

VAV terminal units

Type LVC



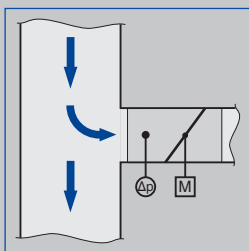
Compact controller



Easy controller



Nozzle for differential pressure measurement



For all upstream conditions



Tested to VDI 6022



For low airflow velocities and low duct pressures

Circular VAV terminal units for supply air and extract air systems with variable volume flows, low airflow velocities and low duct pressures

- New measurement principle, optimised for airflow velocities from 0.6 to 6 m/s
- High control accuracy even in case of unfavourable upstream conditions
- Electronic control components for different applications (Easy, Compact)
- Easy handling due to innovative control technique
- Casing length of only 310 mm for all nominal sizes
- Any installation orientation
- Closed blade air leakage to EN 1751, up to class 2
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Secondary silencer Type CA, CS or CF for the reduction of air-regenerated noise
- Hot water heat exchanger Type WL and electric air heater Type EL for reheating the airflow

Type		Page
LVC	General information	LVC – 2
	Function	LVC – 4
	Technical data	LVC – 5
	Quick sizing	LVC – 6
	Specification text	LVC – 7
	Order code	LVC – 8
	Attachments	LVC – 9
	Dimensions and weight	LVC – 10
	Product details	LVC – 11
	Installation details	LVC – 12
	Basic information and nomenclature	LVC – 14

Application

Application

- Circular VAV terminal units of Type LVC for the precise supply air or extract air flow control in variable air volume systems with low airflow velocities.
- Closed-loop volume flow control using an external power supply
- For low airflow velocities and low duct pressures
- Effective pressure (differential pressure) as the result of two measurements, one upstream and one downstream of the damper blade
- The relation between damper blade position and differential pressure is stored as a characteristic relationship in the controller

- Shut-off by means of switching (equipment supplied by others)

Special features

- Optimised for low airflow velocities from 0.6 to 6 m/s
- High control accuracy even in case of unfavourable upstream conditions
- Any installation orientation
- Volume flow rate control with Easy or Compact controller
- Casing length of only 310 mm

Nominal sizes

- 125, 160, 200, 250

Description

Parts and characteristics

- Ready-to-commission unit which consists of mechanical parts and control components.
- Plastic nozzle with integral damper blade to measure the volume flow rate
- Easy controller with potentiometers, indicator light, terminals, damper blade position indicator, and protective cover
- Wire clamping bracket
- Double lip seal
- Factory-assembled control components complete with wiring and tubing
- Aerodynamic function testing on a special test rig prior to shipping of each unit
- Set-up data is given on a label or volume flow rate scale affixed to the unit
- High control accuracy even in case of unfavourable upstream conditions

Attachments

- Easy controller: Compact unit consisting of controller with potentiometers, differential pressure transducer and actuator
- Compact controller: Compact unit consisting of controller, differential pressure transducer and actuator

Useful additions

- Secondary silencer Type CA, CS or CF for demanding acoustic requirements

Construction features

- Circular casing
- Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180
- Position of the damper blade indicated externally at shaft extension

Easy controller

- Screw terminals for the electrical connection
- Double terminals for looping the supply voltage, i.e. for the simple connection of voltage transmission
- Wire clamping bracket fixed to the casing

Compact controller

- Cable for the electrical connection

Materials and surfaces

- Casing made of galvanised sheet steel
- Nozzle, damper blade, and plain bearings made of ABS plastic, UL 94, flame retardant (V-0)
- Damper blade seal made of TPV (plastic)

Standards and guidelines

- Hygiene conforms to VDI 6022
- Closed blade air leakage to EN 1751, class 2 (nominal sizes 160 – 250, class 1)
- Nominal size 125 meets the general requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage

