TROX® TECHNIK
The art of handling air

TYPE VFL

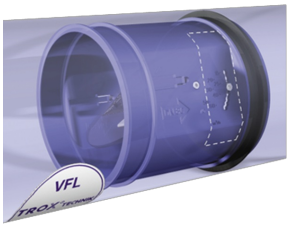
VOLUME FLOW LIMITER FOR INSERTION INTO DUCTING

Circular, mechanical self-powered controllers for insertion into ducting, for the quick and easy balancing of constant volume flow rates in ventilation and air conditioning systems

- Unique damper blade edge for acoustic optimisation
- Simple and quick commissioning on site
- Range of volume flow rate setpoints for each nominal size
- Precise and simple setting of volume flow rates using a scale
- Best accuracy among controllers for insertion
- Suitable for low airflow velocities from 0.8 m/s
- Any installation orientation; maintenance-free

VOLUME FLOW LIMITER TYPE VFL

TESTED TO VDI 6022



INSERT

SET THE VOLUME FLOW RATE

STICKER SHOWING VOLUME FLOW RATES

AERODYNAMIC DAMPER BLADE

Application

Application

- Circular volume flow limiters of Type VFL for the simple balancing of volume flow rates in air conditioning systems
- Mechanical self-powered volume flow limiter without external power supply
- Simplified project handling with orders based on nominal size
- Set the required volume flow rate using a scale

Special features

- Mechanical self-powered
- Low-friction bellows
- For circular ducts
- Lip seal for tight and secure fit
- Aerodynamically tested and factory set to a reference volume flow rate
- Sticker showing volume flow rates (in l/s, m³/h and cfm) that can be set each limiter

Nominal sizes

- 80, 100, 125, 150, 160, 200, 250

Description

Parts and characteristics

- Ready-to-commission limiter
- Damper blade with low-friction bearings
- Bellows that acts as an oscillation damper
- Leaf spring
- Lip seal
- Multi-level volume flow rate setpoint values

Construction features

- Circular casing
- Suitable for insertion into circular ducts to EN 1506 or EN 13180
- Lip seal for tight and secure fit
- Acoustically optimised damper blade with low-friction bearings and special bellows
- Different damper blade construction and volume flow rate sticker for nominal size 150

Materials and surfaces

- Casing and damper blade made of high-quality plastic, to UL 94, V0; to DIN 4102, material classification B2
- Leaf spring made of stainless steel
- Polyurethane bellows

Standards and guidelines

- Hygiene conforms to VDI 6022

Maintenance

- Maintenance-free as construction and materials are not subject to wear

TECHNICAL INFORMATION

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

Functional description

The volume flow limiter is a mechanical self-powered unit and works without external power supply. A damper blade with low-friction bearings is adjusted

by aerodynamic forces such that the set volume flow rate is limited as a consequence.

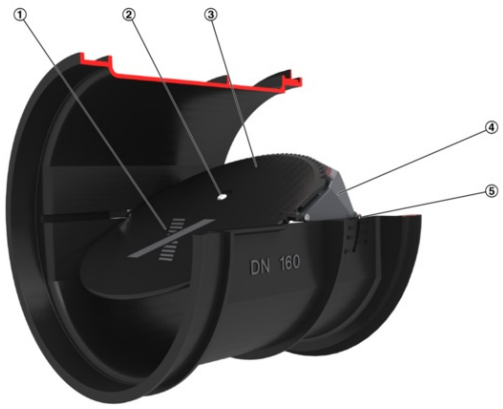
The aerodynamic forces of the airflow create a closing torque on the damper blade. The bellows extends and increases this force while at the same time acting as an oscillation damper. The closing force is countered by a leaf spring. As the differential pressure changes, the leaf spring adjusts the position of the damper blade such that the volume flow rate is limited.

Efficient commissioning

The volume flow limiter performs the previously tedious and expensive balancing of volume flow rates in ventilation and air conditioning systems.

