Easy cleaning of sensor tubes

Variant with flange

VMRK with control component BTS

VMRK with control component ELAB TCU3

Tested to VDI 6022

Volume flow rate measuring devices

VMRK

For the measurement of volume flow rates in ducts with contaminated air

Plastic circular volume flow rate measuring devices for recording or monitoring the volume flow rate

- Manual volume flow rate measurement
- Permanent volume flow rate measurement
- Recording of measured values for other controllers or the air management system
- Optional effective pressure transducer for the automatic recording of measured values, factory assembled and complete with wiring and tubing
- Casing made of flame-resistant polypropylene (PPs)
- Casing leakage according to EN 15727, class C

Optional equipment and accessories

- With flanges on both ends
- Lip seal
- Static effective pressure transducer

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General information

Application
- Plastic circular volume flow rate measuring units for the manual or automatic measuring of volume flow rates
- Suitable for contaminated air
- Simplified commissioning, approval and maintenance
- Suitable for permanent installation because of low differential pressure

Special features
- High measurement accuracy, even in unfavourable upstream conditions
- Effective pressure range of 5 – 260 Pa
- Low differential pressure of only about 15 – 24 % of the measured effective pressure

Nominal sizes
- 125, 160, 200, 250, 315, 400

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

Parts and characteristics
- Ready-to-commission unit which consists of the mechanical parts and optional effective pressure transducers
- Averaging differential pressure sensor for volume flow rate measurement; can be removed for cleaning
- Optional effective pressure transducers, factory assembled and wired
- High measurement accuracy of volume flow rates (even with bend R = 1D).

Attachments
Effective pressure transducer for static pressure measurements
- XTS Type GT-VM-DS3
- BTS Type VRU-M1-M/B
- ELAB: EASYLAB air management system

Accessories
- Matching flanges for both ends, including seals

Construction features
- Circular casing
- Spigot suitable for ducts according to DIN 8077
- Both spigots with same diameter
- Connection points for tubes with 6 mm inside diameter
- The optional matching flange comes complete with a suitable seal

Materials and surfaces
- Casing and damper blade made of flame-resistant polypropylene (PPs)
- Effective pressure sensor made of polypropylene (PP)
- Damper blade seal made of chloroprene rubber (CR)

Standards and guidelines
Fulfils the hygiene requirements of
- EN 16798, Part 3
- VDI 6022, Sheet 1
- DIN 1946, Part 4
- Further standards, guidelines in accordance with hygiene certificate