- Casing air leakage to EN 1751, class C

materials are not subject to wear

Maintenance

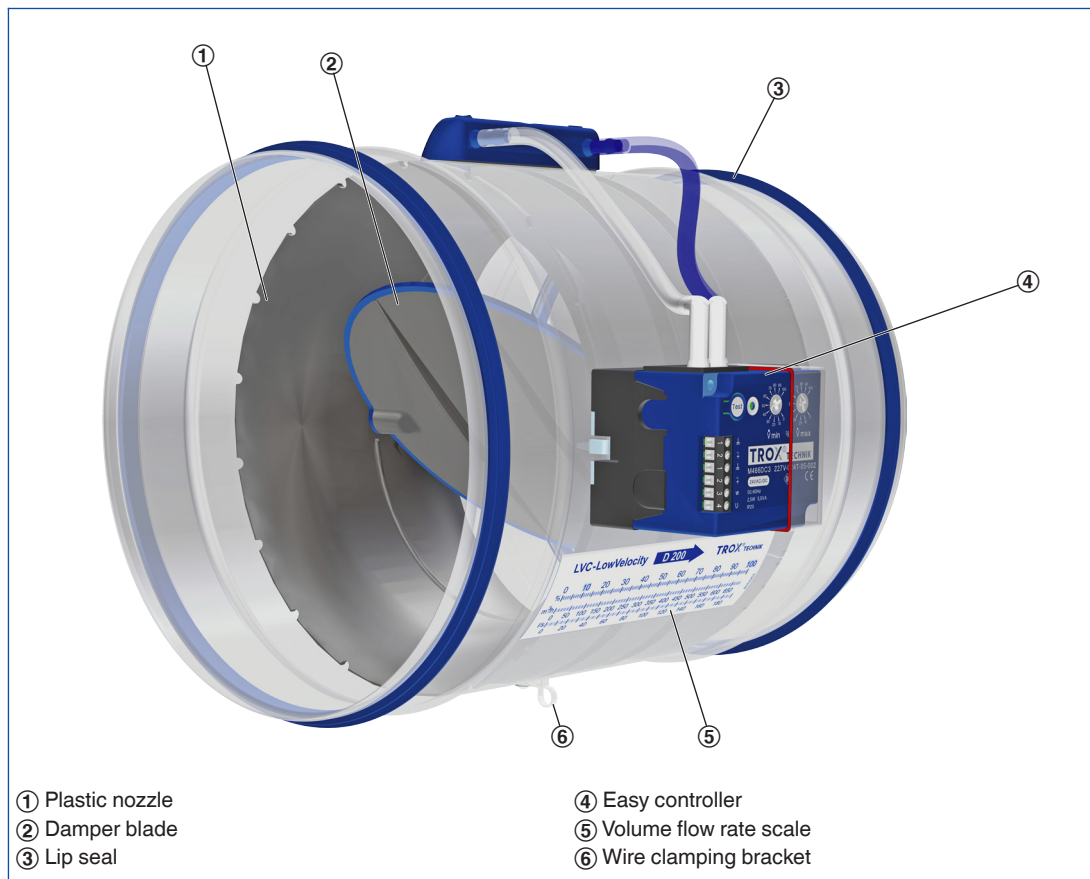
- Maintenance-free as construction and

Functional description

A new measurement principle makes it possible to measure low volume flow rates. The pressure is measured by means of a nozzle with tapings before (upstream) and after (downstream) the damper blade. The Easy controller or the Compact controller of the LVC determines the resulting

differential pressure (effective pressure) and compares it to the stored characteristic. This measurement principle is characterised by small measuring tolerances, and the upstream conditions do not have to meet any special requirements.

Schematic illustration of the LVC



Nominal sizes	125 – 250 mm
Volume flow rate range	8 – 300 l/s or 30 – 1080 m ³ /h
Volume flow rate control range	Approx. 10 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 30 Pa
Maximum differential pressure	600 Pa
Operating temperature	10 – 50 °C

Volume flow rate ranges

The minimum differential pressure of VAV terminal units is an 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 control units. The measurement points for fan speed control must be selected accordingly.

