Control Units

2015



TROX® TECHNIK

The art of handling air

Control Units

2015

The Control Units catalogue corresponds to sections 5.1, 5.2 and 5.4 of the previously used KLIMA 2 catalogue.

The TROX catalogues have been completely revised and now offer several new features:

- Hardcover editions
- Simplified navigation
- List of advantages of each product at a glance
- Different chapters for principal products, additional components and attachments

The following documentation is available to help you select and size TROX components and systems:

- Technical product documentation (catalogues)
- Design manuals
- Easy Product Finder design programme
- Compendium CD
- Website www.troxtechnik.com

This catalogue is a carbon neutral product.

TROX® TECHNIK

The art of handling air

TROX GmbH

Heinrich-Trox-Platz
D-47504 Neukirchen-Vluyn

Phone +49(0)2845202-0
Fax +49(0)2845202-265
E-Mail trox@trox.de
www.troxtechnik.com

Catalogue structure



Diffusers



Air-Water Systems/Decentralised Ventilation



Multileaf Dampers Attenuators/ External Weather Louvres



Fire and Smoke Protection Systems



Control Units

The Control Units catalogue corresponds to sections 5.1, 5.2 and 5.4 of the previously used KLIMA 2 catalogue.



Control Systems



Filter Units/Filter Elements



X-CUBE – Air Handling Units

Documentation · Page numbering



Technical document, or leaflet

Technical product documentation

… comprise:

- Product descriptions
- Information on the materials used
- Aerodynamic and acoustic data
- Dimensions
- Details on product characteristics
- Specification texts

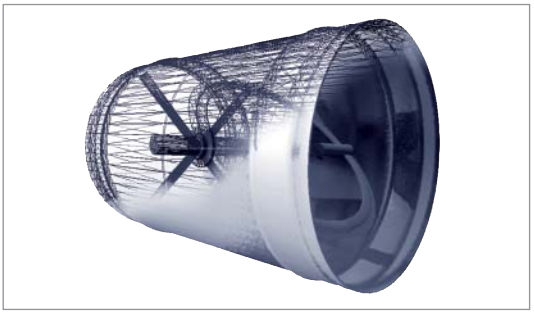


Design manual

Design manuals

… comprise:

- Basic information and technical concepts
- Step-by-step product design
- Overview and explanation on how to select the ideal system components



Design programme

Easy Product Finder design programme

… comprises everything to select and size our products:

- Technical data
- Diagrams, photos
- Order codes that can be edited
- CAD drawings(3D model; export function for DXF and other standard formats)
- Specification texts for each product and variant



Internet

Website www.troxtechnik.com

The entire documentation is available on the internet.

- Catalogue download center
- Individual product leaflets
- Installation examples
- References

Page numbering

K5 – 0.0 – 6 TROX® TECHNIK 05/2015 – DE/en

- K5 – 0.0 – 6: Continuing page numbers
- K5 – 0.0 – 6: Chapter
- K5 – 0.0 – 6: Product segment
- 05/2015 – DE/en: Edition
- 05/2015 – DE/en: Country
- 05/2015 – DE/en: Language

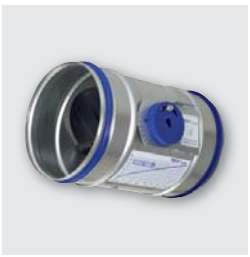
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- 1.5 Basic information and nomenclature

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- 2.2 Actuators for CAV controllers
- 2.3 Basic information and nomenclature

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1 Variable volume flow control – VARYCONTROL

VARYCONTROL VAV terminal units are air terminal units for supply air and extract air systems. They work with an external power supply and can be used for controlling, flow adjustment, or shutting off the airflow in room air conditioning systems. Depending on their construction the units can meet the most demanding acoustic requirements; different materials and surface finishes are also available.

	1.1 VAV terminal units		Type	Page
Circular		For low airflow velocities and low duct pressures	LVC	1.1 – 1
		For the most diverse applications regarding standard volume flow rate ranges	TVR	1.1 – 11
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		For extract air systems with demanding acoustic requirements	TVA	1.1 – 131
		For dual duct systems	TVM	1.1 – 149

	1.1 VAV terminal units	Type	Page
Optimum resistance	 For contaminated air	**TVRK**	**1.1 – 164**
	 Optimised for use in laboratories and on fume cupboards	**TVLK**	**1.1 – 184**
For use in potentially explosive atmospheres	 For the control of variable air volume flows in potentially explosive atmospheres (ATEX)	**TVR-Ex**	**1.1 – 202**
	1.2 Secondary silencers for VAV terminal units		
Circular	 For the reduction of noise in circular ducts, suitable for all circular VAV terminal units and CAV controllers, galvanised sheet steel construction	**CA**	**1.2 – 1**
	 For the reduction of noise in circular ducts, suitable for all circular VAV terminal units and CAV controllers, aluminium construction	**CS**	**1.2 – 8**
	 For the reduction of noise in circular ducts, suitable for all circular VAV terminal units and CAV controllers, flexible aluminium construction	**CF**	**1.2 – 15**
Rectangular	 For the reduction of air-regenerated noise of air terminal units Type TVZ, TVA, TZ-Silenzio, TA-Silenzio or TVM	**TS**	**1.2 – 22**
	 For the reduction of air-regenerated noise of air terminal units Type TVJ, TVT or EN	**TX**	**1.2 – 25**
Optimum resistance	 For the reduction of noise in plastic circular ducts, suitable for all circular VAV terminal units and CAV controllers, plastic construction for contaminated air	**CAK**	**1.2 – 30**

1

1.3 Control components for VAV terminal units		Type	Page
	Quick and easy handling	**Easy**	**1.3 – 1**
	With service interface and bus communication facility	**Compact**	**1.3 – 9**
	For different actuators	**Universal, dynamic**	**1.3 – 30**
	For contaminated extract air or for pressure control	**Universal, static**	**1.3 – 43**
	Rapid replacement without interruption of system operation	**RETROFIT**	**1.3 – 80**
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1.4 Adjustment devices for VAV terminal units			
	For service and commissioning	**Adjustment devices**	**1.4 – 1**
1.5 Basic information and nomenclature			
	Variable volume flow control – VARYCONTROL		**1.5 – 1**

VAV terminal units
Type LVC



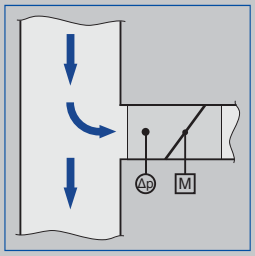
Compact controller



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

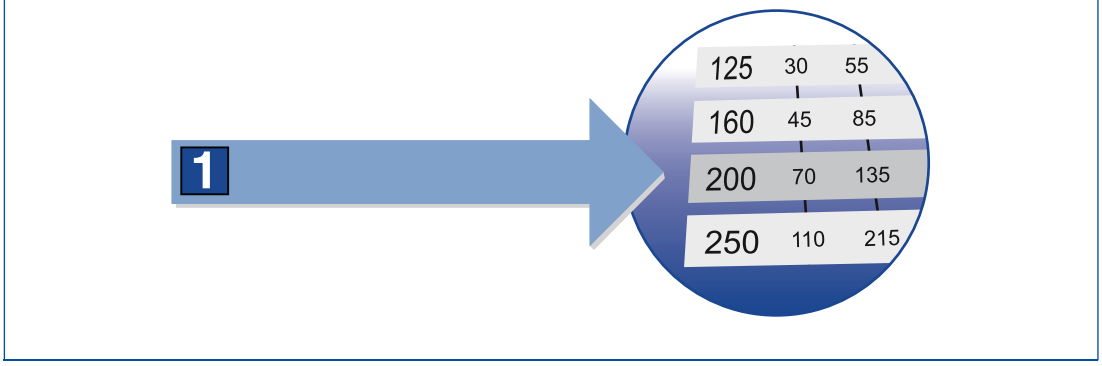
- Secondary silencer Type CA, CS or CF for the reduction of air-regenerated noise
- Hot water heat exchanger Type WL and electric air heater Type EL for reheating the airflow

1

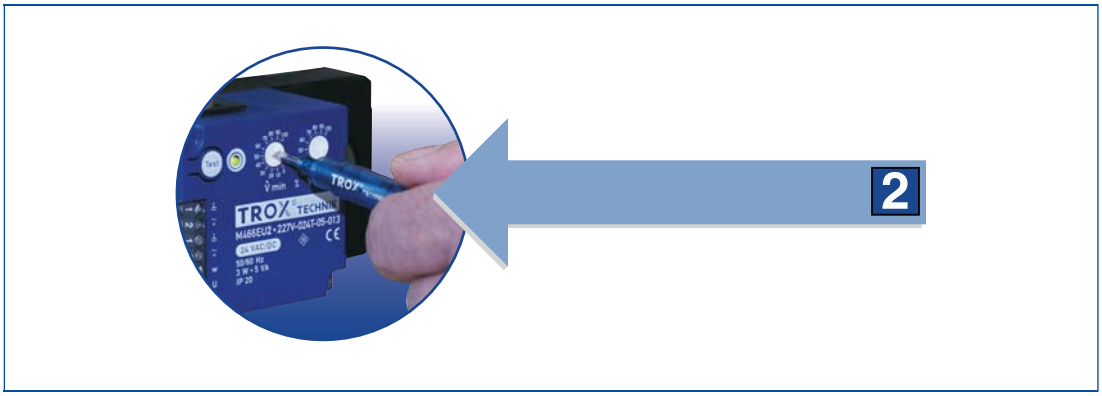
Type		Page
LVC	General information	1.1 – 2
	Order code	1.1 – 5
	Aerodynamic data	1.1 – 6
	Quick sizing	1.1 – 7
	Dimensions and weight	1.1 – 8
	Installation details	1.1 – 9
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	Basic information and nomenclature	1.5 – 1

The Easy principle

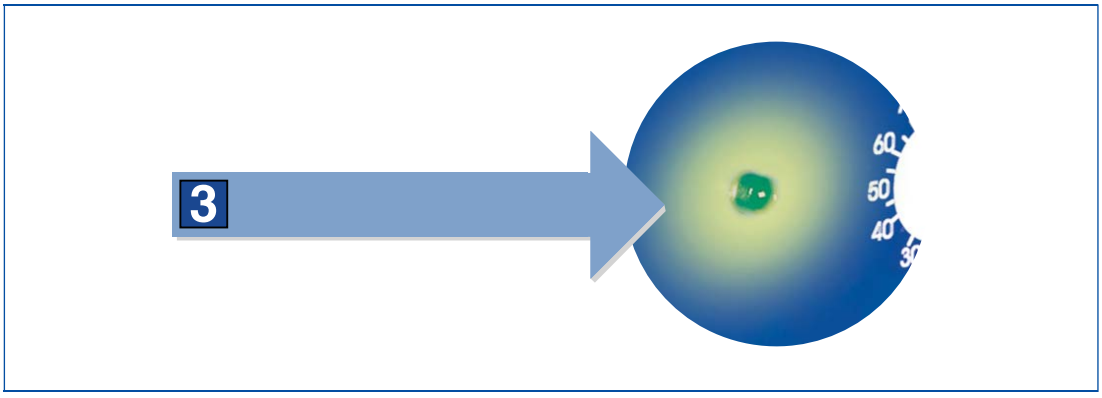
Select nominal size



Set flow rates



Green light: Ready!



1

Description



VAV terminal unit
Type LVC

For detailed information on control components see Chapter K5 – 1.3.

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)

Nominal sizes
- 125, 160, 200, 250

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

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

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

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)

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

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

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

1

Attachments: VARYCONTROL control components for Type LVC

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

Technical data

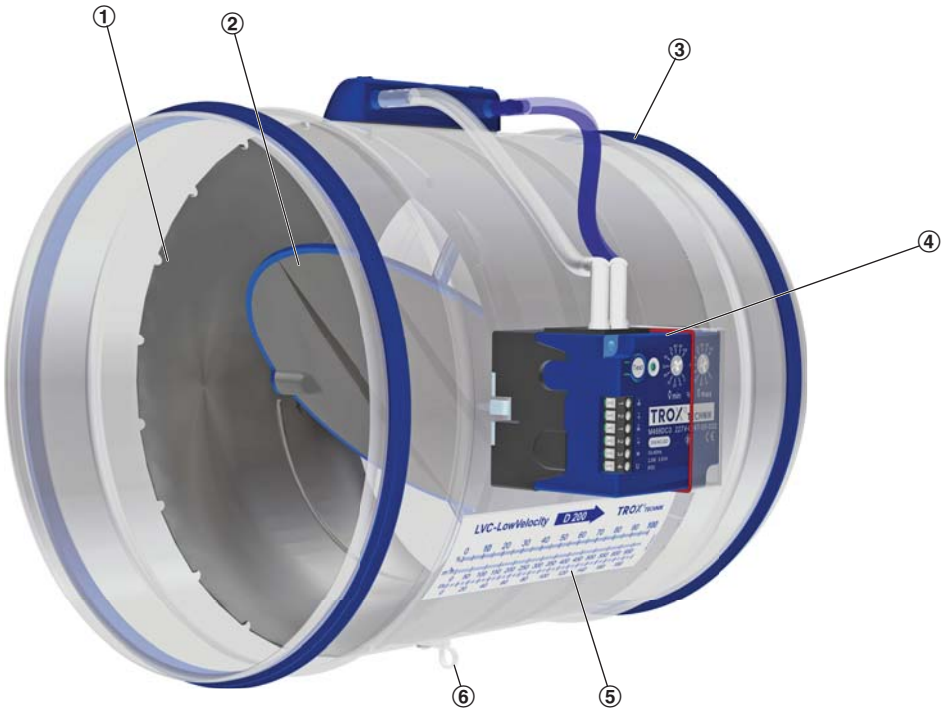
Nominal sizes	125 – 250 mm
Volume flow rate range	8 – 300 l/s or 30 – 1080 m³/h
Volume flow rate control range	Approx. 10 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 30 Pa
Maximum differential pressure	600 Pa
Operating temperature	10 – 50 °C

Function

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 tappings 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



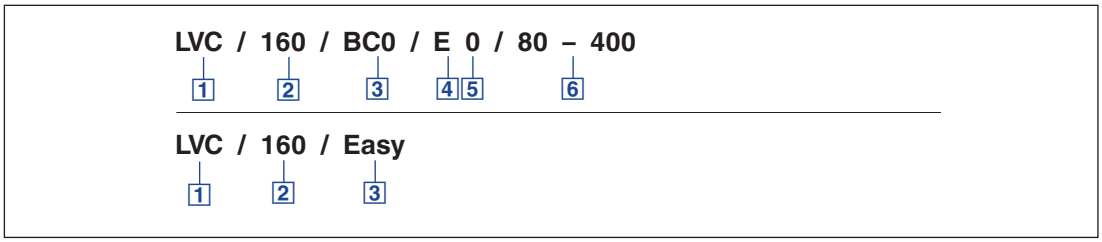
① Plastic nozzle
② Damper blade
③ Lip seal
④ Easy controller
⑤ Volume flow rate scale
⑥ Wire clamping bracket

1

Order code

VARYCONTROL

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 examples

LVC/160/Easy

Nominal size	160 mm
Attachment	Easy controller

LVC/250/BC0/E2/200–800 m³/h

Nominal size	250 mm
Attachment	Compact controller
Operating mode	Single
Signal voltage range	2 – 10 V DC
Volume flow rates	200 – 800 m³/h

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m^3/h	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

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.

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

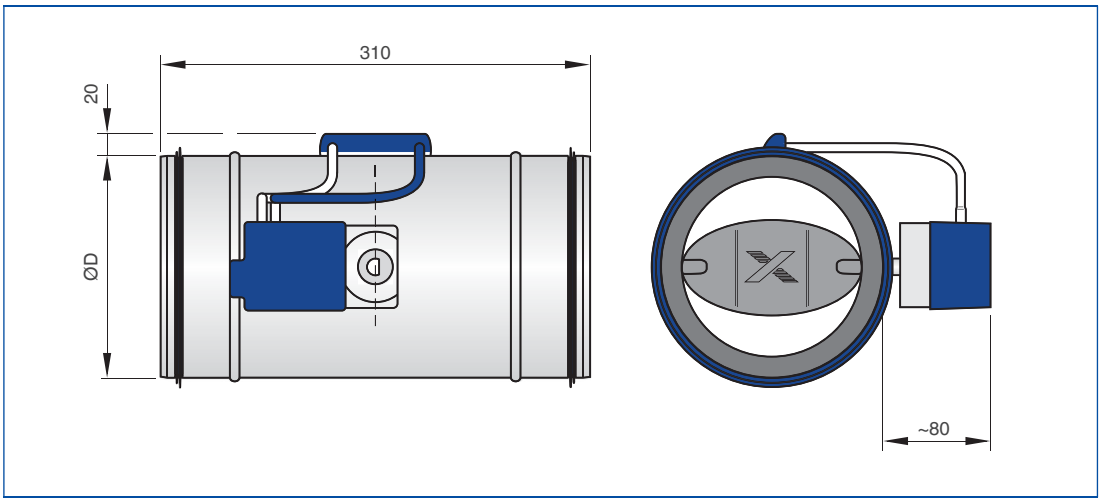
Quick sizing: Sound pressure level at differential pressure 50 Pa

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
			L_{PA}	L_{PA1}			L_{PA2}
	l/s	m^3/h	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

Dimensions

LVC



Dimensions [mm] and weight [kg]

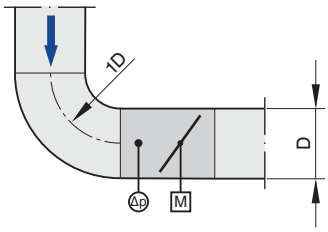
Nominal size	ØD	m
	mm	kg
125	124	1.5
160	159	1.9
200	199	2.1
250	249	2.7

1

Upstream conditions

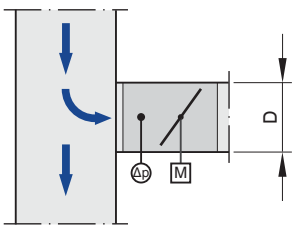
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

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

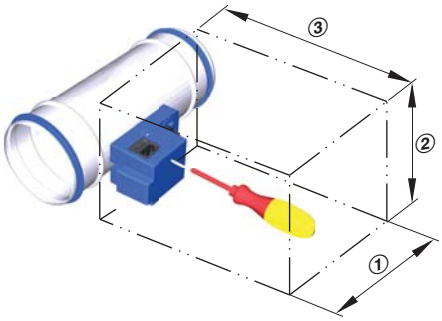


The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed in a branch just off the main duct.

Space requirement 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



Space required

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

Standard text

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 m^3/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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

VARYCONTROL

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 [m^3/h or l/s]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting

VAV terminal units
Type TVR





Universal controller



Compact controller



Easy controller



Tested to VDI 6022

For the most diverse applications regarding standard volume flow rate ranges

Circular VAV terminal units for standard applications regarding the supply air or extract air control in variable air volume systems

- Suitable for the control of volume flow rate, room pressure or duct pressure
- Electronic control components for different applications (Easy, Compact, Universal, and LABCONTROL)
- High control accuracy even with upstream bend (R = 1D)
- Suitable for airflow velocities up to 13 m/s
- Closed blade air leakage to EN 1751, up to class 4
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Acoustic cladding for the reduction of case-radiated noise
- 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

1

Type		Page
TVR	General information	1.1 – 12
	Order code	1.1 – 16
	Aerodynamic data	1.1 – 20
	Quick sizing	1.1 – 21
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	Dimensions and weight – TVR-D	1.1 – 23
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Variants

Product examples

VAV terminal unit, variant TVR



VAV terminal unit, variant TVR-D



Description

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- Circular VARYCONTROL VAV terminal units of Type TVR for the precise supply air or extract air flow control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- For controlling, restricting, or shutting off the airflow in air conditioning systems
- Shut-off by means of switching (equipment supplied by others)

Variants
- TVR: VAV terminal unit
- TVR-D: VAV terminal unit with acoustic cladding
- TVR-FL: VAV terminal unit with flanges on both ends
- TVR-D-FL: VAV terminal unit with acoustic cladding and flanges on both ends
- Units with acoustic cladding and/or a secondary silencer Type CA, CS or CF for demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Nominal sizes
- 100, 125, 160, 200, 250, 315, 400

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
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Accessories
- G2: Matching flanges for both ends
- D2: Lip seals on both ends (factory fitted)

Useful additions
- Secondary silencer Type CA, CS or CF for demanding acoustic requirements
- Heat exchanger Type WL
- Electric air heater Type EL

Special characteristics
- Integral differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blade
- 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 with upstream bend R = 1D)

Construction features
- Circular casing
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Position of the damper blade indicated externally at shaft extension
- TVR-FL: Flanges to EN 12220

Materials and surfaces
Galvanised sheet steel construction
- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Aluminium sensor tubes
- Plastic bearings

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Damper blade and shaft made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

Stainless steel construction (A2)
- Casing, damper blade and shaft made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

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/EG

Installation and commissioning
- Any installation orientation (except units with static differential pressure transducer)
- TVR-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines
- Hygiene conforms to VDI 6022
- Closed blade air leakage to EN 1751, class 4 (nominal size 100, class 2; nominal sizes 125 and 160, class 3)
- Nominal sizes 100, 125, and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class C

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

1

Attachments: VARYCONTROL control components for Type TVR

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
BL0		Compact controller with LonWorks interface TROX/Belimo		
XB0		Compact controller TROX/Gruner		
LN0		Compact controller Siemens		
Universal controller, dynamic				
B13	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator
B1B				Spring return actuator
XC3		Universal controller TROX/Gruner		
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo		Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3				Spring return actuator
BR3	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, integral 100 Pa	Actuator
BRB				Spring return actuator
BRG				Fast-running actuator
BS3			Static, integral 600 Pa	Actuator
BSB				Spring return actuator
BSG				Fast-running actuator
BG3		Differential pressure controller TROX/Belimo	Static, integral 100 Pa	Actuator
BGB				Spring return actuator
BH3			Static, integral 600 Pa	Actuator
BHB				Spring return actuator
XE1		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE3				Spring return actuator
XF1			Static, integral 600 Pa	Actuator
XF3				Spring return actuator

Attachments: LABCONTROL control components for Type TVR

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room supply air Room extract air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room supply air Room extract air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

Technical data

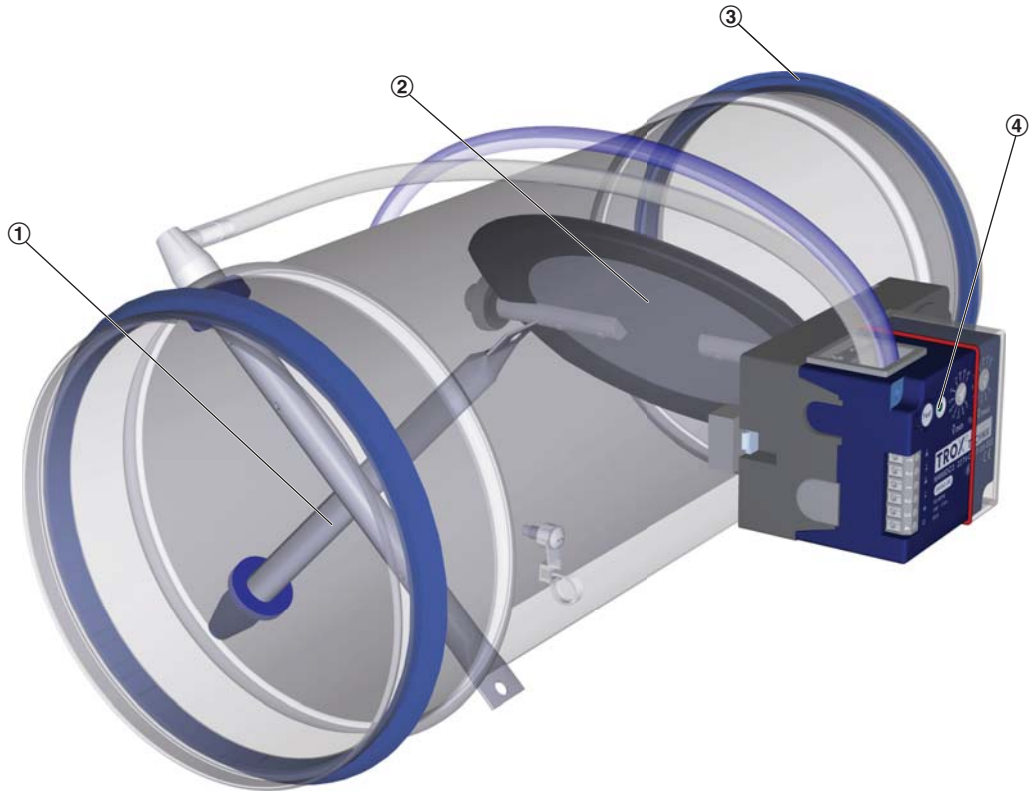
Nominal sizes	100 – 400 mm
Volume flow rate range	10 – 1680 l/s or 36 – 6048 m^3/h
Volume flow rate control range (unit with dynamic differential pressure measurement)	Approx. 10 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 90 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

1 Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate.
The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator; the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal or LABCONTROL).
For most applications, the setpoint value comes from a room temperature controller. The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values.

Schematic illustration of the TVR



① Differential pressure sensor
② Damper blade
③ Lip seal
④ Control components, e.g. an Easy controller

Order code

VARYCONTROL

TVR, TVR/.../Easy

TVR – D – ... –FL / 160 / G2 / B1B / E 0 / 200 – 900 / NO
1 2 3 4 5 6 7 8 9 10 11

TVR – D / 200 / D2 / Easy
1 2 5 6 7

1 Type
TVR VAV terminal unit

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Material
No entry: galvanised sheet steel
P1 Powder-coated (RAL 7001), silver grey
A2 Stainless steel

4 Flange
No entry: none
FL Both ends (not for TVR-D-P1)

5 Nominal size [mm]
100
125
160
200
250
315
400

6 Accessories
No entry: none
D2 Lip seals on both ends
G2 Matching flanges for both ends

7 Attachments (control component)
Example
Easy Compact controller
BC0 Compact controller
B13 Universal controller

8 Operating mode
E Single
M Master
S Slave
F Constant value
A Differential pressure control – extract air
Z Differential pressure control – supply air

9 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

10 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating modes A, Z)

11 Damper blade position
Only with spring return actuators
NO Power off to open
NC Power off to close

Order example

VARYCONTROL

TVR/200/D2/BC0/E0/500–1200 m³/h

Acoustic cladding	Without
Material	Galvanised sheet steel
Flange	Without
Nominal size	200 mm
Accessories	Lip seals on both ends
Attachment	Compact controller
Operating mode	Single
Signal voltage range	0 – 10 V DC
Volume flow rate	500 – 1200 m³/h

1 Order code
LABCONTROL
EASYLAB

TVR with EASYLAB for room control and single operation

TVR – D – ... – FL / 160 / G2 / ELAB / RS / ULZ / LAB / ...
1 2 3 4 5 6 7 8 10 11 12

TVR – D – ... – FL / 160 / G2 / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 8 9 10 12

1 Type
TVR VAV terminal unit

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Material
No entry: galvanised sheet steel
P1 Powder-coated RAL 7001; silver grey
A2 Stainless steel construction

4 Flange
No entry: none
FL Both ends (not for TVR-D-P1)

5 Nominal size [mm]
D_N

6 Accessories
No entry: none
D2 Lip seals on both ends
G2 Matching flanges for both ends

7 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

8 Equipment function
Room control
RS Supply air control (Room Supply)
RE Extract air control (Room Exhaust)
PC Differential pressure control

Single operation
SC Supply air controller
EC Extract air controller

9 External volume flow rate setting
Only for single operation
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value

10 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correctionh

11 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
LAB Extract air led system for laboratories
CLR Supply air led system (clean rooms)
Raum management function is active
LAB-RMF Extract air led system (LAB)
CLR-RMF Supply air led system

12 Operating values [m³/h oder l/s, Pa]
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For single operation (equipment function)
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
BE-LCD-01 40-character display

1

Order code
LABCONTROL
EASYLAB

TVR with EASYLAB for fume cupboard control

TVR – D – ... – FL / 160 / G2 / ELAB / FH – VS / ULZS / 200 – 900
1 2 3 4 5 6 7 8 9 10

1 Type
TVR VAV terminal unit

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Material
No entry: galvanised sheet steel
P1 Powder-coated (RAL 7001), silver grey
A2 Stainless steel

4 Flange
No entry: none
FL Both ends (not for TVR-D-P1)

5 Nominal size [mm]
100
125
160
200
250
315
400

6 Accessories
No entry: none
D2 Lip seals on both ends
G2 Matching flanges for both ends

7 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

8 Equipment function
With face velocity transducer
FH-VS Face velocity control
With sash distance sensor
FH-DS Linear control strategy
FH-DV Safety-optimised control strategy
With switching steps for on-site switch contacts
FH-2P 2 switching steps
FH-3P 3 switching steps
Without signalling
FH-F Volume flow rate constant value

9 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
S EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

10 Operating values [m³/h or l/s]
Depending on the equipment function
VS: $\dot{V}_{min} - \dot{V}_{max}$
DS: $\dot{V}_{min} - \dot{V}_{max}$
DV: $\dot{V}_{min} - \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
BE-SEG-** OLED display
BE-LCD-01 40-character display

Order example
LABCONTROL
EASYLAB

TVR/200/D2/ELAB/FH-2P/200-700

Acoustic cladding	Without
Nominal size	200 mm
Accessories	Lip seals on both ends
Attachments	EASYLAB controller TCU3 with fast-running actuator
Equipment function	Two switching steps

Order code

LABCONTROL

TCU-LON-II

TVR with TCU-LON-II

TVR – D – ... – FL / 160 / G2 / TMA / RE / 1500 / 750 / 100

1 2 3 4 5 6 7 8 9

1 Type
TVR VAV terminal unit

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Material
No entry: galvanised sheet steel
P1 Powder-coated (RAL 7001), silver grey
A2 Stainless steel

4 Flange
No entry: none
FL Flanges on both ends

5 Nominal size [mm]
100
125
160
200
250
315
400

6 Accessories
No entry: none
G2 Matching flanges for both ends
D2 Lip seals on both ends

7 Attachments (control component)
TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

8 Equipment function
FH Fume cupboard
RS Room supply air
RE Room extract air
PS Differential pressure control – supply air (Pressure Supply)
PE Differential pressure control – extract air (Pressure Extract)

9 Operating values [m³/h or l/s, Pa]
Depending on equipment function
FH: $\dot{V}_{min} – \dot{V}_{max}$
RS: $\Delta\dot{V} / \dot{V}_{constant}$
RE: $\dot{V}_{Tag} / \dot{V}_{night} / \dot{V}_{constant}$
PS: $\Delta\dot{V} / \dot{V}_{constant} / \Delta p_{setpoint}$
PE: $\dot{V}_{day} / \dot{V}_{night} / \dot{V}_{constant} / \Delta p_{setpoint}$
The room control volume flow rates (RS, RE, PS, PE) are related to the total extract air volume flow rate for the room

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
BE-TCU-LON-II Control panel

Order example

LABCONTROL

TCU-LON-II

TVR/200/D2/TMB/FH/200–700

Acoustic cladding	Without
Nominal size	200 mm
Accessories	Lip seals on both ends
Attachment	TCU-LON-II with fast-running actuator (brushless motor)
Equipment function	Fume cupboard (Fume Hood)

1

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m^3/h	Pa				± %
100	**10**	**36**	5	5	5	5	15
	40	**144**	15	15	20	20	8
	65	**234**	35	40	45	50	7
	95	**342**	70	85	95	105	5
125	**15**	**54**	5	5	5	5	15
	60	**216**	15	20	20	20	7
	105	**378**	45	50	55	60	6
	150	**540**	90	100	110	115	5
160	**25**	**90**	5	5	5	5	15
	100	**360**	15	15	15	15	8
	175	**630**	35	40	45	45	7
	250	**900**	70	80	85	95	5
200	**40**	**144**	5	5	5	5	15
	160	**576**	15	15	15	15	7
	280	**1008**	35	35	40	40	5
	405	**1458**	65	70	75	80	5
250	**60**	**216**	5	5	5	5	15
	250	**900**	10	10	10	15	7
	430	**1548**	25	25	30	35	5
	615	**2214**	45	50	55	65	5
315	**100**	**360**	5	5	5	5	15
	410	**1476**	5	10	10	10	7
	720	**2592**	15	20	20	20	6
	1030	**3708**	30	35	40	40	5
400	**170**	**612**	5	5	5	5	15
	670	**2412**	5	5	5	5	7
	1175	**4230**	15	15	15	15	6
	1680	**6048**	25	30	30	35	5

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

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.