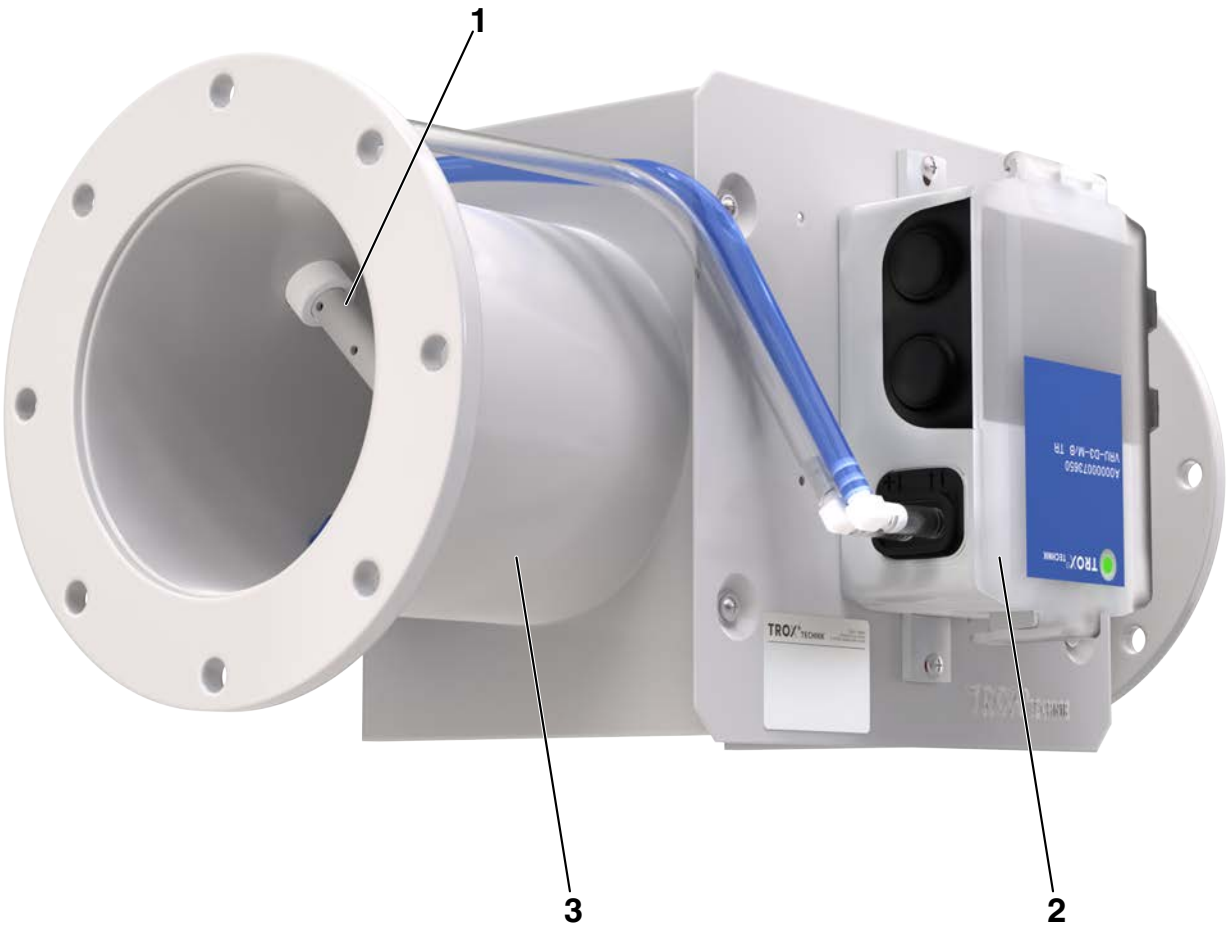
Casing leakage
- EN 1751, Class B

Closed damper blade air leakage
- EN 1751, Class 3
- Meets the general requirements of DIN 1946, part 4, with regard to the acceptable closed damper blade air leakage

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

Function

The volume flow rate 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 electrical signal by a measuring transducer (effective pressure transducer).



1: Effective pressure sensor
2: Measuring transducer
3: Casing

Technical data

Nominal sizes	125 – 400 mm
Volume flow rate range	20 – 1660 l/s or 70 – 5978 m³/h
Maximum differential pressure	1000 Pa
Effective pressure range	Approx. 5 – 260 Pa*
Measurement accuracy	5 – 10 %
Operating temperature	10 to 50 °C

* 260 Pa with nominal flow rate

Quick sizing

Die Schnellauslegung gibt einen guten Überblick über die Volumenstrommessbereiche, Messgenauigkeiten und die C-Werte der einzelnen Nenngrößen. Berechnung der Volumenströme aus den gemessenen Wirkdrücken bei Ausführung ohne Anbauteile siehe in Abschnitt „Produktdetails“.

Volume flow rate ranges
Attachment: XTS, BTS, ELAB or no attachment

NS	qv [l/s]	qv [m³/h]	K value [l/s]	K value [m³/h]	Δqv [±%]
125	20	70	8,6	31,0	10
125	138	499	8,6	31,0	6
160	34	122	15,1	54,0	10
160	243	876	15,1	54,0	5
200	55	196	24,3	87,5	10
200	391	1410	24,3	87,5	5
250	85	306	38,0	136,8	10
250	612	2205	38,0	136,8	5
315	139	500	62,0	223,2	10
315	999	3598	62,0	223,2	5
400	231	830	103,0	370,8	10
400	1660	5978	103,0	370,8	5

Note:

- K values for air density 1.2 kg/m³ at 20°C
- Δ_{pv} in relation to the measured effective pressure

Specification text

This specification text describes just one variant of the product. Texts for other variants can be generated with our Easy Product Finder design program.