The volume flow rates given for VAV terminal units

depend on the nominal size and on the control component (attachment) that is installed. The table gives the minimum and maximum values for a VAV terminal unit. Some control components may only have a limited volume flow rate range. This applies in particular to control components with a static differential pressure transducer. For volume flow rate ranges for all control components refer to our Easy Product Finder design programme.

LVC, Volume flow rate ranges and minimum differential pressures

Nominal size	①	②	③	④			$\Delta\dot{V}$ ± %
	\dot{V}		$\Delta p_{st\ min}$				
	l/s	m ³ /h	Pa	Pa	Pa	Pa	
125	8	29	5	5	5	5	15
	30	108	5	5	5	6	12
	55	198	16	17	18	19	8
	75	270	30	32	34	35	5
160	12	43	5	5	5	5	15
	50	180	5	5	6	6	12
	85	306	15	16	16	17	8
	120	432	30	32	33	34	5
200	20	72	5	5	5	5	15
	75	270	5	5	5	5	12
	135	486	15	16	16	16	8
	190	684	30	31	32	33	5
250	30	108	5	5	5	5	15
	120	432	5	5	5	5	12
	210	756	15	15	15	16	8
	300	1080	30	31	32	32	5

① LVC

② LVC with secondary silencer CS/CF, insulation thickness 50 mm, length 500 mm

③ LVC with secondary silencer CS/CF, insulation thickness 50 mm, length 1000 mm

④ LVC with secondary silencer CS/CF, insulation thickness 50 mm, length 1500 mm

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.

LVC, Sound pressure level at differential pressure 50 Pa

Nominal size	\dot{V}	\dot{V}	Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
	l/s	m ³ /h	L _{PA}	L _{PA1}			L _{PA2}
			dB(A)				
125	8	29	27	<15	<15	<15	<15
	30	108	35	24	17	<15	17
	55	198	39	30	24	21	21
	75	270	42	34	28	25	23
160	12	43	29	19	<15	<15	<15
	50	180	34	26	23	19	19
	85	306	36	28	23	20	22
	120	432	38	31	26	23	24
200	20	72	31	21	<15	<15	<15
	75	270	35	26	19	17	19
	135	486	36	28	22	20	22
	190	684	36	28	23	21	24
250	30	108	31	24	18	16	17
	120	432	36	28	22	19	25
	210	756	36	28	22	20	28
	300	1080	36	29	23	21	31

- ① LVC
- ② LVC with secondary silencer CS/CF, insulation thickness 50 mm, length 500 mm
- ③ LVC with secondary silencer CS/CF, insulation thickness 50 mm, length 1000 mm
- ④ LVC with secondary silencer CS/CF, insulation thickness 50 mm, length 1500 mm

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

Circular VAV terminal units for variable air volume systems with low airflow velocities, suitable for supply or extract air, available in four nominal sizes.

Measurement and control of low volume flow rates based on a new measurement principle. Plastic nozzle with damper blade for measuring the differential pressure upstream and downstream of the damper blade (effective pressure). The relation between damper blade position and differential pressure is stored as a characteristic relationship in the Easy or Compact controller. This results in high control accuracy even in case of unfavourable upstream conditions.

Selection based on nominal size determination. Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Units are equipped with a plastic nozzle with integral damper blade.

The averaging differential pressure sensor is resistant to dust and pollution.

Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180.

Position of the damper blade indicated externally at shaft extension. Damper blade is factory set to open position which allows ventilation airflow even without control.

Closed blade air leakage to EN 1751, at least class 1.

Casing air leakage to EN 1751, class C.

