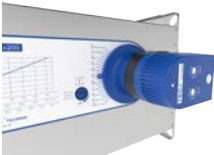




Visual display of the damper blade position



Actuator for switching between setpoint values or steady operation



Unit with two controllers



Tested to VDI 6022

CAV controllers

EN



For the precise control of normal to high constant volume flows

Rectangular self-powered volume flow controllers for the control of supply air or extract air in constant air volume systems

- Suitable for volume flow rates up to 7416 cfm
- Volume flow rate adjustment from outside by rotary knob
- Easy retrofitting of an actuator for volume flow setpoint adjustment
- 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
- Hot water heat exchanger of Type WT for reheating the airflow
- Actuator for switching between setpoint values or steady operation

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General information

Application

- Rectangular CONSTANTFLOW CAV controllers of Type EN for supply air / extract air volume flow control in constant air volume systems
- Mechanical self-powered volume flow control without external power supply
- Simplified project handling with orders based on nominal size

Special characteristics

- 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
- Easy retrofitting of an actuator for volume flow setpoint adjustment

Nominal sizes

- 19 nominal sizes from 8" x 4" – 24" x 24"

Variants

- EN: Volume flow controller
- EN-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

Attachments

- Min/Max actuators: Actuators for switching between minimum and maximum volume flow rate setpoint values
- Modulating actuators: Actuators for the infinite adjustment of volume flow rates or to switch between minimum and maximum volume flow rate setpoint values

- EN with actuator only up to H = 12"

Useful additions

- Secondary silencer Type TX
- Heat exchanger Type WT

Construction features

- Rectangular casing
- Flanges on both sides, suitable for duct connection
- Volume flow controllers from H = 16" are fitted with two damper blades and two volume flow rate scales
- Acoustic cladding cannot be retrofitted

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

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



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

- ⑤ Visual display of the damper blade position
- ⑥ Rotary knob
- ⑦ Actuator (optional)

Technical data

Nominal sizes	8" x 4" – 24" x 24"
Volume flow rate range	82 – 7416 cfm
Volume flow rate control range	Approx. 25 to 100 % of the nominal volume flow rate
Scale accuracy	± 4 %
Minimum differential pressure	0.2 in WC
Maximum differential pressure	4 in WC
Operating temperature	50 to 122 °F

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 [cfm]	① Δpstmin [in WC]	② Δpstmin [in WC]	Δqv [±%]
8" x 4"	39	82	0.2	0.03	17
8" x 4"	68	145	0.2	0.1	11
8" x 4"	104	221	0.2	0.2	8
8" x 4"	164	347	0.2	0.5	5
12" x 4"	65	138	0.2	0.04	13
12" x 4"	137	290	0.2	0.2	8
12" x 4"	199	421	0.2	0.3	6
12" x 4"	260	551	0.2	0.6	5
12" x 6"	82	174	0.2	0.02	15
12" x 6"	152	322	0.2	0.07	10
12" x 6"	294	623	0.2	0.3	6
12" x 6"	460	975	0.2	0.6	5
12" x 8"	120	254	0.2	0.02	14
12" x 8"	197	418	0.2	0.06	10
12" x 8"	349	740	0.2	0.2	7
12" x 8"	515	1091	0.2	0.4	5
16" x 8"	200	424	0.2	0.04	12
16" x 8"	337	714	0.2	0.1	8
16" x 8"	585	1240	0.2	0.3	6
16" x 8"	875	1854	0.2	0.7	4
20" x 8"	180	381	0.2	0.02	15
20" x 8"	271	575	0.2	0.04	11
20" x 8"	554	1174	0.2	0.2	7
20" x 8"	900	1907	0.2	0.5	5
24" x 8"	225	477	0.2	0.02	15
24" x 8"	381	806	0.2	0.06	10
24" x 8"	689	1460	0.2	0.2	7
24" x 8"	1010	2140	0.2	0.4	5
16" x 10"	200	424	0.2	0.02	14
16" x 10"	333	705	0.2	0.07	10
16" x 10"	537	1137	0.2	0.2	7
16" x 10"	885	1875	0.2	0.5	5