Specification text

Circular volume flow rate measuring device made of PPs plastic, for variable and constant air volume systems, suitable for extract air, available in 6 nominal sizes. For manual volume flow rate measurement or for the permanent monitoring of the actual value signal. High measurement accuracy of volume flow rates (even with bend R = 1D). Ready-to-commission unit which consists of the mechanical parts and an optional pressure transducer. Slide-out sensors allow for easy cleaning

Each unit contains an averaging effective pressure sensor for volume flow rate measurement. Effective pressure sensor with 3 mm measuring holes, hence resistant to contamination. Meets the hygiene requirements of EN 16798, Part 3, of VDI 6022, Sheet 1, and of DIN 1946, Part 4.

Special features

- High measurement accuracy, even in unfavourable upstream conditions
- Effective pressure range of 5 – 260 Pa
- Low differential pressure of only about 15 – 24 % of the measured effective pressure

Materials and surfaces

- Casing made of flame-resistant polypropylene (PPs)
- Differential pressure sensor made of polypropylene (PP)

Connection

- Spigot, suitable for ducts according to DIN 8077.

Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 20 – 1660 l/s or 70 – 5978 m³/h
- Effective pressure range: approx. 5 – 260 Pa
- Differential pressure of measuring unit (pressure loss): 15 – 24 % of the measured effective pressure
- Measurement accuracy ± 5 % – ±10 % even with unfavourable upstream conditions
- Operating temperature: 10 to 50 °C
- Casing air leakage to EN 15727, class C
- Maximum differential pressure: 1000 Pa

Order code

Order code for volume flow rate measuring unit (with optional VARYCONTROL attachment)

VMRK	–	FL	/	160	/	GK	/	XTS	/	0
1		2		3		4		5		6

1 Type
VMRK Plastic volume flow rate measuring unit

2 Flange
No entry required: None
FL Flanges on both ends

3 Nominal size [mm]
125, 160, 200, 250, 315, 400

4 Accessories
No entry required: None
GK Matching flanges for both ends, including seals

5 Attachments (differential pressure transducer)
No entry required: None
XTS static effective pressure transducer, analogue, display
BTS static effective pressure transmitter, analogue, and MP-Bus, Modbus RTU, BACnet MS/TP

6 Signal voltage range
Only required if attachment is selected
For the actual value signal
0 0 – 10 V DC
2 2 – 10 V DC

Order example 1: VMRK-FL/315/GK/XTS/0

Duct connection	Flanges on both ends
Nominal size	315 mm
Accessories	Matching flange
Attachments (effective pressure transducer)	Static effective pressure transducer XTS
Actual value signal	0 – 10 V DC

Order example 2: VMRK/160/BTS/2

Duct connection	Spigot
Nominal size	160 mm
Accessories	Matching flange
Attachments (effective pressure transducer)	Static effective pressure transducer BTS
Actual value signal	2 – 10 V DC

Order example 3: VMRK-FL/250/GK

Duct connection	Flanges on both ends
Nominal size	250 mm
Attachments (effective pressure transducer)	None, manual measurement only

Order code for volume flow rate measuring unit (with EASYLAB attachment for recording measured values)

VMRK	–	FL	/	160	/	GK	/	ELAB	/	EC	–	E0	/	UMZ
|		|		|		|		|		|		|
1		2		3		4		5		6		7		8

1 Type
VMRK Volume flow rate measuring unit, plastic

2 Flange
No entry: None
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: None
GK Matching flanges both sides

5 Attachments (control components)
ELAB EASYLAB TCU3

6 Equipment function
EC Extract air recording

7 Voltage range for the actual value signal
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC

8 Expansion modules
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
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 web server
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 example 1: VMRK/200/ELAB/EC/E2/TZ

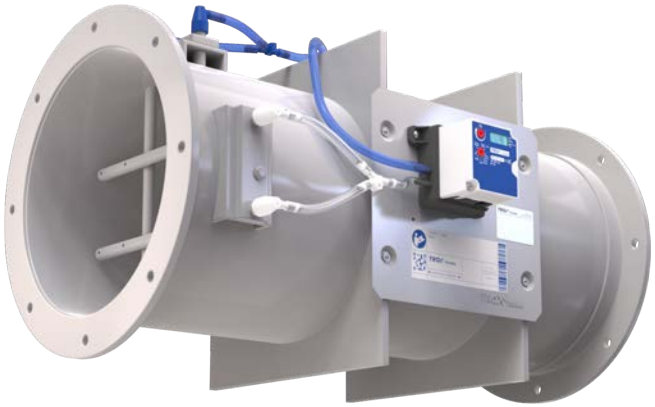
Duct connection	Spigot
Nominal size	200 mm
Attachments	EASYLAB TCU3
Equipment function	Extract air controller
External volume flow rate setting	Voltage signal 2 – 10 V DC
Expansion module	With expansion module EM-TRF, transformer for 230 V AC supply with expansion module EM-AUTOZERO, solenoid valve for automatic zero point correction

