

Visual display of the damper blade position



Unit with two controllers



Tested to VDI 6022



ATEX certification

CAV controllers

EN-Ex



For the precise control of norma to high constant volume flows in potentially explosive atmospheres (ATEX)

Rectangular, mechanical self-powered volume flow controllers for the control of supply air or extract air in constant air volume systems, approved and certified for potentially explosive atmospheres (ATEX)

- ATEX-compliant construction
- Approved for gases, mists, vapours and dusts in zones 1, 2, 21 and 22
- Suitable for volume flow rates up to 12,600 m³/h or 3,500 l/s
- Volume flow rate adjustment from outside by rotary knob
- High control accuracy
- No on-site test measurements required for commissioning
- Casing air leakage tested to EN 1751, class C
- Visual display of damper blade position for operating point optimisation

Optional equipment and accessories

- Acoustic cladding for the reduction of case-radiated noise
- Secondary silencer Type TX for the reduction of air-regenerated noise

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General information

Application

- Rectangular EXCONTROL CONSTANTFLOW CAV controllers of Type EN for supply air / extract air volume flow control in constant air volume systems
- For use in potentially explosive atmospheres (ATEX)
- Mechanical self-powered volume flow control without external power supply
- Simplified project handling with orders based on nominal size

Special characteristics

- ATEX mark and certification
- ATEX equipment-group II, approved for zones 1, 2, 21 and 22
- Volume flow rate setpoint can be set from outside by rotary knob
- High control accuracy of the set volume flow
- Any installation orientation
- Correct operation even under unfavourable upstream conditions
- Visual display of damper blade position for operating point optimisation

Nominal sizes

- 19 nominal sizes from 200 × 100 – 600 × 600 mm

Variants

- EN-Ex: Volume flow controller
- EN-Ex-D: Volume flow controller with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TX for demanding acoustic requirements

Construction

- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)

Parts and characteristics

- Ready-to-commission controller
- Damper blade with low-friction bearings
- Bellows that acts as an oscillation damper
- Cam plate with leaf spring
- Rotary knob with pointer and scale for setting the volume flow setpoint value
- Aerodynamic functional testing of each unit on a special test rig prior to shipping
- Visual display of damper blade position for operating point optimisation

Classification

- Zones 1 and 2 (atmosphere: gases): II 2 G c II T5/T6
- Zones 21 and 22 (atmosphere: dusts): II 2 D c II T 80 °C

Useful additions

- Secondary silencer Type TX

Construction features

- Rectangular casing
- Construction and materials comply with the EU directive for use in potentially explosive atmospheres (ATEX)
- Flanges on both sides, suitable for duct connection
- Volume flow controllers from H = 400 mm are fitted with two damper blades and two volume flow rate scales

Materials and surfaces

Galvanised sheet steel construction

- Casing and damper blade made of galvanised sheet steel
- Leaf spring made of stainless steel
- Polyurethane bellows
- Plain bearings with PTFE coating
- Cam plate and adjusting unit made of galvanised sheet steel

Powder-coated construction (P1)

- Casing and damper blade made of galvanised sheet steel, powder-coated
- Leaf spring made of stainless steel
- Polyurethane bellows
- Plain bearings with PTFE coating
- Cam plate and adjusting unit made of galvanised sheet steel

Variant with acoustic cladding (-D)

- Acoustic cladding made of galvanised sheet steel
- Rubber profile for the insulation of structure-borne noise
- Lining is mineral wool

Mineral wool

- To EN 13501, fire rating class A1, non-combustible
- RAL quality mark RAL-GZ 388
- Biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EC

Standards and guidelines

- Casing air leakage tested to EN 1751, class C
- Hygiene conforms to VDI 6022
- ATEX Directive 2014/34/EC: Equipment and protective systems intended for use in potentially explosive atmospheres

Maintenance

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

Function

Functional description

The volume flow controller 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 maintained within the differential pressure range. The aerodynamic forces of the airflow create a closing torque on the damper blade. The bellows expand and increase this force while at the same time acting as an oscillation damper. The closing force is countered by a leaf spring that unrolls over a cam plate. The shape of the cam plate is such that a change in the differential pressure leads to an adjustment of the damper blade in a way that the volume flow rate is maintained almost exactly. As a result, the volume flow rate remains constant within narrow tolerances.