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise	
			①	②	③	④	①	⑤
			L_{PA}	L_{PA1}			L_{PA2}	L_{PA3}
	l/s	m³/h	dB (A)					
100	10	36	32	20	<15	<15	<15	<15
	40	144	45	36	28	26	25	18
	65	234	51	41	33	31	31	24
	95	342	54	42	33	31	36	27
125	15	54	33	22	<15	<15	<15	<15
	60	216	45	36	30	28	25	17
	105	378	49	40	34	32	31	21
	150	540	52	41	34	32	35	24
160	25	90	40	28	20	16	20	<15
	100	360	47	39	34	31	28	19
	175	630	50	42	37	34	32	23
	250	900	53	44	39	36	37	28
200	40	144	40	31	23	20	20	<15
	160	576	47	40	34	33	29	15
	280	1008	50	44	40	38	32	21
	405	1458	54	45	39	38	38	25
250	60	216	37	28	22	20	20	<15
	250	900	47	40	34	33	35	18
	430	1548	48	42	38	37	37	25
	615	2214	52	44	38	37	42	29
315	105	378	42	35	28	25	28	<15
	410	1476	47	42	35	34	39	21
	720	2592	49	44	39	38	42	28
	1030	3708	53	48	42	41	46	35
400	170	612	43	36	30	26	30	<15
	670	2412	44	38	32	30	37	21
	1175	4230	47	42	36	35	41	29
	1680	6048	50	44	38	37	46	33

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

1

Description

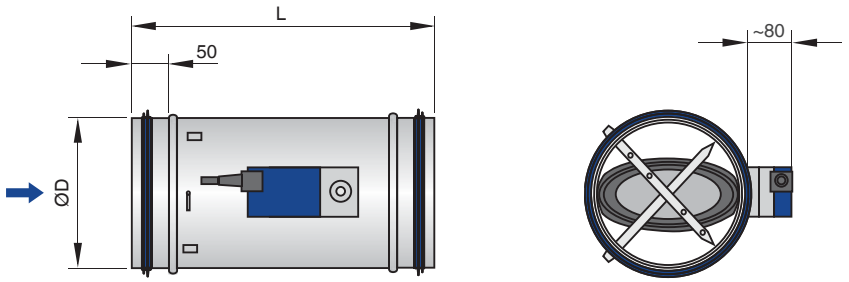


VAV terminal unit, variant TVR

- VAV terminal unit for the control of variable air volume flow rates
- Spigot to make connections to the ducting

Dimensions

TVR



Dimensions [mm] and weight [kg]

Nominal size	Easy Compact	Universal LABCONTROL	ØD	m
	L			
	mm			kg
100	310	600	99	3.3
125	310	600	124	3.6
160	400	600	159	4.2
200	400	600	199	5.1
250	400	600	249	6.1
315	500	600	314	7.2
400	500	600	399	9.4

Description

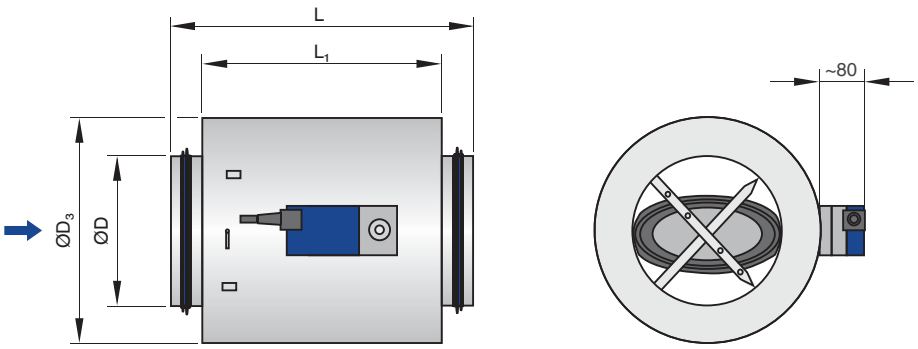


VAV terminal unit, variant TVR-D

- VAV terminal unit with acoustic cladding for the control of variable air volume flows
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular 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

TVR-D



Dimensions [mm] and weight [kg]

Nominal size	Easy Compact		Universal LABCONTROL		ØD	$ØD_3$	m
	L	L_1	L	L_1			
	mm						kg
100	310	232	600	517	99	198	7.2
125	310	232	600	517	124	223	8.5
160	400	312	600	517	159	258	11.0
200	400	312	600	517	199	298	13.9
250	400	312	600	517	249	348	15.9
315	500	417	600	517	314	413	18.0
400	500	417	600	517	399	498	22.6

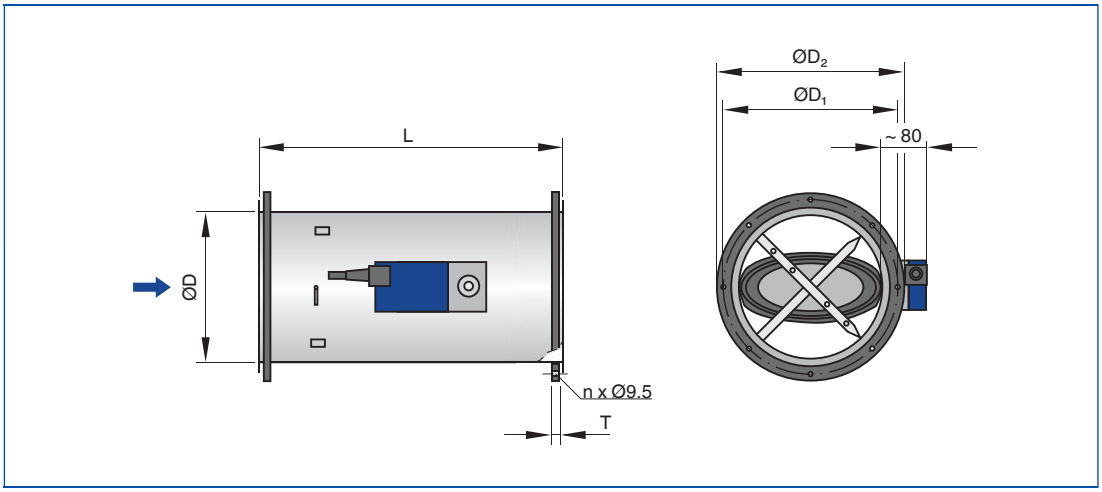
1

Description

- VAV terminal unit for the control of variable air volume flow rates
- With flanges on both ends to make detachable connections to the ducting

Dimensions

TVR-FL



Dimensions [mm] and weight [kg]

Nominal size	Easy Compact	Universal LABCONTROL	ØD	ØD1	ØD2	n	T	m
	L							
	mm						mm	kg
100	290	580	99	132	152	4	4	3.9
125	290	580	124	157	177	4	4	4.2
160	380	580	159	192	212	6	4	5.3
200	380	580	199	233	253	6	4	6.5
250	380	580	249	283	303	6	4	7.8
315	480	580	314	352	378	8	4	10.3
400	480	580	399	438	464	8	4	13.3

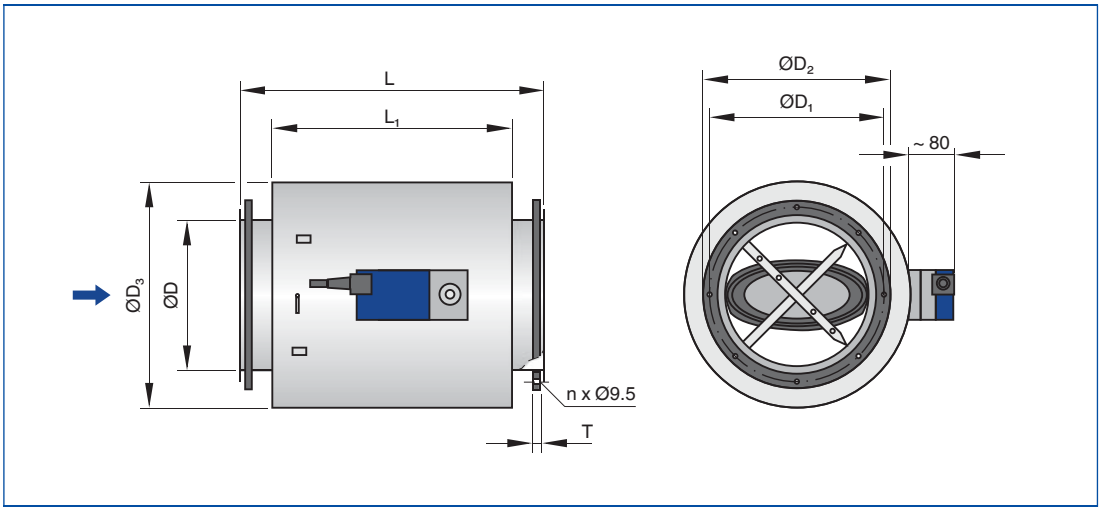
1

Description

- VAV terminal unit with acoustic cladding for the control of variable air volume flows
- With flanges on both ends to make detachable connections to the ducting
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular 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
- Powder-coated surface (P1) or stainless steel construction (A2) not possible

Dimensions

TVR-D-FL



Dimensions [mm] and weight [kg]

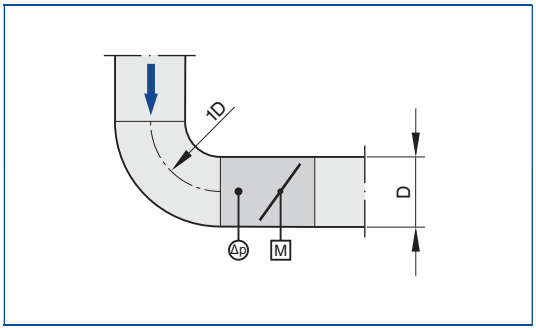
Nominal size	Easy Compact		Universal LABCONTROL		ØD	$ØD_1$	$ØD_2$	$ØD_3$	n	T	m
	L	L_1	L	L_1							
	mm									mm	kg
100	290	232	580	517	99	132	152	198	4	4	7.8
125	290	232	580	517	124	157	177	223	4	4	9.1
160	380	312	580	517	159	192	212	258	6	4	12.1
200	380	312	580	517	199	233	253	298	6	4	14.3
250	380	312	580	517	249	283	303	348	6	4	17.6
315	480	417	580	517	314	352	378	413	8	4	21.2
400	480	417	580	517	399	438	464	498	8	4	26.5

1

Upstream conditions

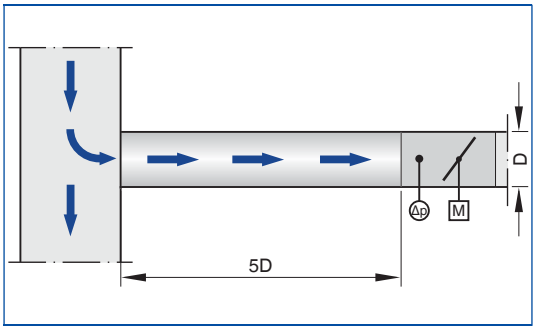
The volume flow rate accuracy ΔV̇ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require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

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

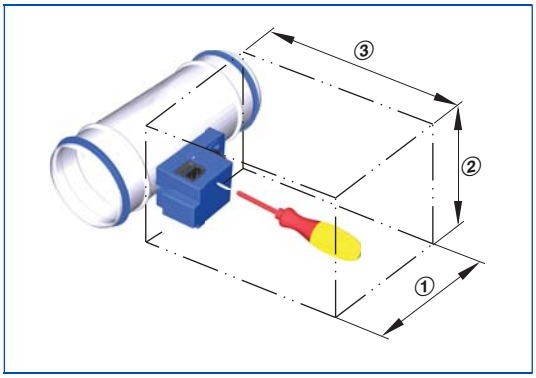


A junction causes strong turbulence. The stated volume flow rate accuracy ΔV̇ can only be achieved with a straight duct section of at least 5D upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Space requirement 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.

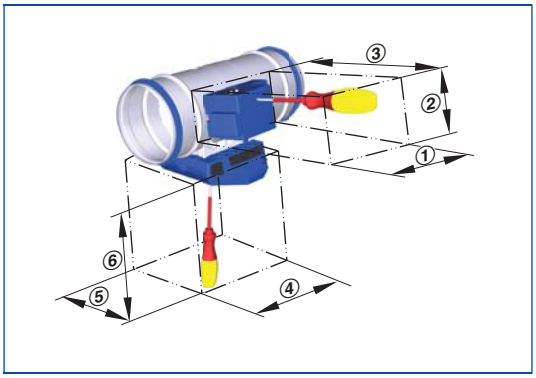
Access to attachments



Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	250	200	300
Compact controller	250	200	250
Universal controller, dynamic	520	250	250
LABCONTROL			
EASYLAB	550	350	400
TCU-LON-II	550	250	300

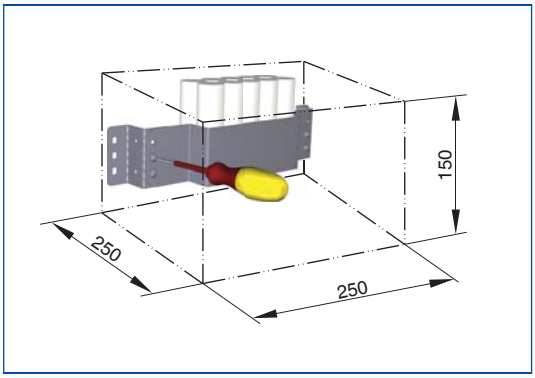
Access to attachments



Space required

Attachments	①	②	③	④	⑤	⑥
	mm					
VARYCONTROL						
Universal controller, static	520	250	250	250	150	250

Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

1

Standard text

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 and constant air volume systems, suitable for supply or extract air, available in seven nominal sizes.
High control accuracy (even with upstream bend R = 1D).
Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement and a damper blade.
Factory assembled control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Spigot with groove for lip seal, suitable for connecting ducts according to EN 1506 or EN 13180.
Position of the damper blade indicated externally at shaft extension.
Closed blade air leakage to EN 1751, class 4 (nominal size 100, class 2; nominal sizes 125 and 160, class 3).
Casing air leakage to EN 1751, class C.

Special characteristics

- Integral differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Materials and surfaces

Galvanised sheet steel construction
- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Aluminium sensor tubes
- Plastic bearings

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Damper blade and shaft made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

Stainless steel construction (A2)
- Casing, damper blade and shaft made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

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/EG

Construction

- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Technical data

- Nominal sizes: 100 to 400 mm
- Volume flow rate range: 10 to 1680 l/s or 36 to 6048 m^3/h
- Volume flow rate control range (unit with dynamic differential pressure measurement): approx. 10 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 90 Pa
- Maximum differential pressure: 1000 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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

VARYCONTROL

1 Type
TVR VAV terminal unit

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Material
No entry: galvanised sheet steel
☐ **P1** Powder-coated (RAL 7001), silver grey
☐ **A2** Stainless steel

4 Flange
No entry: none
☐ **FL** Both ends (not for TVR-D-P1)

5 Nominal size [mm]
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

6 Accessories
No entry: none
☐ **D2** Lip seals on both ends
☐ **G2** Matching flanges for both ends

7 Attachments (control component)
Example
☐ **Easy** Compact controller
☐ **BC0** Compact controller
☐ **B13** Universal controller

8 Operating mode
☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value
☐ **A** Differential pressure control – extract air
☐ **Z** Differential pressure control – supply air

9 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

10 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating modes A, Z)

11 Damper blade position
Only with spring return actuators
☐ **NO** Power off to open
☐ **NC** Power off to close

1 Order options

LABCONTROL

EASYLAB

1 Type

TVR VAV terminal unit

2 Acoustic cladding

No entry: none

☐ **D** With acoustic cladding

3 Material

No entry: galvanised sheet steel

☐ **P1** Powder-coated (RAL 7001), silver grey

☐ **A2** Stainless steel

4 Flange

No entry: none

☐ **FL** Both ends (not for TVR-D-P1)

5 Nominal size [mm]

D_N

6 Accessories

No entry: none

☐ **D2** Lip seals on both ends

☐ **G2** Matching flanges for both ends

7 Attachments (control component)

ELAB EASYLAB controller TCU3 with fast-running actuator

8 Equipment function

Room control

☐ **RS** Supply air control (Room Supply)

☐ **RE** Extract air control (Room Exhaust)

☐ **PC** Differential pressure control

Single operation

☐ **SC** Supply air controller

☐ **EC** Extract air controller

9 External volume flow rate setting

Only for single operation

☐ **E0** Voltage signal 0 – 10 V DC

☐ **E2** Voltage signal 2 – 10 V DC

☐ **2P** On-site switch contacts for 2 switching steps

☐ **3P** On-site switch contacts for 3 switching steps

☐ **F** Volume flow rate constant value, without signalling

10 Module expansions

Option 1: Power supply

No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC

☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

☐ **L** EM-LON for LonWorks FTT-10A

☐ **B** EM-BAC-MOD-01 for BACnet MS/TP

☐ **M** EM-BAC-MOD-01 for Modbus RTU

☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver

☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction

No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

11 Additional functions

Only for room control (equipment function)
Raum management function has been deactivated

☐ **LAB** Extract air led system (laboratories)

☐ **CLR** Supply air led system (clean rooms)

Raum management function is active

☐ **LAB-RMF** Extract air led system (LAB)

☐ **CLR-RMF** Supply air led system (CLR)

12 Operating values [m³/h or l/s, Pa]

For equipment function 'room control' with additional function RMF

Total room extract air/supply air

$\dot{V}_1$: Standard mode

$\dot{V}_2$: Reduced operation

$\dot{V}_3$: Increased operation

$\dot{V}_4$: Constant room supply air

$\dot{V}_5$: Constant room extract air

$\dot{V}_6$: Supply air/extract air difference

$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)

For equipment function 'single operation'

E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$

2P: $\dot{V}_1$ / $\dot{V}_2$

3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$

F: $\dot{V}_1$

Useful additions

Room control panel

☐ **BE-LCD-01** 40-character display

Order options

LABCONTROL

EASYLAB

1 Type
TVR VAV terminal unit

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Material
No entry: galvanised sheet steel
☐ **P1** Powder-coated (RAL 7001), silver grey
☐ **A2** Stainless steel

4 Flange
No entry: none
☐ **FL** Both ends (not for TVR-D-P1)

5 Nominal size [mm]
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

6 Accessories
No entry: none
☐ **D2** Lip seals on both ends
☐ **G2** Matching flanges for both ends

7 Attachments (control component)
ELAB EASYLAB controller TCU3
with fast-running actuator

8 Equipment function
With face velocity transducer
☐ **FH-VS** Face velocity control
With sash distance sensor
☐ **FH-DS** Linear control strategy
☐ **FH-DV** Safety-optimised control strategy
With switching steps
for on-site switch contacts
☐ **FH-2P** 2 switching steps
☐ **FH-3P** 3 switching steps
Without signalling
☐ **FH-F** Volume flow rate constant value

9 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
☐ **S** EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

10 Operating values [m³/h or l/s]
Depending on the equipment function
VS: $\dot{V}_{min} - \dot{V}_{max}$
DS: $\dot{V}_{min} - \dot{V}_{max}$
DV: $\dot{V}_{min} - \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
☐ **BE-SEG-**** OLED display
☐ **BE-LCD-01** 40-character display

1 Order options

LABCONTROL

TCU-LON-II

1 Type

TVR VAV terminal unit

2 Acoustic cladding

No entry: none

☐ **D** With acoustic cladding

3 Material

No entry: galvanised sheet steel

☐ **P1** Powder-coated (RAL 7001), silver grey

☐ **A2** Stainless steel

4 Flange

No entry: none

☐ **FL** Flanges on both ends

5 Nominal size [mm]

☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

6 Accessories

No entry: none

☐ **G2** Matching flanges for both ends

☐ **D2** Lip seals on both ends

7 Attachments (control component)

☐ **TMA** TCU-LON-II with fast-running actuator

☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

8 Equipment function

☐ **FH** Fume cupboard

☐ **RS** Room supply air

☐ **RE** Room extract air

☐ **PS** Differential pressure control – supply air (Pressure Supply)

☐ **PE** Differential pressure control – extract air (Pressure Extract)

9 Operating values [m³/h or l/s, Pa]

Depending on equipment function

FH: $\dot{V}_{min} - \dot{V}_{max}$

RS: $\Delta\dot{V} / \dot{V}_{constant}$

RE: $\dot{V}_{Tag} / \dot{V}_{night} / \dot{V}_{constant}$

PS: $\Delta\dot{V} / \dot{V}_{constant} / \Delta p_{setpoint}$

PE: $\dot{V}_{day} / \dot{V}_{night} / \dot{V}_{constant} / \Delta p_{setpoint}$

The room control volume flow rates (RS, RE, PS, PE) are related to the total extract air volume flow rate for the room

Useful additions

Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175

☐ **BE-TCU-LON-II** Control panel

VAV terminal units
Type TVJ





Universal controller



Compact controller



Easy controller

For normal and high volume flow rate ranges

Rectangular VAV terminal units for standard applications regarding the supply air or extract air control in variable air volume systems

- For volume flow rate ranges up to 36,000 m^3/h or 10,000 l/s
- Suitable for the control of volume flow rate, room pressure or duct pressure
- Electronic control components for different applications (Easy, Compact, Universal, and LABCONTROL)
- High control accuracy
- Suitable for airflow velocities up to 10 m/s
- Casing air leakage to EN 1751, class B

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

1

Type		Page
TVJ	General information	1.1 – 33
	Order code	1.1 – 37
	Aerodynamic data	1.1 – 40
	Quick sizing	1.1 – 42
	Dimensions and weight – TVJ	1.1 – 46
	Dimensions and weight – TVJ-D	1.1 – 48
	Installation details	1.1 – 50
	Specification text	1.1 – 52
	Basic information and nomenclature	1.5 – 1

Variants

Product examples

VAV terminal unit, variant TVJ



VAV terminal unit, variant TVJ-D



Description

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- Rectangular VARYCONTROL VAV terminal units of Type TVJ for the precise supply air or extract air flow control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- For controlling, restricting, or shutting off the airflow in air conditioning systems

Variants
- TVJ: VAV terminal unit
- TVJ-D: VAV terminal unit with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TX for demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

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

Nominal sizes
- 39 nominal sizes from 200 × 100 to 1000 × 1000

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
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Useful additions
- Secondary silencer Type TX for demanding acoustic requirements
- Heat exchanger Type WT

Special characteristics
- Integral differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blades
- 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 volume flow rate control accuracy

Construction features
- Rectangular casing
- Flanges on both sides, suitable for duct connection
- Opposed blade action, blades connected by internal gears at both ends
- Position of the damper blade indicated externally at shaft extension
- Bearings with ring seals

Materials and surfaces

Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Shafts made of galvanised steel
- Damper blades and differential pressure sensor made of aluminium
- Gears made of anti-static plastic (ABS), heat resistant to 50 °C
- Plastic bearings

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated

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/EG

Installation and commissioning

- Any installation orientation (except units with static differential pressure transducer)
- With flanges on both ends to make connections to the ducting
- TVJ-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines

- Casing air leakage to EN 1751, class B

Maintenance

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

1

Attachments: VARYCONTROL control components for Type TVJ

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
BL0		Compact controller with LonWorks interface TROX/Belimo		
XB0		Compact controller TROX/Gruner		
LN0		Compact controller Siemens		
Universal controller, dynamic				
B13	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator
B1B				Spring return actuator
XC3		Universal controller TROX/Gruner		
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo		Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3				Spring return actuator
BR3	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, integral 100 Pa	Actuator
BRB				Spring return actuator
BS3			Static, integral 600 Pa	Actuator
BSB				Spring return actuator
BSG				Fast-running actuator
BG3		Differential pressure controller TROX/Belimo	Static, integral 100 Pa	Actuator
BGB				Spring return actuator
BH3			Static, integral 600 Pa	Actuator
BHB				Spring return actuator
XE1		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE3				Spring return actuator
XF1			Static, integral 600 Pa	Actuator
XF3				Spring return actuator

Attachments: LABCONTROL control components for Type TVJ

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room supply air Room extract air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room supply air Room extract air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

Technical data

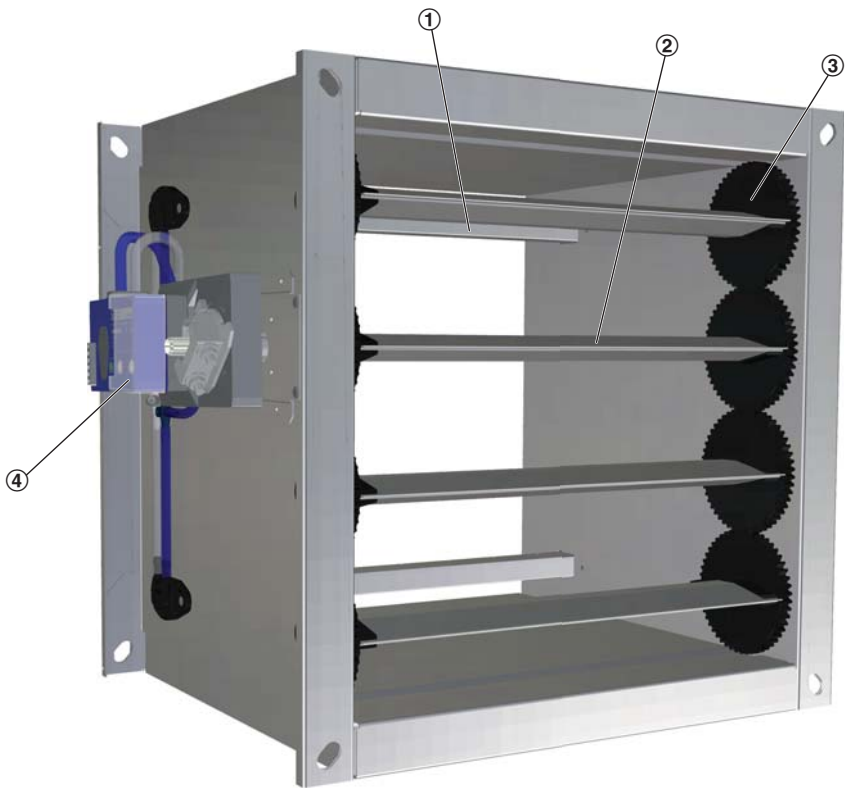
Nominal sizes	200 × 100 to 1000 × 1000 mm
Volume flow rate range	45 – 10100 l/s or 162 – 36360 m^3/h
Volume flow rate control range (unit with dynamic differential pressure measurement)	Approx. 20 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 40 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

1 Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator; the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal or LABCONTROL). For most applications, the setpoint value comes from a room temperature controller. The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values.

