



Variant with rotary knob

# Constant volume flow control CAV controllers

## VFC



Actuator with mechanical stops



Actuator with potentiometers



### For low airflow velocities

Circular mechanical self-powered volume flow controllers for the control of supply air or extract air in constant air volume systems with low airflow velocities

- Suitable for airflow velocities from 0.8 m/s
- Very simple commissioning
- Volume flow rate can be set using a rotary knob and a scale on the outside of the casing
- Simple retrofit of an actuator for variable volume flows
- Any installation orientation; maintenance-free
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Circular silencer CA (for Germany and Switzerland), CAH (for EMEA) or CF for the reduction of air-regenerated noise
- Hot water heat exchanger WL and electric air heater EL for reheating the airflow
- Actuator for variable volume flows or for  $q_{v_{min}}$ - $q_{v_{max}}$  switching



Tested to VDI 6022

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## General information

### Application

- Circular CAV controllers of Type VFC for the precise supply air or extract air flow control in constant air volume systems
- Mechanical self-powered volume flow control without external power supply
- For low airflow velocities
- Simplified project handling with orders based on nominal size

### Special features

- The volume flow rate can be set using an external scale; no tools required
- Simple retrofitting of an actuator
- Correct operation even under unfavourable upstream or downstream conditions (1.5 D straight section required upstream)
- Any installation orientation
- Aerodynamic functional testing of each unit on a special test rig before shipping

### Nominal sizes

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

### Parts and characteristics

- Ready-to-commission controller
- Damper blade with low-friction bearings
- Bellows that acts as an oscillation damper
- Leaf spring
- Rotary knob with pointer for setting the volume flow rate
- Lip seal

### Attachments

- Min/Max actuators: Actuators for switching between minimum and maximum volume flow rate setpoint values
- Modulating actuators: Actuators for varying volume flow rates

### Useful additions

- Circular silencers CA (for Germany and Switzerland) and CAH (for EMEA)
- Heat exchanger WL
- Electric air heater EL
- Useful additions have to be ordered separately

### Construction features

- Circular casing
- Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180
- Damper blade with low-friction bearings and special bellows

### Materials and surfaces

- Casing made of galvanised sheet steel
- Damper blade and other parts made of high-quality plastic, to UL 94, V1; to DIN 4102, fire rating class B2
- Leaf spring made of stainless steel
- Polyurethane bellows

### Standards and guidelines

- Meets the hygiene requirements of VDI 6022
- Casing air leakage to EN 1751, class C

### Maintenance

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

## Function

### Functional description

The volume flow controllers work without an external power supply.

A damper blade with low-friction bearings is adjusted by aerodynamic forces such that a 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 extends and increases this force while at the same time acting as an oscillation damper.

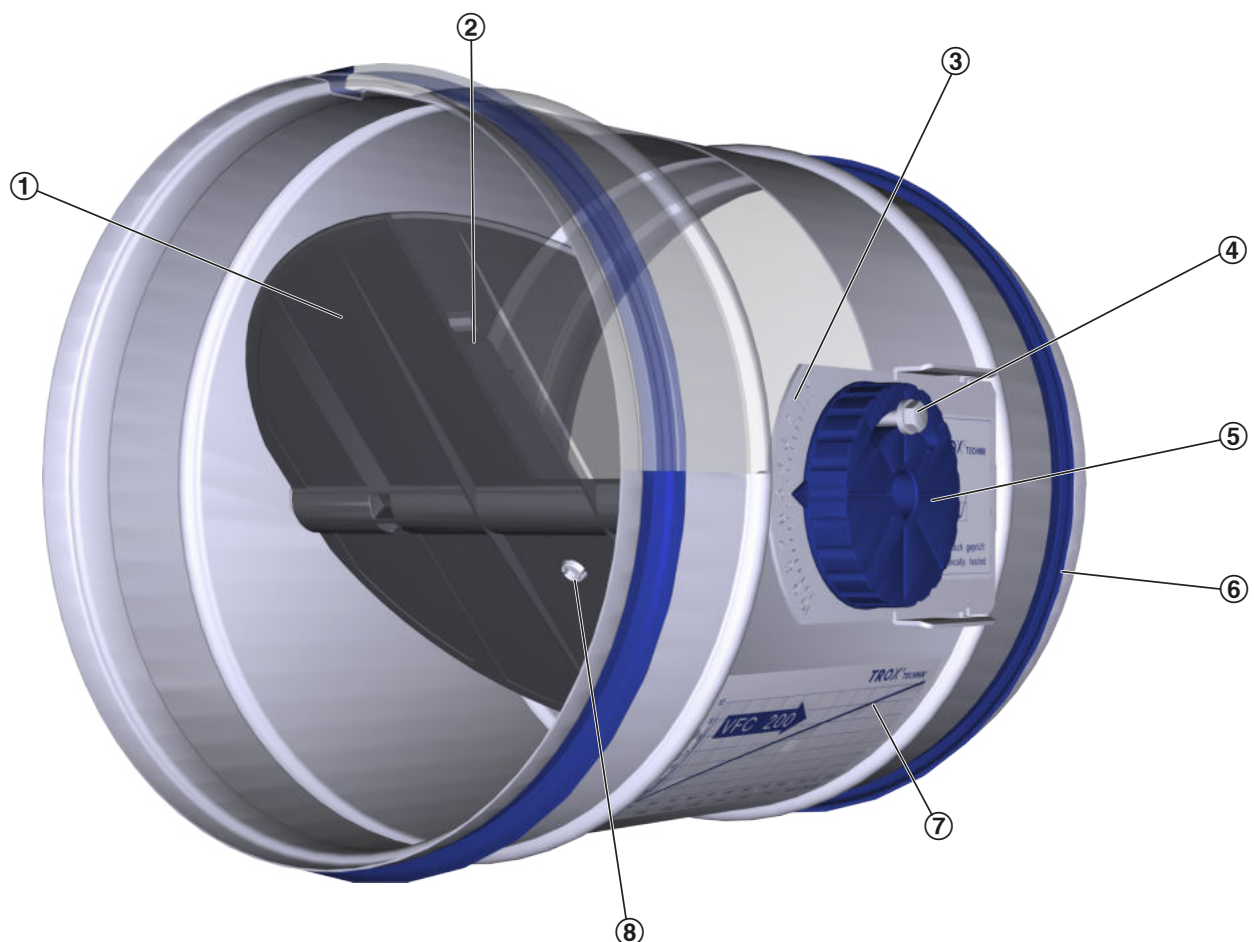
The closing force is countered by a leaf spring. As the differential pressure changes, the leaf spring adjusts the position of the damper blade such that the volume flow rate is maintained almost exactly.