Efficient commissioning

The volume flow rate setpoint value can be set quickly and easily using the rotary knob on the external scale; no measurements are required. The advantage over flow adjustment dampers is that there is no need for repeat measurements or adjustments during commissioning. If the system pressure changes, e.g. by opening or closing a string when using flow adjustment dampers, the volume flow rates in the entire system changes. This is not the case with the use of mechanically independent volumetric flow controllers. A mechanical self-powered controller reacts immediately and adjusts the damper blade such that the set constant volume flow rate is maintained.

Schematic illustration of the EN-Ex



- ① Damper blade
- ② Bellows
- ③ Bellows inlet
- ④ Scale sticker

- ⑤ Connection for equipotential bonding
- ⑥ Visual display of the damper blade position
- ⑦ Rotary knob

Technical data

Nominal sizes	200 × 100 – 600 × 600 mm
Volume flow rate range	39 – 3500 l/s or 140 – 12600 m³/h
Volume flow rate control range	Approx. 25 to 100 % of the nominal volume flow rate
Scale accuracy	± 4 %
Minimum differential pressure	50 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 to 50 °C

Volume flow rate ranges

The minimum differential pressure of CAV controllers is an important factor in designing the ductwork and in rating the fan (including speed control). Sufficient differential pressure must be

ensured for all operating conditions and for all control units. The measurement points for fan speed control must be selected accordingly.

Volume flow rate ranges and minimum differential pressure values

NS	qv [l/s]	qv [m³/h]	① Δpstmin [Pa]	② Δpstmin [Pa]	Δqv [±%]
200 x 100	39	140	50	7	17
200 x 100	68	246	50	22	11
200 x 100	104	376	50	51	8
200 x 100	164	590	50	125	5
300 x 100	65	234	50	9	13
300 x 100	137	492	50	39	8
300 x 100	199	716	50	82	6
300 x 100	260	936	50	140	5
300 x 150	82	295	50	5	15
300 x 150	152	547	50	17	10
300 x 150	294	1059	50	64	6
300 x 150	460	1656	50	157	5
300 x 200	120	432	50	6	14
300 x 200	197	710	50	16	10
300 x 200	349	1257	50	51	7
300 x 200	515	1854	50	111	5
400 x 200	200	720	50	9	12
400 x 200	337	1213	50	27	8
400 x 200	585	2106	50	80	6
400 x 200	875	3150	50	179	4
500 x 200	180	648	50	5	15
500 x 200	271	977	50	11	11
500 x 200	554	1995	50	46	7
500 x 200	900	3240	50	122	5
600 x 200	225	810	50	5	15
600 x 200	381	1370	50	15	10
600 x 200	689	2480	50	49	7
600 x 200	1010	3636	50	106	5
400 x 250	200	720	50	6	14
400 x 250	333	1198	50	17	10
400 x 250	537	1932	50	43	7
400 x 250	885	3186	50	117	5

			①	②	
NS	qv [l/s]	qv [m³/h]	Δpstmin [Pa]	Δpstmin [Pa]	Δqv [±%]
500 x 250	235	846	50	5	15
500 x 250	460	1655	50	20	9
500 x 250	815	2932	50	64	6
500 x 250	1190	4284	50	136	5
600 x 250	300	1080	50	6	14
600 x 250	499	1795	50	17	10
600 x 250	897	3231	50	54	7
600 x 250	1310	4716	50	114	5
400 x 300	310	1116	50	10	12
400 x 300	553	1992	50	32	8
400 x 300	902	3249	50	85	6
400 x 300	1280	4608	50	171	4
500 x 300	365	1314	50	9	12
500 x 300	535	1928	50	19	9
500 x 300	998	3593	50	66	6
500 x 300	1580	5688	50	166	4
600 x 300	350	1260	50	6	14
600 x 300	669	2409	50	21	9
600 x 300	1137	4094	50	60	6
600 x 300	1750	6300	50	142	5
400 x 400	400	1440	50	9	12
400 x 400	674	2425	50	27	8
400 x 400	1170	4212	50	80	6
400 x 400	1750	6300	50	179	4
500 x 400	360	1296	50	5	15
500 x 400	715	2574	50	19	9
500 x 400	1330	4787	50	66	6
500 x 400	1800	6480	50	122	5
600 x 400	450	1620	50	5	15
600 x 400	958	3448	50	24	9
600 x 400	1595	5741	50	66	6
600 x 400	2020	7272	50	106	5
500 x 500	470	1692	50	5	15
500 x 500	1143	4113	50	31	8
500 x 500	1882	6776	50	85	6
500 x 500	2380	8568	50	136	5
600 x 500	600	2160	50	6	14
600 x 500	1246	4487	50	26	8
600 x 500	2084	7503	50	72	6
600 x 500	2620	9432	50	114	5
600 x 600	700	2520	50	6	14
600 x 600	1948	7014	50	44	7
600 x 600	2921	10517	50	99	5
600 x 600	3500	12600	50	142	5

