

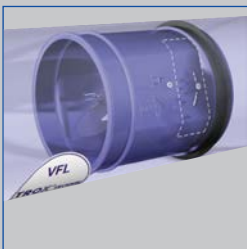
Aerodynamic damper blade



Sticker showing volume flow rates



Set the volume flow rate



Insert



Tested to VDI 6022

# CAV controllers

## 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

| Type |                                    | Page     |
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## 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
- 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, m<sup>3</sup>/h and cfm) that can be set each limiter

### Special features

#### 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

**Functional description**

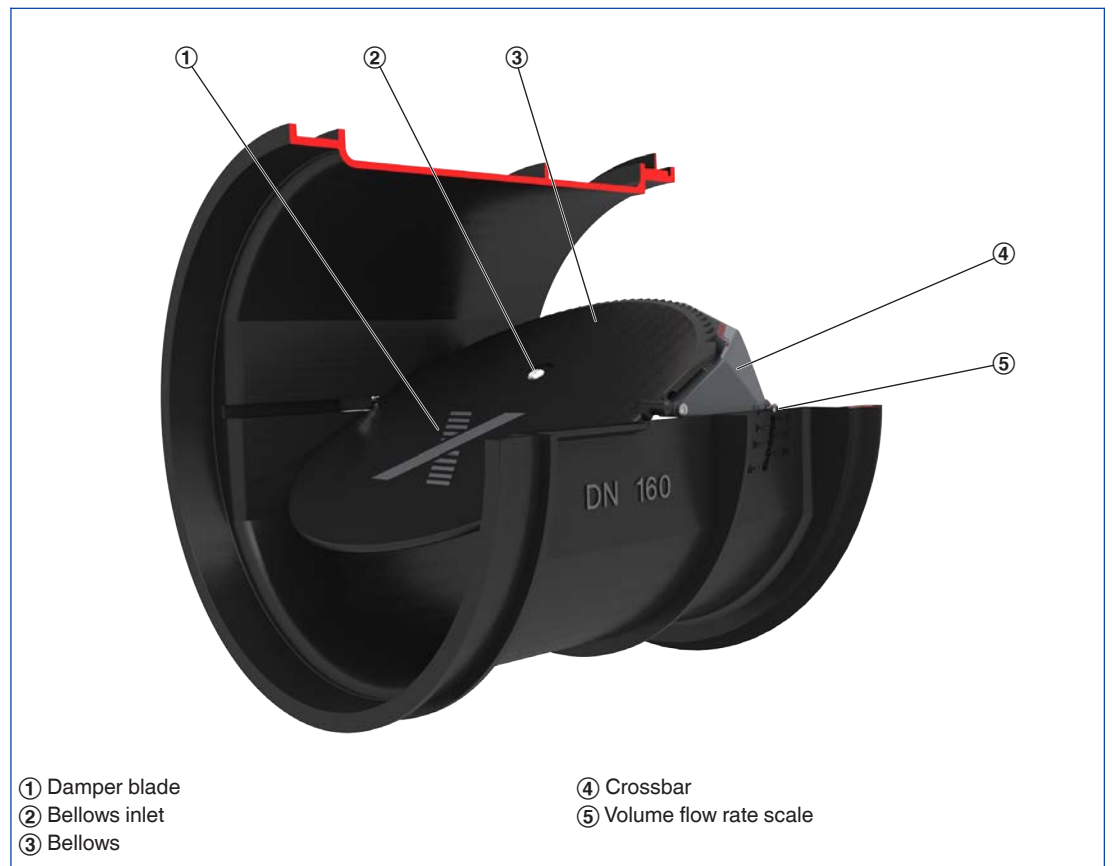
The volume flow limiter is a mechanical self-powered unit and works without external power supply. A damper blade with low-friction bearings is adjusted by aerodynamic forces such that the set volume flow rate is limited as a consequence. The aerodynamic forces of the airflow create a closing torque 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**



|                                |  |
|--------------------------------|--|
| Nominal sizes                  | 80 – 250 mm                                    |
| Volume flow rate range         | 4 – 212 l/s or 14 – 764 m <sup>3</sup> /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                                     |

#### Volume flow rate ranges

The volume flow limiters are factory set to the reference volume flow rate  $\dot{V}_{ref}$ . Customers can

then simply set the required volume flow rate (setting values 1 to 11).