### Efficient commissioning

The volume flow rate setpoint value can be set quickly and easily using the pointer 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 by an air conditioning engineer. Should the system pressure change, e.g. by opening or closing of duct sections, the flow rates in the entire system will also change if flow adjustment dampers are used; however, this is not the case with mechanical self-powered volume 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 VFC



- ① Damper blade
- ② Leaf spring
- ③ Volume flow rate scale
- ④ Rotary knob locking screw
- ⑤ Rotary knob
- ⑥ Lip seal
- ⑦ Diagram with setting values
- ⑧ Bellows inlet

**Technical data**

Nominal sizes	80 – 250 mm
Volume flow rate range	6 – 370 l/s or 22 – 1332 m <sup>3</sup> /h
Volume flow rate control range	Approx. 10 – 100 % of the nominal volume flow rate
Volume flow rate accuracy	Approx. $\pm$ 10 % of the nominal volume flow rate
Minimum differential pressure	30 Pa
Maximum differential pressure	500 Pa
Operating temperature	10 to 50 °C

## Quick sizing

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  $q_{v_{min}}$  and  $q_{v_{max}}$ . 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.

### VFC, sound pressure level at differential pressure 50 Pa

Nom. size [mm]	qv [l/s]	qv [m³/h]	Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
			L <sub>PA</sub> [dB(A)]	L <sub>PA1</sub> [dB(A)]			L <sub>PA2</sub> [dB(A)]
80	6	22	25	<15	<15	<15	<15
80	10	36	28	16	<15	<15	<15
80	20	72	33	21	<15	<15	<15
80	42	151	39	27	18	16	17
100	6	22	29	15	<15	<15	<15
100	15	54	33	20	<15	<15	15
100	30	108	37	26	18	17	18
100	65	234	41	33	26	25	21
125	10	36	22	<15	<15	<15	<15
125	20	72	27	16	<15	<15	<15
125	45	162	34	25	18	16	<15
125	100	360	41	34	29	27	16
160	18	65	25	16	<15	<15	<15
160	45	162	32	24	18	16	18
160	85	306	36	29	24	22	22
160	185	666	41	35	30	28	27
200	25	90	27	16	<15	<15	<15
200	60	216	31	22	16	<15	18
200	120	432	35	27	21	19	22
200	250	900	37	30	25	24	26
250	37	133	31	21	<15	<15	18
250	100	360	35	25	18	16	22
250	185	666	36	28	21	19	25
250	370	1332	37	29	23	22	29

① VFC without silencer

② VFC with circular silencer CF, insulation thickness 50 mm, length 500 mm

③ VFC with circular silencer CF, insulation thickness 50 mm, length 1000 mm

④ VFC with circular silencer CF, insulation thickness 50 mm, length 1500 mm

## Specification text

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

Circular volume flow controllers for constant and variable air volume systems with low airflow velocities, mechanical self-powered, without external power supply, suitable for supply or extract air, available in 6 nominal sizes.

