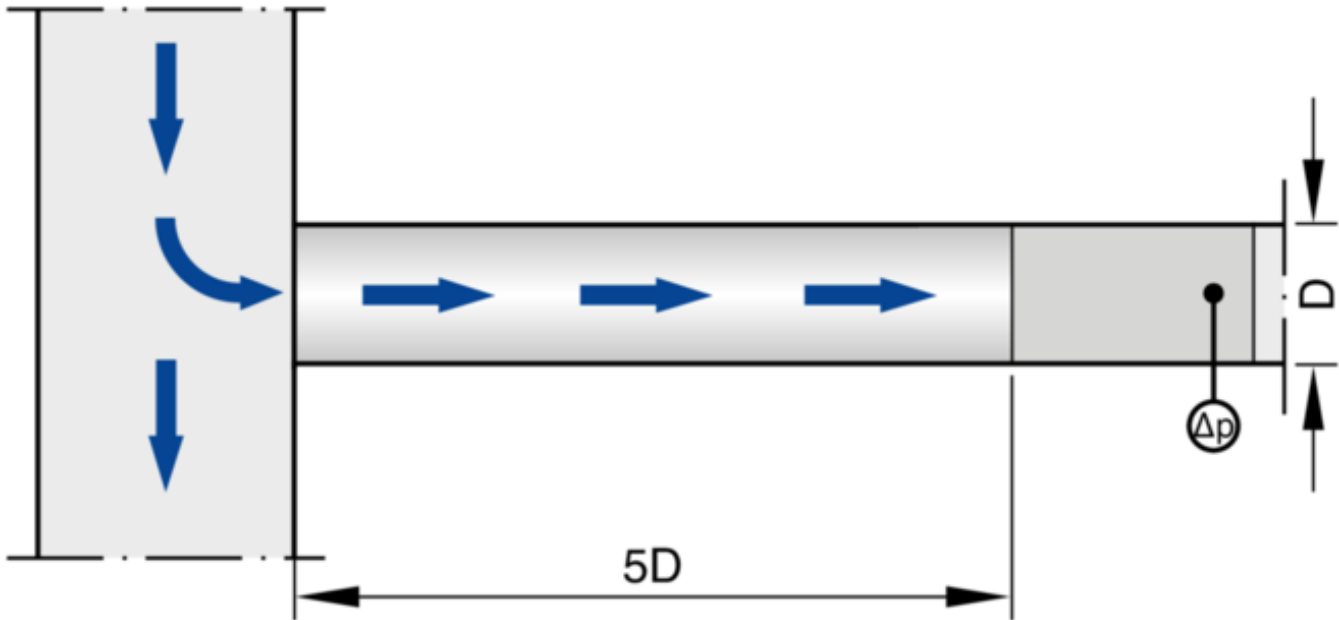
Attachments	①	②	③
	mm		
Without attachments	200	200	200
VARYCONTROL			
Universal controller	250	200	250
LABCONTROL			
EASYLAB	370	350	400

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.