#### Available volume flow rate setpoint values [m<sup>3</sup>/h]

| Nominal size | $\dot{V}$ |     |     |     |     |     |     |     |     |     |     | $\dot{V}_{Nenn}$<br>m <sup>3</sup> /h | $\dot{V}_{ref}$<br>m <sup>3</sup> /h |
|--------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------------------------------|--------------------------------------|
|              | 1         | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  |                                       |                                      |
| 80           | 14        | 17  | 22  | 28  | 33  | 39  | 50  | 62  | 73  | 82  | –   | 82                                    | 33                                   |
| 100          | 18        | 24  | 33  | 39  | 48  | 58  | 71  | 79  | 92  | 105 | 122 | 122                                   | 71                                   |
| 125          | 39        | 48  | 58  | 69  | 82  | 98  | 113 | 131 | 150 | 171 | 195 | 195                                   | 98                                   |
| 150          | 50        | 70  | 85  | 105 | 120 | 140 | 160 | 185 | 205 | 230 | 265 | 265                                   | 160                                  |
| 160          | 58        | 82  | 102 | 128 | 156 | 175 | 195 | 217 | 242 | 272 | 323 | 323                                   | 156                                  |
| 200          | 94        | 127 | 166 | 207 | 253 | 297 | 343 | 391 | 436 | 481 | 529 | 529                                   | 297                                  |
| 250          | 159       | 215 | 278 | 337 | 399 | 473 | 519 | 574 | 632 | 705 | 764 | 764                                   | 473                                  |

#### Available volume flow rate setpoint values [l/s]

| Nominal size | $\dot{V}$ |    |    |    |     |     |     |     |     |     |     | $\dot{V}_{Nenn}$<br>l/s | $\dot{V}_{ref}$<br>l/s |
|--------------|-----------|----|----|----|-----|-----|-----|-----|-----|-----|-----|-------------------------|------------------------|
|              | 1         | 2  | 3  | 4  | 5   | 6   | 7   | 8   | 9   | 10  | 11  |                         |                        |
| 80           | 4         | 5  | 6  | 8  | 9   | 11  | 14  | 17  | 20  | 23  | –   | 23                      | 9                      |
| 100          | 5         | 7  | 9  | 11 | 13  | 16  | 20  | 22  | 26  | 29  | 34  | 34                      | 20                     |
| 125          | 11        | 13 | 16 | 19 | 23  | 27  | 31  | 37  | 42  | 48  | 54  | 54                      | 27                     |
| 150          | 14        | 19 | 24 | 29 | 33  | 39  | 44  | 51  | 57  | 64  | 74  | 74                      | 44                     |
| 160          | 16        | 23 | 28 | 36 | 43  | 49  | 54  | 60  | 67  | 76  | 90  | 90                      | 43                     |
| 200          | 26        | 35 | 46 | 58 | 70  | 83  | 95  | 109 | 121 | 134 | 147 | 147                     | 83                     |
| 250          | 44        | 60 | 77 | 94 | 111 | 131 | 144 | 160 | 175 | 196 | 212 | 212                     | 131                    |

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  $\dot{V}_{\min}$  and  $\dot{V}_{\max}$ . 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 | $\dot{V}$ | $\dot{V}$         | Air-regenerated noise     |
|--------------|-----------|-------------------|---------------------------|
|              | l/s       | m <sup>3</sup> /h | L <sub>PA</sub><br>dB (A) |
| 80           | 4         | 14                | 30                        |
|              | 6         | 22                | 30                        |
|              | 14        | 50                | 32                        |
|              | 20        | 73                | 33                        |
|              | 23        | 82                | 34                        |
| 100          | 5         | 18                | 31                        |
|              | 11        | 39                | 33                        |
|              | 16        | 58                | 35                        |
|              | 26        | 92                | 36                        |
|              | 34        | 122               | 37                        |
| 125          | 11        | 39                | 36                        |
|              | 19        | 69                | 37                        |
|              | 27        | 98                | 37                        |
|              | 42        | 150               | 38                        |
|              | 54        | 195               | 39                        |
| 150          | 14        | 50                | 32                        |
|              | 29        | 105               | 32                        |
|              | 44        | 160               | 33                        |
|              | 57        | 205               | 33                        |
|              | 74        | 265               | 34                        |
| 160          | 16        | 58                | 26                        |
|              | 28        | 102               | 29                        |
|              | 49        | 175               | 32                        |
|              | 67        | 242               | 34                        |
|              | 90        | 323               | 36                        |
| 200          | 26        | 94                | 23                        |
|              | 70        | 253               | 27                        |
|              | 109       | 391               | 30                        |
|              | 134       | 481               | 31                        |
|              | 147       | 529               | 31                        |
| 250          | 44        | 159               | 23                        |
|              | 94        | 337               | 26                        |
|              | 144       | 519               | 28                        |
|              | 175       | 632               | 28                        |
|              | 212       | 764               | 28                        |

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 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, m<sup>3</sup>/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 m<sup>3</sup>/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