Special features

- Optimised for low airflow velocities from 0.6 to 6 m/s
- High control accuracy even in case of unfavourable upstream conditions
- Any installation orientation
- Volume flow rate control with Easy or Compact controller
- Casing length of only 310 mm

Materials and surfaces

- Casing made of galvanised sheet steel
- Nozzle, damper blade, and plain bearings made of ABS plastic, UL 94, flame retardant (V-0)
- Damper blade seal made of TPV (plastic)

Technical data

- Nominal sizes: 125 to 250 mm
- Volume flow rate range: 8 to 300 l/s or 30 to 1080 m³/h
- Volume flow rate control range: approx. 10 – 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 30 Pa
- Maximum differential pressure: 600 Pa

Attachments

Variable volume flow control with electronic Easy controller to connect an external control signal; actual value signal can be integrated into the central BMS.

- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC
- Possible override controls with external switches using volt-free contacts: CLOSED, OPEN, \dot{V}_{\min} and \dot{V}_{\max}
- Potentiometers with percentage scales to set the volume flow rates \dot{V}_{\min} and \dot{V}_{\max}
- The actual value signal relates to the nominal volume flow rate such that commissioning and subsequent adjustment are simplified
- Volume flow rate control range: approx. 10 – 100 % of the nominal volume flow rate
- Clearly visible external indicator light for signalling the functions: Set, not set, and power failure

Electrical connections with screw terminals.

Double terminals for looping the supply voltage, i.e. for the simple connection of voltage transmission to the next controller.

Sizing data

- \dot{V} _____
[m³/h]
- Δp_{st} _____
[Pa]