Simple handling and perfect function help to save valuable working time on site. The required volume flow rate can be set at the point of installation, then the volume flow limiter is inserted into the duct. The set volume flow rate will then be limited and maintained within close tolerances.

Schematic illustration of the VFL



① Damper blade
② Bellows inlet
③ Bellows
④ Crossbar
⑤ Volume flow rate scale

Volume flow rate ranges

The volume flow limiters are factory set to the reference volume flow rate Vref. Customers can then simply set the required volume flow rate (setting values 1 to 11).

Nominal sizes	80 – 250 mm
Volume flow rate range	4 – 212 l/s or 14 – 764 m³/h
Volume flow rate control range	< 20 – 100 % of the nominal volume flow rate
Volume flow rate accuracy	approx. ± 10 % of the nominal volume flow rate
Minimum differential pressure	30 Pa
Maximum differential pressure	300 Pa
Operating temperature	10 – 50 °C

Quick sizing tables provide a good overview of the room sound pressure levels that can be expected. Approximate intermediate values can be interpolated. Precise intermediate values and spectral data can be calculated with our Easy Product Finder design programme.

The first selection criteria for the nominal size are the actual volume flow rates V_{min} and V_{max}. The quick sizing tables are based on generally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger air terminal unit and/or a silencer is required.

VFL, Sound pressure level at differential pressure 50 Pa

Nominal size	V		Air-regenerated noise
			L_{PA}
Nominal size	l/s	m³/h	dB (A)
80	4	14	30
	6	22	30
80	14	50	32
	20	73	33
80	23	82	34
100	5	18	31
	11	39	33
100	16	58	35
	26	92	36
100	34	122	37
125	11	39	36
	19	69	37
125	27	98	37
	42	150	38
125	54	195	39
150	14	50	32
	29	105	32
150	44	160	33
	57	205	33
150	74	265	34
160	16	58	26
	28	102	29
160	49	175	32
	67	242	34
160	90	323	36
200	26	94	23
	70	253	27

200	**109**	**391**	30
	134	**481**	31
200	**147**	**529**	31
250	**44**	**159**	23
	94	**337**	26
250	**144**	**519**	28
	175	**632**	28
250	**212**	**764**	28

Circular volume flow limiters in 7 nominal sizes, made of high-quality plastic, to limit and control volume flows in air conditioning systems.

Ready-to-commission unit which consists of the casing with setpoint scale and the control mechanism with leaf spring and low-friction, silicone-free bellows.

Easy insertion into circular ducts to EN 1506 or EN 13180; secure fit ensured by a lip seal.

Aerodynamically tested and factory set to a reference volume flow rate. Can be subsequently accurately adjusted within a volume flow rate range of at least 5 : 1.

Special features

- Mechanical self-powered
- Low-friction bellows
- For circular ducts
- Lip seal for tight and secure fit
- Aerodynamically tested and factory set to a reference volume flow rate
- Sticker showing volume flow rates (in l/s, m³/h and cfm) that can be set each limiter

Materials and surfaces

- Casing and damper blade made of high-quality plastic, to UL 94, V0; to DIN 4102, material classification B2
- Leaf spring made of stainless steel
- Polyurethane bellows

Technical data

- Nominal sizes: 80 – 250 mm
- Volume flow rate range: 4 to 212 l/s or 14 to 764 m³/h
- Volume flow rate control range: < 20 to 100 % of the nominal volume flow rate
- Volume flow rate accuracy: approx. ± 10 % of the nominal volume flow rate
- Minimum differential pressure: 30 Pa
- Maximum differential pressure: 300 Pa

Sizing data

- V _____ [m³/h]
- Δp_{st} _____ [Pa]

Air-regenerated noise

- L_{PA} _____ [dB(A)]