Schematic illustration of the TVJ



① Differential pressure sensor
② Damper blade
③ Gears
④ Control components, e.g. an Easy controller

1

Order code VARYCONTROL

TVJ, TVJ/.../Easy

TVJ – D – P1 / 600×400 / B1B / E 0 / 200 – 900 / NO
1 2 3 4 5 6 7 8 9

TVJ – D / 900×300 / Easy
1 2 4 5

1 Type
TVJ VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
Example
Easy Easy controller
BC0 Compact controller
B13 Universal controller

6 Operating mode
E Single
M Master
S Slave
F Constant value
A Differential pressure control – extract air
Z Differential pressure control – supply air

7 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

8 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating modes A, Z)

9 Damper blade position
Only with spring return actuators
NO Power off to OPEN
NC Power off to CLOSE

Order example VARYCONTROL

TVJ/400×200/B13/M0/800–2000 m³/h

Acoustic cladding	Without
Material	Galvanised sheet steel
Nominal size	400 × 200 mm
Attachment	Universal controller
Operating mode	Master
Signal voltage range	0 – 10 V DC
Volume flow rate	800 – 2000 m³/h

1 Order code
LABCONTROL
EASYLAB

TVJ with EASYLAB for room control and single operation

TVJ – D – P1 / 600×400 / ELAB / RS / ULZ / LAB / ...
1 2 3 4 5 6 8 9 10

TVJ – D / P1 / 600×400 / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 9 10

1 Type
TVJ VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
RS Supply air control (Room Supply)
RE Extract air control (Room Exhaust)
PC Differential pressure control

Single operation
SC Supply air controller
EC Extract air controller

7 External volume flow rate setting
Only for single operation
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
LAB Extract air led system (laboratories)
CLR Supply air led system (clean rooms)
Raum management function is active
LAB-RMF Extract air led system (LAB)
CLR-RMF Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
BE-LCD-01 40-character display

Order example
LABCONTROL
EASYLAB

TVJ/900×300/ELAB/RS/Z/LAB

Acoustic cladding	Without
Nominal size	900 × 300 mm
Attachments	EASYLAB controller TCU3 with fast-running actuator
Equipment function	Supply air control (Room Supply)
Module expansions	EM-AUTOZERO Solenoid valve for automatic zero point correction
Additional functions	Extract air led system for laboratories

Order code
LABCONTROL
TCU-LON-II

TVJ with TCU-LON-II

TVJ – D – P1 / 600×400 / TMA / RE / 1500 / 750 / 100
1 2 3 4 5 6 7

1 Types
TVJ VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function
RS Room supply air
RE Room extract air
PS Differential pressure control – supply air (Pressure Supply)
PE Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]
Depending on equipment function
RS: $\Delta\dot{V}$ / $\dot{V}_{constant}$
RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$
PS: $\Delta\dot{V}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
PE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

Order example
LABCONTROL
TCU-LON-II

TVJ-D/900×300/TMA/RS/100/300

Acoustic cladding	With
Nominal size	900 × 300 mm
Attachment	TCU-LON-II with fast-running actuator
Equipment function	Supply air control (Room Supply)
Operating values	Volume flow rate difference 100 m³/h, constant volume flow rates 300 m³/h

1

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	V̇		①	②	ΔV̇
			$\Delta p_{st\ min}$		
	l/s	m³/h	Pa		± %
200 × 100	45	162	5	10	14
	85	306	10	25	8
	150	540	20	80	5
	215	774	40	155	5
300 × 100	65	234	5	10	14
	120	432	10	25	8
	210	756	20	70	5
	320	1152	40	155	5
400 × 100	85	306	5	10	14
	170	612	10	25	8
	300	1080	20	80	5
	425	1530	40	155	5
500 × 100	105	378	5	10	14
	200	720	10	25	8
	350	1260	20	70	5
	535	1926	40	155	5
600 × 100	130	468	5	10	14
	260	936	10	25	8
	450	1620	20	75	5
	650	2340	40	155	5
200 × 200	85	306	5	10	14
	160	576	10	25	8
	280	1008	20	75	5
	415	1494	40	155	5
300 × 200	125	450	5	10	14
	240	864	10	25	8
	420	1512	20	75	5
	620	2232	40	155	5
400 × 200	165	594	5	10	14
	330	1188	10	25	8
	580	2088	20	80	5
	825	2970	40	155	5
500 × 200	205	738	5	10	14
	400	1440	10	25	8
	700	2520	20	75	5
	1035	3726	40	155	5
600 × 200	250	900	5	10	14
	500	1800	10	25	8
	870	3132	20	80	5
	1250	4500	40	155	5
700 × 200	290	1044	5	10	14
	560	2016	10	25	8
	980	3528	20	75	5
	1450	5220	40	155	5
800 × 200	330	1188	5	10	14
	660	2376	10	25	8
	1160	4176	20	80	5
	1650	5940	40	155	5

Nominal size	V̇		①	②	ΔV̇
			$\Delta p_{st\ min}$		
	l/s	m³/h	Pa		± %
300 × 300	185	666	5	10	14
	360	1296	10	25	8
	630	2268	20	75	5
	920	3312	35	150	5
400 × 300	245	882	5	10	14
	480	1728	10	25	8
	840	3024	20	70	8
	1230	4428	35	150	5
500 × 300	305	1098	5	10	14
	600	2160	10	25	8
	1050	3780	20	70	5
	1535	5526	35	150	5
600 × 300	370	1332	5	10	14
	740	2664	10	25	8
	1290	4644	20	75	5
	1850	6660	35	150	5
700 × 300	430	1548	5	10	14
	840	3024	10	25	8
	1470	5292	20	70	5
	2150	7740	35	150	5
800 × 300	490	1764	5	10	14
	980	3528	10	25	8
	1720	6192	20	75	5
	2450	8820	35	150	5
900 × 300	555	1998	5	10	14
	1080	3888	10	25	8
	1890	6804	20	70	5
	2770	9972	35	150	5
1000 × 300	620	2232	5	10	14
	1240	4464	10	25	8
	2150	7740	20	75	5
	3100	11160	35	150	5
400 × 400	325	1170	5	10	14
	640	2304	10	25	8
	1120	4032	20	75	5
	1630	5868	35	150	5
500 × 400	410	1476	5	10	14
	800	2880	10	25	8
	1400	5040	20	75	5
	2040	7344	35	150	5
600 × 400	490	1764	5	10	14
	980	3528	10	25	8
	1720	6192	20	75	5
	2450	8820	35	150	5
700 × 400	570	2052	5	10	14
	1120	4032	10	25	8
	1960	7056	20	75	5
	2850	10260	35	150	5

① TVJ
② TVJ with secondary silencer TX

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.

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		① ② $\Delta p_{st\ min}$		$\Delta\dot{V}$
	l/s	m³/h	Pa		± %
800 × 400	650	2340	5	10	14
	1300	4680	10	25	8
	2280	8208	20	75	5
	3250	11700	35	150	5
900 × 400	735	2646	5	10	14
	1440	5184	10	25	8
	2520	9072	20	75	5
	3670	13212	35	150	5
1000 × 400	820	2952	5	10	14
	1640	5904	10	25	8
	2850	10260	20	75	5
	4100	14760	35	150	5
500 × 500	510	1836	5	10	14
	1000	3600	10	25	8
	1750	6300	20	75	5
	2540	9144	40	155	5
600 × 500	610	2196	5	10	14
	1200	4320	10	25	8
	2100	7560	20	75	5
	3050	10980	40	155	5
700 × 500	710	2556	5	10	14
	1400	5040	10	25	8
	2450	8820	20	75	5
	3550	12780	40	155	5
800 × 500	810	2916	5	10	14
	1600	5760	10	25	8
	2800	10080	20	75	5
	4050	14580	40	155	5
900 × 500	915	3294	5	10	14
	1800	6480	10	25	8
	3150	11340	20	75	5
	4570	16452	40	155	5

Nominal size	$\dot{V}$		① ② $\Delta p_{st\ min}$		$\Delta\dot{V}$
	l/s	m³/h	Pa		± %
1000 × 500	1020	3672	5	10	14
	2000	7200	10	25	8
	3500	12600	20	75	5
	5100	18360	40	155	5
600 × 600	730	2628	5	10	14
	1440	5184	10	25	8
	2520	9072	20	75	5
	3650	13140	40	155	5
800 × 600	970	3492	5	10	14
	1920	6912	10	25	8
	3360	12096	20	75	5
	4850	17460	40	155	5
1000 × 600	1220	4392	5	10	14
	2400	8640	10	25	8
	4200	15120	20	75	5
	6100	21960	40	155	5
800 × 800	1300	4680	5	10	14
	2560	9216	10	25	8
	4480	16128	20	75	5
	6500	23400	40	155	5
1000 × 800	1620	5832	5	10	14
	3200	11520	10	25	8
	5600	20160	20	75	5
	8100	29160	40	155	5
1000 × 1000	2020	7272	5	10	14
	4000	14400	10	25	8
	7000	25200	20	75	5
	10100	36360	40	155	5

① TVJ
② TVJ with secondary silencer TX

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.

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
200 x 100	45	162	43	17	31	19
	85	306	47	26	35	24
	150	540	49	36	38	29
	215	774	49	41	41	33
300 x 100	65	234	44	18	32	20
	120	432	47	27	35	25
	210	756	48	34	38	30
	320	1152	48	40	41	34
400 x 100	85	306	45	20	33	21
	170	612	47	28	37	27
	300	1080	47	35	40	32
	425	1530	48	40	43	36
500 x 100	105	378	46	20	34	22
	200	720	47	28	37	27
	350	1260	47	34	41	32
	535	1926	48	40	44	37
600 x 100	130	468	46	22	34	22
	260	936	47	28	38	29
	450	1620	47	35	42	34
	650	2340	48	39	45	37
200 x 200	85	306	45	20	33	21
	160	576	48	28	36	26
	280	1008	48	35	41	32
	415	1494	49	40	43	36
300 x 200	125	450	46	21	34	22
	240	864	47	27	37	27
	420	1512	48	34	41	33
	620	2232	48	39	44	37
400 x 200	165	594	46	22	35	23
	330	1188	46	27	38	29
	580	2088	47	34	43	35
	825	2970	48	39	46	39
500 x 200	205	738	46	22	36	24
	400	1440	46	27	39	30
	700	2520	47	34	44	36
	1035	3726	48	39	47	40
600 x 200	250	900	46	22	36	25
	500	1800	46	27	40	31
	870	1800	47	34	45	37
	1250	4500	47	39	47	41
700 x 200	290	1044	46	22	37	25
	560	2016	46	27	40	31
	980	3528	47	34	45	38
	1450	5220	47	39	48	42
800 x 200	330	1188	46	22	37	26
	660	2376	46	27	41	32
	1160	4176	47	34	46	38
	1650	5940	47	39	49	42

① TVJ
② TVJ with secondary silencer TX
③ TVJ-D

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
300 x 300	185	666	46	21	35	23
	360	1296	46	26	39	29
	630	2268	47	33	43	35
	920	3312	47	39	46	39
400 x 300	245	882	46	21	36	24
	480	1728	46	27	40	30
	840	3024	46	33	44	37
	1230	4428	47	39	47	41
500 x 300	305	1098	46	22	67	25
	600	2160	46	27	41	31
	1050	3780	47	33	45	38
	1535	5526	47	39	48	42
600 x 300	370	1332	46	22	37	26
	740	2664	46	27	42	32
	1290	4644	47	33	46	39
	1850	6660	47	39	49	42
700 x 300	430	1548	46	22	38	27
	840	3024	46	27	42	33
	1470	5292	46	33	47	40
	2150	7740	47	39	50	43
800 x 300	490	1764	45	22	38	27
	980	3528	46	27	43	34
	1720	6192	46	33	47	40
	2450	8820	47	39	50	44
900 x 300	555	1998	46	22	39	28
	1080	3888	46	27	43	34
	1890	6804	46	33	48	41
	2770	9972	47	39	51	44
1000 x 300	620	2232	45	22	39	28
	1240	4464	46	28	44	35
	2150	7740	46	33	48	41
	3100	11160	47	38	51	45
400 x 400	325	1170	45	21	37	26
	640	2304	46	27	41	31
	1120	4032	46	34	45	37
	1630	5868	47	40	49	42
500 x 400	410	1476	45	21	38	27
	800	2880	46	27	42	32
	1400	5040	46	34	46	38
	2040	7344	47	40	50	43
600 x 400	490	1764	45	21	38	27
	980	3528	46	27	43	33
	1720	6192	46	34	47	40
	2450	8820	47	39	50	44
700 x 400	570	2052	45	22	39	28
	1120	4032	46	27	43	34
	1960	7056	46	33	48	40
	2850	10260	47	39	51	44

① TVJ
② TVJ with secondary silencer TX
③ TVJ-D

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
800 x 400	650	2340	45	22	39	28
	1300	4680	45	27	44	35
	2280	8208	46	33	48	41
	3250	11700	47	39	51	45
900 x 400	735	2646	45	22	40	29
	1440	5184	46	26	44	35
	2520	9072	46	33	49	41
	3670	13212	47	39	52	46
1000 x 400	820	2952	45	22	40	29
	1640	5904	45	27	44	36
	2850	10260	46	33	49	42
	4100	14760	47	38	52	46
500 x 500	510	1836	45	21	38	27
	1000	3600	46	26	43	33
	1750	6300	46	33	47	39
	2540	9144	47	39	50	44
600 x 500	610	2196	45	21	39	28
	1200	4320	46	26	43	34
	2100	7560	46	33	48	40
	3050	10980	47	39	51	44
700 x 500	710	2556	45	21	39	29
	1400	5040	46	27	44	35
	2450	8820	46	33	48	41
	3550	12780	47	39	52	45
800 x 500	810	2916	45	22	40	29
	1600	5760	45	27	44	36
	2800	10080	46	33	49	42
	4050	14580	47	39	52	46
900 x 500	915	3294	45	21	40	30
	1800	6480	46	27	45	36
	3150	11340	46	33	50	42
	4570	16452	47	39	53	47
1000 x 500	1020	3672	44	22	41	30
	2000	7200	45	27	45	37
	3500	12600	46	33	50	43
	5100	18360	46	38	53	47
600 x 600	730	2628	45	21	40	28
	1440	5184	45	27	44	35
	2520	9072	46	33	49	41
	3650	13140	46	39	52	45
800 x 600	970	3492	45	22	41	30
	1920	6912	45	27	45	36
	3360	12096	46	33	50	43
	4850	17460	46	39	53	47
1000 x 600	1220	4392	45	22	41	31
	2400	8640	45	27	46	37
	4200	15120	46	33	51	44
	6100	21960	46	38	54	48

① TVJ
② TVJ with secondary silencer TX
③ TVJ-D

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
800 x 800	1300	4680	44	21	42	31
	2560	9216	45	27	47	38
	4480	16128	46	33	51	44
	6500	23400	46	39	55	49
1000 x 800	1620	5832	44	21	42	32
	3200	11520	45	26	47	39
	5600	20160	46	33	52	45
	8100	29160	46	39	55	49
1000 x 1000	2020	7272	44	21	43	33
	4000	14400	45	26	48	40
	7000	25200	45	33	53	46
	10100	36360	46	39	57	51

① TVJ
② TVJ with secondary silencer TX
③ TVJ-D

1

Description

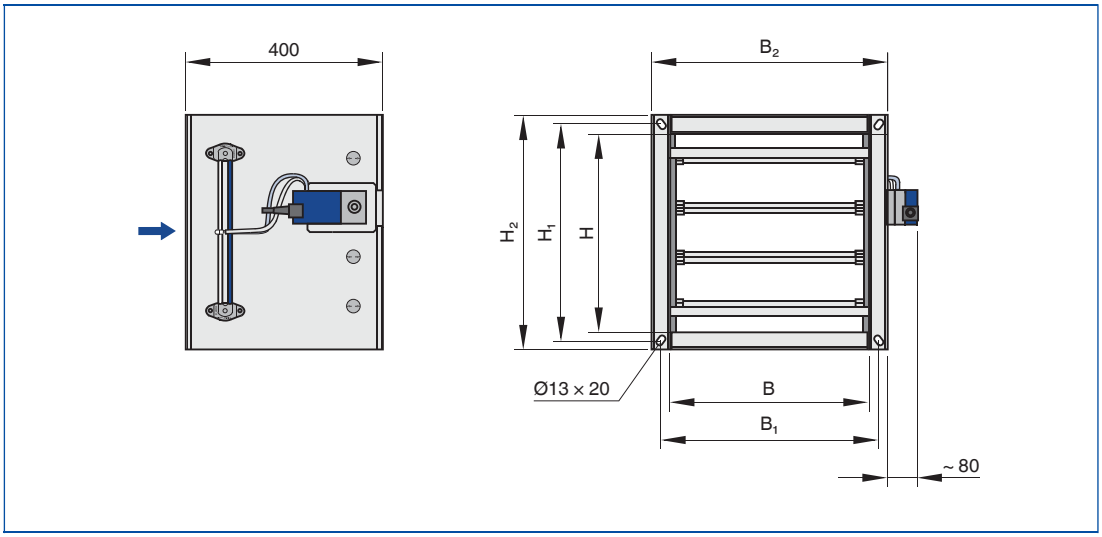
– VAV terminal unit for the control of variable air volume flow rates



VAV terminal unit, variant TVJ

Dimensions

TVJ

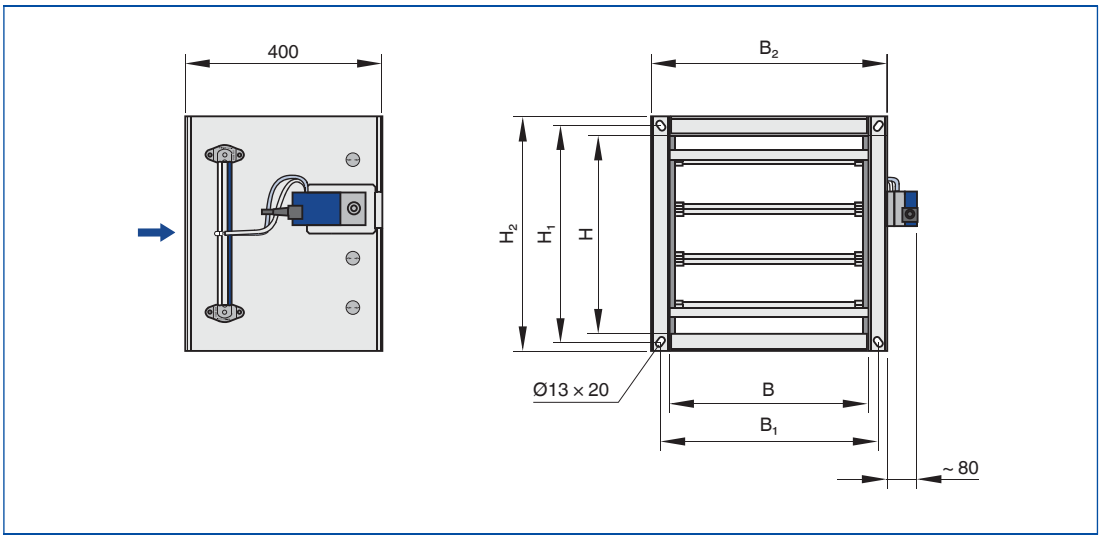


Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	276	134	176	6
300 × 100	300	100	334	376	134	176	7
400 × 100	400	100	434	476	134	176	8
500 × 100	500	100	534	576	134	176	9
600 × 100	600	100	634	676	134	176	10
200 × 200	200	200	234	276	234	276	9
300 × 200	300	200	334	376	234	276	10
400 × 200	400	200	434	476	234	276	11
500 × 200	500	200	534	576	234	276	12
600 × 200	600	200	634	676	234	276	13
700 × 200	700	200	734	776	234	276	14
800 × 200	800	200	834	876	234	276	15
300 × 300	300	300	334	376	334	376	10
400 × 300	400	300	434	476	334	376	11
500 × 300	500	300	534	576	334	376	12
600 × 300	600	300	634	676	334	376	13
700 × 300	700	300	734	776	334	376	15
800 × 300	800	300	834	876	334	376	16
900 × 300	900	300	934	976	334	376	18
1000 × 300	1000	300	1034	1076	334	376	19

Dimensions

TVJ



Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
400 × 400	400	400	434	476	434	476	14
500 × 400	500	400	534	576	434	476	15
600 × 400	600	400	634	676	434	476	16
700 × 400	700	400	734	776	434	476	17
800 × 400	800	400	834	876	434	476	18
900 × 400	900	400	934	976	434	476	21
1000 × 400	1000	400	1034	1076	434	476	20
500 × 500	500	500	534	576	534	576	19
600 × 500	600	500	634	676	534	576	20
700 × 500	700	500	734	776	534	576	22
800 × 500	800	500	834	876	534	576	23
900 × 500	900	500	934	976	534	576	25
1000 × 500	1000	500	1034	1076	534	576	26
600 × 600	600	600	634	676	634	676	19
800 × 600	800	600	834	876	634	676	23
1000 × 600	1000	600	1034	1076	634	676	27
800 × 800	800	800	834	876	834	876	28
1000 × 800	1000	800	1034	1076	834	876	32
1000 × 1000	1000	1000	1034	1076	1034	1076	38

1

Description

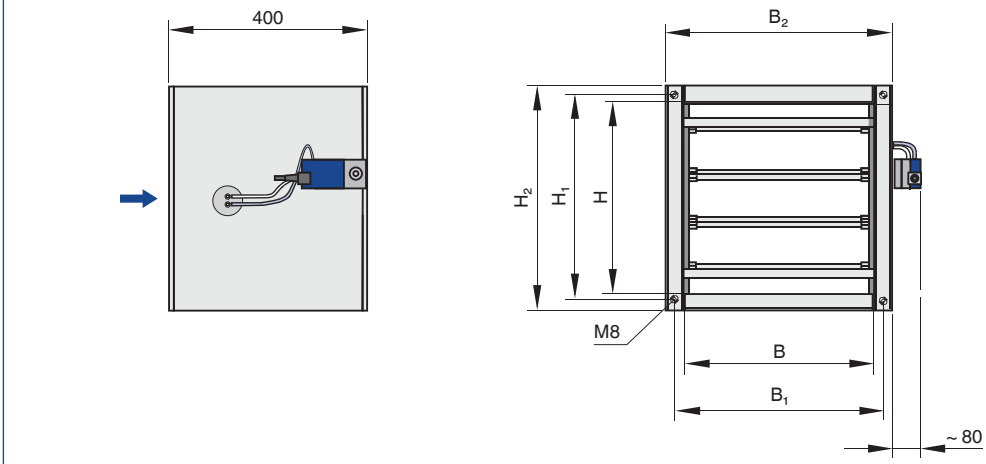


VAV terminal unit, variant TVJ-D

- VAV terminal unit with acoustic cladding for the control of variable air volume flows
- 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

TVJ-D

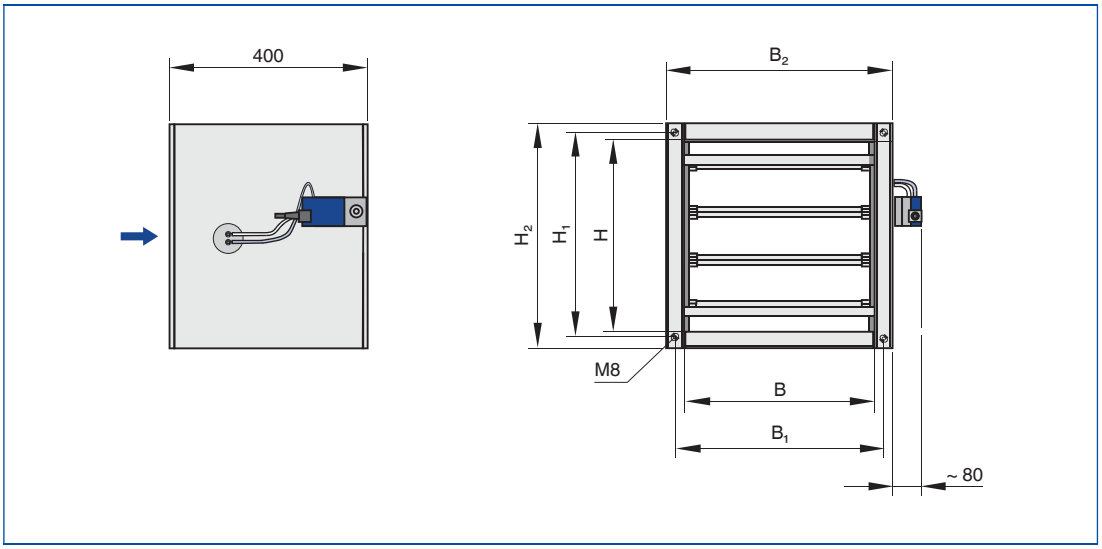


Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	280	134	180	9
300 × 100	300	100	334	380	134	180	11
400 × 100	400	100	434	480	134	180	12
500 × 100	500	100	534	580	134	180	14
600 × 100	600	100	634	680	134	180	15
200 × 200	200	200	234	280	234	280	14
300 × 200	300	200	334	380	234	280	15
400 × 200	400	200	434	480	234	280	17
500 × 200	500	200	534	580	234	280	18
600 × 200	600	200	634	680	234	280	20
700 × 200	700	200	734	780	234	280	21
800 × 200	800	200	834	880	234	280	23
300 × 300	300	300	334	380	334	380	15
400 × 300	400	300	434	480	334	380	17
500 × 300	500	300	534	580	334	380	18
600 × 300	600	300	634	680	334	380	20
700 × 300	700	300	734	780	334	380	22
800 × 300	800	300	834	880	334	380	24
900 × 300	900	300	934	980	334	380	26
1000 × 300	1000	300	1034	1080	334	380	29

Dimensions

TVJ-D



Dimensions [mm] and weight [kg]

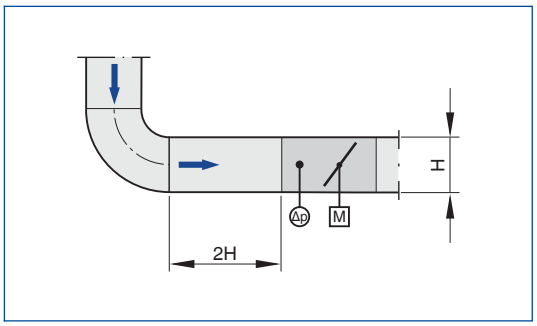
Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
400 × 400	400	400	434	480	434	480	21
500 × 400	500	400	534	580	434	480	23
600 × 400	600	400	634	680	434	480	24
700 × 400	700	400	734	780	434	480	26
800 × 400	800	400	834	880	434	480	27
900 × 400	900	400	934	980	434	480	29
1000 × 400	1000	400	1034	1080	434	480	32
500 × 500	500	500	534	580	534	580	28
600 × 500	600	500	634	680	534	580	30
700 × 500	700	500	734	780	534	580	32
800 × 500	800	500	834	880	534	580	35
900 × 500	900	500	934	980	534	580	37
1000 × 500	1000	500	1034	1080	534	580	39
600 × 600	600	600	634	680	634	680	29
800 × 600	800	600	834	880	634	680	35
1000 × 600	1000	600	1034	1080	634	680	41
800 × 800	800	800	834	880	834	880	42
1000 × 800	1000	800	1034	1080	834	880	48
1000 × 1000	1000	1000	1034	1080	1034	1080	57

1

Upstream conditions

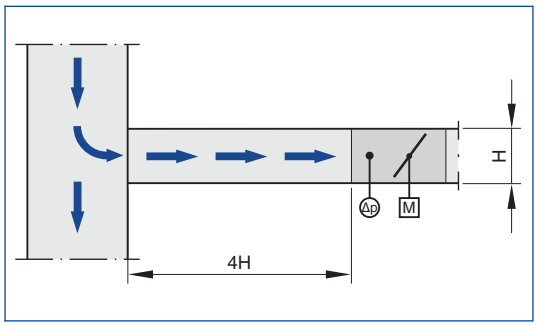
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

Bend, vertical



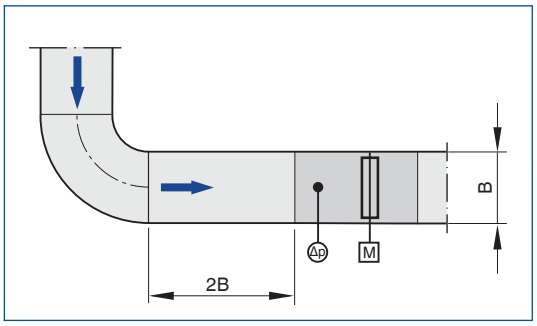
A bend – with a straight duct section of at least 2H upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction, vertical



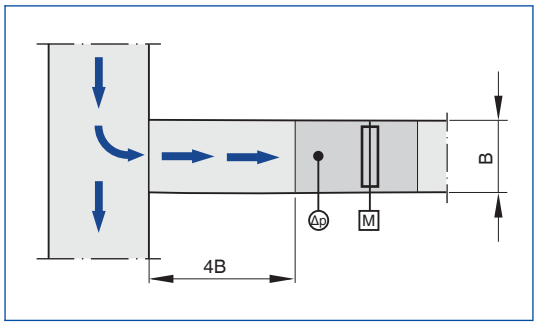
A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 4H upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Bend, horizontal



A bend – with a straight duct section of at least 2B upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction, horizontal

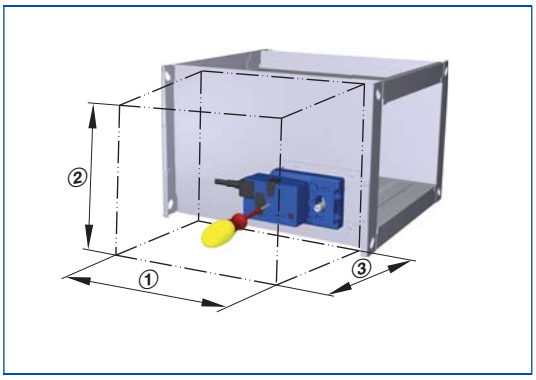


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 4B upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

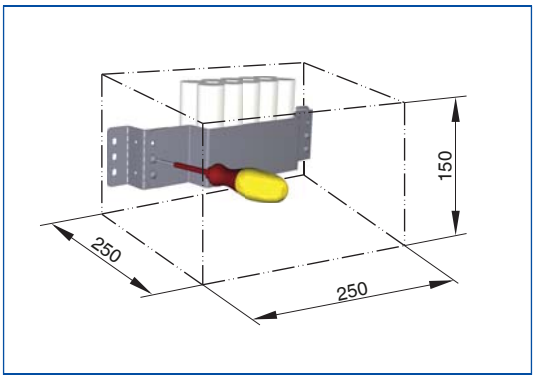
Space requirement for commissioning and maintenance

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



Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	400	H	300
Compact controller	400	H	300
Universal controller	500	H	300
LABCONTROL			
EASYLAB	500	H	400
TCU-LON-II	500	H	300

H: Unit height

1

Standard text

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

Rectangular VAV terminal units for variable and constant air volume systems, suitable for supply or extract air, available in 39 nominal sizes.
High volume flow rate control accuracy.
Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement and damper blades.
Factory assembled control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Both ends suitable for the connection of ducts.
Position of the damper blades indicated externally at the shaft extension.
Casing air leakage to EN 1751, class B.