Variants

Volume flow rate measuring unit VMRK

- Spigot

Volume flow rate measuring unit VMRK-FL



- With flanges to make detachable connections to the ductwork

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Materials

Standard construction

Order code detail	Part	Material
–	Casing	Plastic, polypropylene (PPs), flame resistant
	Effective pressure sensor	

Optional flange

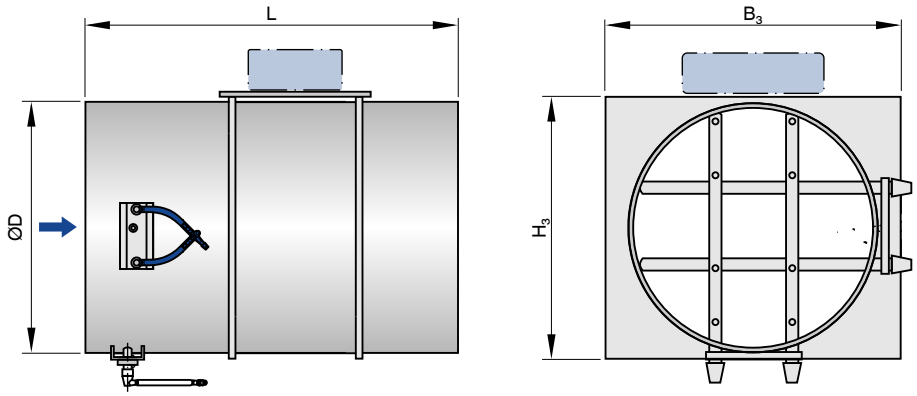
Order code detail	Part	Material
FL	Flange	Plastic, polypropylene (PPs), flame resistant

Optional matching flange

Order code detail	Part	Material
GK	Seal	Rubber, EPDM
	Matching flange	Plastic, polypropylene (PPs), flame resistant

Dimensions and weight

Standard construction



Dimensions and weights of VMRK (standard)

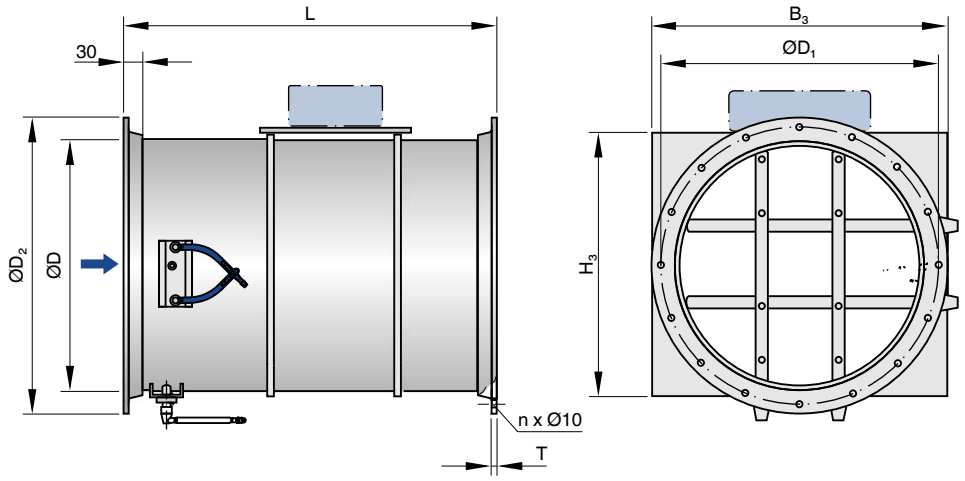
NG	L	ØD	B_3	H_3	kg
125	394	125	195	145	0.8
160	394	160	230	180	1
200	394	200	270	220	1.4
250	394	250	320	270	2.4
315	594	315	385	335	4
400	594	400	470	420	5.8

Note:

Weights (~) apply only to VMRK without any attachments.