Order example: VFL/100

Nominal size	100 mm

1 Type		2 Nominal size [mm]
VFL	Volume flow limiter	80 100 125 150 160 200 250

Dimensions and weight, Product details

Anbauteile: VARYCONTROL Regelkomponenten

☒	Regel-größe	Schnittstelle	V_{min} -/ V_{max} - Verstellung	Differenzdruck- transmitter	Stellantrieb	Fabrikat
		Easyregler		Dynamisch		
Easy	V			Integriert	Integriert	①
		Compactregler		Dynamisch		
BC0	V	MP-Bus		Integriert	Integriert	②
BF0	V	MP-Bus		Integriert	Integriert	②
BL0	V	LonWorks		Integriert	Integriert	②
BM0	V	Modbus		Integriert	Integriert	②
BM0-J6	V	Modbus und steckerfertiger Anschlussleitung		Integriert	Integriert	②
XG0	V			Integriert	Integriert	③

XB0	V			Integriert	Integriert	③
LN0	V			Integriert	Integriert	⑤
LK0	V	KNX				⑤
LY0	V			Integriert	Integriert	⑤
		Compactregler		Statisch		
SA0	V			Integriert	Integriert	④
SC0	Δp			Integriert	Schnelllaufender Stellantrieb integriert	④
		Universalregler		Dynamisch		
B11	V			Integriert	Stellantrieb, Drehmoment für TVT	②
B13	V			Integriert	Stellantrieb	②
B27	V			Integriert	Stellantrieb	②
B1B	V			Integriert	Federrücklaufantrieb	②
XC3	V			Integriert	Federrücklaufantrieb	③
		Universalregler		Statisch		
BP1	V	MP-Bus		Separates Bauteil	Stellantrieb, Drehmoment für TVT	②
BP3	V	MP-Bus		Separates Bauteil	Stellantrieb	②
BPB	V	MP-Bus		Separates Bauteil	Federrücklaufantrieb	②
BPG	V	MP-Bus		Separates Bauteil	Schnelllaufender Stellantrieb	②
BB1	V			Separates Bauteil	Stellantrieb, Drehmoment für TVT	②
BB3	V			Separates Bauteil	Stellantrieb	②
BBB	V			Separates Bauteil	Federrücklaufantrieb	②
XD1	V			Integriert	Stellantrieb	③
XD3	V			Integriert	Federrücklaufantrieb	③
BR1	Δp	MP-Bus		100 Pa	Stellantrieb, Drehmoment für TVT	②
BR3	Δp	MP-Bus		100 Pa	Stellantrieb	②
BRB	Δp	MP-Bus		100 Pa	Federrücklaufantrieb	②
BRG	Δp	MP-Bus		100 Pa	Schnelllaufender Stellantrieb	②
BS1	Δp	MP-Bus		600 Pa	Stellantrieb, Drehmoment für TVT	②
BS3	Δp	MP-Bus		600 Pa	Stellantrieb	②
BSB	Δp	MP-Bus		600 Pa	Federrücklaufantrieb	②
BSG	Δp	MP-Bus		600 Pa	Schnelllaufender Stellantrieb	②
BG1	Δp			100 Pa	Stellantrieb, Drehmoment für TVT	②
BG3	Δp			100 Pa	Stellantrieb	②

BGB	Δp			100 Pa	Federrücklaufantrieb	②
BH1	Δp			600 Pa	Stellantrieb, Drehmoment für TVT	②
BH3	Δp			600 Pa	Stellantrieb	②
BHB	Δp			600 Pa	Federrücklaufantrieb	②
XE1	Δp			Integriert, 100 Pa	Stellantrieb	③
XE3	Δp			Integriert, 100 Pa	Federrücklaufantrieb	③
XF1	Δp			Integriert, 600 Pa	Stellantrieb	③
XF3	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
XF3	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
XF3	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
XF3	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
XF3	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
XF3	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③