NS	qv [l/s]	qv [cfm]	①	②	$\Delta qv [\pm\%]$
			Δp_{stmin} [in WC]	Δp_{stmin} [in WC]	
20" x 10"	235	498	0.2	0.02	15
20" x 10"	460	974	0.2	0.08	9
20" x 10"	815	1726	0.2	0.3	6
20" x 10"	1190	2521	0.2	0.5	5
24" x 10"	300	636	0.2	0.02	14
24" x 10"	499	1056	0.2	0.07	10
24" x 10"	897	1902	0.2	0.2	7
24" x 10"	1310	2776	0.2	0.5	5
16" x 12"	310	657	0.2	0.04	12
16" x 12"	553	1172	0.2	0.1	8
16" x 12"	902	1912	0.2	0.3	6
16" x 12"	1280	2712	0.2	0.7	4
20" x 12"	365	773	0.2	0.04	12
20" x 12"	535	1135	0.2	0.08	9
20" x 12"	998	2115	0.2	0.3	6
20" x 12"	1580	3348	0.2	0.7	4
24" x 12"	350	742	0.2	0.02	14
24" x 12"	669	1418	0.2	0.08	9
24" x 12"	1137	2410	0.2	0.2	6
24" x 12"	1750	3708	0.2	0.6	5
16" x 16"	400	848	0.2	0.04	12
16" x 16"	674	1427	0.2	0.1	8
16" x 16"	1170	2479	0.2	0.3	6
16" x 16"	1750	3708	0.2	0.7	4
20" x 16"	360	763	0.2	0.02	15
20" x 16"	715	1515	0.2	0.08	9
20" x 16"	1330	2818	0.2	0.3	6
20" x 16"	1800	3814	0.2	0.5	5
24" x 16"	450	953	0.2	0.02	15
24" x 16"	958	2029	0.2	0.1	9
24" x 16"	1595	3379	0.2	0.3	6
24" x 16"	2020	4280	0.2	0.4	5
20" x 20"	470	996	0.2	0.02	15
20" x 20"	1143	2421	0.2	0.1	8
20" x 20"	1882	3988	0.2	0.3	6
20" x 20"	2380	5043	0.2	0.5	5
24" x 20"	600	1271	0.2	0.02	14
24" x 20"	1246	2641	0.2	0.1	8
24" x 20"	2084	4416	0.2	0.3	6
24" x 20"	2620	5551	0.2	0.5	5
24" x 24"	700	1483	0.2	0.02	14
24" x 24"	1948	4128	0.2	0.2	7
24" x 24"	2921	6190	0.2	0.4	5
24" x 24"	3500	7416	0.2	0.6	5

① EN

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_{vmin} and q_{vmax} . 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, sound pressure level at differential pressure 0.6 in WC

NS	qv [l/s]	qv [cfm]	①	②	③	④
			Air-regenerated noise [dB(A)]		Case-radiated noise	
8" x 4"	39	82	40	23	26	18
8" x 4"	68	145	44	29	31	23
8" x 4"	104	221	47	34	35	27
8" x 4"	164	347	50	38	38	31
12" x 4"	65	138	41	26	28	20
12" x 4"	137	290	47	35	35	28
12" x 4"	199	421	48	38	38	33
12" x 4"	260	551	49	40	41	36
12" x 6"	82	174	43	26	30	21
12" x 6"	152	322	47	32	35	27
12" x 6"	294	623	49	36	40	33
12" x 6"	460	975	50	38	44	38
12" x 8"	120	254	44	29	31	23
12" x 8"	197	418	47	33	36	29
12" x 8"	349	740	49	37	42	36
12" x 8"	515	1091	51	39	46	41
16" x 8"	200	424	45	30	34	25
16" x 8"	337	714	47	33	39	31
16" x 8"	585	1240	50	37	45	38
16" x 8"	875	1854	53	40	49	43
20" x 8"	180	381	47	29	34	23
20" x 8"	271	575	48	30	37	27
20" x 8"	554	1174	49	33	42	33
20" x 8"	900	1907	50	36	45	38
24" x 8"	225	477	48	28	36	25
24" x 8"	381	806	48	29	39	29
24" x 8"	689	1460	48	32	43	34
24" x 8"	1010	2140	49	33	45	37
16" x 10"	200	424	44	28	32	23
16" x 10"	333	705	46	30	37	28
16" x 10"	537	1137	48	33	41	33
16" x 10"	885	1875	49	36	45	38
20" x 10"	235	498	47	28	35	24
20" x 10"	460	974	47	30	39	29
20" x 10"	815	1726	47	32	42	34
20" x 10"	1190	2521	47	34	44	37
24" x 10"	300	636	47	29	37	26
24" x 10"	499	1056	47	30	39	30
24" x 10"	897	1902	47	32	43	35