Special characteristics

- Integral differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Materials and surfaces

Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Shafts made of galvanised steel
- Damper blades and differential pressure sensor made of aluminium
- Gears made of anti-static plastic (ABS), heat resistant to 50 °C
- Plastic bearings

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated

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/EG

Construction

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

Technical data

- Nominal sizes: 200 × 100 to 1000 × 1000 mm
- Volume flow rate range: 45 to 10100 l/s or 162 to 36360 m^3/h
- Volume flow rate control range (unit with dynamic differential pressure measurement): approx. 20 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 40 Pa
- Maximum differential pressure: 1000 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. 20 – 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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

VARYCONTROL

1 Type
TVJ VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
Example
☐ **Easy** Easy controller
☐ **BC0** Compact controller
☐ **B13** Universal controller

6 Operating mode
☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value
☐ **A** Differential pressure control – extract air
☐ **Z** Differential pressure control – supply air

7 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

8 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating modes A, Z)

9 Damper blade position
Only with spring return actuators
☐ **NO** Power off to OPEN
☐ **NC** Power off to CLOSE

1 Order options
LABCONTROL
EASYLAB

1 Type
TVJ VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
☐ **RS** Supply air control (Room Supply)
☐ **RE** Extract air control (Room Exhaust)
☐ **PC** Differential pressure control

Single operation
☐ **SC** Supply air controller
☐ **EC** Extract air controller

7 External volume flow rate setting
Only for single operation
☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC
☐ **2P** On-site switch contacts for 2 switching steps
☐ **3P** On-site switch contacts for 3 switching steps
☐ **F** Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
☐ **LAB** Extract air led system (laboratories)
☐ **CLR** Supply air led system (clean rooms)
Raum management function is active
☐ **LAB-RMF** Extract air led system (LAB)
☐ **CLR-RMF** Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
☐ **BE-LCD-01** 40-character display

Order options

LABCONTROL

TCU-LON-II

1 Types
TVJ VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
☐ **TMA** TCU-LON-II with fast-running actuator
☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function
☐ **RS** Room supply air
☐ **RE** Room extract air
☐ **PS** Differential pressure control – supply air (Pressure Supply)
☐ **PE** Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]
Depending on equipment function
RS: $\Delta\dot{V}$ / $\dot{V}_{constant}$
RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$
PS: $\Delta\dot{V}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
PE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

1

VAV terminal units
Type TVT





Universal controller



Compact controller



Easy controller



With sealing elements
for low-leakage shut-off

For normal and high volume flow rate ranges and air-tight shut-off

Rectangular VAV terminal units for standard applications regarding the supply air or extract air control in variable air volume systems where low-leakage shut-off is required

- For volume flow rate ranges up to 21,000 m^3/h or 5,800 l/s
- Suitable for the control of volume flow rate, room pressure or duct pressure
- Electronic control components for different applications (Easy, Compact, Universal, and LABCONTROL)
- High control accuracy
- Suitable for airflow velocities up to 10 m/s
- Closed blade air leakage to EN 1751, class 3
- Casing air leakage to EN 1751, up to class C

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

1

Type		Page
TVT	General information	1.1 – 57
	Order code	1.1 – 61
	Aerodynamic data	1.1 – 64
	Quick sizing	1.1 – 66
	Dimensions and weight – TVT	1.1 – 69
	Dimensions and weight – TVT-D	1.1 – 71
	Installation details	1.1 – 73
	Specification text	1.1 – 75
	Basic information and nomenclature	1.5 – 1

Variants

Product examples

VAV terminal unit, variant TVT



VAV terminal unit, variant TVT-D



Description

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- Rectangular VARYCONTROL VAV terminal units of Type TVT for the precise supply air or extract air flow control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- For controlling, restricting, or shutting off the airflow in air conditioning systems
- Shut-off by means of switching (equipment supplied by others)

Variants
- TVT: VAV terminal unit
- TVT-D: VAV terminal unit with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TX for demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

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

Nominal sizes
- 36 nominal sizes from 200 × 100 to 1000 × 600
- Up to nominal size 800 × 300 including all attachments, larger units only with actuators with higher torque

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
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Useful additions
- Secondary silencer Type TX for demanding acoustic requirements
- Heat exchanger Type WT

Special characteristics
- Integral differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blades
- 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 volume flow rate control accuracy

Construction features
- Rectangular casing
- Flanges on both sides, suitable for duct connection
- Opposed blade action, blades connected by internal gears (enclosed) at both ends
- Damper blades with replaceable seals
- Position of the damper blade indicated externally at shaft extension
- Bearings with ring seals

Materials and surfaces
Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Shaft and linkage made of galvanised steel
- Damper blades and differential pressure sensor made of aluminium
- Gears made of anti-static plastic (ABS), heat resistant to 50 °C
- Plastic bearings

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated

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/EG

Installation and commissioning
- Any installation orientation (except units with static differential pressure transducer)
- With flanges on both ends to make connections to the ducting
- TVT-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines
- Closed blade air leakage to EN 1751, class 3
- 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 (B + H ≤400, class B)

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

1

Attachments: VARYCONTROL control components for Type TVT

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
BL0		Compact controller with LonWorks interface TROX/Belimo		
XB0		Compact controller TROX/Gruner		
LN0		Compact controller Siemens		
Universal controller, dynamic				
B11	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator
B1B				Spring return actuator
XC3		Universal controller TROX/Gruner		
Universal controller, static				
BP1	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB1		Universal controller TROX/Belimo		Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3				Spring return actuator
BR1	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, integral 100 Pa	Actuator
BRB				Spring return actuator
BS1			Static, integral 600 Pa	Actuator
BSB				Spring return actuator
BSG				Fast-running actuator
BG1		Differential pressure controller TROX/Belimo	Static, integral 100 Pa	Actuator
BGB				Spring return actuator
BH1			Static, integral 600 Pa	Actuator
BHB				Spring return actuator
XE1		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE3				Spring return actuator
XF1			Static, integral 600 Pa	Actuator
XF3				Spring return actuator

Attachments: LABCONTROL control components for Type TVT

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room supply air Room extract air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room supply air Room extract air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

Technical data

Nominal sizes	200 × 100 to 1000 × 600 mm
Volume flow rate range	45 – 6100 l/s or 162 – 21960 m³/h
Volume flow rate control range (unit with dynamic differential pressure measurement)	Approx. 20 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 40 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

1 Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator; the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal or LABCONTROL).
For most applications, the setpoint value comes from a room temperature controller.
The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values.

Schematic illustration of the TVT



① Differential pressure sensor
② Damper blade with seal
③ Gears
④ Control components, e.g. an Easy controller

Order code

VARYCONTROL

TVT, TVT/.../Easy

TVT – D – P1 / 600×400 / B1B / E 0 / 200 – 900 / NO

1 2 3 4 5 6 7 8 9

TVT – D / 600×400 / Easy

1 2 4 5

1 Type
TVT VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
Example
Easy Easy controller
BC0 Compact controller
B11 Universal controller

6 Operating mode
E Single
M Master
S Slave
F Constant value
A Differential pressure control – extract air
Z Differential pressure control – supply air

7 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

8 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating modes A, Z)

9 Damper blade position
Only with spring return actuators
NO Power off to OPEN
NC Power off to CLOSE

Order example

VARYCONTROL

TVT/500×300/BC0/E0/2000–5500 m³/h

Acoustic cladding	Without
Material	Galvanised sheet steel
Nominal size	500 × 300 mm
Attachment	Compact controller
Operating mode	Single
Signal voltage range	0 – 10 V DC
Volume flow rate	2000 – 5500 m³/h

1 Order code
LABCONTROL
EASYLAB

TVT with EASYLAB for room control and single operation

TVT – D – P1 / 600×400 / ELAB / RS / ULZ / LAB / ...
1 2 3 4 5 6 8 9 10

TVT – D / P1 / 600×400 / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 9 10

1 Type
TVT VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
RS Supply air control (Room Supply)
RE Extract air control (Room Exhaust)
PC Differential pressure control

Single operation
SC Supply air controller
EC Extract air controller

7 External volume flow rate setting
Only for single operation
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
LAB Extract air led system (laboratories)
CLR Supply air led system (clean rooms)
Raum management function is active
LAB-RMF Extract air led system (LAB)
CLR-RMF Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
BE-LCD-01 40-character display

Order example
LABCONTROL
EASYLAB

TVT/600×400/ELAB/SC/2P/3000/7000

Acoustic cladding	Without
Nominal size	600 × 400 mm
Attachment	EASYLAB controller TCU3 with fast-running actuator
Equipment function	Supply air controller
External volume flow rate setting	On-site switch contacts for 2 switching steps, 3000 and 7000 m³/h

Order code
LABCONTROL
TCU-LON-II

TVT with TCU-LON-II

TVT – D – P1 / 600×400 / TMA / RE / 1500 / 750 / 100
1 2 3 4 5 6 7

1 Types
TVT VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function
RS Room supply air
RE Room extract air
PS Differential pressure control – supply air (Pressure Supply)
PE Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]
Depending on equipment function
RS: $\Delta\dot{V}$ / $\dot{V}_{constant}$
RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$
PS: $\Delta\dot{V}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
PE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

Order example
LABCONTROL
TCU-LON-II

TVT-P1/600×400/TMB/RE/1500/750/100

Acoustic cladding	Without
Material	Powder-coated RAL 7001, silver grey
Nominal size	600 × 400 mm
Attachment	TCU-LON-II with fast-running actuator (brushless motor)
Equipment function	Room extract air
Operating values	Total extract air – day-time operation = 1500 m³/h, total extract air – night-time operation = 750 m³/h, constant volume flow rates = 100 m³/h

1

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		① $\Delta p_{st\ min}$	② $\Delta p_{st\ min}$	$\Delta\dot{V}$
	l/s	m³/h	Pa		± %
200 × 100	45	162	5	10	14
	85	306	10	25	8
	150	540	20	80	5
	215	774	40	155	5
300 × 100	65	234	5	10	14
	120	432	10	25	8
	210	756	20	70	5
	320	1152	40	155	5
400 × 100	85	306	5	10	14
	170	612	10	25	8
	300	1080	20	80	5
	425	1530	40	155	5
500 × 100	105	378	5	10	14
	200	720	10	25	8
	350	1260	20	70	5
	535	1926	40	155	5
600 × 100	130	468	5	10	14
	260	936	10	25	8
	450	1620	20	75	5
	650	2340	40	155	5
200 × 200	85	306	5	10	14
	160	576	10	25	8
	280	1008	20	75	5
	415	1494	40	155	5
300 × 200	125	450	5	10	14
	240	864	10	25	8
	420	1512	20	75	5
	620	2232	40	155	5
400 × 200	165	594	5	10	14
	330	1188	10	25	8
	580	2088	20	80	5
	825	2970	40	155	5
500 × 200	205	738	5	10	14
	400	1440	10	25	8
	700	2520	20	75	5
	1035	3726	40	155	5
600 × 200	250	900	5	10	14
	500	1800	10	25	8
	870	3132	20	80	5
	1250	4500	40	155	5
700 × 200	290	1044	5	10	14
	560	2016	10	25	8
	980	3528	20	75	5
	1450	5220	40	155	5

Nominal size	$\dot{V}$		① $\Delta p_{st\ min}$	② $\Delta p_{st\ min}$	$\Delta\dot{V}$
	l/s	m³/h	Pa		± %
800 × 200	330	1188	5	10	14
	660	2376	10	25	8
	1160	4176	20	80	5
	1650	5940	40	155	5
300 × 300	185	666	5	10	14
	360	1296	10	25	8
	630	2268	20	75	5
	920	3312	35	150	5
400 × 300	245	882	5	10	14
	480	1728	10	25	8
	840	3024	20	70	8
	1230	4428	35	150	5
500 × 300	305	1098	5	10	14
	600	2160	10	25	8
	1050	3780	20	70	5
	1535	5526	35	150	5
600 × 300	370	1332	5	10	14
	740	2664	10	25	8
	1290	4644	20	75	5
	1850	6660	35	150	5
700 × 300	430	1548	5	10	14
	840	3024	10	25	8
	1470	5292	20	70	5
	2150	7740	35	150	5
800 × 300	490	1764	5	10	14
	980	3528	10	25	8
	1720	6192	20	75	5
	2450	8820	35	150	5
900 × 300	555	1998	5	10	14
	1080	3888	10	25	8
	1890	6804	20	70	5
	2770	9972	35	150	5
1000 × 300	620	2232	5	10	14
	1240	4464	10	25	8
	2150	7740	20	75	5
	3100	11160	35	150	5
400 × 400	325	1170	5	10	14
	640	2304	10	25	8
	1120	4032	20	75	5
	1630	5868	35	150	5
500 × 400	410	1476	5	10	14
	800	2880	10	25	8
	1400	5040	20	75	5
	2040	7344	35	150	5

① TVT
② TVT with secondary silencer TX

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.

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m^3/h	Pa		± %
600 × 400	490	1764	5	10	14
	980	3528	10	25	8
	1720	6192	20	75	5
	2450	8820	35	150	5
700 × 400	570	2052	5	10	14
	1120	4032	10	25	8
	1960	7056	20	75	5
	2850	10260	35	150	5
800 × 400	650	2340	5	10	14
	1300	4680	10	25	8
	2280	8208	20	75	5
	3250	11700	35	150	5
900 × 400	735	2646	5	10	14
	1440	5184	10	25	8
	2520	9072	20	75	5
	3670	13212	35	150	5
1000 × 400	820	2952	5	10	14
	1640	5904	10	25	8
	2850	10260	20	75	5
	4100	14760	35	150	5
500 × 500	510	1836	5	10	14
	1000	3600	10	25	8
	1750	6300	20	75	5
	2540	9144	40	155	5
600 × 500	610	2196	5	10	14
	1200	4320	10	25	8
	2100	7560	20	75	5
	3050	10980	40	155	5

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m^3/h	Pa		± %
700 × 500	710	2556	5	10	14
	1400	5040	10	25	8
	2450	8820	20	75	5
	3550	12780	40	155	5
800 × 500	810	2916	5	10	14
	1600	5760	10	25	8
	2800	10080	20	75	5
	4050	14580	40	155	5
900 × 500	915	3294	5	10	14
	1800	6480	10	25	8
	3150	11340	20	75	5
	4570	16452	40	155	5
1000 × 500	1020	3672	5	10	14
	2000	7200	10	25	8
	3500	12600	20	75	5
	5100	18360	40	155	5
600 × 600	730	2628	5	10	14
	1440	5184	10	25	8
	2520	9072	20	75	5
	3650	13140	40	155	5
800 × 600	970	3492	5	10	14
	1920	6912	10	25	8
	3360	12096	20	75	5
	4850	17460	40	155	5
1000 × 600	1220	4392	5	10	14
	2400	8640	10	25	8
	4200	15120	20	75	5
	6100	21960	40	155	5

① TVT
② TVT with secondary silencer TX

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.

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
200 x 100	45	162	43	17	31	19
	85	306	47	26	35	24
	150	540	49	36	38	29
	215	774	49	41	41	33
300 x 100	65	234	44	18	32	20
	120	432	47	27	35	25
	210	756	48	34	38	30
	320	1152	48	40	41	34
400 x 100	85	306	45	20	33	21
	170	612	47	28	37	27
	300	1080	47	35	40	32
	425	1530	48	40	43	36
500 x 100	105	378	46	20	34	22
	200	720	47	28	37	27
	350	1260	47	34	41	32
	535	1926	48	40	44	37
600 x 100	130	468	46	22	34	22
	260	936	47	28	38	29
	450	1620	47	35	42	34
	650	2340	48	39	45	37
200 x 200	85	306	45	20	33	21
	160	576	48	28	36	26
	280	1008	48	35	41	32
	415	1494	49	40	43	36
300 x 200	125	450	46	21	34	22
	240	864	47	27	37	27
	420	1512	48	34	41	33
	620	2232	48	39	44	37
400 x 200	165	594	46	22	35	23
	330	1188	46	27	38	29
	580	2088	47	34	43	35
	825	2970	48	39	46	39
500 x 200	205	738	46	22	36	24
	400	1440	46	27	39	30
	700	2520	47	34	44	36
	1035	3726	48	39	47	40
600 x 200	250	900	46	22	36	25
	500	1800	46	27	40	31
	870	1800	47	34	45	37
	1250	4500	47	39	47	41
700 x 200	290	1044	46	22	37	25
	560	2016	46	27	40	31
	980	3528	47	34	45	38
	1450	5220	47	39	48	42
800 x 200	330	1188	46	22	37	26
	660	2376	46	27	41	32
	1160	4176	47	34	46	38
	1650	5940	47	39	49	42

① TVT
② TVT with secondary silencer TX
③ TVT-D

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
300 x 300	185	666	46	21	35	23
	360	1296	46	26	39	29
	630	2268	47	33	43	35
	920	3312	47	39	46	39
400 x 300	245	882	46	21	36	24
	480	1728	46	27	40	30
	840	3024	46	33	44	37
	1230	4428	47	39	47	41
500 x 300	305	1098	46	22	67	25
	600	2160	46	27	41	31
	1050	3780	47	33	45	38
	1535	5526	47	39	48	42
600 x 300	370	1332	46	22	37	26
	740	2664	46	27	42	32
	1290	4644	47	33	46	39
	1850	6660	47	39	49	42
700 x 300	430	1548	46	22	38	27
	840	3024	46	27	42	33
	1470	5292	46	33	47	40
	2150	7740	47	39	50	43
800 x 300	490	1764	45	22	38	27
	980	3528	46	27	43	34
	1720	6192	46	33	47	40
	2450	8820	47	39	50	44
900 x 300	555	1998	46	22	39	28
	1080	3888	46	27	43	34
	1890	6804	46	33	48	41
	2770	9972	47	39	51	44
1000 x 300	620	2232	45	22	39	28
	1240	4464	46	28	44	35
	2150	7740	46	33	48	41
	3100	11160	47	38	51	45
400 x 400	325	1170	45	21	37	26
	640	2304	46	27	41	31
	1120	4032	46	34	45	37
	1630	5868	47	40	49	42
500 x 400	410	1476	45	21	38	27
	800	2880	46	27	42	32
	1400	5040	46	34	46	38
	2040	7344	47	40	50	43
600 x 400	490	1764	45	21	38	27
	980	3528	46	27	43	33
	1720	6192	46	34	47	40
	2450	8820	47	39	50	44
700 x 400	570	2052	45	22	39	28
	1120	4032	46	27	43	34
	1960	7056	46	33	48	40
	2850	10260	47	39	51	44

① TVT
② TVT with secondary silencer TX
③ TVT-D

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
800 x 400	650	2340	45	22	39	28
	1300	4680	45	27	44	35
	2280	8208	46	33	48	41
	3250	11700	47	39	51	45
900 x 400	735	2646	45	22	40	29
	1440	5184	46	26	44	35
	2520	9072	46	33	49	41
	3670	13212	47	39	52	46
1000 x 400	820	2952	45	22	40	29
	1640	5904	45	27	44	36
	2850	10260	46	33	49	42
	4100	14760	47	38	52	46
500 x 500	510	1836	45	21	38	27
	1000	3600	46	26	43	33
	1750	6300	46	33	47	39
	2540	9144	47	39	50	44
600 x 500	610	2196	45	21	39	28
	1200	4320	46	26	43	34
	2100	7560	46	33	48	40
	3050	10980	47	39	51	44
700 x 500	710	2556	45	21	39	29
	1400	5040	46	27	44	35
	2450	8820	46	33	48	41
	3550	12780	47	39	52	45
800 x 500	810	2916	45	22	40	29
	1600	5760	45	27	44	36
	2800	10080	46	33	49	42
	4050	14580	47	39	52	46
900 x 500	915	3294	45	21	40	30
	1800	6480	46	27	45	36
	3150	11340	46	33	50	42
	4570	16452	47	39	53	47
1000 x 500	1020	3672	44	22	41	30
	2000	7200	45	27	45	37
	3500	12600	46	33	50	43
	5100	18360	46	38	53	47
600 x 600	730	2628	45	21	40	28
	1440	5184	45	27	44	35
	2520	9072	46	33	49	41
	3650	13140	46	39	52	45
800 x 600	970	3492	45	22	41	30
	1920	6912	45	27	45	36
	3360	12096	46	33	50	43
	4850	17460	46	39	53	47
1000 x 600	1220	4392	45	22	41	31
	2400	8640	45	27	46	37
	4200	15120	46	33	51	44
	6100	21960	46	38	54	48

① TVT
② TVT with secondary silencer TX
③ TVT-D

Description

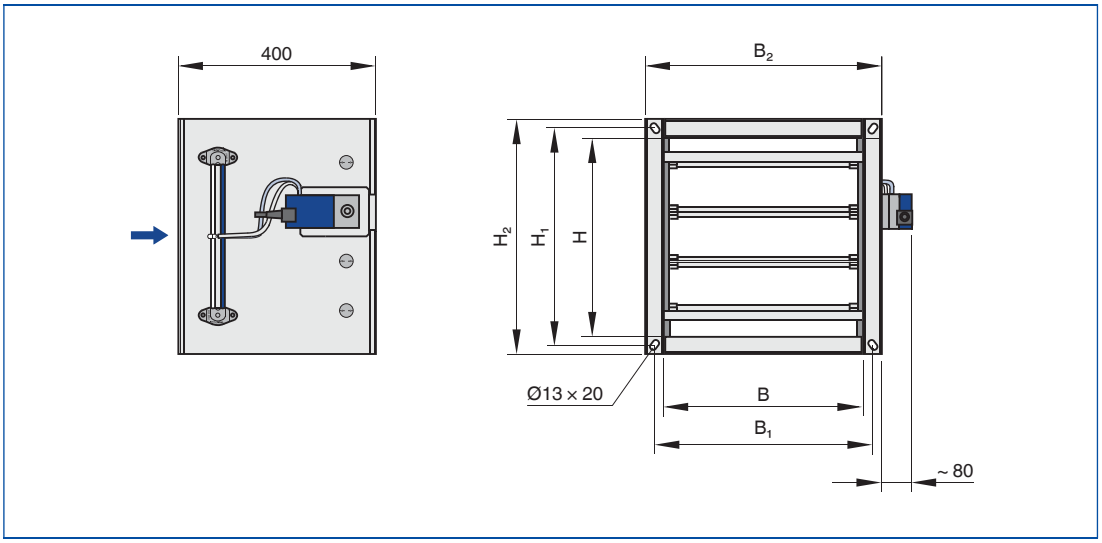
– VAV terminal unit for the control of variable air volume flow rates



VAV terminal unit, variant TVT

Dimensions

TVT



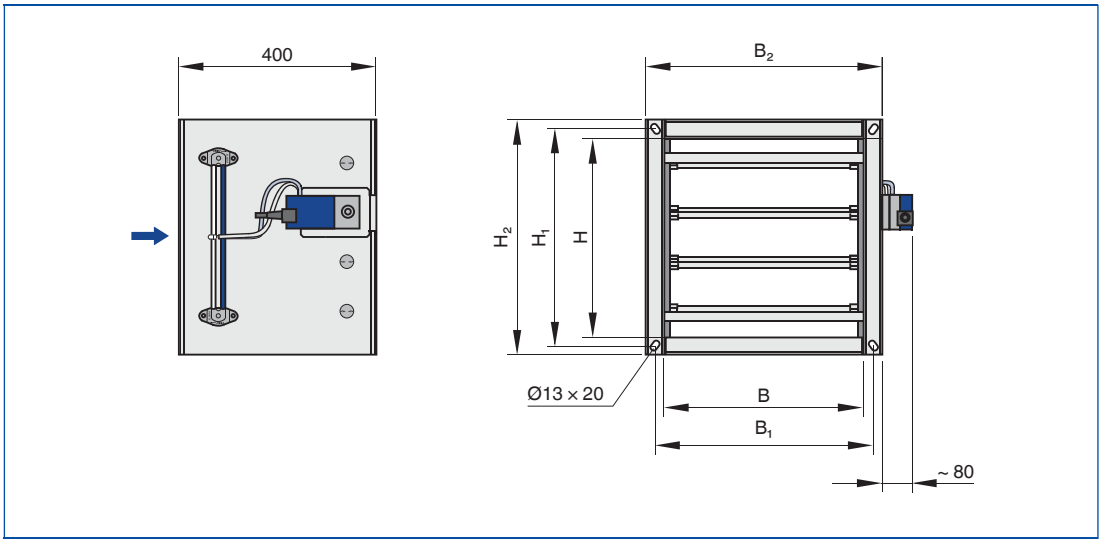
Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	276	134	176	6
300 × 100	300	100	334	376	134	176	7
400 × 100	400	100	434	476	134	176	8
500 × 100	500	100	534	576	134	176	9
600 × 100	600	100	634	676	134	176	10
200 × 200	200	200	234	276	234	276	9
300 × 200	300	200	334	376	234	276	10
400 × 200	400	200	434	476	234	276	11
500 × 200	500	200	534	576	234	276	12
600 × 200	600	200	634	676	234	276	13
700 × 200	700	200	734	776	234	276	14
800 × 200	800	200	834	876	234	276	15
300 × 300	300	300	334	376	334	376	10
400 × 300	400	300	434	476	334	376	11
500 × 300	500	300	534	576	334	376	12
600 × 300	600	300	634	676	334	376	13
700 × 300	700	300	734	776	334	376	15
800 × 300	800	300	834	876	334	376	16
900 × 300	900	300	934	976	334	376	18
1000 × 300	1000	300	1034	1076	334	376	19

1

Dimensions

TVT



Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
400 × 400	400	400	434	476	434	476	14
500 × 400	500	400	534	576	434	476	15
600 × 400	600	400	634	676	434	476	16
700 × 400	700	400	734	776	434	476	17
800 × 400	800	400	834	876	434	476	18
900 × 400	900	400	934	976	434	476	21
1000 × 400	1000	400	1034	1076	434	476	20
500 × 500	500	500	534	576	534	576	19
600 × 500	600	500	634	676	534	576	20
700 × 500	700	500	734	776	534	576	22
800 × 500	800	500	834	876	534	576	23
900 × 500	900	500	934	976	534	576	25
1000 × 500	1000	500	1034	1076	534	576	26
600 × 600	600	600	634	676	634	676	19
800 × 600	800	600	834	876	634	676	23
1000 × 600	1000	600	1034	1076	634	676	27

Description

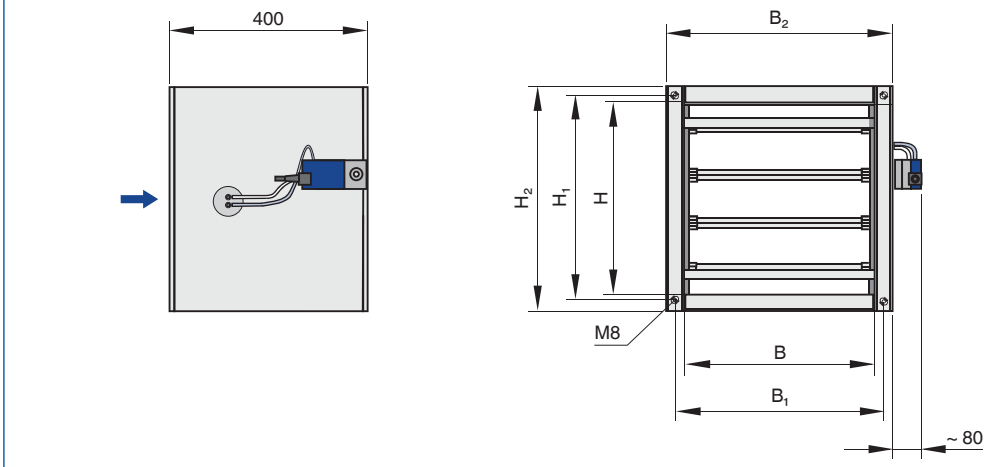


VAV terminal unit, variant TVT-D

- VAV terminal unit with acoustic cladding for the control of variable air volume flows
- 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

TVT-D



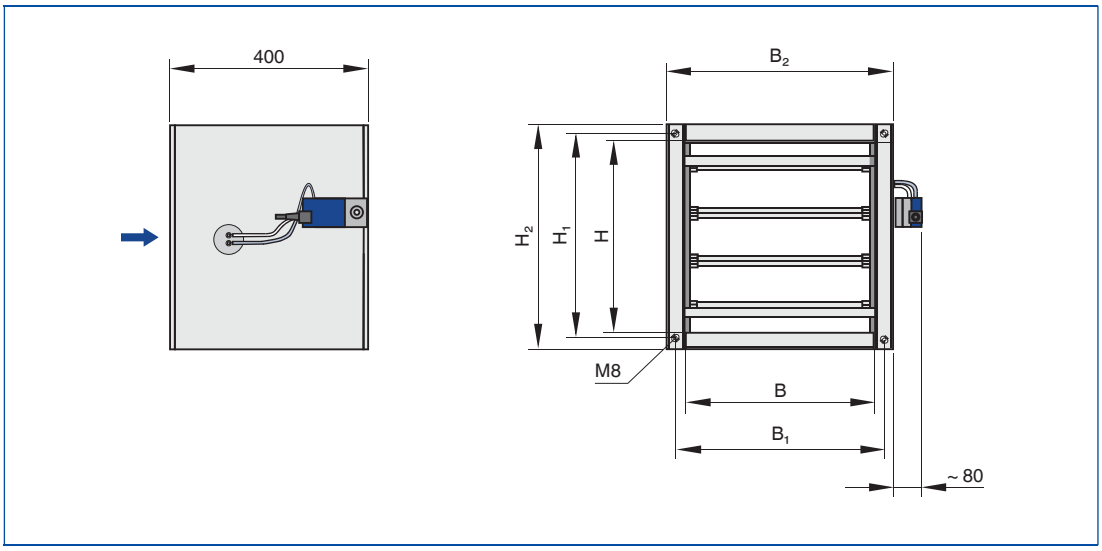
Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	280	134	180	9
300 × 100	300	100	334	380	134	180	11
400 × 100	400	100	434	480	134	180	12
500 × 100	500	100	534	580	134	180	14
600 × 100	600	100	634	680	134	180	15
200 × 200	200	200	234	280	234	280	14
300 × 200	300	200	334	380	234	280	15
400 × 200	400	200	434	480	234	280	17
500 × 200	500	200	534	580	234	280	18
600 × 200	600	200	634	680	234	280	20
700 × 200	700	200	734	780	234	280	21
800 × 200	800	200	834	880	234	280	23
300 × 300	300	300	334	380	334	380	15
400 × 300	400	300	434	480	334	380	17
500 × 300	500	300	534	580	334	380	18
600 × 300	600	300	634	680	334	380	20
700 × 300	700	300	734	780	334	380	22
800 × 300	800	300	834	880	334	380	24
900 × 300	900	300	934	980	334	380	26
1000 × 300	1000	300	1034	1080	334	380	29