Ready-to-commission unit consists of the casing containing a damper blade with low-friction bearings, bellows, leaf spring, and a rotary knob to set the volume flow rate setpoint.

Differential pressure: 30 – 500 Pa

Volume flow rate: max. 10 : 1

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

Casing air leakage to EN 1751, class C.

### Special features

- The volume flow rate can be set using an external scale; no tools required
- Simple retrofitting of an actuator
- Correct operation even under unfavourable upstream or downstream conditions (1.5 D straight section required upstream)
- Any installation orientation
- Aerodynamic functional testing of each unit on a special test rig before shipping

### Materials and surfaces

- Casing made of galvanised sheet steel
- Damper blade and other parts made of high-quality plastic, to UL 94, V1; to DIN 4102, fire rating class B2
- Leaf spring made of stainless steel
- Polyurethane bellows

### Technical data

- Nominal sizes: 80 to 250 mm
- Volume flow rate range: 6 – 370 l/s or 22 – 1332 m<sup>3</sup>/h
- Volume flow rate control range: approx. 10 – 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: 500 Pa

### Sizing data

- $q_v$  [m<sup>3</sup>/h]
- $\Delta p_{st}$  [Pa]

Air-regenerated noise

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

Case-radiated noise

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

**Order code**

VFC / 100 / E03  
|     |     |  
1    2    3

**1 Type**

**VFC** Volume flow controller

**2 Nominal size [mm]**

**80, 100, 125, 160, 200, 250**

**Order example: VFC/100/E03**

Type

Nominal size [mm]

Actuator

**3 Actuator**

No entry: manual adjustment

**E01** 24 V AC/DC, 3-point (min/max), potentiometer

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

**M01** 24 V AC/DC, 3-point (min/max), mechanical stops

VFC

100

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

## Variants

CAV controller variant VFC, with rotary knob



CAV controller variant VFC/.../E0\*, with actuator (potentiometer)



CAV controller variant VFC/.../M0\* with actuator (mechanical stops)





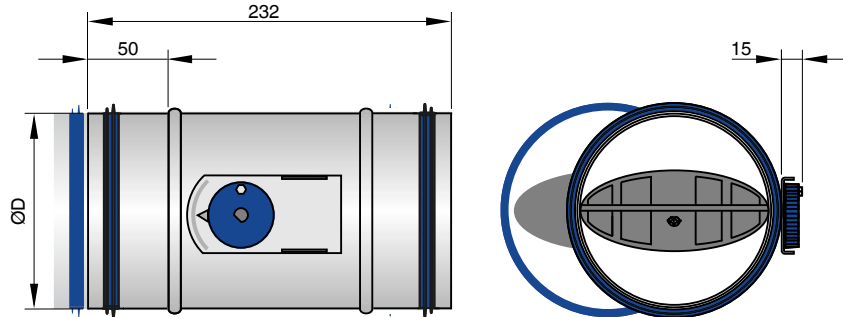
## Attachments

### VFC, actuators

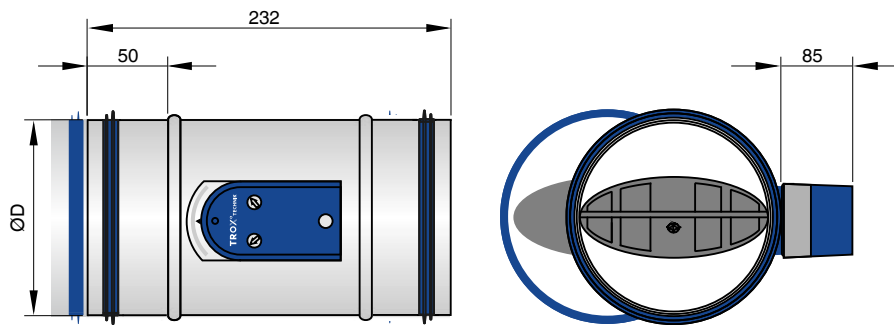
Order code detail	Actuator	Supply voltage
Min/Max actuators		
E01	Actuator with potentiometers, TROX/ Gruner	24 V AC/DC
E02	Actuator with potentiometers, TROX/ Gruner	230 V AC
M01	Actuator with mechanical stops, TROX/ Belimo	24 V AC/DC
M02	Actuator with mechanical stops, TROX/ Belimo	230 V AC
Modulating actuators		
E03	Actuator with potentiometers, TROX/ Gruner	24 V AC/DC