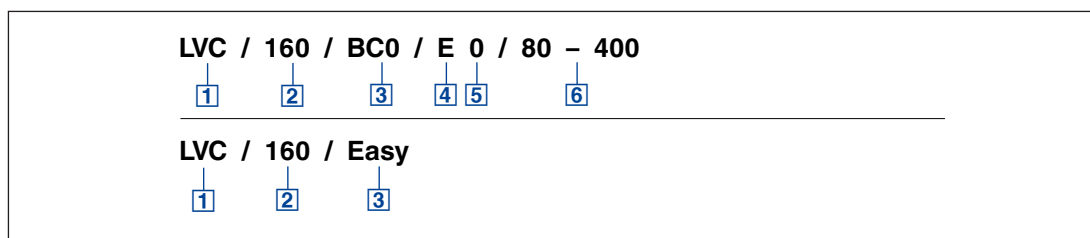
Air-regenerated noise

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

Case-radiated noise

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

LVC



1 Type

LVC VAV terminal unit

2 Nominal size [mm]

125
160
200
250

3 Attachments (control component)

Easy Easy controller
BC0 Compact controller

4 Operating mode

E Single
M Master
S Slave
F Constant value

5 Signal voltage range

For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

6 Volume flow rates [m³/h or l/s]

$\dot{V}_{\min} - \dot{V}_{\max}$ for factory setting

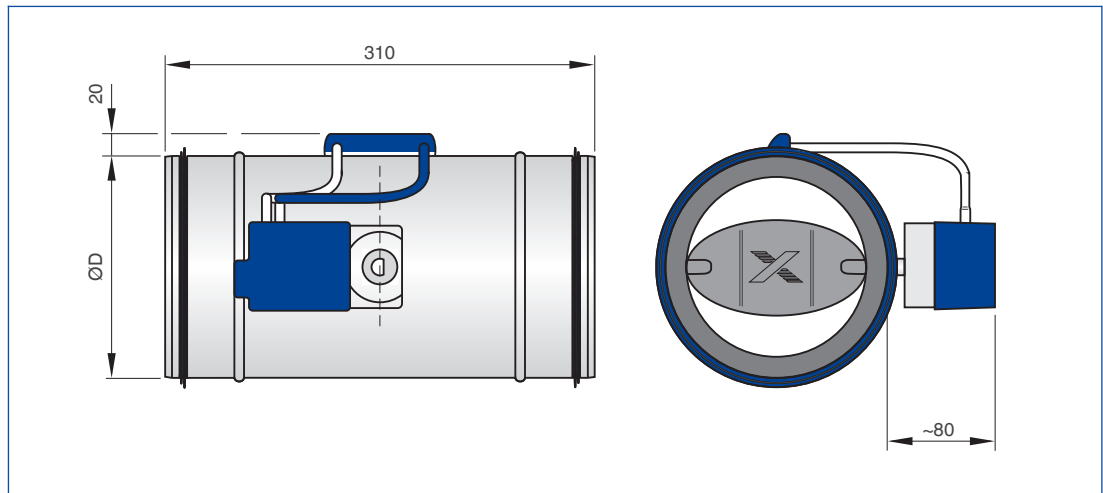
Order example: LVC/160/Easy

Nominal size	160 mm
Attachment	Easy controller

LVC, control components VARYCONTROL

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
Easy controller				
Easy	Volume flow rate	Easy controller TROX	Dynamic, integral	Integral
Compact controller				
BC0	Volume flow rate	Compact controller with MP bus interface TROX/Belimo	Dynamic, integral	Integral

LVC

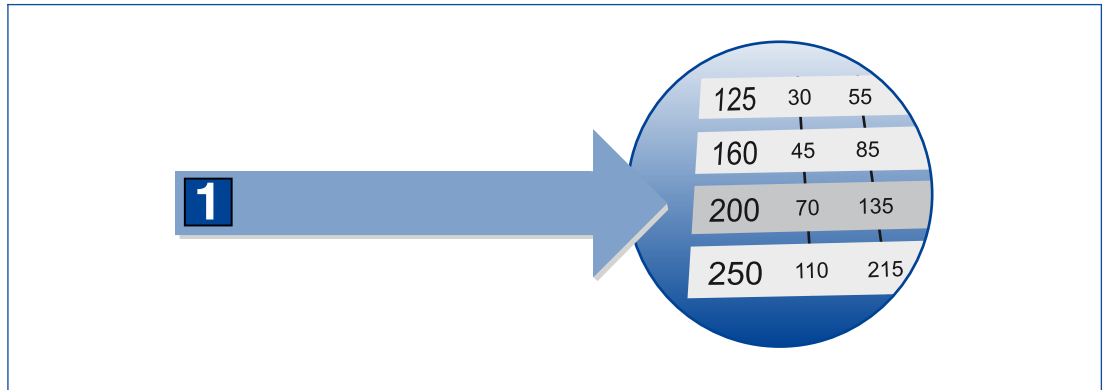


LVC

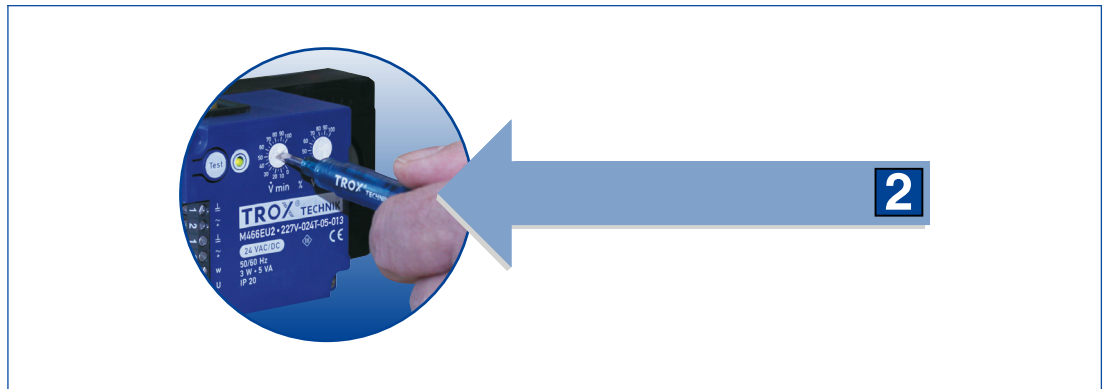
Nominal size	ØD	m
	mm	kg
125	124	1.5
160	159	1.9
200	199	2.1
250	249	2.7