1

Dimensions

TVT-D



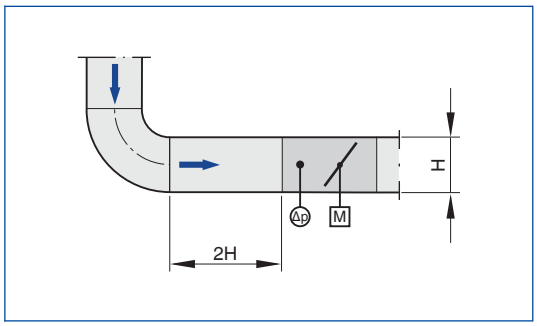
Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
400 × 400	400	400	434	480	434	480	21
500 × 400	500	400	534	580	434	480	23
600 × 400	600	400	634	680	434	480	24
700 × 400	700	400	734	780	434	480	26
800 × 400	800	400	834	880	434	480	27
900 × 400	900	400	934	980	434	480	29
1000 × 400	1000	400	1034	1080	434	480	32
500 × 500	500	500	534	580	534	580	28
600 × 500	600	500	634	680	534	580	30
700 × 500	700	500	734	780	534	580	32
800 × 500	800	500	834	880	534	580	35
900 × 500	900	500	934	980	534	580	37
1000 × 500	1000	500	1034	1080	534	580	39
600 × 600	600	600	634	680	634	680	29
800 × 600	800	600	834	880	634	680	35
1000 × 600	1000	600	1034	1080	634	680	41

Upstream conditions

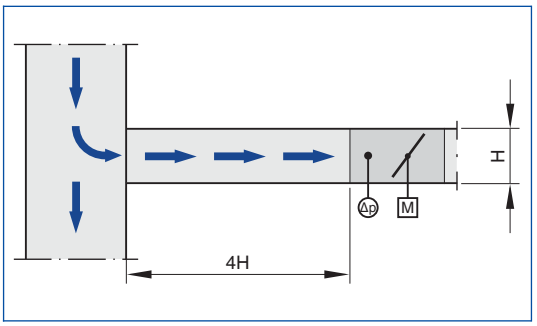
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

Bend, vertical



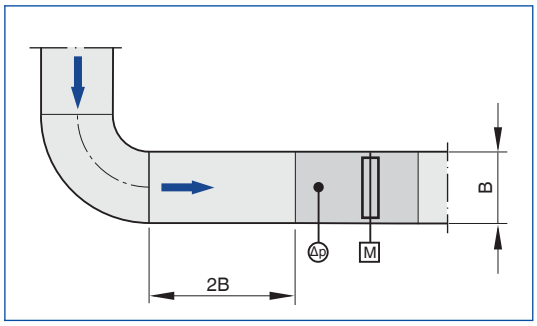
A bend – with a straight duct section of at least 2H upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction, vertical



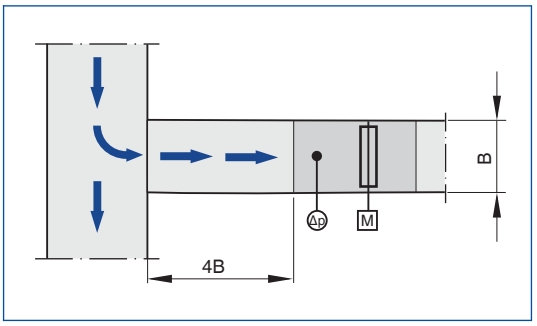
A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 4H upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Bend, horizontal



A bend – with a straight duct section of at least 2B upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction, horizontal

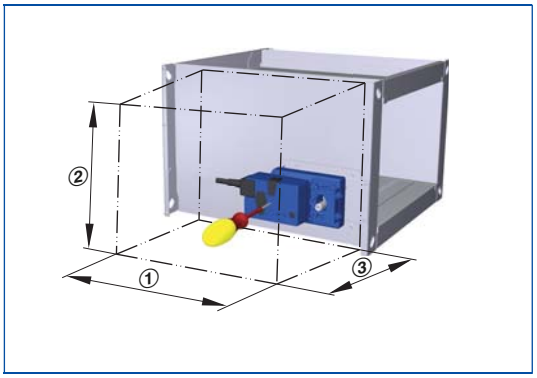


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 4B upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

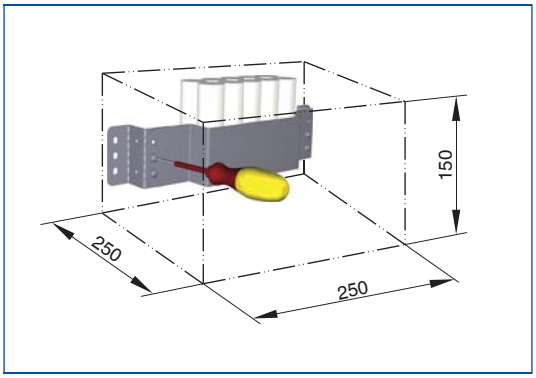
1 Space requirement for commissioning and maintenance

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



Access to attachments



Separate space for fixing and accessing the battery pack
(LABCONTROL EASYLAB accessory)

Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	400	H	300
Compact controller	400	H	300
Universal controller	500	H	300
LABCONTROL			
EASYLAB	500	H	400
TCU-LON-II	500	H	300

H: Unit height

1

Standard text

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

Rectangular VAV terminal units for variable and constant air volume systems, suitable for supply or extract air, available in 36 nominal sizes. High volume flow rate control accuracy. Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement and damper blades.
Factory assembled control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Both ends suitable for the connection of ducts.
Position of the damper blades indicated externally at the shaft extension.
Closed blade air leakage to EN 1751, class 3.
Casing air leakage to EN 1751, class C (B + H ≤400, class B)

Special characteristics

- Integral differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Materials and surfaces

Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Shaft and linkage made of galvanised steel
- Damper blades and differential pressure sensor made of aluminium
- Gears made of anti-static plastic (ABS), heat resistant to 50 °C
- Plastic bearings

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated

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/EG

Construction

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

Technical data

- Nominal sizes: 200 × 100 to 1000 × 600 mm
- Volume flow rate range: 45 to 6100 l/s or 162 to 21960 m^3/h
- Volume flow rate control range (unit with dynamic differential pressure measurement): approx. 20 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 40 Pa
- Maximum differential pressure: 1000 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. 20 – 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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

1 Order options

1 Type
TVT VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
Example
☐ Easy Easy controller
☐ **BC0** Compact controller
☐ **B11** Universal controller

6 Operating mode
☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value
☐ **A** Differential pressure control – extract air
☐ **Z** Differential pressure control – supply air

7 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

8 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating modes A, Z)

9 Damper blade position
Only with spring return actuators
☐ **NO** Power off to OPEN
☐ **NC** Power off to CLOSE

Order options

LABCONTROL

EASYLAB

1 Type
TVT VAV terminal unit

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 [mm]
B × H

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
☐ **RS** Supply air control (Room Supply)
☐ **RE** Extract air control (Room Exhaust)
☐ **PC** Differential pressure control

Single operation
☐ **SC** Supply air controller
☐ **EC** Extract air controller

7 External volume flow rate setting
Only for single operation
☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC
☐ **2P** On-site switch contacts for 2 switching steps
☐ **3P** On-site switch contacts for 3 switching steps
☐ **F** Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
☐ **LAB** Extract air led system (laboratories)
☐ **CLR** Supply air led system (clean rooms)
Raum management function is active
☐ **LAB-RMF** Extract air led system (LAB)
☐ **CLR-RMF** Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
☐ **BE-LCD-01** 40-character display

1 Order options

LABCONTROL

TCU-LON-II

1 Types

TVT VAV terminal unit

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 [mm]

B × H

5 Attachments (control component)

☐ **TMA** TCU-LON-II with fast-running actuator

☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function

☐ **RS** Room supply air

☐ **RE** Room extract air

☐ **PS** Differential pressure control – supply air (Pressure Supply)

☐ **PE** Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]

Depending on equipment function

RS: $\Delta\dot{V}$ / $\dot{V}_{constant}$

RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$

PS: $\Delta\dot{V}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$

PE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$

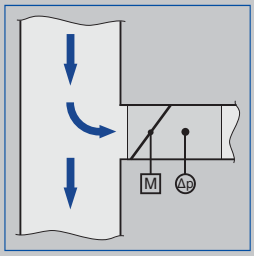
The room control volume flow rates are related to the total extract air volume flow rate for the room

VAV terminal units
Type TZ-Silenzio





Rectangular connections on both ends



For all upstream conditions



Tested to VDI 6022

For supply air systems with demanding acoustic requirements and low airflow velocities

Rectangular VAV terminal units for the supply air or extract air control in buildings with variable air volume systems, demanding acoustic requirements and low airflow velocities

- Highly effective integral attenuator
- Optimised for airflow velocities of 0.7 – 6 m/s
- High control accuracy even in case of unfavourable upstream conditions
- Compact construction with rectangular connections on both ends
- Electronic control components for different applications (Easy, Compact, Universal, and LABCONTROL)
- Closed blade air leakage to EN 1751, class 4
- Casing air leakage to EN 1751, class B

Optional equipment and accessories

- Acoustic cladding for the reduction of case-radiated noise
- Secondary silencer Type TS for the reduction of air-regenerated noise
- Hot water heat exchanger of Type WT for reheating the airflow

1

Type		Page
TZ-Silenzio	General information	1.1 – 80
	Order code	1.1 – 83
	Aerodynamic data	1.1 – 86
	Quick sizing	1.1 – 87
	Dimensions and weight – TZ-Silenzio	1.1 – 88
	Dimensions and weight – TZ-Silenzio-D	1.1 – 89
	Installation details	1.1 – 90
	Specification text	1.1 – 92
	Basic information and nomenclature	1.5 – 1

Description



VAV terminal unit
Type TZ-Silenzio

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- VARYCONTROL VAV terminal units of Type TZ-Silenzio for the supply air control in variable air volume systems with low airflow velocities
- Closed-loop volume flow control using an external power supply
- Integral attenuator for demanding acoustic requirements
- Shut-off by means of switching (equipment supplied by others)

Variants
- TZ-Silenzio: Supply air unit
- TZ-Silenzio-D: Supply air unit with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TS for very demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Nominal sizes
- 125, 160, 200, 250, 315

Attachments
- Easy controller: Compact unit with potentiometers
- Compact controller: Compact unit consisting of controller, differential pressure transducer and actuator
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Useful additions
- Secondary silencer Type TS
- Heat exchanger Type WT

Special characteristics
- Hygiene tested and certified
- Direct connection of ducting
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blade
- Integral attenuator
- 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

Construction features
- Rectangular casing
- Replaceable seals
- Flanges on both ends for connection to ductwork
- Position of the damper blade indicated externally at shaft extension
- Thermal and acoustic insulation (lining)

Materials and surfaces
- Casing made of galvanised sheet steel
- Damper blade and differential pressure sensor made of aluminium
- Lining is mineral wool
- Plastic bearings

Variant with acoustic cladding (-D)
- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Installation and commissioning

- Any installation orientation (except units with static differential pressure transducer)
- Return edges of the casing with drilled holes suitable for M10 threaded rods
- TZ-Silenzio-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines

- Hygiene conforms to VDI 6022
- VDI 2083, air cleanliness class 3, and US standard 209E, class 100
- Closed blade air leakage to EN 1751, class 4
- Meets the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class B

Maintenance

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

Attachments: VARYCONTROL control components for Type TZ-Silenzio

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
BL0		Compact controller with LonWorks interface TROX/Belimo		
XB0		Compact controller TROX/Gruner		
LN0		Compact controller Siemens		
Universal controller, dynamic				
B13	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator
B1B				Spring return actuator
XC3		Universal controller TROX/Gruner		
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo		Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3				Spring return actuator
BR3	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, 100 Pa	Actuator
BRB				Spring return actuator
BRG				Fast-running actuator
BG3		Differential pressure controller TROX/Belimo		Actuator
BGB				Spring return actuator
XE1		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE3				Spring return actuator

Attachments: LABCONTROL control components for Type TZ-Silenzio

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room supply air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room supply air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

1

Technical data

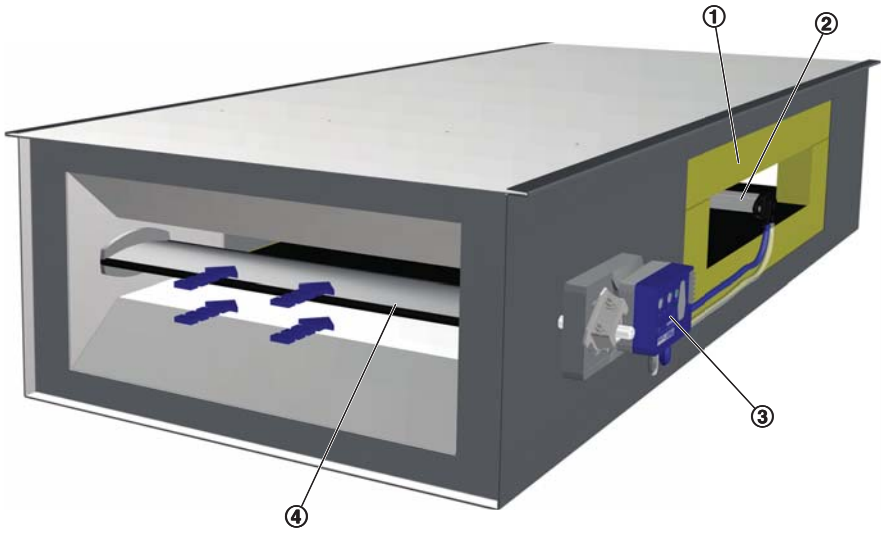
Nominal sizes	125 – 315
Volume flow rate range	30 – 840 l/s or 108 – 3024 m³/h
Volume flow rate control range (unit with dynamic differential pressure measurement)	Approx. 10 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 65 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator;
the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal).
For most applications, the setpoint value comes from a room temperature controller.
The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values.
An integral attenuator reduces the noise that is created by the restriction of the airflow.

Schematic illustration of the TZ-Silenzio



① Integral attenuator
② Differential pressure sensor
③ Control components, e.g. an Easy controller
④ Damper blade with seal

Order code

VARYCONTROL

TZ-Silenzio, TZ-Silenzio/.../Easy

TZ–Silenzio – D / 200 / B1B / E 0 / 400 – 1200 / NO
1 2 3 4 5 6 7 8

TZ–Silenzio – D / 200 / Easy
1 2 3 4

1 Type
TZ-Silenzio VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size
125
160
200
250
315

4 Attachments (control component)
Example
Easy Easy controller
BC0 Compact controller
B13 Universal controller

5 Operating mode
E Single
M Master
S Slave
F Constant value
Z Differential pressure control – supply air

6 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

7 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting (operating mode A)

8 Damper blade position
Only with spring return actuators
NO Power off to OPEN
NC Power off to CLOSE

Order example

VARYCONTROL

TZ-Silenzio/200/BC0/E0/300–1200 m³/h

Acoustic cladding	Without
Nominal size	200
Attachment	Compact controller
Operating mode	Single
Signal voltage range	0 – 10 V DC
Volume flow rate	300 – 1200 m³/h

1 Order code
LABCONTROL
EASYLAB

TZ-Silenzio with EASYLAB for room control and single operation

TZ–Silenzio – D / 200 / ELAB / RS / ULZ / LAB / ...
1 2 3 4 5 7 8 9

TZ–Silenzio – D / 200 / ELAB / SC – E0 / ULZ / ...
1 2 3 4 5 6 7 9

1 Type
TZ-Silenzio VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size
125
160
200
250
315

4 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

5 Equipment function
Room control
RS Supply air control (Room Supply)
PC Differential pressure control

Single operation
SC Supply air controller

6 External volume flow rate setting
Only for single operation
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

7 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

8 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
LAB Extract air led system (laboratories)
CLR Supply air led system (clean rooms)
Raum management function is active
LAB-RMF Extract air led system (LAB)
CLR-RMF Supply air led system (CLR)

9 Operating values [m³/h or l/s, Pa]
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
BE-LCD-01 40-character display

Order example
LABCONTROL
EASYLAB

TZ–Silenzio/200/ELAB/RS/LAB

Acoustic cladding	Without
Nominal size	200
Attachment	EASYLAB controller TCU3 with fast-running actuator
Equipment function	Supply air control (Room Supply)
Additional function	Extract air led system for laboratories

Order code
LABCONTROL
TCU-LON-II

TZ-Silenzio with TCU-LON-II

TZ–Silenzio – D / 200 / TMA / RS / -100 / -100
1 2 3 4 5 6

1 Type
TZ-Silenzio VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size
125
160
200
250
315

4 Attachments (control component)
TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

5 Equipment function
RS Room supply air
PS Differential pressure control – supply air (Pressure Supply)

6 Operating values [m³/h or l/s, Pa]
Depending on equipment function
RS: $\Delta\dot{V}$ / $\dot{V}_{constant}$
PS: $\Delta\dot{V}$ / $\dot{V}_{constant}$ / Δp_{Soll}
The room control volume flow rates are related to the total extract air volume flow rate for the room

---

Order example
LABCONTROL
TCU-LON-II

TZ–Silenzio-D/125/TMA/RS/100/400

Acoustic cladding	With
Nominal size	125
Attachment	TCU-LON-II with fast-running actuator
Equipment function	Supply air control (Room Supply)
Operating values	Volume flow rate difference 100 m³/h, constant volume flow rates 400 m³/h

1

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. he measurement points for fan speed control must be selected accordingly.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m^3/h	Pa		± %
125	**30**	**108**	5	5	8
	70	**252**	10	20	7
	125	**450**	35	60	5
	180	**648**	65	120	5
160	**45**	**162**	5	5	8
	110	**396**	10	20	7
	195	**702**	30	55	5
	275	**990**	55	105	5
200	**65**	**234**	5	5	8
	150	**540**	10	20	7
	265	**954**	30	60	5
	380	**1368**	55	120	5
250	**85**	**306**	5	5	8
	200	**720**	10	20	7
	345	**1242**	30	60	5
	495	**1782**	60	115	5
315	**145**	**522**	5	5	8
	335	**1206**	15	20	7
	590	**2124**	35	50	5
	840	**3024**	65	105	5

① TZ-Silenzio
② TZ-Silenzio with secondary silencer TS

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.

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB (A)			
125	**30**	**108**	15	5	10	8
	70	**252**	26	16	19	19
	125	**450**	34	23	26	26
	180	**648**	39	28	30	31
160	**45**	**162**	15	5	13	10
	110	**396**	27	17	22	21
	195	**702**	34	23	29	29
	275	**990**	37	27	34	34
200	**65**	**234**	13	1	12	8
	150	**540**	23	12	22	18
	265	**954**	29	17	28	26
	380	**1368**	32	22	33	31
250	**85**	**306**	14	3	13	8
	200	**720**	23	12	23	19
	345	**1242**	28	17	30	26
	495	**1782**	32	20	34	31
315	**145**	**522**	15	4	17	12
	335	**1206**	23	11	27	23
	590	**2124**	28	16	35	31
	840	**3024**	32	21	39	36

① TZ-Silenzio
② TZ-Silenzio with secondary silencer TS
③ TZ-Silenzio-D

1

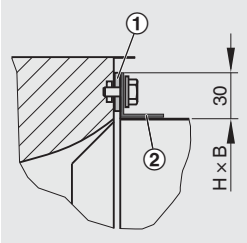
Description

– VAV terminal unit for the control of variable supply air volume flows



VAV terminal unit
Type TZ-Silenzio

Dimensions

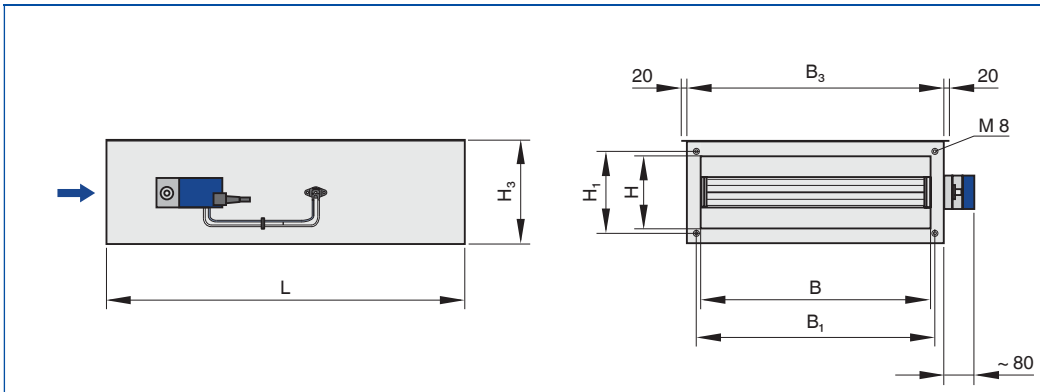


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TZ-Silenzio



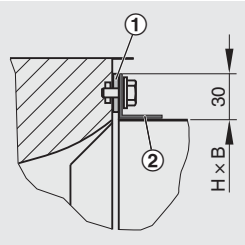
Dimensions [mm] and weight [kg]

Nominal size	L	B_3	H_3	B	B_1	H	H_1	m
	mm							kg
125	1035	300	236	198	232	152	186	17
160	1035	410	236	308	342	152	186	21
200	1250	560	281	458	492	210	244	32
250	1250	700	311	598	632	201	235	41
315	1250	900	361	798	832	252	286	54

Description

- VAV terminal unit with acoustic cladding for the control of variable supply air volume flows
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The ducts for the room under consideration must have adequate acoustic insulation (to be provided by others) on the fan end
- Acoustic cladding cannot be retrofitted

Dimensions

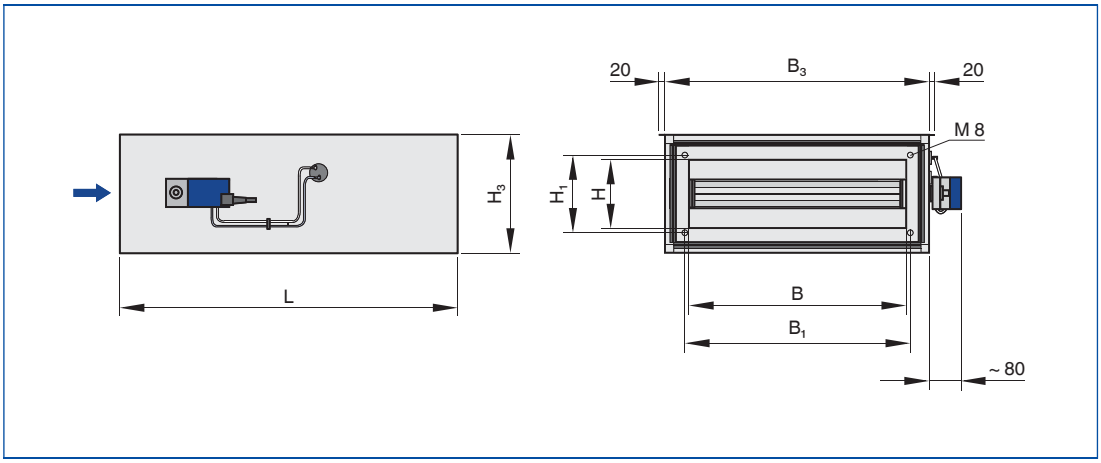


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TZ-Silenzio-D



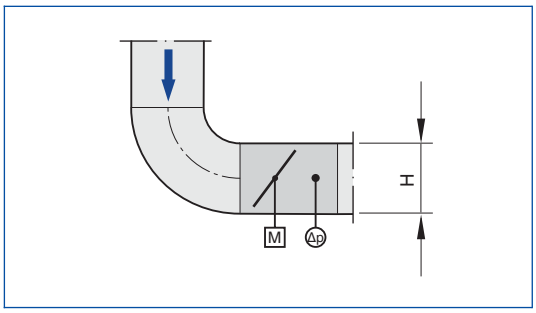
Dimensions [mm] and weight [kg]

Nominal size	L	B_3	H_3	B	B_1	H	H_1	m
	mm							kg
125	1035	380	316	198	232	152	186	32
160	1035	490	316	308	342	152	186	38
200	1250	640	361	458	492	210	244	64
250	1250	780	391	598	632	201	235	72
315	1250	980	441	798	832	252	286	91

1 Upstream conditions

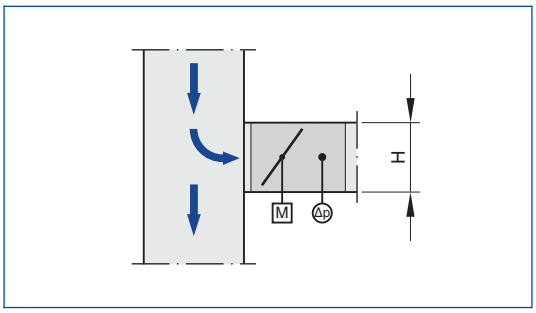
The volume flow rate accuracy $\Delta\dot{V}$ applies to all upstream conditions.

Bend, vertical



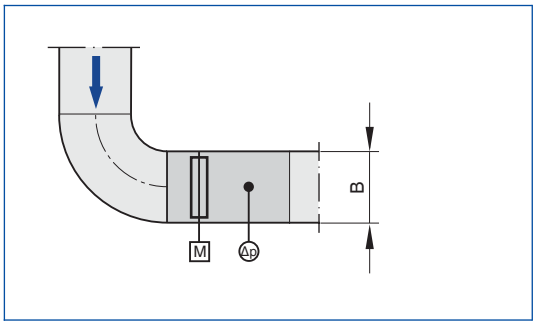
A bend – without a straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction, vertical



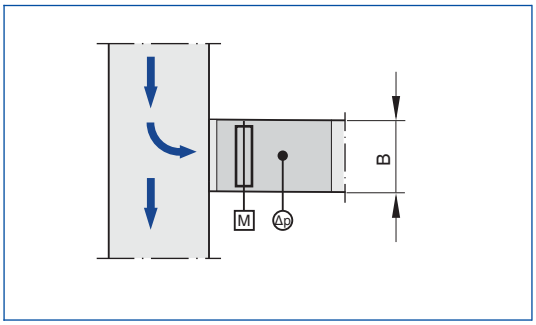
The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed in a branch just off the main duct.

Bend, horizontal



A bend – without a straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction, horizontal

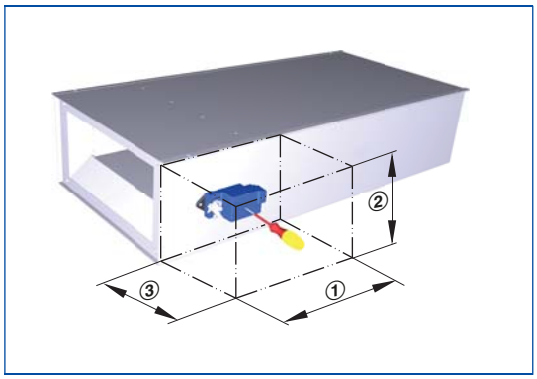


The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed in a branch just off the main duct.

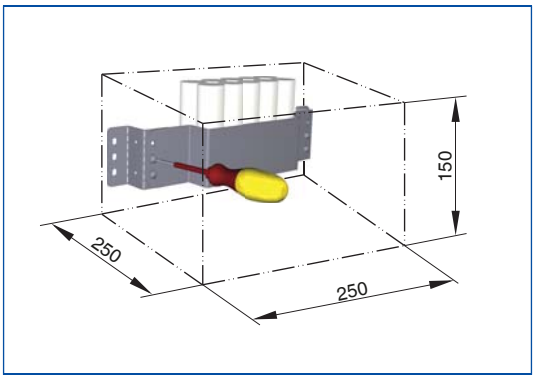
Space requirement for commissioning and maintenance

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



Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	700	300	300
Compact controller	700	300	300
Universal controller	700	300	300
LABCONTROL			
EASYLAB	700	350	400

1

Standard text

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

Rectangular VAV terminal units for variable and constant air volume systems for demanding acoustic requirements, suitable for supply or extract air, available in 5 nominal sizes.
High control accuracy even in case of unfavourable upstream conditions.
Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement, a damper blade, and an integral attenuator. Factory-assembled control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Both ends suitable for the connection of air duct profiles.
Casing with acoustic and thermal insulation.
Position of the damper blade indicated externally at shaft extension.
Closed blade air leakage to EN 1751, class 4.
Casing air leakage to EN 1751, class B.
Complies with VDI 2083, clean room class 3, and US standard 209E, class 100.
Hygiene complies with VDI 6022, DIN 1946, part 4, as well as EN 13779 and VDI 3803.