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

☒ Bestellschlüsseldetail, V Volumenstrom, Δp Differenzdruck

Anbauteile: VARYCONTROL Regelkomponenten

☒	Regel- größe	Schnittstelle	V_{min} -/ V_{max} - Verstellung	Differenzdruck-transmitter	Stellantrieb	Fabrikat	LVC	TVR	TVJ	TVT	TZ-S	TA-S	TVZ	TVA	TVM	TVRK	TVLK
	Easyregler		**Dynamisch**														
Easy	V			Integriert	Integriert	①	●	●	●	●	●	●	●	●			
		Compactregler		**Dynamisch**													
BC0	V	MP-Bus		Integriert	Integriert	②	●	●	●	●	●	●	●	●			
BF0	V	MP-Bus		Integriert	Integriert	②									●		
BL0	V	LonWorks		Integriert	Integriert	②		●	●	●	●	●	●	●			
BM0	V	Modbus		Integriert	Integriert	②											
BM0-J6	V	Modbus und steckerfertiger Anschlussleitung		Integriert	Integriert	②											

XG0	V			Integriert	Integriert	③									●		
XB0	V			Integriert	Integriert	③		●	●	●	●	●	●	●			
LN0	V			Integriert	Integriert	⑤		●	●	●	●	●	●	●			
LK0	V	KNX				⑤											
LY0	V			Integriert	Integriert	⑤									●		
		Compactregler		**Statisch**													
SA0	V			Integriert	Integriert	④											
SC0	Δp			Integriert	Schnelllaufender Stellantrieb integriert	④											
		Universalregler		**Dynamisch**													
B11	V			Integriert	Stellantrieb, Drehmoment für TVT	②				●							
B13	V			Integriert	Stellantrieb	②		●	●		●	●	●	●			
B27	V			Integriert	Stellantrieb	②									●		
B1B	V			Integriert	Federrücklaufantrieb	②		●	●	●	●	●	●	●			
XC3	V			Integriert	Federrücklaufantrieb	③		●	●	●	●	●	●	●			
		Universalregler		**Statisch**													
BP1	V	MP-Bus		Separates Bauteil	Stellantrieb, Drehmoment für TVT	②				●							
BP3	V	MP-Bus		Separates Bauteil	Stellantrieb	②		●	●		●	●	●	●		●	●
BPB	V	MP-Bus		Separates Bauteil	Federrücklaufantrieb	②		●	●	●	●	●	●	●		●	
BPG	V	MP-Bus		Separates Bauteil	Schnelllaufender Stellantrieb	②		●	●	●	●	●	●	●		●	●
BB1	V			Separates Bauteil	Stellantrieb, Drehmoment für TVT	②				●							
BB3	V			Separates Bauteil	Stellantrieb	②		●	●		●	●	●	●		●	●
BBB	V			Separates Bauteil	Federrücklaufantrieb	②			●	●	●	●	●	●		●	
XD1	V			Integriert	Stellantrieb	③		●	●	●	●	●	●	●		●	
XD3	V			Integriert	Federrücklaufantrieb	③		●	●	●	●	●	●	●		●	
BR1	Δp	MP-Bus		100 Pa	Stellantrieb, Drehmoment für TVT	②				●							
BR3	Δp	MP-Bus		100 Pa	Stellantrieb	②		●	●		●	●	●	●		●	
BRB	Δp	MP-Bus		100 Pa	Federrücklaufantrieb	②		●	●	●	●	●	●	●		●	
BRG	Δp	MP-Bus		100 Pa	Schnelllaufender Stellantrieb	②		●			●	●	●	●		●	