Note that an optional effective pressure transducer (attachment BTS, XTS or ELAB) may add to the weight.

Circular, with flanges on both ends



Dimensions and weights of VMRK-FL

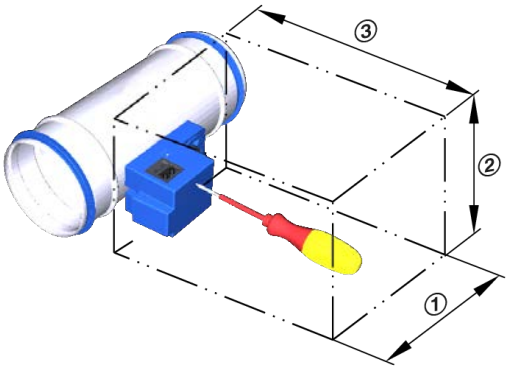
NG	L	ØD	ØD1	ØD2	B3	H3	D	n	kg
125	400	125	165	185	195	145	8	8	1.1
160	400	160	200	230	230	180	8	8	1.4
200	400	200	240	270	270	270	8	8	1.9
250	400	250	290	320	320	270	8	12	2.9
315	600	315	350	395	385	335	10	12	5
400	600	400	445	475	470	420	10	16	7

Note:
Weights (~) apply only to VMRK with flange and matching flange, but without any attachments.
Note that an optional effective pressure transducer (attachment BTS, XTS or ELAB) may add to the weight.

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. Product illustrations do not show any installation situation details. If an attachment requires a certain installation orientation, this is specified on a sticker on the product.

Access to attachments



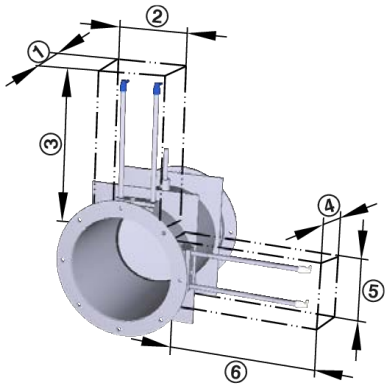
Schematic illustration of required installation space

ELAB, BTS, XTS

Space required

Attachment	①	②	③
Effective pressure transducer: BTS, XTS	300	320	300
Effective pressure transducer: ELAB	350	350	400

Access to sensor tubes for cleaning

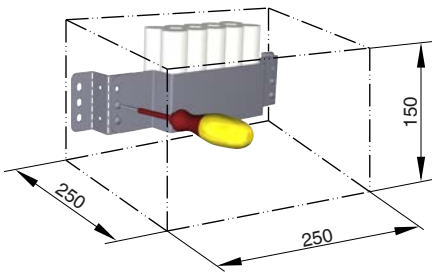


Space required for cleaning the sensor tubes

Nominal size	①	②	③	④	⑤	⑥
125 – 200	100	100	D	–	–	–
250 – 400	100	160	D	100	160	D

D: Casing diameter

Accessibility of the battery pack



Schematic illustration of required installation space

Note:

Weights apply only to VMRK with flange and matching flange, but without any attachments. Note that an optional effective pressure transducer (attachment BTS, XTS or ELAB) may add to the weight.

Product details

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 ρ = 1.2 kg/m³

Given data

- VMRK/160
- Δ_{pw} = 100 Pa (manometer reading of effective pressure)
- Volume flow rate q_v in m³/h

Device data

- K value from table: K = 54 m³/h (15.1 l/s)

Volume flow rate calculation for air density 1.2 kg/m³

$$q_v = C \times \sqrt{\Delta p_w}$$

Volume flow rate calculation for other air densities

$$q_v = \sqrt{\frac{1{,}2}{\rho}} \times C \times \sqrt{\Delta p_w}$$

Calculation procedure

$$q_v = 54\ m^3/h \times \sqrt{100}$$

$$q_v = 540\ m^3/h$$

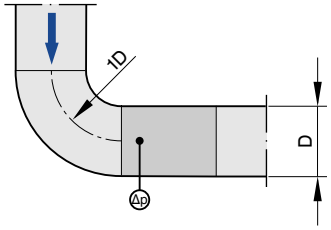
Installation and commissioning

- The installation orientation of ELAB must be as shown on the sticker
- The installation orientation of XTS and BTS is not critical