Dimensions and weight

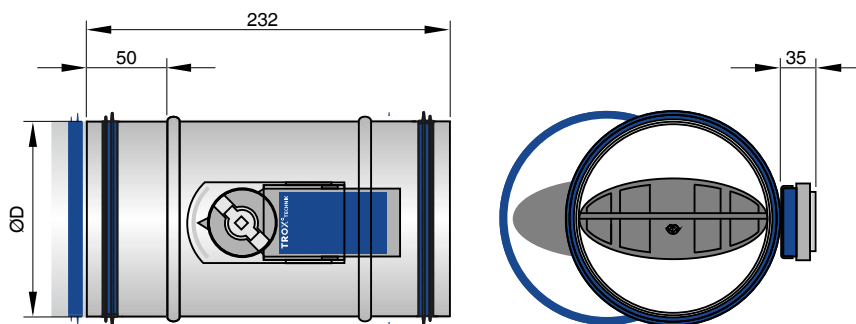
VFC



VFC/.../E0\*



VFC/.../M0\*



VFC

NS	VFC	VFC/.../E0*	VFC/.../M0*	ØD [mm]
	m [kg]			
80	0.5	0.8	0.7	79
100	0.6	0.9	0.8	99
125	0.7	1	0.9	124
160	0.8	1.1	1	159
200	1	1.3	1.2	199
250	1.3	1.6	1.5	249

## Product details

## VFC system



- ① CAV controller with rotary knob
- ② Actuator E0\* with potentiometers
- ③ Actuator M0\* with mechanical stops

## Installation details

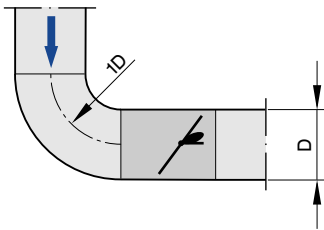
### Installation and commissioning

- Any installation orientation
- Take the adjustment value from the characteristic on the sticker (on each volume flow controller)
- Volume flow rate setpoint can be set on external scale

### Upstream conditions

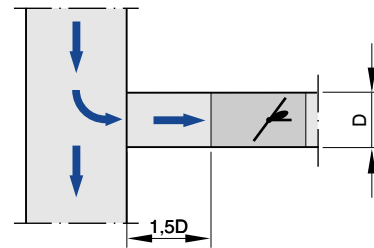
The volume flow rate accuracy  $\Delta V$  applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require straight duct sections upstream. Free air intake only with a straight duct section of  $1D$  upstream.

#### Bend



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

#### Junction

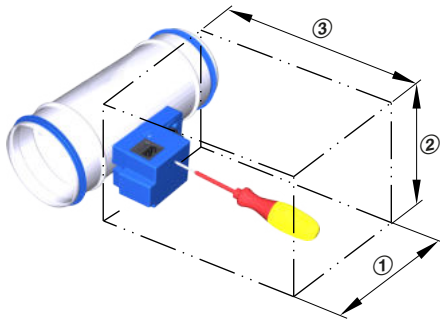


A junction causes strong turbulence. The stated volume flow rate accuracy  $\Delta V$  can only be achieved with a straight duct section of at least  $1.5D$  upstream. Shorter upstream sections require a perforated plate in the branch and before the CAV controller. If there is no straight upstream section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

**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.

**Access to attachments, mounted on one side**



Schematic illustration of required installation space

**Space required**

Attachments	①	②	③
	mm		
Without actuator	200	200	200
With actuator E0*	200	200	300
With actuator M0*	200	200	230

## Nomenclature

$\varnothing D$  [mm]

Outer diameter of the spigot

$L$  [mm]

Length of unit including connecting spigot

$L_1$  [mm]

Length of casing or acoustic cladding

$m$  [kg]

Weight

$f_m$  [Hz]

Octave band centre frequency

$L_{PA}$  [dB(A)]

A-weighted sound pressure level of air-regenerated noise of the CAV controller, system attenuation taken into account

$L_{PA1}$  [dB(A)]

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

$L_{PA2}$  [dB(A)]

A-weighted sound pressure level of case-regenerated noise of the CAV controller, system attenuation taken into account

$q_{vNenn}$  [m<sup>3</sup>/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.
- Upper limit of the setting range and maximum volume flow rate setpoint value for the CAV controller

$q_v$  [m<sup>3</sup>/h]; [l/s]

Volume flow rate

$\Delta q_v$  [± %]

Volume flow rate accuracy in relation to the setpoint (tolerance)

$\Delta p_{st}$  [Pa]

Static differential pressure

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

Static minimum differential pressure: The static minimum differential pressure is equal to the pressure loss of the terminal unit when the damper blade is open, caused by flow resistance (damper blade).

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.

### Verzinktes Stahlblech

- 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