① EN-Ex

② Secondary silencer TX (to be considered additionally)

Quick sizing

Quick sizing tables provide a good overview of the room sound pressure levels that can be expected. The first selection criteria for the nominal size are the actual volume flow rates $q_{v,min}$ and $q_{v,max}$. Intermediate values can be interpolated. Precise results

and spectral data can be calculated with our Easy Product Finder design programme. 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 or acoustic cladding are required.

EN-Ex, sound pressure level at differential pressure 150 Pa

NS	qv [l/s]	qv [m³/h]	①	②	③	④
			Air-regenerated noise [dB(A)]		Case-radiated noise	
200 x 100	39	140	40	23	26	18
200 x 100	68	246	44	29	31	23
200 x 100	104	376	47	34	35	27
200 x 100	164	590	50	38	38	31
300 x 100	65	234	41	26	28	20
300 x 100	137	492	47	35	35	28
300 x 100	199	716	48	38	38	33
300 x 100	260	936	49	40	41	36
300 x 150	82	295	43	26	30	21
300 x 150	152	547	47	32	35	27
300 x 150	294	1059	49	36	40	33
300 x 150	460	1656	50	38	44	38
300 x 200	120	432	44	29	31	23
300 x 200	197	710	47	33	36	29
300 x 200	349	1257	49	37	42	36
300 x 200	515	1854	51	39	46	41
400 x 200	200	720	45	30	34	25
400 x 200	337	1213	47	33	39	31
400 x 200	585	2106	50	37	45	38
400 x 200	875	3150	53	40	49	43
500 x 200	180	648	47	29	34	23
500 x 200	271	977	48	30	37	27
500 x 200	554	1995	49	33	42	33
500 x 200	900	3240	50	36	45	38
600 x 200	225	810	48	28	36	25
600 x 200	381	1370	48	29	39	29
600 x 200	689	2480	48	32	43	34
600 x 200	1010	3636	49	33	45	37
400 x 250	200	720	44	28	32	23
400 x 250	333	1198	46	30	37	28
400 x 250	537	1932	48	33	41	33
400 x 250	885	3186	49	36	45	38
500 x 250	235	846	47	28	35	24
500 x 250	460	1655	47	30	39	29
500 x 250	815	2932	47	32	42	34
500 x 250	1190	4284	47	34	44	37
600 x 250	300	1080	47	29	37	26
600 x 250	499	1795	47	30	39	30
600 x 250	897	3231	47	32	43	35

			①	②	③	④
NS	qv [l/s]	qv [m³/h]	Air-regenerated noise [dB(A)]		Case-radiated noise	
600 x 250	1310	4716	47	34	45	37
400 x 300	310	1116	44	29	35	27
400 x 300	553	1992	47	33	41	33
400 x 300	902	3249	50	36	46	39
400 x 300	1280	4608	52	39	50	43
500 x 300	365	1314	47	30	38	28
500 x 300	535	1928	48	31	40	31
500 x 300	998	3593	48	33	44	36
500 x 300	1580	5688	49	35	47	39
600 x 300	350	1260	47	29	37	26
600 x 300	669	2409	47	30	41	31
600 x 300	1137	4094	47	32	43	35
600 x 300	1750	6300	47	34	46	39
400 x 400	400	1440	45	29	37	28
400 x 400	674	2425	47	33	42	34
400 x 400	1170	4212	50	37	48	41
400 x 400	1750	6300	53	40	52	46
500 x 400	360	1296	47	28	37	26
500 x 400	715	2574	48	31	42	32
500 x 400	1330	4787	49	34	46	38
500 x 400	1800	6480	50	36	48	41
600 x 400	450	1620	48	28	39	28
600 x 400	958	3448	48	30	43	34
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500 x 500	1143	4113	47	31	43	34
500 x 500	1882	6776	47	33	45	38
500 x 500	2380	8568	47	34	47	40
600 x 500	600	2160	47	29	40	29
600 x 500	1246	4487	47	31	44	35
600 x 500	2084	7503	47	32	47	39
600 x 500	2620	9432	47	34	48	40
600 x 600	700	2520	47	29	40	29
600 x 600	1948	7014	47	31	46	37
600 x 600	2921	10517	47	33	48	40
600 x 600	3500	12600	47	34	49	42