- $\dot{V}$  \_\_\_\_\_  
[m<sup>3</sup>/h]
- $\Delta p_{st}$  \_\_\_\_\_  
[Pa]
- Air-regenerated noise
- $L_{PA}$  \_\_\_\_\_  
[dB(A)]

VFL

|   |
|---|
| <b>VFL / 100</b><br>↓      ↓<br><b>1</b> <b>2</b> |
|---|

**1** Type

VFL Volume flow limiter

**2** Nominal size [mm]

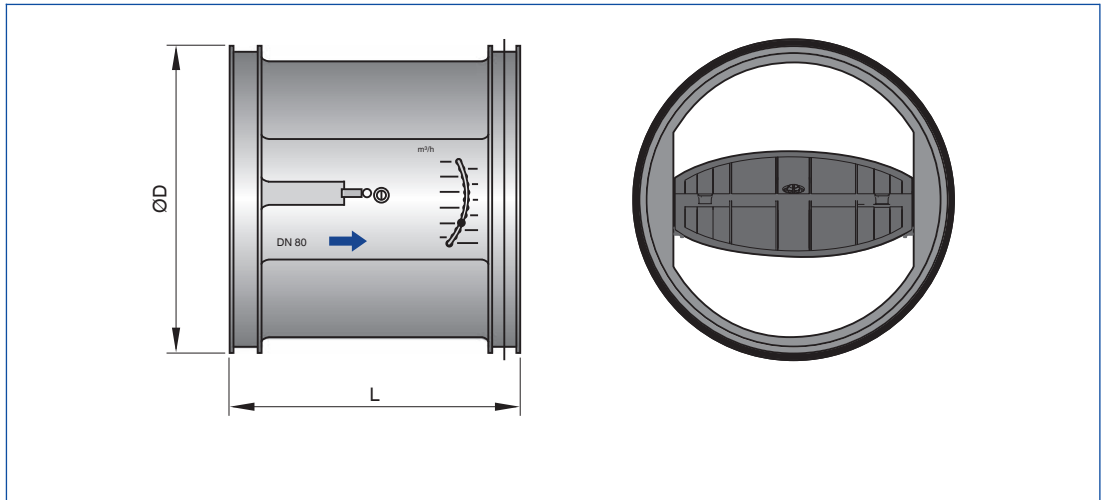
80  
100  
125  
150  
160  
200  
250

**Order example: VFL/100**

Nominal size

100 mm

VFL

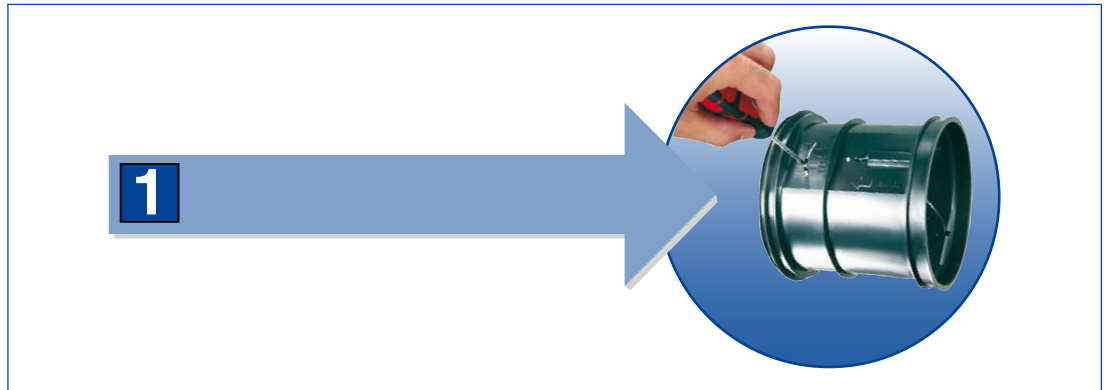


VFL

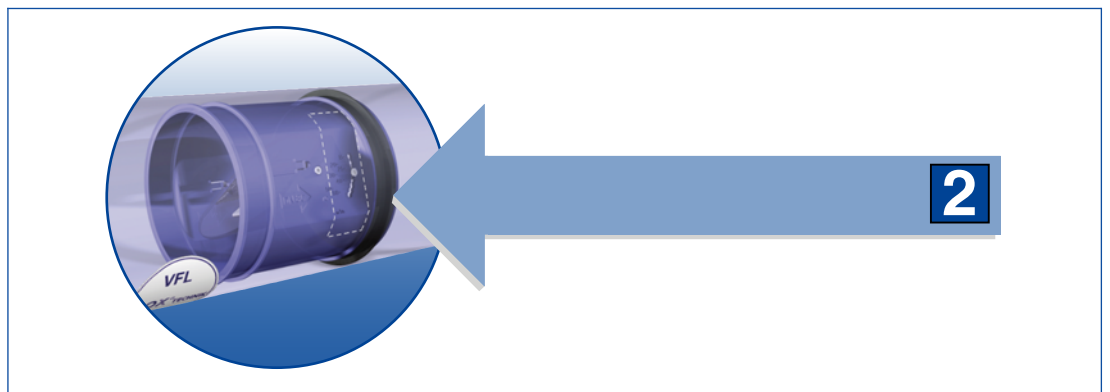
| Nominal size | ØD  | L   |  | m    |
|--------------|-----|-----|--|------|
|              | mm  | mm  |  | kg   |
| 80           | 78  | 86  |  | 0.10 |
| 100          | 98  | 100 |  | 0.15 |
| 125          | 122 | 118 |  | 0.25 |
| 160          | 156 | 148 |  | 0.40 |
| 200          | 196 | 175 |  | 0.50 |
| 250          | 246 | 220 |  | 0.70 |



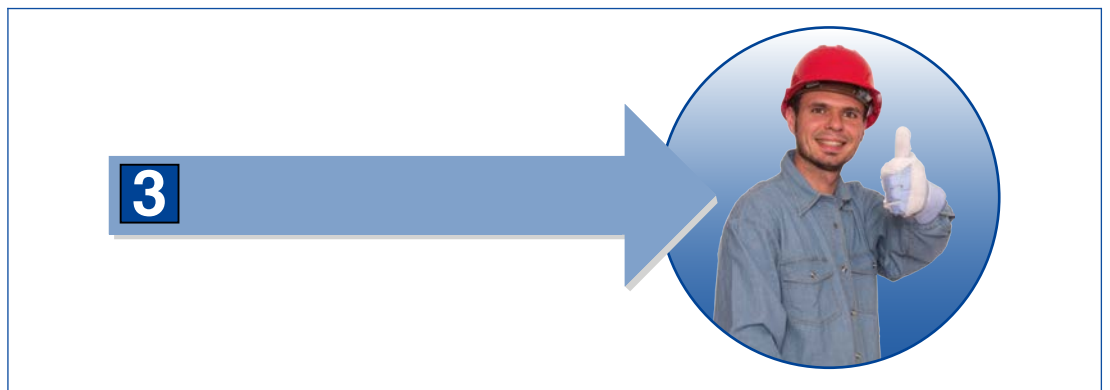
Set



Insert



Done



### Prinipal dimensions

#### ØD [mm]

Outside diameter of the spigot

#### ØD<sub>1</sub> [mm]

Pitch circle diameter of flanges

#### ØD<sub>2</sub> [mm]

Outside 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]