BS1	Δp	MP-Bus		600 Pa	Stellantrieb, Drehmoment für TVT	②				●							
BS3	Δp	MP-Bus		600 Pa	Stellantrieb	②		●	●					●		●	
BSB	Δp	MP-Bus		600 Pa	Federrücklaufantrieb	②		●	●	●						●	
BSG	Δp	MP-Bus		600 Pa	Schnelllaufender Stellantrieb	②		●	●	●						●	
BG1	Δp			100 Pa	Stellantrieb, Drehmoment für TVT	②				●							
BG3	Δp			100 Pa	Stellantrieb	②		●	●		●	●	●	●		●	
BGB	Δp			100 Pa	Federrücklaufantrieb	②		●	●	●	●	●	●	●		●	
BH1	Δp			600 Pa	Stellantrieb, Drehmoment für TVT	②				●							
BH3	Δp			600 Pa	Stellantrieb	②		●	●							●	
BHB	Δp			600 Pa	Federrücklaufantrieb	②		●	●	●						●	
XE1	Δp			Integriert, 100 Pa	Stellantrieb	③		●	●	●	●	●	●	●		●	
XE3	Δp			Integriert, 100 Pa	Federrücklaufantrieb	③		●	●	●	●	●	●	●		●	
XF1	Δp			Integriert, 600 Pa	Stellantrieb	③		●	●	●						●	
XF3	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③		●	●	●						●	

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

☒ Bestellschlüsseldetail, V Volumenstrom, Δp Differenzdruck

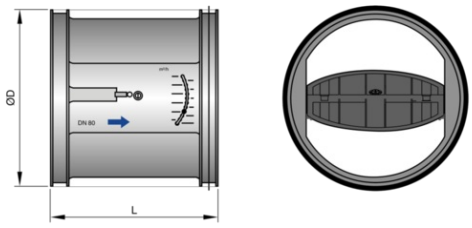
Anbauteile: VARYCONTROL Regelkomponenten

☒	Regel- größe	Schnittstelle	V_{min} -/ V_{max} - Verstellung	Differenzdruck- transmitter	Stellantrieb	Fabrikat
		Easylabregler		Statisch		
Elab	RS, RE, PC, C	TCU3		Integriert	Schnelllaufender Stellantrieb	
	RS, PC, C	TCU3		Integriert	Schnelllaufender Stellantrieb	
Elab	RE, PC, C	TCU3		Integriert	Schnelllaufender Stellantrieb	
	RS, RE, PC, FH, C	TCU3		Integriert	Schnelllaufender Stellantrieb	
		Elektronischer Regler		Statisch	Elektronischer Regler	
TMA	RS, RE, PC	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb	
TMB	RS, RE, PC	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb (bürstenloser Motor)	
TMA	RS, RE,	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb	
TMB	RS, RE,	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb (bürstenloser Motor)	
TMA	RE ,PC	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb	
TMB	RE ,PC	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb (bürstenloser Motor)	
TMA	RS, RE ,PC, FH	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb	
TMB	RS, RE ,PC, FH	TCU-LON-II mit LonWorks-Schnittstelle		Integriert	Schnelllaufender Stellantrieb (bürstenloser Motor)	
XF3	Δp			Integriert, 600 Pa	Federrücklaufantrieb	③
BB3	V			Separates Bauteil	Stellantrieb	②

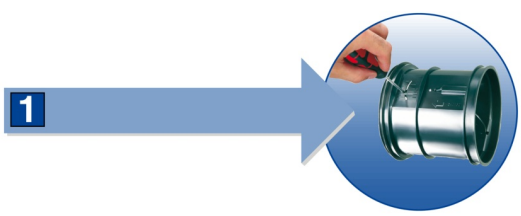
① TROX, ② TROX/Belimo, ③ TROX/Gruner, ④ Sauter, ⑤ Siemens

☒ Bestellschlüsseldetail, V Volumenstrom, Δp Differenzdruck

VFL



Set



Installation details, Basic information and nomenclature

Installation and commissioning

- Any installation orientation
- Set the required volume flow rate using a scale
- Insert the unit into the duct
- Mark the installation location

Upstream conditions

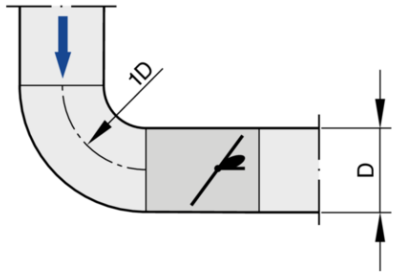
The volume flow rate accuracy ΔV applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require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

Free air intake only with a straight duct section of 1D upstream.