NS	qv [l/s]	qv [cfm]	①	②	③	④
			Air-regenerated noise [dB(A)]		Case-radiated noise	
24" x 10"	1310	2776	47	34	45	37
16" x 12"	310	657	44	29	35	27
16" x 12"	553	1172	47	33	41	33
16" x 12"	902	1912	50	36	46	39
16" x 12"	1280	2712	52	39	50	43
20" x 12"	365	773	47	30	38	28
20" x 12"	535	1135	48	31	40	31
20" x 12"	998	2115	48	33	44	36
20" x 12"	1580	3348	49	35	47	39
24" x 12"	350	742	47	29	37	26
24" x 12"	669	1418	47	30	41	31
24" x 12"	1137	2410	47	32	43	35
24" x 12"	1750	3708	47	34	46	39
16" x 16"	400	848	45	29	37	28
16" x 16"	674	1427	47	33	42	34
16" x 16"	1170	2479	50	37	48	41
16" x 16"	1750	3708	53	40	52	46
20" x 16"	360	763	47	28	37	26
20" x 16"	715	1515	48	31	42	32
20" x 16"	1330	2818	49	34	46	38
20" x 16"	1800	3814	50	36	48	41
24" x 16"	450	953	48	28	39	28
24" x 16"	958	2029	48	30	43	34
24" x 16"	1595	3379	48	32	47	38
24" x 16"	2020	4280	49	33	48	40
20" x 20"	470	996	47	28	38	27
20" x 20"	1143	2421	47	31	43	34
20" x 20"	1882	3988	47	33	45	38
20" x 20"	2380	5043	47	34	47	40
24" x 20"	600	1271	47	29	40	29
24" x 20"	1246	2641	47	31	44	35
24" x 20"	2084	4416	47	32	47	39
24" x 20"	2620	5551	47	34	48	40
24" x 24"	700	1483	47	29	40	29
24" x 24"	1948	4128	47	31	46	37
24" x 24"	2921	6190	47	33	48	40
24" x 24"	3500	7416	47	34	49	42

① EN, L_{PA}

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

③ EN, L_{PA2}

④ EN-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 reference volume flow rate. Sound power level measured according to DIN EN ISO 5135. Meets the hygiene requirements according to VDI 6022.

Special characteristics

- 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
- Easy retrofitting of an actuator for volume flow setpoint adjustment

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: 8" x 4" to 24" x 24"
- Volume flow rate range: 82 – 7416 cfm
- Volume flow rate control range: approx. 25 – 100 % of the nominal volume flow rate
- Minimum differential pressure: 0.2 in WC
- Maximum differential pressure: 4 in WC
- Casing air leakage to EN 1751, class C

Sizing data

- q_v _____ [cfm]
- Δp_{st} _____ [in WC]

Air-regenerated noise

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

Case-radiated noise

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

Order code

EN - D - P1 / 16 × 8 / E01
 1 2 3 4 5

1 Type

EN Volume flow controller

2 Acoustic cladding

No entry: none

D With acoustic cladding

3 Material

No entry: galvanised sheet steel

P1 Powder-coated RAL 7001, silver grey

4 Nominal size [in]

B × H

5 Actuator

No entry: none

E01 24 V AC/DC, 3-point (Min/Max), potentiometer

E02 230 V AC, 3-point (Min/Max), potentiometer

E03 24 V AC/DC, modulating 0–10V DC, potentiometer

Order example: EN-D/8x4

Acoustic cladding

Material

Nominal size

With

Galvanised sheet steel

8" × 4"