Unit weight including the minimum required attachments for manual adjustment

### Acoustic data

#### f<sub>m</sub> [Hz]

Octave band centre frequency

#### L<sub>PA</sub> [dB(A)]

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

#### L<sub>PA1</sub> [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<sub>PA2</sub> [dB(A)]

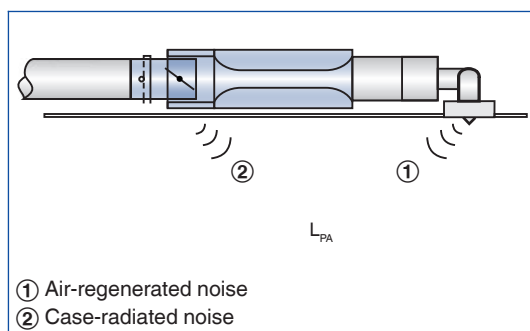
A-weighted sound pressure level of case-regenerated noise of the VAV terminal unit, system attenuation taken into account

#### L<sub>PA3</sub> [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.

### Definition of noise



### Volume flow rates

#### $\dot{V}_{nom}$ [m<sup>3</sup>/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

$\dot{V}$  [ $\text{m}^3/\text{h}$ ] and [ $\text{l/s}$ ]

Volume flow rate

$\Delta\dot{V}$  [ $\pm \%$ ]

Volume flow rate tolerance from setpoint value

### Differential pressure

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

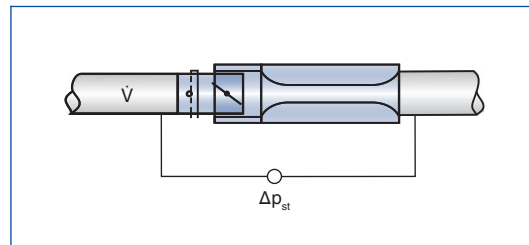
Static differential pressure

$\Delta p_{\text{st min}}$  [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,

### Static differential pressure



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