① EN-Ex, L_{PA}

② EN-Ex, L_{PA1} , with secondary silencer TX

③ EN-Ex, L_{PA2}

④ EN-Ex-D, L_{PA3}

The sound power levels for calculating the sound pressure levels were measured in the TROX laboratory according to DIN EN ISO 5135 – see "Basic information and nomenclature".

Specification text

This specification text describes the general properties of the product. Text for variants can be generated with our Easy

Product Finder design programme.

Specification text

Rectangular volume flow controllers for constant air volume systems, mechanical self-powered, without external power supply, suitable for supply or extract air, available in 19 nominal sizes.

Ready-to-commission unit consists of the casing containing a damper blade with low-friction bearings, bellows, external cam plate and leaf spring. The volume flow controllers are factory-adjusted and preset to a reference volume flow rate. Sound power level measured according to DIN EN ISO 5135. Meets the hygiene requirements according to VDI 6022. Meets the requirements of ATEX Directive 2014/34 EU.

Special characteristics

- ATEX mark and certification
- ATEX equipment-group II, approved for zones 1, 2, 21 and 22
- Volume flow rate setpoint can be set from outside by rotary knob
- High control accuracy of the set volume flow
- Any installation orientation
- Correct operation even under unfavourable upstream conditions
- Visual display of damper blade position for operating point optimisation

Materials and surfaces

Galvanised sheet steel construction

- Casing and damper blade made of galvanised sheet steel
- Leaf spring made of stainless steel
- Polyurethane bellows
- Plain bearings with PTFE coating
- Cam plate and adjusting unit made of galvanised sheet steel

Powder-coated construction (P1)

- Casing and damper blade made of galvanised sheet steel, powder-coated
- Leaf spring made of stainless steel
- Polyurethane bellows
- Plain bearings with PTFE coating
- Cam plate and adjusting unit made of galvanised sheet steel

Variant with acoustic cladding (-D)

- Acoustic cladding made of galvanised sheet steel

- Rubber profile for the insulation of structure-borne noise
- Lining is mineral wool

Mineral wool

- To EN 13501, fire rating class A1, non-combustible
- RAL quality mark RAL-GZ 388
- Biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EC

Construction

- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)

Technical data

- Nominal sizes: 200 × 100 to 600 × 600 mm
- Volume flow rate range: 39 – 3500 l/s or 140 – 12600 m³/h
- Volume flow rate control range: approx. 25 – 100 % of the nominal volume flow rate
- Minimum differential pressure: 50 Pa
- Maximum differential pressure: 1000 Pa
- Casing air leakage to EN 1751, class C

Sizing data

- q_v _____ [m³/h]
- Δp_{st} _____ [Pa]

Air-regenerated noise

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

Case-radiated noise

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

Order code

EN-Ex – D – P1 / 400 × 200
| | | |
1 2 3 4

1 Type EN-Ex

Volume flow controllers

4 Nominal size [mm]

B × H

2 Acoustic cladding

No entry: none

D With acoustic cladding

3 Material

No entry: galvanised sheet steel

P1 Powder-coated RAL 7001, silver grey

Order example: EN-Ex-D/200×100

Acoustic cladding

With

Material

Galvanised sheet steel

Nominal size

200 × 100 mm

Variants

EN-Ex



Application

- Volume flow controller for constant air volume flow control

EN-Ex-D



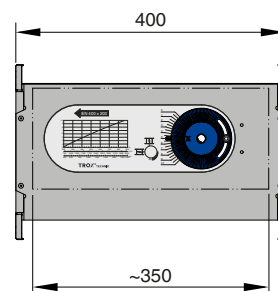
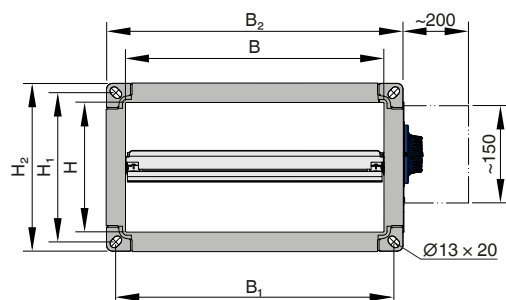
Application