Variants

EN



Application

- Volume flow controller for constant air volume flow control

EN-D



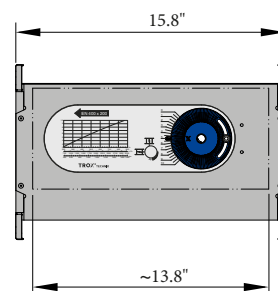
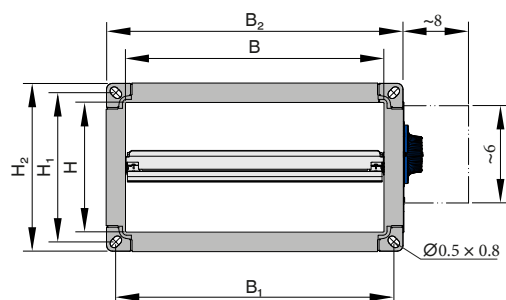
Application

- 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

EN



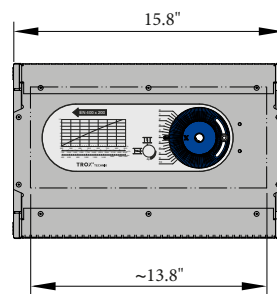
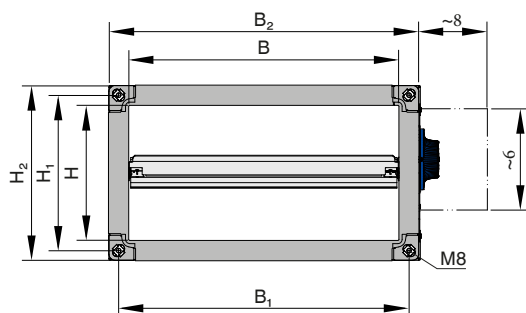
Product specific data EN

NS	B	H	B ₁	B ₂	H ₁	H ₂	lbs
8" x 4"	8	4	9	10	5	6	8.8
12" x 4"	12	4	13	14	5	6	11
12" x 6"	12	6	13	14	7	8	13.2
12" x 8"	12	8	13	14	9	10	13.2
16" x 8"	16	8	17	18	9	10	15.4
16" x 10"	16	10	17	18	11	12	17.6
16" x 12"	16	12	17	18	13	14	18.7
16" x 16"	16	16	17	18	17	18	28.7
20" x 8"	20	8	21	22	9	10	18.7
20" x 10"	20	10	21	22	11	12	19.8
20" x 12"	20	12	21	22	13	14	20.9
20" x 16"	20	16	21	22	17	18	32
20" x 20"	20	20	21	22	21	22	34.2
24" x 8"	24	8	25	26	9	10	22
24" x 10"	24	10	25	26	11	12	23.1
24" x 12"	24	12	25	26	13	14	25.4
24" x 16"	24	16	25	26	17	18	37.5
24" x 20"	24	20	25	26	21	22	39.7
24" x 24"	24	24	25	26	25	26	44.1

For construction with actuator, add 0.71 lbs additionally.