Special characteristics

- Hygiene tested and certified
- Direct connection of ducting
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Materials and surfaces

- Casing made of galvanised sheet steel
- Damper blade and differential pressure sensor made of aluminium
- Lining is mineral wool
- Plastic bearings

Variant with acoustic cladding (-D)

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

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Technical data

- Nominal sizes: 125 – 315
- Volume flow rate range: 30 to 840 l/s or 108 to 3024 m^3/h
- Volume flow rate control range (unit with dynamic differential pressure measurement): approx. 10 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 65 Pa
- Maximum differential pressure: 1000 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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

1 Type
TZ-Silenzio VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**

4 Attachments (control component)
Example
☐ **Easy** Easy controller
☐ **BC0** Compact controller
☐ **B13** Universal controller

5 Operating mode
☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value
☐ **Z** Differential pressure control – supply air

6 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

7 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating mode A)

8 Damper blade position
Only with spring return actuators
☐ **NO** Power off to OPEN
☐ **NC** Power off to CLOSE

1 Order options

LABCONTROL

EASYLAB

1 Type

TZ-Silenzio VAV terminal unit, supply air

2 Acoustic cladding

No entry: none

☐ **D** With acoustic cladding

3 Nominal size

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**

4 Attachments (control component)

ELAB EASYLAB controller TCU3 with fast-running actuator

5 Equipment function

Room control

☐ **RS** Supply air control (Room Supply)
☐ **PC** Differential pressure control

Single operation

☐ **SC** Supply air controller

6 External volume flow rate setting

Only for single operation

☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC
☐ **2P** On-site switch contacts for 2 switching steps
☐ **3P** On-site switch contacts for 3 switching steps
☐ **F** Volume flow rate constant value, without signalling

7 Module expansions

Option 1: Power supply
No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none

☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

8 Additional functions

Only for room control (equipment function)
Raum management function has been deactivated

☐ **LAB** Extract air led system (laboratories)
☐ **CLR** Supply air led system (clean rooms)
Raum management function is active
☐ **LAB-RMF** Extract air led system (LAB)
☐ **CLR-RMF** Supply air led system (CLR)

9 Operating values [m³/h or l/s, Pa]

For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions

Room control panel

☐ **BE-LCD-01** 40-character display

Order options

LABCONTROL

TCU-LON-II

1 Type
TZ-Silenzio VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**

4 Attachments (control component)
☐ **TMA** TCU-LON-II with fast-running actuator
☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

5 Equipment function
☐ **RS** Room supply air
☐ **PS** Differential pressure control – supply air (Pressure Supply)

6 Operating values [m³/h or l/s, Pa]
Depending on equipment function
RS: $\Delta\dot{V} / \dot{V}_{constant}$
PS: $\Delta\dot{V} / \dot{V}_{constant} / \Delta p_{Soll}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

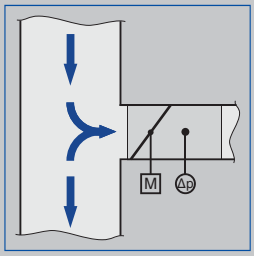
1

VAV terminal units
Type TA-Silenzio





Rectangular connections on both ends



For all upstream conditions



Tested to VDI 6022

For extract air systems with demanding acoustic requirements and low airflow velocities

Rectangular VAV terminal units for the extract air control in buildings with variable air volume systems, demanding acoustic requirements and low airflow velocities

- Highly effective integral attenuator
- Optimised for airflow velocities of 0.7 – 6 m/s
- High control accuracy even in case of unfavourable upstream conditions
- Compact construction with rectangular connections on both ends
- Electronic control components for different applications (Easy, Compact, Universal, and LABCONTROL)
- Closed blade air leakage to EN 1751, class 4
- Casing air leakage to EN 1751, class B

Optional equipment and accessories

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

1

Type		Page
TA-Silenzio	General information	1.1 – 97
	Order code	1.1 – 100
	Aerodynamic data	1.1 – 103
	Quick sizing	1.1 – 104
	Dimensions and weight – TA-Silenzio	1.1 – 105
	Dimensions and weight – TA-Silenzio-D	1.1 – 106
	Installation details	1.1 – 107
	Specification text	1.1 – 109
	Basic information and nomenclature	1.5 – 1

Description



VAV terminal unit
Type TA-Silenzio

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- VARYCONTROL VAV terminal units of Type TA-Silenzio for the extract air flow control in variable air volume systems with low airflow velocities
- Closed-loop volume flow control using an external power supply
- Integral attenuator for demanding acoustic requirements
- Shut-off by means of switching (equipment supplied by others)

Variants
- TA-Silenzio: Extract air unit
- TA-Silenzio-D: Extract air unit with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TS for very demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Nominal sizes
- 125, 160, 200, 250, 315

Attachments
- Easy controller: Compact unit with potentiometers
- Compact controller: Compact unit consisting of controller, differential pressure transducer and actuator
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Useful additions
- Secondary silencer Type TS

Special features
- Hygiene tested and certified
- Direct connection of ducting
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blade
- Integral attenuator
- 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

Construction features
- Rectangular casing
- Replaceable seals
- Flanges on both ends for connection to ductwork
- Position of the damper blade indicated externally at shaft extension
- Thermal and acoustic insulation (lining)

Materials and surfaces
- Casing made of galvanised sheet steel
- Damper blade and differential pressure sensor made of aluminium
- Lining is mineral wool
- Plastic bearings

Variant with acoustic cladding (-D)
- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Installation and commissioning

- Any installation orientation (except units with static differential pressure transducer)
- Return edges of the casing with drilled holes suitable for M10 threaded rods
- TA-Silenzio-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines

- Hygiene conforms to VDI 6022
- VDI 2083, air cleanliness class 3, and US standard 209E, class 100
- Closed blade air leakage to EN 1751, class 4
- Meets the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class B

Maintenance

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

Attachments: VARYCONTROL control components for Type TA-Silenzio

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
BL0		Compact controller with LonWorks interface TROX/Belimo		
XB0		Compact controller TROX/Gruner		
LN0		Compact controller Siemens		
Universal controller, dynamic				
B13	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator
B1B				Spring return actuator
XC3		Universal controller TROX/Gruner		
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo		Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3				Spring return actuator
BR3	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, 100 Pa	Actuator
BRB				Spring return actuator
BRG				Fast-running actuator
BG3		Differential pressure controller TROX/Belimo		Actuator
BGB				Spring return actuator
XE1		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE3				Spring return actuator

Attachments: LABCONTROL control components for Type TA-Silenzio

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room extract air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room extract air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

1

Technical data

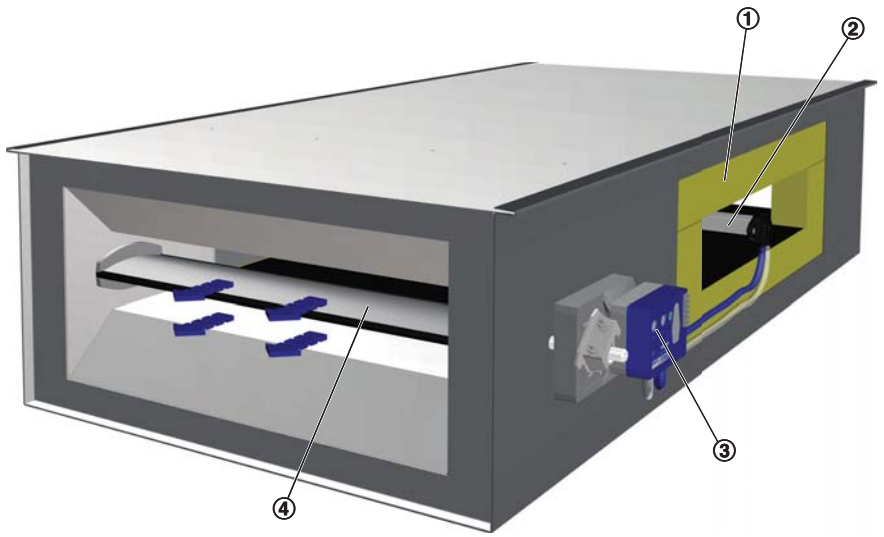
Nominal sizes	125 – 315
Volume flow rate range	30 – 840 l/s or 108 – 3024 m^3/h
Volume flow rate control range (unit with dynamic differential pressure measurement)	Approx. 10 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 65 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator; the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal). For most applications, the setpoint value comes from a room temperature controller. The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values. An integral attenuator reduces the noise that is created by the restriction of the airflow.

Schematic illustration of the TA-Silenzio



① Differential pressure sensor
② Indicator light
③ Control components, e.g. an Easy controller
④ Damper blade with seal

Order code

VARYCONTROL

TA-Silenzio, TA-Silenzio/.../Easy

TA–Silenzio – D / 200 / B1B / E 0 / 400 – 1200 / NO
1 2 3 4 5 6 7 8

TA–Silenzio – D / 200 / Easy
1 2 3 4

1 Type
TA-Silenzio VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size
125
160
200
250
315

4 Attachments (control component)
Example
Easy Easy controller
BC0 Compact controller
B13 Universal controller

5 Operating mode
E Single
M Master
S Slave
F Constant value
A Differential pressure control – extract air

6 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

7 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting (operating mode A)

8 Damper blade position
Only with spring return actuators
NO Power off to OPEN
NC Power off to CLOSE

Order example

VARYCONTROL

TA-Silenzio/250/BC0/M0/500–1500 m³/h

Acoustic cladding	Without
Nominal size	250
Attachment	Compact controller
Operating mode	Master
Signal voltage range	0 – 10 V DC
Volume flow rate	500 – 1500 m³/h

1 Order code
LABCONTROL
EASYLAB

TA-Silenzio with EASYLAB for room control and single operation

TA–Silenzio – D / 200 / ELAB / RE / ULZ / LAB / ...
1 2 3 4 5 7 8 9

TA–Silenzio – D / 200 / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 9

1 Type
TA-Silenzio VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size
125
160
200
250
315

4 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

5 Equipment function
Room control
RE Extract air control (Room Exhaust)
PC Differential pressure control

Single operation
EC Extract air controller

6 External volume flow rate setting
Only for single operation
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

7 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

8 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
LAB Extract air led system (laboratories)
CLR Supply air led system (clean rooms)
Raum management function is active
LAB-RMF Extract air led system (LAB)
CLR-RMF Supply air led system (CLR)

9 Operating values [m³/h or l/s, Pa]
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
BE-LCD-01 40-character display

Order example
LABCONTROL
EASYLAB

TA–Silenzio/200/ELAB/EC/E0/300-1000

Acoustic cladding	Without
Nominal size	200
Attachment	EASYLAB controller TCU3 with fast-running actuator
Equipment function	Extract air controller
External volume flow rate setting	Voltage signal 0 – 10 V DC
Operating values	300 – 1000 m^3/h

Order code
LABCONTROL
TCU-LON-II

TA-Silenzio with TCU-LON-II

TA–Silenzio – D / 200 / TMA / RE / 1200 / 750 / 100
1 2 3 4 5 6

1 Type
TA-Silenzio VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size
125
160
200
250
315

4 Attachments (control component)
TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

5 Equipment function
RE Room extract air
PE Differential pressure control – extract air (Pressure Extract)

6 Operating values [m^3/h or l/s, Pa]
Depending on equipment function
RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$
PE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

---

Order example
LABCONTROL
TCU-LON-II

TA–Silenzio-D/200/TMB/RE/1200/750/100

Acoustic cladding	With
Nominal size	200
Attachment	TCU-LON-II with fast-running actuator (brushless motor)
Equipment function	Room extract air
Operating values	Total extract air – day-time operation 1200 m^3/h, total extract air – night-time operation 750 m^3/h, constant volume flow rate 100 m^3/h

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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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m^3/h	Pa		± %
125	**30**	**108**	5	5	8
	70	**252**	10	20	7
	125	**450**	35	60	5
	180	**648**	65	120	5
160	**45**	**162**	5	5	8
	110	**396**	10	20	7
	195	**702**	30	55	5
	275	**990**	55	105	5
200	**65**	**234**	5	5	8
	150	**540**	10	20	7
	265	**954**	30	60	5
	380	**1368**	55	120	5
250	**85**	**306**	5	5	8
	200	**720**	10	20	7
	345	**1242**	30	60	5
	495	**1782**	60	115	5
315	**145**	**522**	5	5	8
	335	**1206**	15	20	7
	590	**2124**	35	50	5
	840	**3024**	65	105	5

① TA-Silenzio
② TA-Silenzio with secondary silencer TS

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.

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
125	**30**	**108**	13	3	10	8
	70	**252**	23	13	19	19
	125	**450**	30	21	26	26
	180	**648**	33	26	30	31
160	**45**	**162**	14	4	13	10
	110	**396**	25	14	22	21
	195	**702**	30	21	29	29
	275	**990**	33	26	34	34
200	**65**	**234**	13	0	12	8
	150	**540**	22	10	22	18
	265	**954**	26	16	28	26
	380	**1368**	29	21	33	31
250	**85**	**306**	14	2	13	8
	200	**720**	22	10	23	19
	345	**1242**	26	15	30	26
	495	**1782**	29	19	34	31
315	**145**	**522**	16	3	17	12
	335	**1206**	22	9	27	23
	590	**2124**	26	14	35	31
	840	**3024**	29	20	39	36

① TA-Silenzio
② TA-Silenzio with secondary silencer TS
③ TA-Silenzio-D

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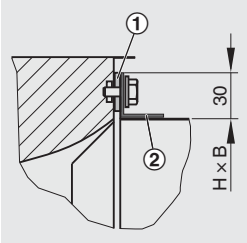
Description

– VAV terminal unit for the control of variable extract air volume flows



VAV terminal unit
Type TA-Silenzio

Dimensions

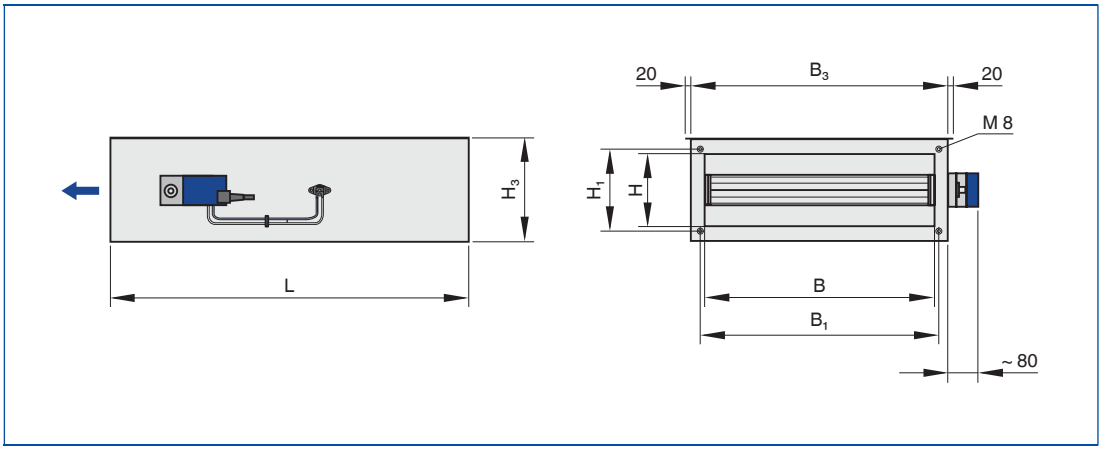


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TA-Silenzio



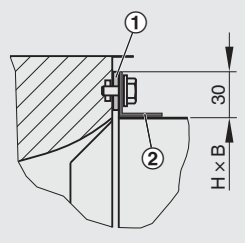
Dimensions [mm] and weight [kg]

Nominal size	L	B_3	H_3	B	B_1	H	H_1	m
	mm							kg
125	1035	300	236	198	232	152	186	17
160	1035	410	236	308	342	152	186	21
200	1250	560	281	458	492	210	244	32
250	1250	700	311	598	632	201	235	41
315	1250	900	361	798	832	252	286	54

Description

- VAV terminal unit with acoustic cladding for the control of variable extract air volume flows
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The ducts for the room under consideration must have adequate acoustic insulation (to be provided by others) on the fan end
- Acoustic cladding cannot be retrofitted

Dimensions

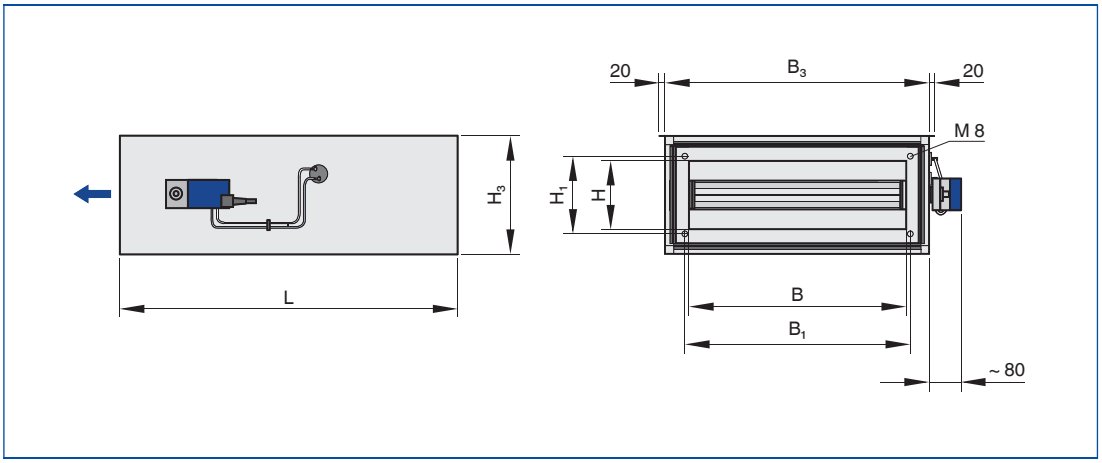


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TA-Silenzio-D



Dimensions [mm] and weight [kg]

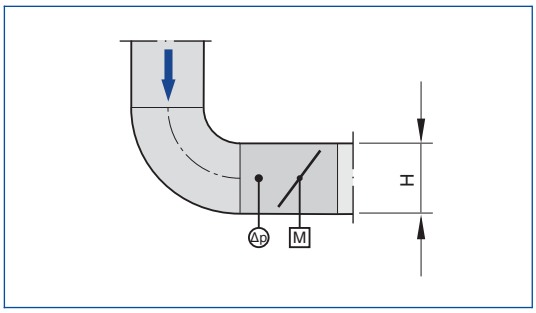
Nominal size	L	B_3	H_3	B	B_1	H	H_1	m
	mm							kg
125	1035	380	316	198	232	152	186	32
160	1035	490	316	308	342	152	186	38
200	1250	640	361	458	492	210	244	64
250	1250	780	391	598	632	201	235	72
315	1250	980	441	798	832	252	286	91

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Upstream conditions

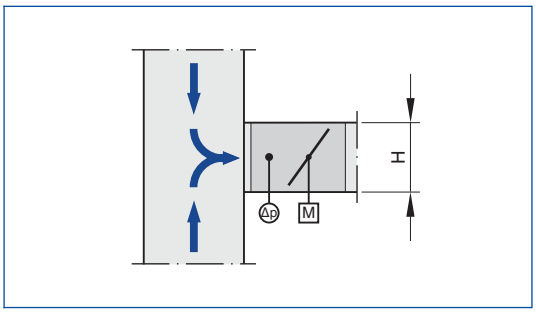
The volume flow rate accuracy $\Delta\dot{V}$ applies to all upstream conditions.

Bend, vertical



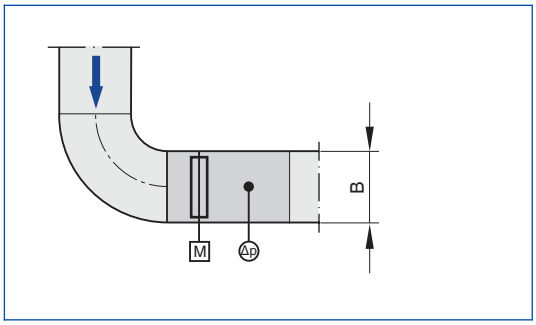
A bend – without a straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Convergence of two airflows, vertical



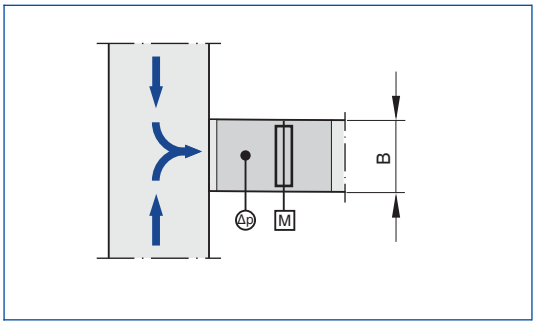
The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed at a junction and at the point of convergence of two airflows.

Bend, horizontal



A bend – without a straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Convergence of two airflows, horizontal

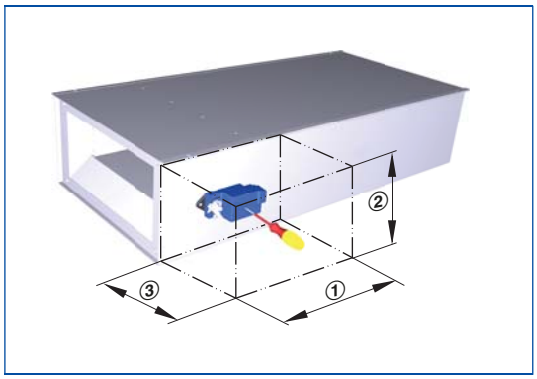


The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed at a junction and at the point of convergence of two airflows.

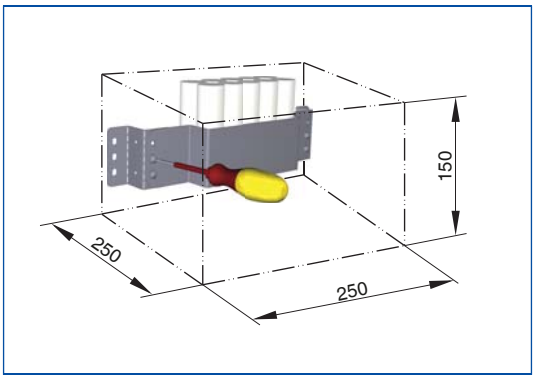
Space requirement for commissioning and maintenance

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



Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	700	300	300
Compact controller	700	300	300
Universal controller	700	300	300
LABCONTROL			
EASYLAB	700	350	400

1

Standard text

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

Rectangular VAV terminal units for variable and constant air volume systems for demanding acoustic requirements, suitable for extract air, available in 5 nominal sizes.
High control accuracy even in case of unfavourable upstream conditions.
Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement, a damper blade, and an integral attenuator. Factory-assembled control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Both ends suitable for the connection of air duct profiles.
Casing with acoustic and thermal insulation.
Position of the damper blade indicated externally at shaft extension.
Closed blade air leakage to EN 1751, class 4.
Casing air leakage to EN 1751, class B.
Complies with VDI 2083, clean room class 3, and US standard 209E, class 100.
Hygiene complies with VDI 6022, DIN 1946, part 4, as well as EN 13779 and VDI 3803.

Special features

- Hygiene tested and certified
- Direct connection of ducting
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary

Materials and surfaces

- Casing made of galvanised sheet steel
- Damper blade and differential pressure sensor made of aluminium
- Lining is mineral wool
- Plastic bearings

Variant with acoustic cladding (-D)

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

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Technical data

- Nominal sizes: 125 – 315
- Volume flow rate range: 30 to 840 l/s or 108 to 3024 m^3/h
- Volume flow rate control range (unit with dynamic differential pressure measurement): approx. 10 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 65 Pa
- Maximum differential pressure: 1000 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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

VARYCONTROL

1 Type
TA-Silenzio VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**

4 Attachments (control component)
Example
☐ **Easy** Easy controller
☐ **BC0** Compact controller
☐ **B13** Universal controller

5 Operating mode
☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value
☐ **A** Differential pressure control – extract air

6 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

7 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating mode A)

8 Damper blade position
Only with spring return actuators
☐ **NO** Power off to OPEN
☐ **NC** Power off to CLOSE

1 Order options

LABCONTROL

EASYLAB

1 Type

TA-Silenzio VAV terminal unit, extract air

2 Acoustic cladding

No entry: none

☐ **D** With acoustic cladding

3 Nominal size

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**

4 Attachments (control component)

ELAB EASYLAB controller TCU3 with fast-running actuator

5 Equipment function

Room control

☐ **RE** Extract air control (Room Exhaust)
☐ **PC** Differential pressure control

Single operation

☐ **EC** Extract air controller

6 External volume flow rate setting

Only for single operation

☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC
☐ **2P** On-site switch contacts for 2 switching steps
☐ **3P** On-site switch contacts for 3 switching steps
☐ **F** Volume flow rate constant value, without signalling

7 Module expansions

Option 1: Power supply
No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none

☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

8 Additional functions

Only for room control (equipment function)
Raum management function has been deactivated

☐ **LAB** Extract air led system (laboratories)
☐ **CLR** Supply air led system (clean rooms)
Raum management function is active
☐ **LAB-RMF** Extract air led system (LAB)
☐ **CLR-RMF** Supply air led system (CLR)

9 Operating values [m³/h or l/s, Pa]

For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions

Room control panel

☐ **BE-LCD-01** 40-character display

Order options

LABCONTROL

TCU-LON-II

1 Type
TA-Silenzio VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**

4 Attachments (control component)
☐ **TMA** TCU-LON-II with fast-running actuator
☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

5 Equipment function
☐ **RE** Room extract air
☐ **PE** Differential pressure control – extract air (Pressure Extract)

6 Operating values [m³/h or l/s, Pa]
Depending on equipment function
RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$
PE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

1

VAV terminal units
Type TVZ



Easy controller



Compact controller



Rectangular connection on the room end



Circular connection on the fan end



Tested to VDI 6022



For supply air systems with demanding acoustic requirements

VAV terminal units for the supply air control in buildings with variable air volume systems and demanding acoustic requirements

- Highly effective integral attenuator
- Box style construction for the reduction of the airflow velocity
- Electronic control components for different applications (Easy, Compact, Universal, and LABCONTROL)
- Suitable for airflow velocities up to 13 m/s
- Closed blade air leakage to EN 1751, up to class 4
- Casing air leakage to EN 1751, class A

Optional equipment and accessories

- Acoustic cladding for the reduction of case-radiated noise
- Secondary silencer Type TS for the reduction of air-regenerated noise
- Hot water heat exchanger of Type WT for reheating the airflow

1

Type		Page
TVZ	General information	1.1 – 114
	Order code	1.1 – 118
	Aerodynamic data	1.1 – 121
	Quick sizing	1.1 – 122
	Dimensions and weight – TVZ	1.1 – 123
	Dimensions and weight – TVZ-D	1.1 – 124
	Installation details	1.1 – 125
	Specification text	1.1 – 127
	Basic information and nomenclature	1.5 – 1

Variants

Product examples

VAV terminal unit, variant TVZ



VAV terminal unit, variant TVZ-D



Description

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- VARYCONTROL VAV terminal units of Type TVZ for the supply air control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- Integral attenuator for demanding acoustic requirements
- Shut-off by means of switching (equipment supplied by others)

Variants
- TVZ: Supply air unit
- TVZ-D: Supply air unit with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TS for very demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Nominal sizes
- 125, 160, 200, 250, 315, 400

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
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Accessories
- Lip seal (factory fitted)

Useful additions
- Secondary silencer Type TS
- Heat exchanger Type WT

Special characteristics
- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Hygiene tested and certified
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary
- Inspection access for cleaning to VDI 6022

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blade
- Integral attenuator
- Inspection access
- Factory assembled control components complete with wiring and tubing
- Aerodynamic functional 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 with upstream bend R = 1D)

Construction features
- Rectangular casing
- Spigot on the fan end suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Connection on the room end suitable for air duct profiles
- Baffle plate is fitted after the damper blade for optimum aerodynamic performance
- Position of the damper blade indicated externally at shaft extension
- Thermal and acoustic insulation (lining)

Materials and surfaces
- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)
- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Installation and commissioning
- Any installation orientation (except units with static differential pressure transducer)
- Return edges of the casing with drilled holes suitable for M10 threaded rods
- TVZ-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines
- Hygiene conforms to VDI 6022
- VDI 2083, air cleanliness class 3, and US standard 209E, class 100
- Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3)
- Nominal sizes 125 and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class A

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

1

Attachments: VARYCONTROL control components for Type TVZ

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
BL0		Compact controller with LonWorks interface TROX/Belimo		
XB0		Compact controller TROX/Gruner		
LN0		Compact controller Siemens		
Universal controller, dynamic				
B13	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator
B1B				Spring return actuator
XC3		Universal controller TROX/Gruner		
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo		Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3				Spring return actuator
BR3	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, 100 Pa	Actuator
BRB				Spring return actuator
BRG				Fast-running actuator
BG3		Differential pressure controller TROX/Belimo		Actuator
BGB				Spring return actuator
XE1		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE3				Spring return actuator

Attachments: LABCONTROL control components for Type TVZ

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room supply air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room supply air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

Technical data

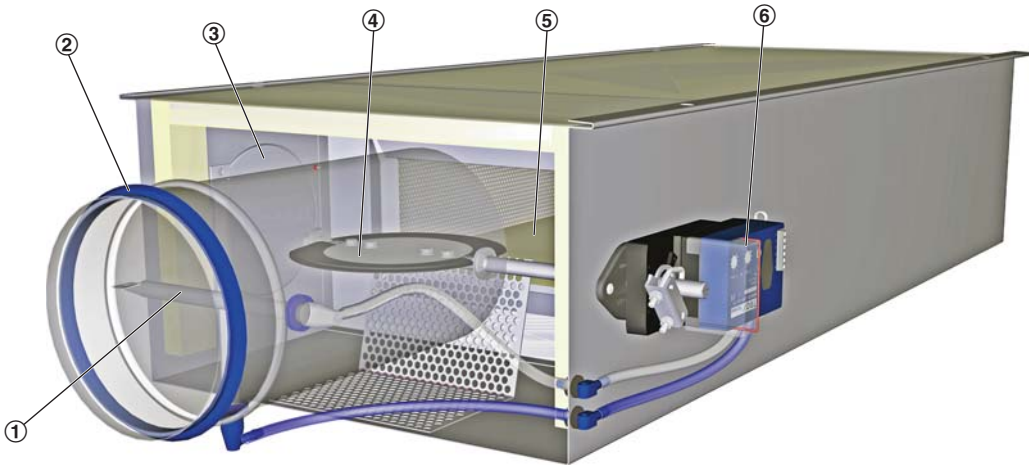
Nominal sizes	125 – 400 mm
Volume flow rate range	15 – 1680 l/s or 54 – 6048 m^3/h
Volume flow rate control range (unit with dynamic differential pressure measurement)	Approx. 10 – 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 80 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator; the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal or LABCONTROL). For most applications, the setpoint value comes from a room temperature controller. The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values. An integral attenuator reduces the noise that is created by the restriction of the airflow. The airflow velocity at the room end is, due to the larger rectangular cross section, about half the velocity in the circular duct.