- Volume flow controller with acoustic cladding for constant air volume flow control
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The rectangular ducts for the room under consideration must have adequate acoustic insulation (provided by others) on the fan and room ends
- Acoustic cladding cannot be retrofitted

Dimensions

EN-Ex

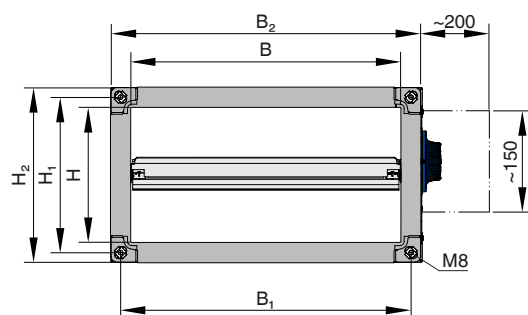
EN-Ex



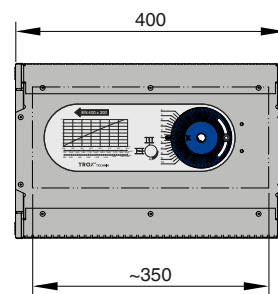
Product specific data EN-Ex

NS	B	H	B ₁	B ₂	H ₁	H ₂	kg
200 × 100	200	100	230	260	130	160	4
300 × 100	300	100	330	360	130	160	5
300 × 150	300	150	330	360	180	210	6
300 × 200	300	200	330	360	230	260	6
400 × 200	400	200	430	460	230	260	7
400 × 250	400	250	430	460	280	310	8
400 × 300	400	300	430	460	330	360	8,5
400 × 400	400	400	430	460	430	460	13
500 × 200	500	200	530	560	230	260	8,5
500 × 250	500	250	530	560	280	310	9
500 × 300	500	300	530	560	330	360	9,5
500 × 400	500	400	530	560	430	460	14,5
500 × 500	500	500	530	560	530	560	15,5
600 × 200	600	200	630	660	230	260	10
600 × 250	600	250	630	660	280	310	10,5
600 × 300	600	300	630	660	330	360	11,5
600 × 400	600	400	630	660	430	460	17
600 × 500	600	500	630	660	530	560	18
600 × 600	600	600	630	660	630	660	20

EN-Ex-D



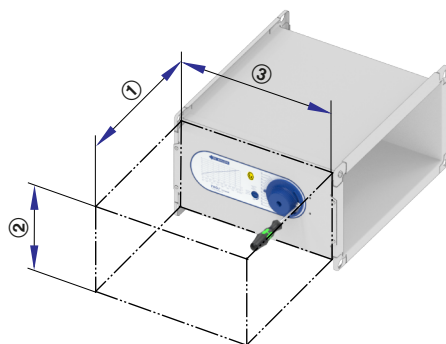
EN-Ex-D



Product specific data EN-Ex-D

NS	B	H	B ₁	B ₂	H ₁	H ₂	kg
200 × 100	200	100	230	260	130	160	6,5
300 × 100	300	100	330	360	130	160	8
300 × 150	300	150	330	360	180	210	9
300 × 200	300	200	330	360	230	260	10
400 × 200	400	200	430	460	230	260	12
400 × 250	400	250	430	460	280	310	13
400 × 300	400	300	430	460	330	360	14
400 × 400	400	400	430	460	430	460	18
500 × 200	500	200	530	560	230	260	14
500 × 250	500	250	530	560	280	310	14,5
500 × 300	500	300	530	560	330	360	15,5
500 × 400	500	400	530	560	430	460	20,5
500 × 500	500	500	530	560	530	560	22
600 × 200	600	200	630	660	230	260	15,5
600 × 250	600	250	630	660	280	310	16,5
600 × 300	600	300	630	660	330	360	18
600 × 400	600	400	630	660	430	460	23
600 × 500	600	500	630	660	530	560	25
600 × 600	600	600	630	660	630	660	27,5

En-Ex Installation space



Space required

①	②	③
200	H	200

H: Unit height

Product details

Installation and commissioning

- Any installation orientation (from $H = 500$ mm, the horizontal air duct must be installed so that the operating side is positioned to the side (right / left) or below)
- Equipotential bonding to be provided by others
- Volume flow rate setpoint can be set from outside by rotary knob
- Loosen and lock the rotary knob with hexagonal socket screw
- No repeat measurements or adjustments required during commissioning
- EN-Ex-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