EN-D

EN-D

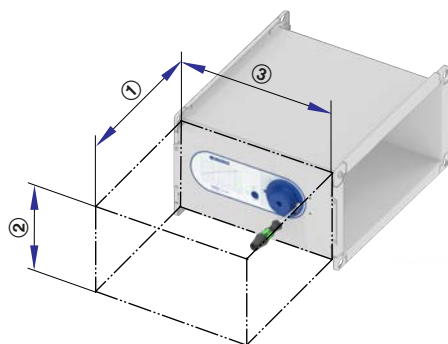


Product specific data EN-D

NS	B	H	B_1	B_2	H_1	H_2	lbs
8" x 4"	8	4	9	10	5	6	14.3
12" x 4"	12	4	13	14	5	6	17.6
12" x 6"	12	6	13	14	7	8	19.8
12" x 8"	12	8	13	14	9	10	22
16" x 8"	16	8	17	18	9	10	26.5
16" x 10"	16	10	17	18	11	12	28.7
16" x 12"	16	12	17	18	13	14	30.9
16" x 16"	16	16	17	18	17	18	39.7
20" x 8"	20	8	21	22	9	10	30.9
20" x 10"	20	10	21	22	11	12	32
20" x 12"	20	12	21	22	13	14	34.2
20" x 16"	20	16	21	22	17	18	45.2
20" x 20"	20	20	21	22	21	22	48.5
24" x 8"	24	8	25	26	9	10	34.2
24" x 10"	24	10	25	26	11	12	36.4
24" x 12"	24	12	25	26	13	14	40
24" x 16"	24	16	25	26	17	18	50.7
24" x 20"	24	20	25	26	21	22	55.1
24" x 24"	24	24	25	26	25	26	60.6

For construction with actuator, add 0.71 lbs additionally.

EN Installation space



Space required

Attachments	①	②	③
Without actuator	8	H	8
With actuator	8	H	8

H: Unit height

Product details

Installation and commissioning

- Any installation orientation (from $H = 20''$, the horizontal air duct must be installed so that the operating side is positioned to the side (right/left) or below)
- 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-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

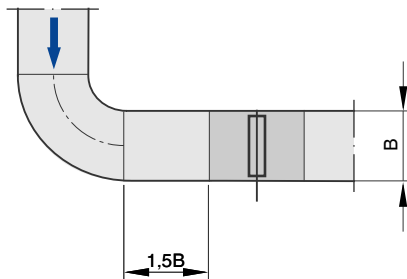
Upstream conditions

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

Space required for commissioning and maintenance

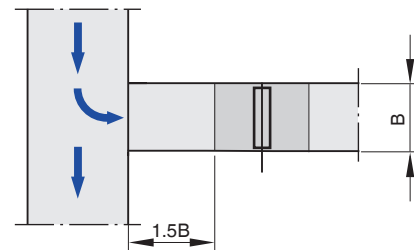
Sufficient space must be kept clear near any attachments to allow for commissioning and maintenance. It may be necessary to provide sufficiently sized inspection access openings.

Bend, horizontal



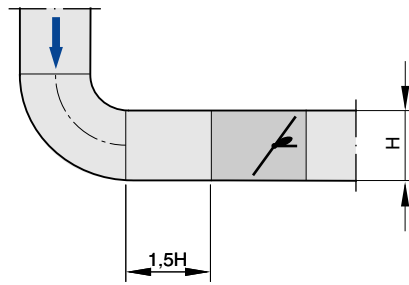
The stated volume flow rate accuracy Δq_v can only be achieved with a straight duct section of at least 1.5B upstream between any bend and the controller.

Junction, horizontal



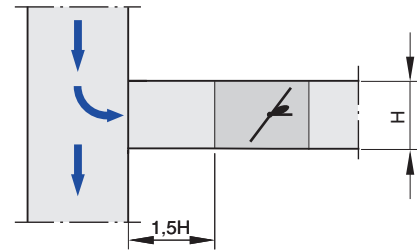
A junction causes strong turbulence. The stated volume flow rate accuracy Δq_v can only be achieved with a straight duct section of at least 1.5B upstream. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

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

NS [in] Nominal size	L_{PA2} [dB(A)] A-weighted sound pressure level of case-regenerated noise of the CAV terminal unit, system attenuation taken into account
B [in] Duct width	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
B_1 [in] Screw hole pitch of flange (horizontal)	
B_2 [in] Outside dimension of flange (width)	Δ_{pst} [in WC] Static differential pressure
H [in] Duct height	$\Delta_{pst \min}$ [in WC] 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.
H_1 [in] Screw hole pitch of flange (vertical)	
H_2 [in] Outside dimension of flange (height)	
m [lbs] Unit weight including the minimum required attachments for manual adjustment	q_{vnom} [cfm] 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.
f_m [Hz] Octave band centre frequency	
L_{PA} [dB(A)] A-weighted sound pressure level of air-regenerated noise of the CAV controllers, system attenuation taken into account	q_v [cfm] Volume flow rate
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	Δ_{qv} [± %] Volume flow rate tolerance from setpoint value