Schematic illustration of the TVZ



① Differential pressure sensor
② Lip seal
③ Inspection access
④ Damper blade
⑤ Integral attenuator
⑥ Control components, e.g. an Easy controller

1

Order code VARYCONTROL

TVZ, TVZ/.../Easy

TVZ – D / 160 / D1 / B1B / E 0 / 200 – 900 / NO
1 2 3 4 5 6 7 8 9

TVZ – D / 160 / D1 / Easy
1 2 3 4 5

1 Type
TVZ VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
D1 Lip seal

5 Attachments (control component)
Example
Easy Easy controller
BC0 Compact controller
B13 Universal controller

6 Operating mode
E Single
M Master
S Slave
F Constant value
Z Differential pressure control – supply air

7 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

8 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting (operating mode A)

9 Damper blade position
Only with spring return actuators
NO Power off to OPEN
NC Power off to CLOSE

Order example VARYCONTROL

TVZ-D/160/D1/BC0/E0/180–850 m³/h

Acoustic cladding	With
Nominal size	160 mm
Accessories	Lip seal
Attachment	Compact controller
Operating mode	Single
Signal voltage range	0 – 10 V DC
Volume flow rate	180 – 850 m³/h

Order code
LABCONTROL
EASYLAB

TVZ with EASYLAB for room control and single operation

TVZ – D / 160 / D1 / ELAB / RS / ULZ / LAB / ... (1 2 3 4 5 6 8 9 10)

TVZ – D / 160 / D1 / ELAB / SC – E0 / ULZ / ... (1 2 3 4 5 6 7 8 10)

1 Type
TVZ VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
D1 Lip seal

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
RS Supply air control (Room Supply)
PC Differential pressure control

Single operation
SC Supply air controller

7 External volume flow rate setting
Only for single operation
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
LAB Extract air led system (laboratories)
CLR Supply air led system (clean rooms)
Raum management function is active
LAB-RMF Extract air led system (LAB)
CLR-RMF Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
BE-LCD-01 40-character display

1

Order example
LABCONTROL
EASYLAB

TVZ/200/ELAB/RS/CLR-RMF/3500/1000/5000/250/0/-150

Acoustic cladding	Without
Nominal size	200 mm
Attachment	EASYLAB controller TCU3 with fast-running actuator
Equipment function	Supply air control (Room Supply)
Additional functions	Supply air led system
Operating values	Total supply air – standard mode 3500 m^3/h Reduced operation 1000 m^3/h Increased operation 5000 m^3/h Constant supply air 250 m^3/h Constant extract air 0 Supply air/extract air difference –150 m^3/h

---

Order code
LABCONTROL
TCU-LON-II

TVZ with TCU-LON-II

TVZ – D / 160 / D1 / TMA / RS / -100 / -100
1 2 3 4 5 6 7

1 Type
TVZ VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
D1 Lip seal

5 Attachments (control component)
TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function
RS Room supply air
PS Differential pressure control – supply air (Pressure Supply)

7 Operating values [m^3/h or l/s, Pa]
Depending on equipment function
RS: $\Delta\dot{V} / \dot{V}_{constant}$
PS: $\Delta\dot{V} / \dot{V}_{constant} / \Delta p_{Soll}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

---

Order example
LABCONTROL
TCU-LON-II

TVZ/200/TMA/PS/-120/-300

Acoustic cladding	Without
Nominal size	200 mm
Attachment	TCU-LON-II with fast-running actuator
Equipment function	Differential pressure control – supply air (Pressure Supply)

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m³/h	Pa	Pa	± %
125	**15**	**54**	5	5	19
	60	**216**	15	25	8
	105	**378**	45	65	7
	150	**540**	90	130	5
160	**25**	**90**	5	5	19
	100	**360**	15	20	8
	175	**630**	40	50	7
	250	**900**	80	100	5
200	**40**	**144**	5	5	19
	160	**576**	15	20	8
	280	**1008**	40	50	7
	405	**1458**	80	100	5
250	**60**	**216**	5	5	19
	250	**900**	15	20	8
	430	**1548**	40	50	7
	615	**2214**	80	100	5
315	**100**	**360**	5	5	19
	410	**1476**	15	20	8
	720	**2592**	40	60	7
	1030	**3708**	80	120	5
400	**170**	**612**	5	5	19
	670	**2412**	15	20	8
	1175	**4230**	40	60	7
	1680	**6048**	80	120	5

① TVZ
② TVZ with secondary silencer TS

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.

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m^3/h	dB(A)			
125	15	54	17	16	21	<15
	60	216	24	20	24	16
	105	378	29	24	27	19
	150	540	34	29	32	23
160	25	90	18	16	20	<15
	100	360	28	24	25	18
	175	630	35	29	29	21
	250	900	36	30	35	27
200	40	144	16	<15	22	15
	160	576	21	17	27	20
	280	1008	23	17	31	23
	405	1458	31	24	39	31
250	60	216	16	15	22	16
	250	900	17	<15	26	19
	430	1548	22	15	29	22
	615	2214	31	21	37	28
315	105	378	18	15	21	15
	410	1476	21	16	27	19
	720	2592	24	18	33	24
	1030	3708	29	22	38	29
400	170	612	17	<15	25	17
	670	2412	19	15	29	20
	1175	4230	26	20	33	25
	1680	6048	32	27	43	35

① TVZ
② TVZ with secondary silencer TS
③ TVZ-D

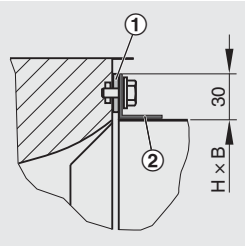
Description

– VAV terminal unit for the control of variable supply air volume flows



VAV terminal unit, variant TVZ

Dimensions

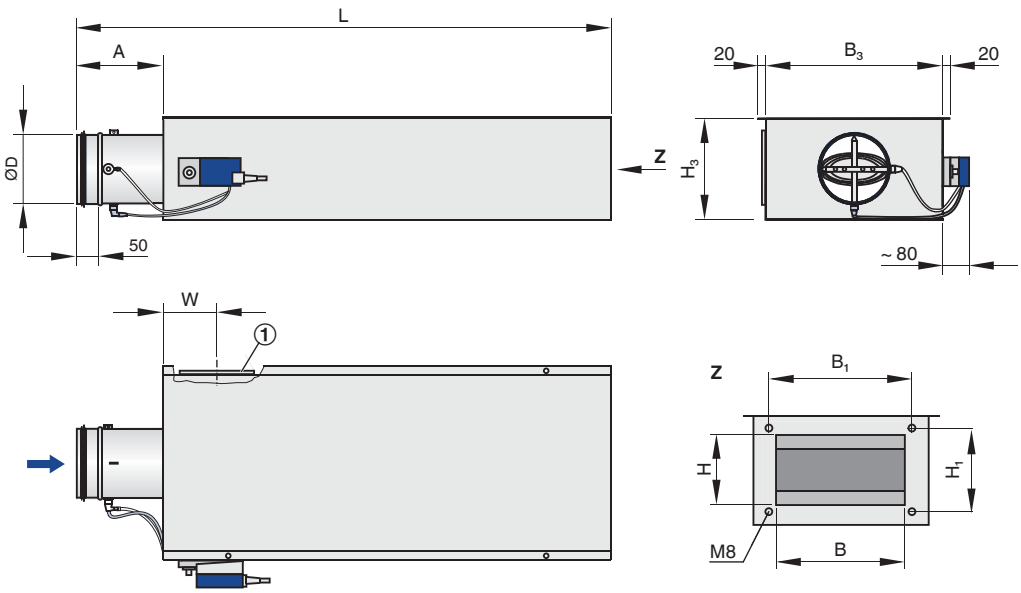


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TVZ



① Inspection access

Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	B	B_1	H	H_1	A	W	m
	mm										kg
125	124	1185	300	236	198	232	152	186	150	115	21
160	159	1235	410	236	308	342	152	186	200	115	25
200	199	1520	560	281	458	492	210	244	200	115	33
250	249	1690	700	311	598	632	201	235	250	215	55
315	314	1690	900	361	798	832	252	286	250	215	73
400	399	2070	1000	446	898	932	354	388	250	215	118

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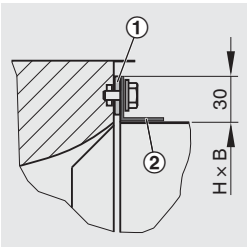
Description



VAV terminal unit, variant TVZ-D

- VAV terminal unit with acoustic cladding for the control of variable supply air volume flows
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular ducts for the room under consideration must have adequate acoustic insulation (provided by others) on the fan end
- Acoustic cladding cannot be retrofitted

Dimensions

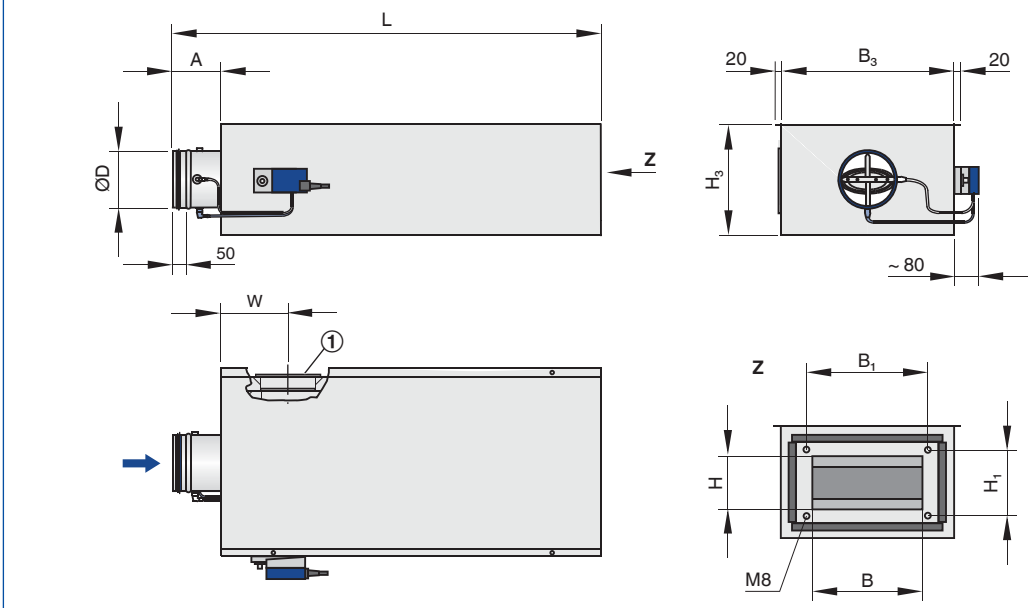


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TVZ-D



① Inspection access

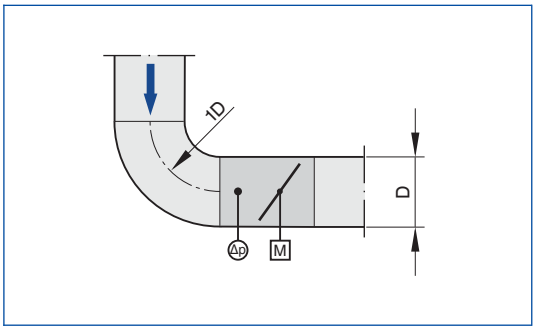
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	B	B_1	H	H_1	A	W	m
	mm										kg
125	124	1185	380	316	198	232	152	186	110	155	41
160	159	1235	490	316	308	342	152	186	160	155	50
200	199	1520	640	361	458	492	210	244	160	155	63
250	249	1690	780	391	598	632	201	235	210	255	95
315	314	1690	980	441	798	832	252	286	210	255	133
400	399	2070	1080	526	898	932	354	388	210	255	193

Upstream conditions

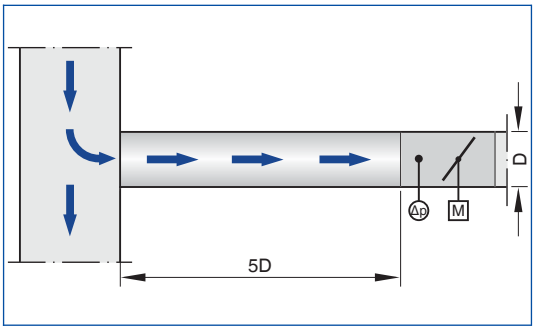
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

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

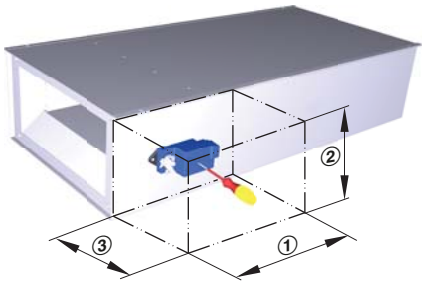


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 5D upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

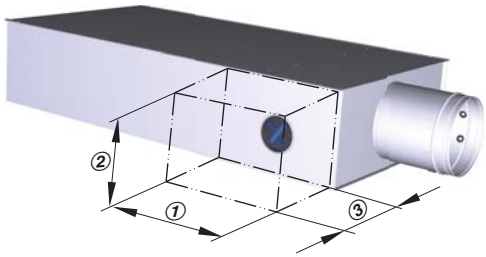
1 Space requirement for commissioning and maintenance

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



Inspection access



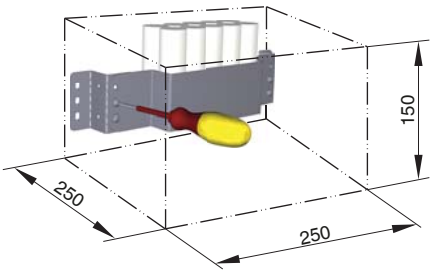
Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	400	300	300
Compact controller	400	300	300
Universal controller	700	300	300
LABCONTROL			
EASYLAB	900	350	400
TCU-LON-II	700	300	300

Space required

Part	①	②	③
	mm		
Inspection access	400	300	300

Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Standard text

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

Rectangular VAV terminal units for variable and constant air volume systems, suitable for supply air, available in 6 nominal sizes.
High control accuracy (even with upstream bend R = 1D).
Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement, a damper blade, and an integral attenuator. Factory-assembled control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
On the fan end, spigot with groove for lip seal, suitable for connecting ducts according to EN 1506 or EN 13180.
Room end suitable for the connection of air duct profiles.
Baffle plate is fitted after the damper blade for optimum acoustic and aerodynamic performance.
Casing with acoustic and thermal insulation.
Position of the damper blade indicated externally at shaft extension.
Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).
Casing air leakage to EN 1751, class B.
Complies with VDI 2083, clean room class 3, and US standard 209E, class 100.
Hygiene complies with VDI 6022, DIN 1946, part 4, as well as EN 13779 and VDI 3803.

Special characteristics

- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Hygiene tested and certified
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary
- Inspection access for cleaning to VDI 6022

Materials and surfaces

- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)
- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 15 to 1680 l/s or 54 to 6048 m^3/h
- Volume flow rate control range (unit with dynamic differential pressure measurement): approx. 10 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 80 Pa
- Maximum differential pressure: 1000 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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

1 Order options

VARYCONTROL

1 Type
TVZ VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **D1** Lip seal

5 Attachments (control component)
Example
☐ **Easy** Easy controller
☐ **BC0** Compact controller
☐ **B13** Universal controller

6 Operating mode
☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value
☐ **Z** Differential pressure control – supply air

7 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

8 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating mode A)

9 Damper blade position
Only with spring return actuators
☐ **NO** Power off to OPEN
☐ **NC** Power off to CLOSE

Order options

LABCONTROL

EASYLAB

1 Type
TVZ VAV terminal unit, supply air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **D1** Lip seal

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
☐ **RS** Supply air control (Room Supply)
☐ **PC** Differential pressure control

Single operation
☐ **SC** Supply air controller

7 External volume flow rate setting
Only for single operation
☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC
☐ **2P** On-site switch contacts for 2 switching steps
☐ **3P** On-site switch contacts for 3 switching steps
☐ **F** Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
☐ **LAB** Extract air led system (laboratories)
☐ **CLR** Supply air led system (clean rooms)
Raum management function is active
☐ **LAB-RMF** Extract air led system (LAB)
☐ **CLR-RMF** Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
☐ **BE-LCD-01** 40-character display

1 Order options

LABCONTROL

TCU-LON-II

1 Type

TVZ VAV terminal unit, supply air

2 Acoustic cladding

No entry: none

☐ **D** With acoustic cladding

3 Nominal size [mm]

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories

No entry: none

☐ **D1** Lip seal

5 Attachments (control component)

☐ **TMA** TCU-LON-II with fast-running actuator
☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function

☐ **RS** Room supply air
☐ **PS** Differential pressure control – supply air (Pressure Supply)

7 Operating values [m³/h or l/s, Pa]

Depending on equipment function
RS: $\Delta\dot{V}$ / $\dot{V}_{constant}$
PS: $\Delta\dot{V}$ / $\dot{V}_{constant}$ / Δp_{Soll}
The room control volume flow rates are related to the total extract air volume flow rate for the room

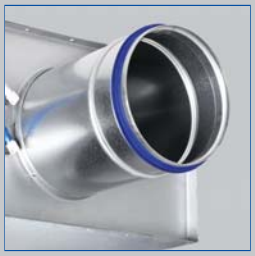
VAV terminal units
Type TVA



Easy controller



Compact controller



Circular connection
on the fan end



Rectangular connection
on the room end



Tested to VDI 6022



For extract air systems with demanding acoustic requirements

VAV terminal units for the extract air control in buildings
with variable air volume systems and demanding acoustic requirements

- Highly effective integral attenuator
- Box style construction for the reduction of the airflow velocity
- Electronic control components for different applications
  (Easy, Compact, Universal, and LABCONTROL)
- Suitable for airflow velocities up to 13 m/s
- Closed blade air leakage to EN 1751, class 4
- Casing air leakage to EN 1751, class A

Optional equipment and accessories

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

1

Type		Page
TVA	General information	1.1 – 132
	Order code	1.1 – 136
	Aerodynamic data	1.1 – 139
	Quick sizing	1.1 – 140
	Dimensions and weight – TVA	1.1 – 141
	Dimensions and weight – TVA-D	1.1 – 142
	Installation details	1.1 – 143
	Specification text	1.1 – 145
	Basic information and nomenclature	1.5 – 1

Variants

Product examples

VAV terminal unit, variant TVA



VAV terminal unit, variant TVA-D



Description

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- VARYCONTROL VAV terminal units of Type TVA for the extract air flow control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- Integral attenuator for demanding acoustic requirements
- Shut-off by means of switching (equipment supplied by others)

Variants
- TVA: Extract air unit
- TVA-D: Extract air unit with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TS for very demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Nominal sizes
- 125, 160, 200, 250, 315, 400

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
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Accessories
- Lip seal (factory fitted)

Useful additions
- Secondary silencer Type TS

Special features
- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Hygiene tested and certified
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blade
- Integral attenuator
- 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

Construction features
- Rectangular casing
- Spigot on the fan end suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Connection on the room end suitable for air duct profiles
- Baffle plate is fitted after the damper blade for optimum aerodynamic performance
- Position of the damper blade indicated externally at shaft extension
- Thermal and acoustic insulation (lining)

Materials and surfaces
- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)
- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Installation and commissioning
- Any installation orientation (except units with static differential pressure transducer)
- Return edges of the casing with drilled holes suitable for M10 threaded rods
- TVA-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines
- Hygiene conforms to VDI 6022
- VDI 2083, air cleanliness class 3, and US standard 209E, class 100
- Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).
- Nominal sizes 125 and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class A

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

1

Attachments: VARYCONTROL control components for Type TVA

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
BL0		Compact controller with LonWorks interface TROX/Belimo		
XB0		Compact controller TROX/Gruner		
LN0		Compact controller Siemens		
Universal controller, dynamic				
B13	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator
B1B				Spring return actuator
XC3		Universal controller TROX/Gruner		
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo		Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3				Spring return actuator
BR3	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, 100 Pa	Actuator
BRB				Spring return actuator
BRG				Fast-running actuator
BS3				Actuator
BG3		Differential pressure controller TROX/Belimo		
BGB				Spring return actuator
XE1		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE3				Spring return actuator

Attachments: LABCONTROL control components for Type TVA

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room extract air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room extract air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

Technical data

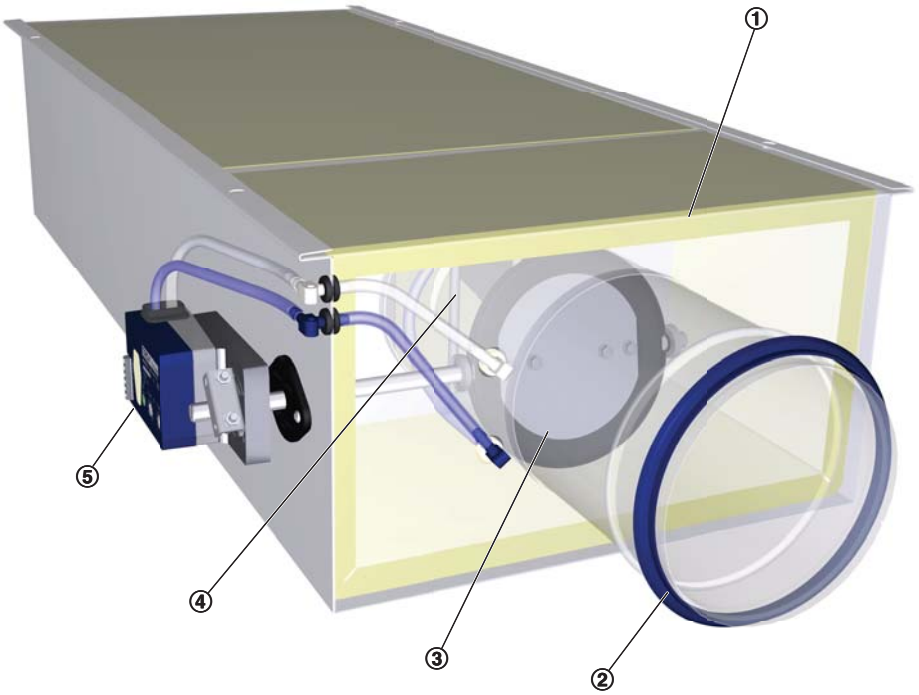
Nominal sizes	125 – 400 mm
Volume flow rate range	15 – 1680 l/s or 54 – 6048 m^3/h
Volume flow rate control range (unit with dynamic differential pressure measurement)	Approx. 10 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 190 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator; the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal or LABCONTROL). For most applications, the setpoint value comes from a room temperature controller. The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values. An integral attenuator reduces the noise that is created by the restriction of the airflow. The airflow velocity at the room end is, due to the larger rectangular cross section, about half the velocity in the circular duct.

Schematic illustration of the TVA



① Integral attenuator
② Lip seal
③ Damper blade
④ Differential pressure sensor
⑤ Control components, e.g. an Easy controller

1

Order code VARYCONTROL

TVA, TVA/.../Easy

TVA – D / 160 / D1 / B1B / E 0 / 200 – 900 / NO
1 2 3 4 5 6 7 8 9

TVA – D / 160 / D1 / Easy
1 2 3 4 5

1 Type
TVA VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
D1 Lip seal

5 Attachments (control component)
Example
Easy Easy controller
BC0 Compact controller
B13 Universal controller

6 Operating mode
E Single
M Master
S Slave
F Constant value
A Differential pressure control – extract air

7 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

8 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting (operating mode A)

9 Damper blade position
Only with spring return actuators
NO Power off to OPEN
NC Power off to CLOSE

Order example VARYCONTROL

TVA-D/160/D1/BC0/E0/200–800 m³/h

Acoustic cladding	With
Nominal size	160 mm
Accessories	Lip seal
Attachment	Compact controller
Operating mode	Single
Signal voltage range	0 – 10 V DC
Volume flow rate	200 – 800 m³/h

Order code
LABCONTROL
EASYLAB

TVA with EASYLAB for room control and single operation

TVA – D / 160 / D1 / ELAB / RE / ULZ / LAB / ...
1 2 3 4 5 6 8 9 10

TVA – D / 160 / D1 / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 8 10

1 Type
TVA VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
D1 Lip seal

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
RE Extract air control (Room Exhaust)
PC Differential pressure control

Single operation
EC Extract air controller

7 External volume flow rate setting
Only for single operation
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
LAB Extract air led system (laboratories)
CLR Supply air led system (clean rooms)
Raum management function is active
LAB-RMF Extract air led system (LAB)
CLR-RMF Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
BE-LCD-01 40-character display

1

Order example
LABCONTROL
EASYLAB

TVA/200/ELAB/RE/TZ/CLR

Acoustic cladding	Without
Nominal size	200 mm
Attachment	EASYLAB controller TCU3 with fast-running actuator
Equipment function	Extract air control (Room Exhaust)
Module expansions	EM-TRF for 230 V AC, EM-AUTOZERO Solenoid valve for automatic zero point correction
Additional function	Supply air led system (clean rooms), room management function is active

---

Order code
LABCONTROL
TCU-LON-II

TVA with TCU-LON-II

TVA – D / 160 / D1 / TMA / RE / 1500 / 750/ 100
1 2 3 4 5 6 7

1 Type
TVA VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
D1 Lip seal

5 Attachments (control component)
TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function
RE Room extract air
PE Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]
Depending on equipment function
RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$
PE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

---

Order example
LABCONTROL
TCU-LON-II

TVA-D/400/D1/TMB/PE/1500/750/250/20

Acoustic cladding	With
Nominal size	400 mm
Accessories	Lip seal
Attachment	TCU-LON-II with fast-running actuator (brushless motor)
Equipment function	Differential pressure control – extract air (Pressure Extract)
Operating values	Total room extract air – day-time operation 1500 m³/h, total room extract air – night-time operation 750 m³/h, constant volume flow rate 100 m³/h, pressure setpoint value 20 Pa

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m^3/h	Pa		± %
125	15	54	5	5	19
	60	216	25	35	8
	105	378	75	95	7
	150	540	150	190	5
160	25	90	5	5	19
	100	360	25	30	8
	175	630	75	85	7
	250	900	150	170	5
200	40	144	5	5	19
	160	576	30	35	8
	280	1008	95	105	7
	405	1458	190	210	5
250	60	216	5	5	19
	250	900	25	30	8
	430	1548	75	85	7
	615	2214	150	170	5
315	100	360	5	5	19
	410	1476	30	35	8
	720	2592	90	110	7
	1030	3708	180	220	5
400	170	612	5	5	19
	670	2412	25	35	8
	1175	4230	75	95	7
	1680	6048	150	190	5

① TVA
② TVA with secondary silencer TS

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.