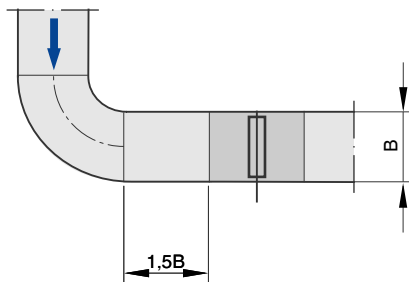
Upstream conditions

The volume flow rate accuracy Δq_v applies to straight upstream. 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. Free air intake only with a straight duct section of $1.5B$ or $1.5H$ upstream.

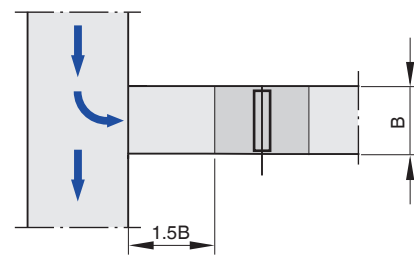
Space required for commissioning and maintenance

Sufficient space must be clear near to allow for commissioning and maintenance. If necessary, inspection openings of sufficient size are required.

Bend, horizontal



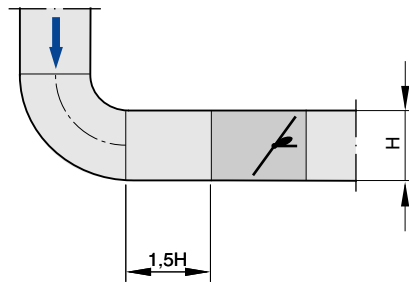
Junction, horizontal



The stated volume flow rate accuracy Δq_v can only be achieved with a straight duct section of at least $1.5B$ upstream between any bend and the controller.

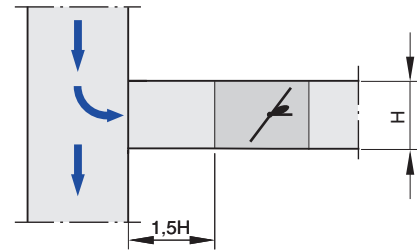
A junction causes strong turbulence. The stated volume flow rate accuracy Δq_v can only be achieved with a straight duct section of at least $1.5B$ upstream. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Bend, vertical



The stated volume flow rate accuracy Δq_v can only be achieved with a straight duct section of at least 1.5H upstream between any bend and the controller.

Junction, vertical



A junction causes strong turbulence. The stated volume flow rate accuracy Δq_v can only be achieved with a straight duct section of at least 1.5H upstream. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Explanation

<p>NS [mm] Nominal size</p>	<p>L_{PA2} [dB(A)] A-weighted sound pressure level of case-regenerated noise of the CAV terminal unit, system attenuation taken into account</p>
<p>B [mm] Duct width</p>	<p>L_{PA3} [dB(A)] A-weighted sound pressure level of case-regenerated noise of the CAV terminal unit with acoustic cladding, system attenuation taken into account</p>
<p>B_1 [mm] Screw hole pitch of flange (horizontal)</p>	
<p>B_2 [mm] Outside dimension of flange (width)</p>	<p>Δ_{pst} [Pa] Static differential pressure</p>
<p>H [mm] Duct height</p>	<p>$\Delta_{pst\ min}$ [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 differential 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.</p>
<p>H_1 [mm] Screw hole pitch of flange (vertical)</p>	
<p>H_2 [mm] Outside dimension of flange (height)</p>	
<p>m [kg] Unit weight including the minimum required attachments for manual adjustment</p>	<p>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 software. Reference value for calculating percentages (e.g. q_{vmax}). Upper limit of the setting range and maximum volume flow rate setpoint value for the VAV terminal unit.</p>
<p>f_m [Hz] Octave band centre frequency</p>	
<p>L_{PA} [dB(A)] A-weighted sound pressure level of air-regenerated noise of the CAV controllers, system attenuation taken into account</p>	<p>q_v [m³/h]; [l/s] Volume flow rate</p>
<p>L_{PA1} [dB(A)] A-weighted sound pressure level of air-regenerated noise of the CAV terminal unit with secondary silencer, system attenuation taken into account</p>	<p>Δ_{qv} [± %] Volume flow rate tolerance from setpoint value</p>