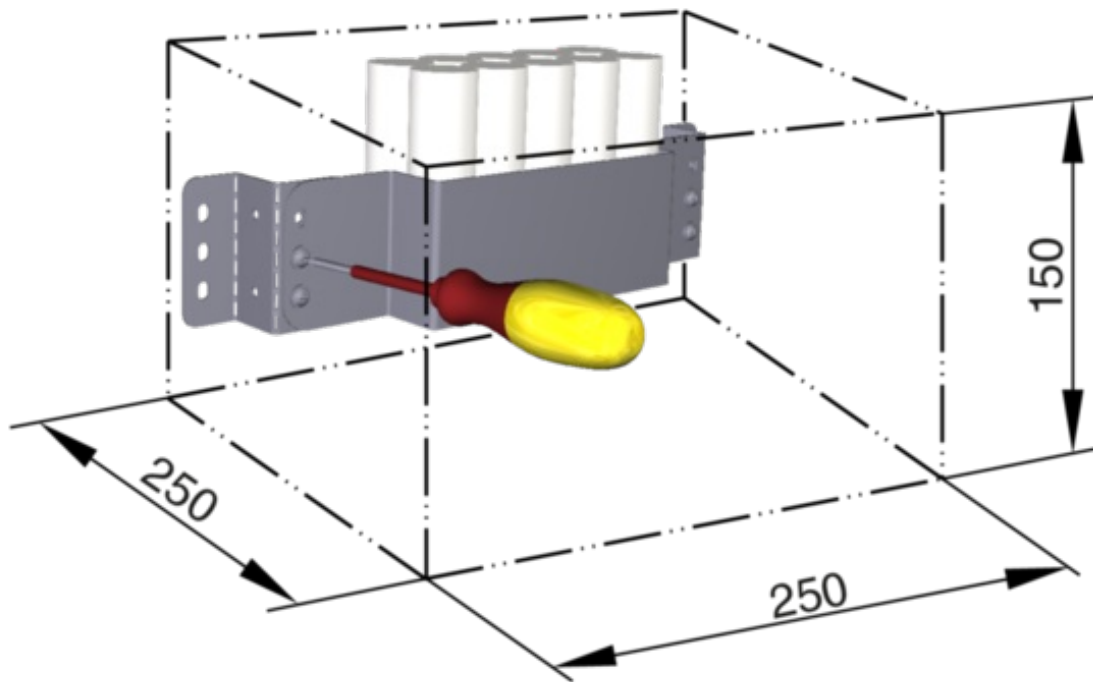
Junction



A junction causes strong turbulence. The stated volume flow rate accuracy  $\Delta V$  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.

Access to attachments, attached on one side

Access to battery pack



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

## COMMISSIONING

### 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  $\rho = 1.2 \text{ kg/m}^3$

### Given data

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

#### Unit data

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

Volume flow rate calculation for air density  $1.2 \text{ kg}/\text{m}^3$

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

Volume flow rate calculation for other air densities

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

Calculation procedure

$$\dot{V} = 15.9 \times \sqrt{100}$$
$$\dot{V} = 159 \text{ l/s}$$

## BASIC INFORMATION AND NOMENCLATURE

### Principal dimensions

#### ØD [mm]

VAV terminal units made of stainless steel: Outer diameter of the spigot

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

#### ØD<sub>1</sub> [mm]

Pitch circle diameter of flanges

#### ØD<sub>2</sub> [mm]

Outer diameter of flanges

#### ØD<sub>4</sub> [mm]

Inside diameter of the screw holes of flanges

#### L [mm]

Length of unit including connecting spigot

#### L<sub>1</sub> [mm]

Length of casing or acoustic cladding

#### B [mm]

Duct width

**B<sub>1</sub> [mm]**

Screw hole pitch of flange (horizontal)

**B<sub>2</sub> [mm]**

Outside dimension of flange (width)

**B<sub>3</sub> [mm]**

Width of device

**H [mm]**

Duct height

**H<sub>1</sub> [mm]**

Screw hole pitch of flange (vertical)

**H<sub>2</sub> [mm]**

Outside dimension of flange (height)

**H<sub>3</sub> [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**

**V<sub>nom</sub> [m<sup>3</sup>/h] and [l/s]**

Nominal volume flow rate (100 %)

**V<sub>min</sub> [m<sup>3</sup>/h] and [l/s]**



Volume flow rate

$\Delta V$  [± %]

Volume flow rate accuracy

**K value** [m<sup>3</sup>/h] and [l/s]

Unit-related constant for air density 1.2 kg/m<sup>3</sup>

$\Delta p_w$  [Pa]

Effective pressure

$\Delta p_{st}$  [%]

Static differential pressure in relation to the measured effective pressure

## TROX Middle East (LLC)

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P.O. Box No. 31432  
19 Street  
Al Quoz Industrial Estate #3  
Dubai  
United Arab. Emirates  
Tel.: +971 4 3417448  
Fax: +971 4 3417449

## Online-Services

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TROX Academy

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Your contact partner

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## Service-Hotlines

---

United Arab. Emirates

Tel.: +971 4 3417448

Fax: +971 4 3417449

[Contact](#)