The Easy principle

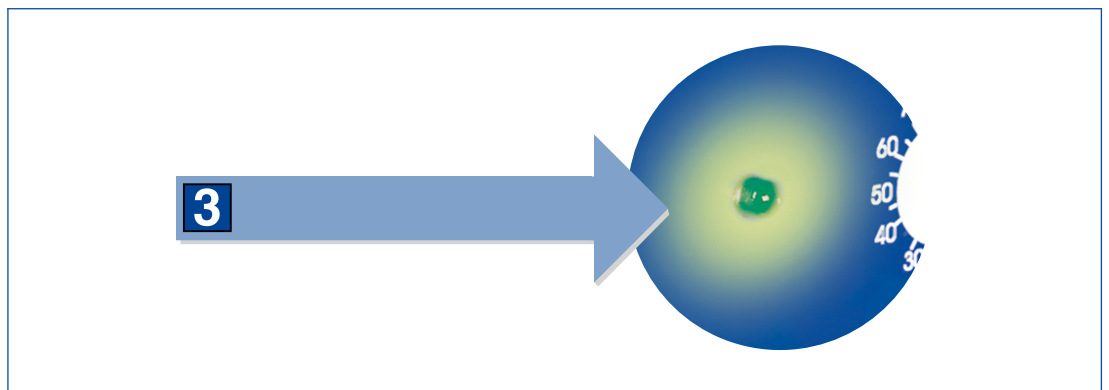
Select nominal size



Set flow rate



Green light: Ready!



Installation and commissioning

- Any installation orientation
- Selection based on nominal size determination
- Damper blade is factory set to open position which allows ventilation airflow even without control
- Can be installed at a junction

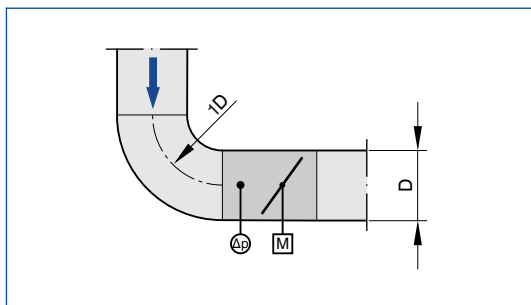
Upstream conditions

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.

Space required for commissioning and maintenance

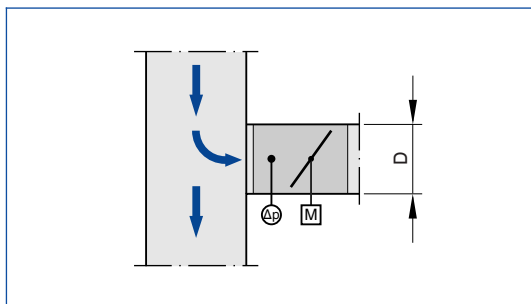
Sufficient space must be kept clear near any attachments to allow for commissioning and maintenance. It may be necessary to provide sufficiently sized inspection access openings.

Bend



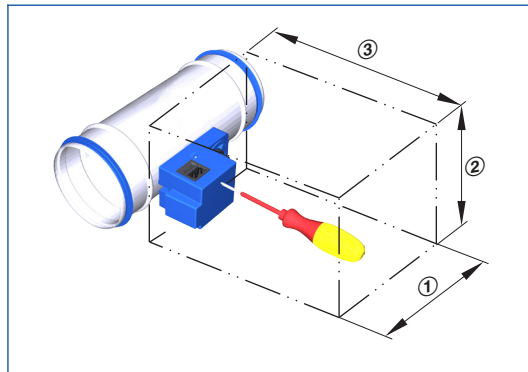
A bend with a centre line curvature radius of at least $1D$ – without an additional straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction



The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed in a branch just off the main duct.