Space required for commissioning and maintenance

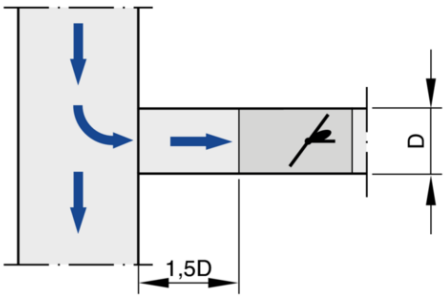
Sufficient space must be kept clear near any attachments to allow for commissioning and maintenance. It may be necessary to provide sufficiently sized inspection access openings.

Bend



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

Junction



A junction causes strong turbulence. The stated volume flow rate accuracy ΔV can only be achieved with a straight duct section of at least 1.5D upstream. Shorter upstream sections require a perforated plate in the branch and before the volume flow limiter. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Prinipal dimensions

ØD [mm]

Outside diameter of the spigot

ØD₁ [mm]

Pitch circle diameter of flanges

ØD₂ [mm]

Outside diameter of flanges

ØD₄ [mm]

Inside diameter of the screw holes of flanges

L [mm]

Length of unit including connecting spigot

L₁ [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]

Unit weight including the minimum required attachments for manual adjustment

Acoustic data

f_m [Hz]

Octave band centre frequency

L_{PA} [dB(A)]

A-weighted sound pressure level of air-regenerated noise of the VAV terminal unit, system attenuation taken into account

L_{PA1} [dB(A)]

A-weighted sound pressure level of air-regenerated noise of the VAV terminal unit with secondary silencer, system attenuation taken into account

L_{PA2} [dB(A)]

A-weighted sound pressure level of case-regenerated noise of the VAV terminal unit, system attenuation taken into account

L_{PA3} [dB(A)]

A-weighted sound pressure level of case-regenerated noise of the VAV terminal unit with acoustic cladding, system attenuation taken into account

All sound pressure levels are based on 20 µPa.

Volume flow rates

V_{nom} [m³/h] and [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 software.
- Upper limit of the setting range and maximum volume flow rate setpoint value for the CAV controller

V [m³/h] and [l/s]

Volume flow rate

ΔV [± %]

Volume flow rate tolerance from setpoint value

Differential pressure

Δp_{st} [Pa]

Static differential pressure

$\Delta p_{st\ min}$ [Pa]

Static differential pressure, minimum

- The static minimum differential pressure is equal to the pressure loss of the CAV controller when the damper blade is open, caused by flow resistance (bellows, crossbar)
- If the pressure on the CAV controller is too low, the setpoint volume flow rate may not be achieved, not even when the damper blade is open
- Important factor in designing the ductwork and in rating the fan including speed control
- Sufficient duct pressure must be ensured for all operating conditions and for all controllers, and the measurement point or points for speed control must have been selected accordingly to achieve this

Construction

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

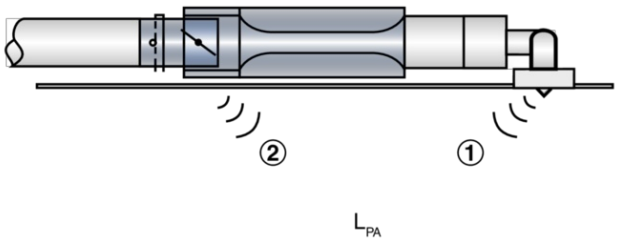
Powder-coated surface (P1)

- 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

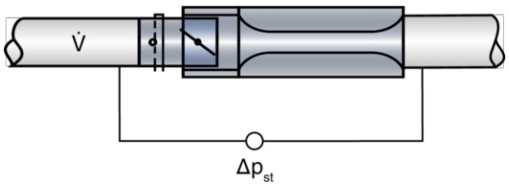
Definition of noise



① Air-regenerated noise
② Case-radiated noise

TROX® TECHNIK
The art of handling air

Static differential pressure



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