Upstream conditions

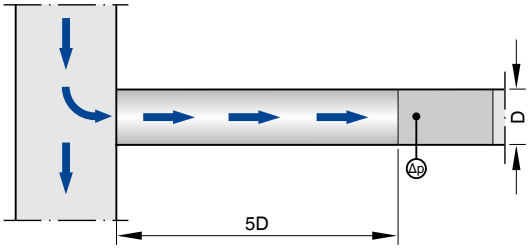
The volume flow rate accuracy Δ_{qv} applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require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

Bogenanschluss



Ein Bogen mit mindestens 1D Krümmungsradius – ohne zusätzliche gerade Anströmlänge vor der Volumenstrommesseinrichtung – hat keinen nennenswerten Einfluss auf die Volumenstromgenauigkeit.

Abzweig von einer Hauptleitung



Das Abzweigen einer Strömung von einer Hauptleitung verursacht starke Turbulenzen. Die angegebene Volumenstromgenauigkeit Δq_v ist nur mit mindestens 5D gerader Anströmlänge zu erreichen.

Optional attachments for effective pressure transducers

Attachment	Actual value	Effective pressure transducer	Manufacturer
Effective pressure transducer, static			
XTS	0 – 10 V or 2 – 10 V	integral	①
BTS	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral	②
ELAB	TROX plug and play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	integral	③

① TROX/Gruner, ② TROX/Belimo, ③ TROX

Nomenclature

Dimensions of rectangular units

B [mm]
Duct width

B_1 [mm]
Screw hole pitch of flange (horizontal)

B_2 [mm]
Overall dimension of flange (width)

H [mm]
Duct height

H_1 [mm]
Screw hole pitch of flange (vertical)

H_2 [mm]
Overall dimension of flange (height)

Dimensions of circular units

ØD [mm]
Basic units made of sheet steel: Outer diameter of the spigot; basic units made of plastic: Inside diameter of the spigot

$ØD_1$ [mm]
Pitch circle diameter of flanges

$ØD_2$ [mm]
Outer diameter of flanges

L [mm]
Length of unit including connecting spigot

L_1 [mm]
Length of casing or acoustic cladding

n [ ]
Number of flange screw holes

T [mm]
Flange thickness

General information

m [kg]
Unit weight without any attachments

NS [mm]
Nominal size

q_{vNom} [m³/h]; [l/s]
Nominal volume flow rate (100 %): The value depends on product type and nominal size. Values are published on the internet and in technical leaflets and stored in the Easy Product Finder design program.

Note on acoustic data: All sound pressure levels are based on a reference value of 20 µPa.

q_v [m³/h]; [l/s]
Volume flow rate

Δ_{qv} [%]
Volume flow rate accuracy

Δ_{pw}
Quantity measured with the sensor (in this case the differential pressure). Basis for the calculation of the actual volume flow rate or for the conversion into an electrical signal (linear to the volume flow rate) by an effective pressure transducer.

Lengths
All lengths are given in millimetres [mm] unless stated otherwise.

Volume flow rate measuring unit
Consists of a basic unit and an optional effective pressure transducer.

Basic unit
Unit for recording volume flow rates without an attached measuring transducer. The main components include the casing with sensor(s) to measure the effective pressure and the connection points for effective pressure tubes. In contrast to a volume flow controller, there is no damper blade. Distinguishing features of the basic unit: unit shape (geometry), materials and types of connection. The basic unit can either be prepared for manual measurement with a mobile differential pressure measuring unit or be fitted with an electric attachment for converting the effective pressure into an electrical (effective pressure transducer).

Effective pressure transducer
Electronic device mounted on the basic unit for measuring volume flow rates. The electronic device essentially consists of an effective pressure transducer. Important distinguishing features: Transducer for dynamic pressure measurements that is suitable for clean air or transducer for static pressure measurements that is suitable for contaminated air and interface(s) (analogue interface and digital bus interface).