Access to attachments, attached on one side



Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	370	200	300
Compact controller	370	200	200

Principal dimensions

ØD [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

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

B₁ [mm]

Screw hole pitch of flange (horizontal)

B₂ [mm]

Outside dimension of flange (width)

B₃ [mm]

Width of device

H [mm]

Duct height

H₁ [mm]

Screw hole pitch of flange (vertical)

H₂ [mm]

Outside dimension of flange (height)

H₃ [mm]

Unit height

n []

Number of flange screw holes

T [mm]

Flange thickness

m [kg]

Unit weight including the minimum required attachments (e.g. Compact controller)

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)]

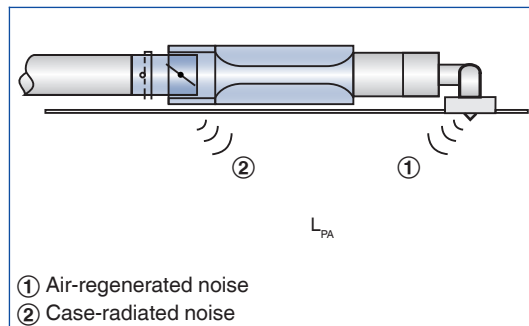
A-weighted sound pressure level of case-regenerated noise of the VAV terminal unit, system attenuation taken into account

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.

Definition of noise



Volume flow rates

\dot{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.
- Reference value for calculating percentages (e.g. \dot{V}_{\max})
- Upper limit of the setting range and maximum volume flow rate setpoint value for the VAV terminal unit

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

- Technically possible minimum volume flow rate
- The value depends on product type, nominal size and control component (attachment)
 - Values are stored in the Easy Product Finder design software
 - Lower limit of the setting range and minimum volume flow rate setpoint value for the VAV terminal unit
 - Depending on the controller, setpoint values below $\dot{V}_{\min \text{ unit}}$ (if \dot{V}_{\min} equals zero) may result in unstable control or shut-off

\dot{V}_{\max} [m^3/h] and [l/s]

- Upper limit of the operating range for the VAV terminal unit that can be set by customers
- \dot{V}_{\max} can only be smaller than or equal to \dot{V}_{nom}
 - In case of analog signalling to volume flow controllers (which are typically used), the set maximum value (\dot{V}_{\max}) is allocated to the

setpoint signal maximum (10 V) (see characteristic)

\dot{V}_{\min} [m^3/h] and [l/s]

- Lower limit of the operating range for the VAV terminal unit that can be set by customers
- \dot{V}_{\min} should be smaller than or equal to \dot{V}_{\max}
 - Do not set \dot{V}_{\min} smaller than $\dot{V}_{\min \text{ unit}}$, otherwise the control may become unstable or the damper blade may close
 - \dot{V}_{\min} may equal zero
 - In case of analog signalling to volume flow controllers (which are typically used), the set minimum value (\dot{V}_{\min}) is allocated to the setpoint signal minimum (0 or 2 V) (see characteristic)

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

Volume flow rate

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

Volume flow rate tolerance from setpoint value

$\Delta\dot{V}_{\text{warm}}$ [$\pm \%$]

Volume flow rate tolerance for the warm air flow of dual duct terminal units

Differential pressure

Δp_{st} [Pa]

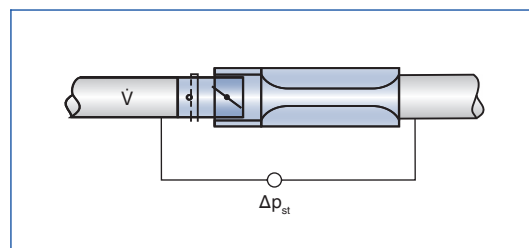
Static differential pressure

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

- Static differential pressure, minimum
- The static minimum differential pressure is equal to the pressure loss of the VAV terminal unit when the damper blade is open, caused by flow resistance (sensor tubes, damper mechanism)

- If the pressure on the VAV terminal unit 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 terminal units, and the measurement point or points for speed control must have been selected accordingly to achieve this

Static differential pressure



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