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
125	15	54	18	16	15	<15
	60	216	24	21	26	21
	105	378	26	23	30	25
	150	540	25	25	33	27
160	25	90	16	15	15	<15
	100	360	28	23	24	20
	175	630	28	23	29	24
	250	900	23	22	32	27
200	40	144	15	<15	16	<15
	160	576	20	17	24	20
	280	1008	23	18	30	25
	405	1458	26	25	32	27
250	60	216	16	<15	15	<15
	250	900	19	16	25	20
	430	1548	20	18	29	24
	615	2214	27	27	33	28
315	105	378	17	15	15	<15
	410	1476	26	21	28	23
	720	2592	25	22	34	29
	1030	3708	27	27	37	32
400	170	612	16	<15	17	<15
	670	2412	18	<15	32	26
	1175	4230	23	19	37	32
	1680	6048	32	29	42	38

① TVA
② TVA with secondary silencer TS
② TVA-d

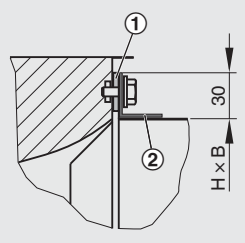
Description

– VAV terminal unit for the control of variable extract air volume flows



VAV terminal unit, variant TVA

Dimensions

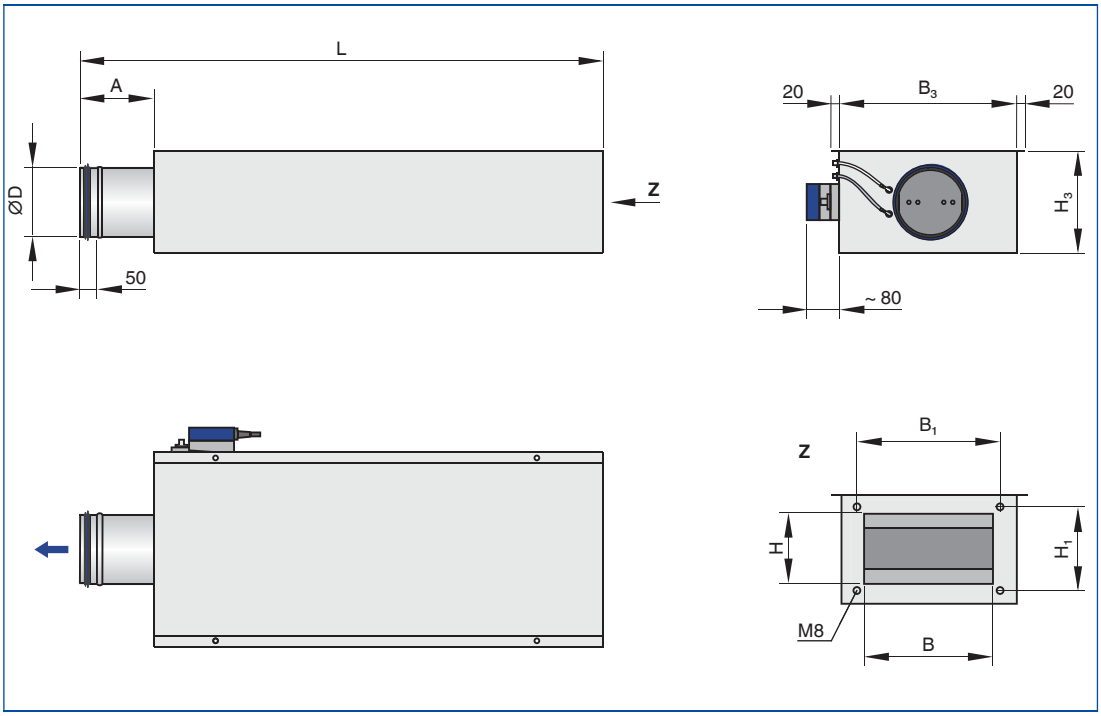


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TVA



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	B	B_1	H	H_1	A	m
	mm									kg
125	124	1220	300	236	198	232	152	186	185	21
160	159	1205	410	236	308	342	152	186	170	25
200	199	1460	560	281	458	492	210	244	138	33
250	249	1540	700	311	598	632	201	235	97	55
315	314	1685	900	361	798	832	252	286	245	73
400	399	1995	1000	446	898	932	354	388	176	118

1

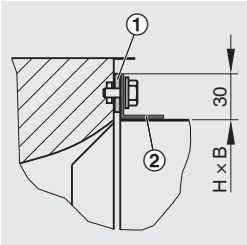
Description



VAV terminal unit, variant TVA-D

- VAV terminal unit with acoustic cladding for the control of variable extract air volume flows
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular ducts for the room under consideration must have adequate acoustic insulation (provided by others) on the fan end
- Acoustic cladding cannot be retrofitted

Dimensions

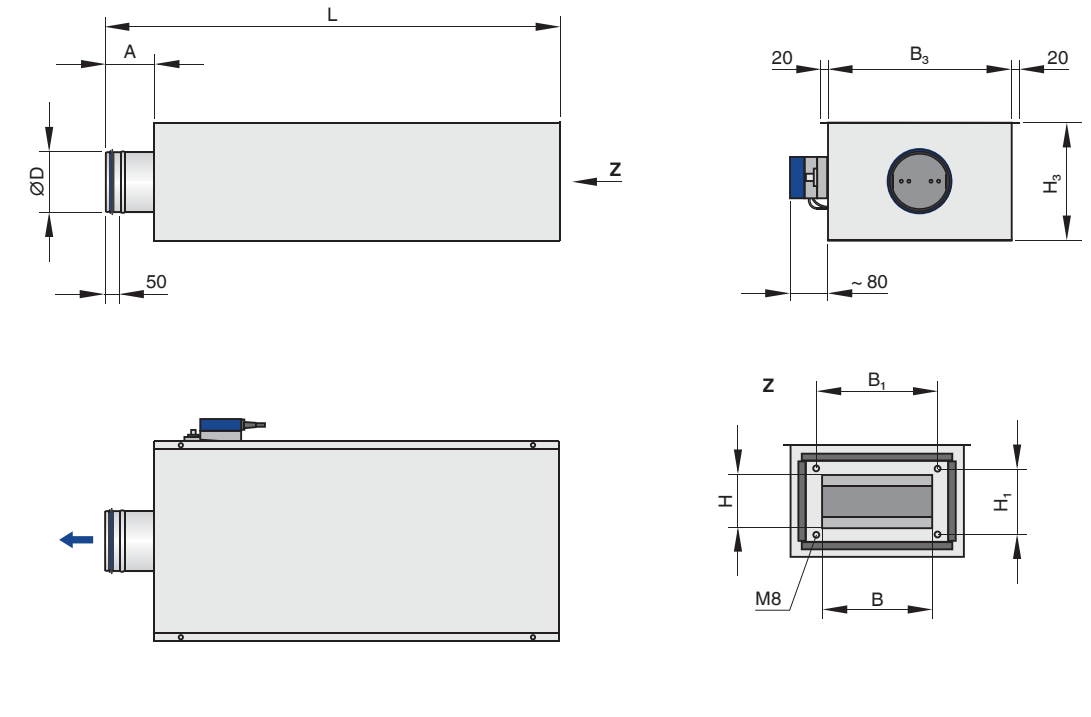


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TVA-D



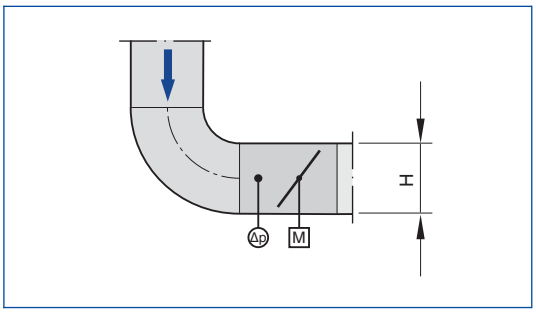
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	B	B_1	H	H_1	A	m
	mm									kg
125	124	1220	380	316	198	232	152	186	145	41
160	159	1205	490	316	308	342	152	186	130	50
200	199	1460	640	361	458	492	210	244	98	63
250	249	1540	780	391	598	632	201	235	57	95
315	314	1685	980	441	798	832	252	286	205	133
400	399	1995	1080	526	898	932	354	388	136	193

Upstream conditions

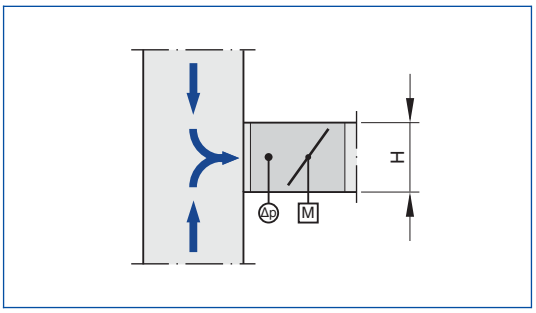
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

Bend, vertical



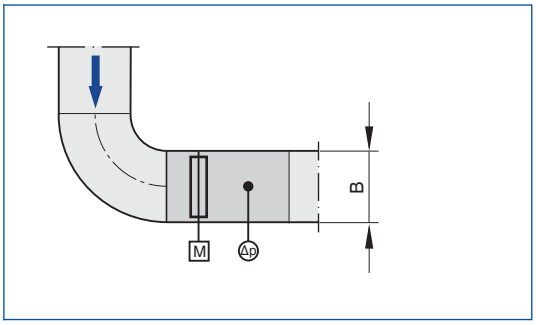
A bend – without a straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Convergence of two airflows, vertical



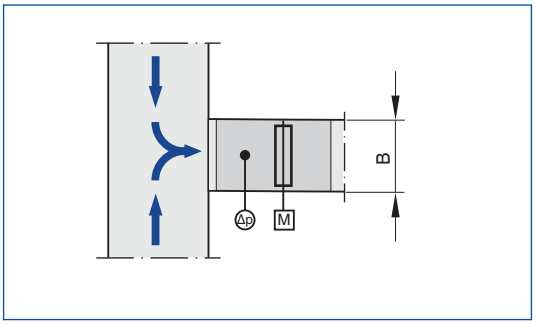
The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed at a junction and at the point of convergence of two airflows.

Bend, horizontal



A bend – without a straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Convergence of two airflows, horizontal

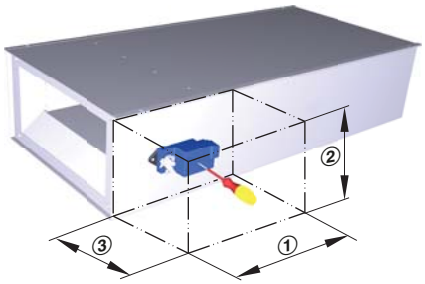


The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed at a junction and at the point of convergence of two airflows.

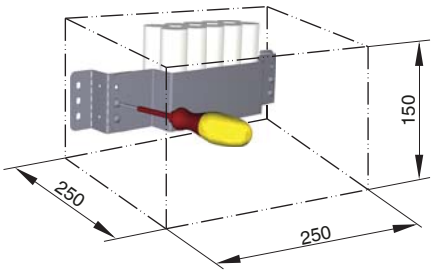
1 Space requirement for commissioning and maintenance

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



Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	400	300	300
Compact controller	400	300	300
Universal controller	700	300	300
LABCONTROL			
EASYLAB	900	350	400
TCU-LON-II	700	300	300

Standard text

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

Rectangular VAV terminal units for variable and constant air volume systems, suitable for extract air, available in 6 nominal sizes. High volume flow rate control accuracy. Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement, a damper blade, and an integral attenuator. Factory-assembled control components complete with wiring and tubing. Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution) On the fan end, spigot with groove for lip seal, suitable for connecting ducts to EN 1506 or EN 13180. Room end suitable for the connection of air duct profiles. Baffle plate is fitted after the damper blade for optimum acoustic and aerodynamic performance. Casing with acoustic and thermal insulation. Position of the damper blade indicated externally at shaft extension. Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3). Casing air leakage to EN 1751, class B. Complies with VDI 2083, clean room class 3, and US standard 209E, class 100. Hygiene complies with VDI 6022, DIN 1946, part 4, as well as EN 13779 and VDI 3803.

Special features

- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Hygiene tested and certified
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary

Materials and surfaces

- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)

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

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 15 to 1680 l/s or 54 to 6048 m^3/h
- Volume flow rate control range (unit with dynamic differential pressure measurement): approx. 10 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 190 Pa
- Maximum differential pressure: 1000 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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

1 Order options

VARYCONTROL

1 Type
TVA VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **D1** Lip seal

5 Attachments (control component)
Example
☐ **Easy** Easy controller
☐ **BC0** Compact controller
☐ **B13** Universal controller

6 Operating mode
☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value
☐ **A** Differential pressure control – extract air

7 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

8 Volume flow rates [m^3/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating mode A)

9 Damper blade position
Only with spring return actuators
☐ **NO** Power off to OPEN
☐ **NC** Power off to CLOSE

Order options
LABCONTROL
EASYLAB

1 Type
TVA VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **D1** Lip seal

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
☐ **RE** Extract air control (Room Exhaust)
☐ **PC** Differential pressure control

Single operation
☐ **EC** Extract air controller

7 External volume flow rate setting
Only for single operation
☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC
☐ **2P** On-site switch contacts for 2 switching steps
☐ **3P** On-site switch contacts for 3 switching steps
☐ **F** Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
☐ **LAB** Extract air led system (laboratories)
☐ **CLR** Supply air led system (clean rooms)
Raum management function is active
☐ **LAB-RMF** Extract air led system (LAB)
☐ **CLR-RMF** Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel
☐ **BE-LCD-01** 40-character display

1 Order options

LABCONTROL

TCU-LON-II

1 Type
TVA VAV terminal unit, extract air

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **D1** Lip seal

5 Attachments (control component)
☐ **TMA** TCU-LON-II with fast-running actuator
☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function
☐ **RE** Room extract air
☐ **PE** Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]
Depending on equipment function
RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$
PE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$ / $\Delta p_{setpoint}$
The room control volume flow rates are related to the total extract air volume flow rate for the room

VAV terminal units
Type TVM

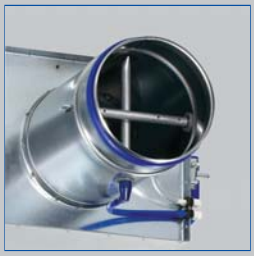




Variant TVM-S



Rectangular connection on the room end



Circular connection on the fan end



Tested to VDI 6022

For dual duct systems

VAV dual duct terminal units for dual duct systems
with variable volume flows in buildings with demanding acoustic requirements

- Individual temperature control for each room or zone
- Highly effective integral attenuator
- Electronic control components for different applications (Compact and Universal)
- Suitable for airflow velocities up to 13 m/s
- Closed blade air leakage to EN 1751, up to class 4
- Casing air leakage to EN 1751, class A

Optional equipment and accessories

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

1

Type		Page
TVM	General information	1.1 – 150
	Order code	1.1 – 155
	Aerodynamic data	1.1 – 156
	Quick sizing	1.1 – 157
	Dimensions and weight – TVM-S	1.1 – 158
	Dimensions and weight – TVM-S-D	1.1 – 159
	Dimensions and weight – TVM	1.1 – 160
	Dimensions and weight – TVM-D	1.1 – 161
	Specification text	1.1 – 162
	Basic information and nomenclature	1.5 – 1

Variants

Product examples

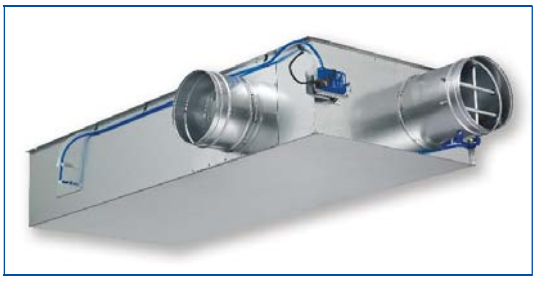
VAV dual duct terminal unit, variant TVM-S



VAV dual duct terminal unit, variant TVM-S-D



VAV dual duct terminal unit, variant TVM



VAV dual duct terminal unit, variant TVM-D



Description

For detailed information on control components see Chapter K5 – 1.3.

Application
- VARYCONTROL VAV dual duct terminal units of Type TVM for the supply air control in dual duct variable or constant air volume systems
- Closed-loop volume flow control using an external power supply
- For maximum acoustic and thermal comfort
- Demand-based mixing of cold and warm air
- Shut-off by means of switching (equipment supplied by others)

Variants
- TVM-S Dual duct unit, 60° spigot arrangement
- TVM-S-D Dual duct unit with acoustic cladding, 60° spigot arrangement
- TVM: Dual duct unit, 90° spigot arrangement
- TVM-D: Dual duct unit with acoustic cladding, 90° spigot arrangement
- Units with acoustic cladding and/or secondary silencer Type TS for very demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Nominal sizes
- TVM-S: 125, 160, 200
- TVM: 125, 160, 200, 250, 315, 400

Attachments
- Compact controller: Compact unit consisting of controller, differential pressure transducer and actuator
- Universal controller: Controller, differential pressure transducer and actuators for special applications

Accessories
- Lip seals (factory fitted)

Useful additions
- Secondary silencer Type TS

Special characteristics
- Integral differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary
- Inspection access for cleaning to VDI 6022

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensors for volume flow rate measurement, one in the cold air spigot and one in the silencer
- Damper blade
- Integral attenuator
- Inspection access
- Factory assembled control components complete with wiring and tubing
- Aerodynamic functional 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 with upstream bend R = 1D)

Construction features
- Rectangular casing
- Spigot on the fan end suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Connection on the room end suitable for air duct profiles
- Baffle plate is fitted after the damper blade for optimum aerodynamic performance
- Position of the damper blade indicated externally at shaft extension
- Thermal and acoustic insulation (lining)

Materials and surfaces
- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)
- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Installation and commissioning
- Any installation orientation
- Connecting spigots for warm and cold air arranged at an angle of 60° (TVM-S) or 90° (TVM)
- Return edges of the casing with drilled holes suitable for threaded rods

Standards and guidelines
- Hygiene conforms to VDI 6022
- VDI 2083, air cleanliness class 3, and US standard 209E, class 100
- Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3)
- Nominal sizes 125 and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class A

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

1

Attachments: VARYCONTROL control components for Type TVM

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
Compact controller				
BF0	Volume flow rate	Compact controller with MP bus interface TROX/Belimo	Dynamic, integral	Integral
XG0		Compact controller TROX/Gruner		
LY0		Compact controller Siemens		
Universal controller, dynamic				
B27	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator

Technical data

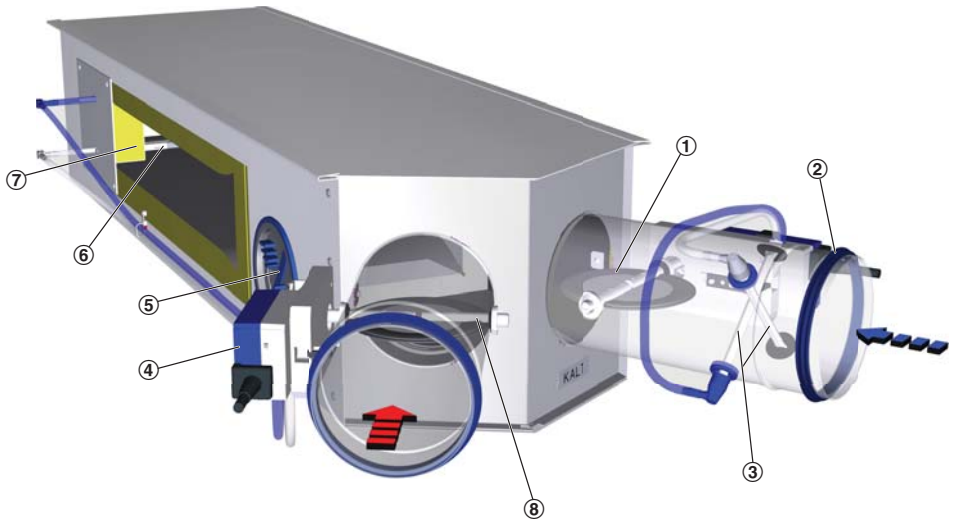
Nominal sizes	125 – 400 mm
Volume flow rate range	45 – 1680 l/s or 162 – 6048 m^3/h
Volume flow rate control range	Approx. 30 to 100 % of the nominal volume flow rate
Minimum differential pressure	120 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Function

Functional description

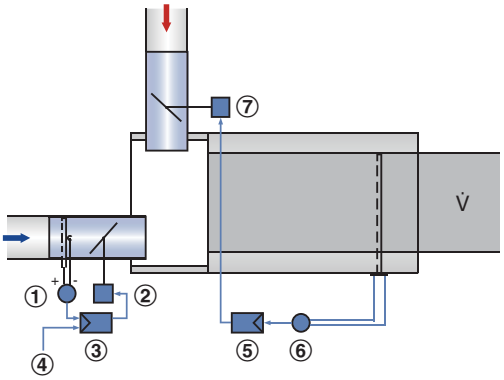
The VAV terminal unit is fitted with two differential pressure sensors for measuring the volume flow rates, one in the cold air flow and one in the total air flow. The control components (attachments) include two differential pressure transducers that transform the differential pressure (effective pressure) into an electric signal, two controllers, and two actuators; the control functions can be achieved with a Compact controller or with individual components. In most cases, the setpoint value for the dual duct terminal unit comes from a room temperature controller. The room temperature controller 'leads' the cold air volume flow controller and alters the setpoint for the cold air flow rate between 0 and the maximum volume flow $\dot{V}_{max}$. The controller compares the actual value with the setpoint value and alters the control signal of the damper actuator if there is a difference between the two values. The warm/total air controller is set to the minimum volume flow rate $\dot{V}_{min}$ and controls the warm air damper blade. As a consequence, a corresponding proportion of warm air is added. As the demand for cooling increases, the warm air damper blade closes such that eventually only cold air flows.
An integral attenuator reduces the noise that is created by the restriction of the airflow. The airflow velocity at the room end is, due to the larger rectangular cross section, about half the velocity in the circular duct.

Schematic illustration of the TVM-S



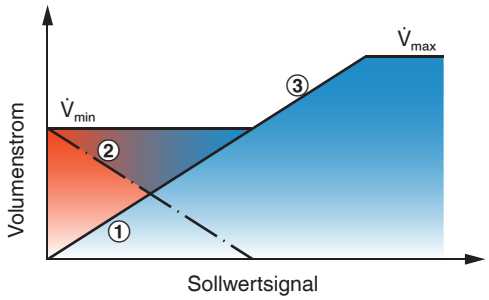
① Damper blade – cold air
② Lip seal
③ Differential pressure sensor – cold air
④ Control components, e. g. a Compact controller
⑤ Inspection access
⑥ Differential pressure sensor – total air
⑦ Acoustic insulation
⑧ Damper blade – warm air

Control loop



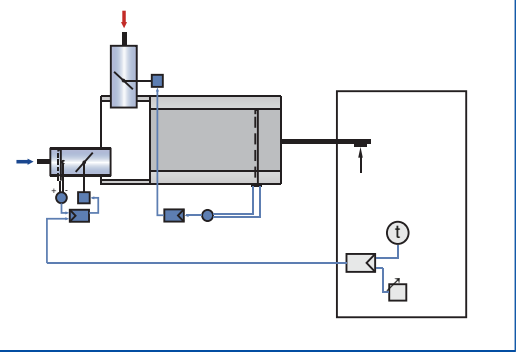
① Effective pressure transducer
④ Actuator for cold air duct
③ Volume flow controller
④ Setpoint value signal
⑤ Volume flow controller for $\dot{V}_{tot}$ ($\dot{V}_{warm}$)
⑥ Effective pressure transducer for $\dot{V}_{tot}$
⑦ Actuator for warm air duct

Control diagram

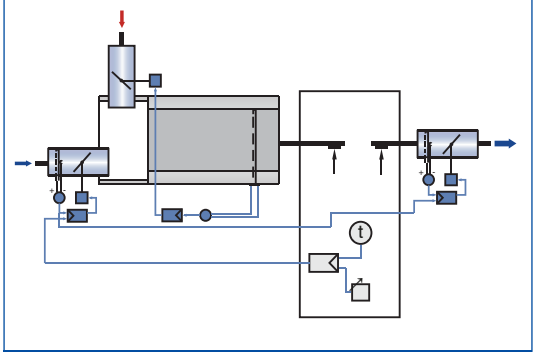


① Cold air supply
② Warm air supply
③ Total extract air at the unit outlet

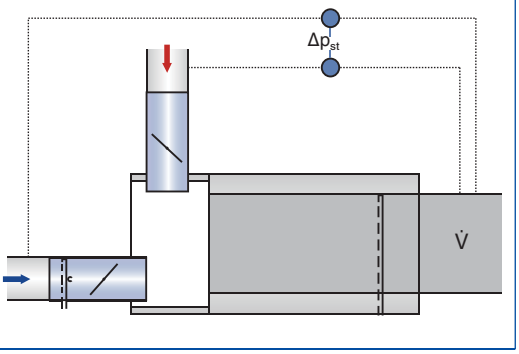
Single operation



Slave operation (master-slave)



Static differential pressure



Order code **TVM**

VARYCONTROL

TVM – S – D / 160 / D2 / B27 / E 0 / 300 – 900 / 0 – 900

1 2 3 4 5 6 7 8 9

1 Type
TVM Dual duct terminal unit

2 Spigot arrangement
No entry: 90°
S 60° (up to nominal size 200)

3 Acoustic cladding
No entry: none
D With acoustic cladding

4 Nominal size [mm]
125
160
200
250
315
400

5 Accessories
No entry: none
D2 Lip seal

6 Attachments (control component)
Example
BF0 Compact controller
B27 Universal controller

7 Operating mode
E Single
M Master
F Constant value

8 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

9 Volume flow rates [m³/h or l/s]
$\dot{V}_{warm,\ min}$ – $\dot{V}_{warm,\ max}$ / $\dot{V}_{cold,\ min}$ – $\dot{V}_{cold,\ max}$
for factory setting

Order example **TVM/160/BF0/E0/300–900 m³/h/0–900 m³/h**

VARYCONTROL

Spigot arrangement	90°
Acoustic cladding	Without
Nominal size	160 mm
Attachment	Compact controller
Operating mode	Single
Signal voltage range	0 – 10 V DC
Volume flow rate, warm	300 – 900 m³/h
Volume flow rate, cold	0 – 900 m³/h

1

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		① $\Delta p_{st\ min}$	② $\Delta p_{st\ min}$	$\Delta\dot{V}$	$\Delta\dot{V}_{warm}$
	l/s	m^3/h	Pa		± %	
125	45	162	120	160	8	17
	60	216	120	160	7	15
	100	360	120	160	5	12
	150	540	120	160	5	7
160	75	270	120	140	8	17
	100	360	120	140	7	15
	170	612	120	140	5	12
	250	900	120	140	5	7
200	120	432	120	140	8	17
	180	648	120	140	7	15
	280	1008	120	140	5	12
	405	1458	120	140	5	7
250	185	666	120	145	8	17
	270	972	120	145	7	15
	470	1692	120	145	5	12
	615	2214	120	145	5	7
315	310	1116	120	160	8	17
	420	1512	120	160	7	15
	720	2592	120	160	5	12
	1030	3708	120	160	5	7
400	505	1818	120	160	8	17
	710	2556	120	160	7	15
	1250	4500	120	160	5	12
	1680	6048	120	160	5	7

① TVM, TVM-S
② TVM, TVM-S with secondary silencer TS

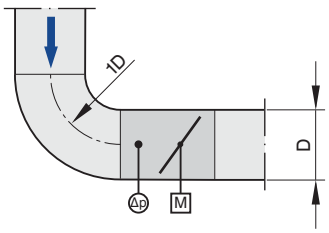
The volume flow rates given for VAV terminal units depend on the nominal size and on the control component (attachment) that is installed. The table gives the minimum and maximum values for a VAV terminal unit. Some control components may only have a limited volume flow rate range. This applies in particular 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.

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.

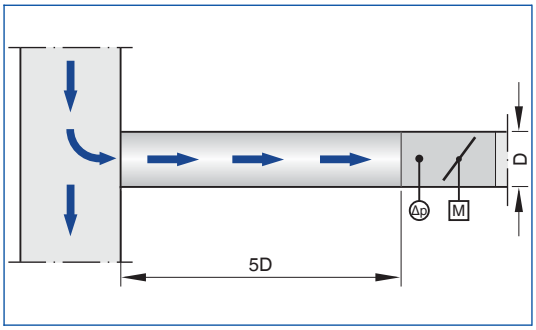
The upstream conditions shown apply to cold air. For warm air, no particular upstream conditions are required.

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



A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 5D upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
125	45	162	25	15	25	21
	60	216	28	19	28	24
	100	360	34	24	32	29
	150	540	38	29	36	33
160	75	270	25	16	35	26
	100	360	28	19	36	28
	170	612	34	25	39	33
	250	900	37	28	41	37
200	120	432	24	15	30	25
	180	648	28	18	33	28
	280	1008	31	21	36	33
	405	1458	34	25	39	37
250	185	666	18	8	25	20
	270	972	23	12	29	24
	470	1692	30	19	34	30
	615	2214	34	24	37	33
315	310	1116	21	8	30	27
	420	1512	24	11	32	30
	720	2592	31	18	35	33
	1030	3708	37	26	38	35
400	505	1818	18	6	28	25
	710	2556	23	9	32	29
	1250	4500	31	16	37	35
	1680	6048	37	21	40	38

① TVM, TVM-S
② TVM, TVM-S with secondary silencer TS
③ TVM-D, TVM-S-D

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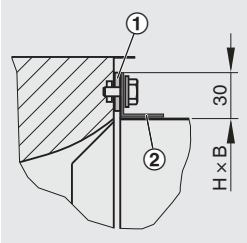
Description



VAV dual duct terminal unit, variant TVM-S

- VAV terminal unit for the control of variable supply air volume flows
- Connecting spigots for warm and cold air arranged at an angle of 60°

Dimensions

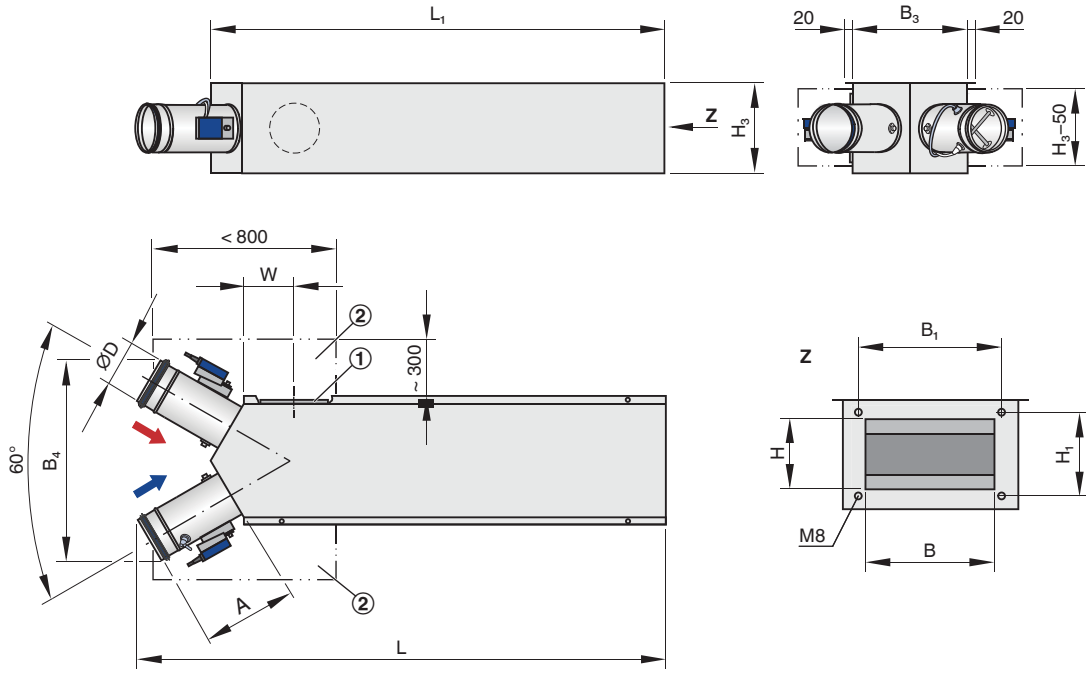


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TVM-S



① Inspection access
② Keep clear to provide access to attachments

Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	L_1	B	B_1	H	H_1	A	B_4	W	m
	mm												kg
125	124	1385	300	236	1190	198	232	152	186	245	525	173	30
160	159	1630	410	236	1360	308	342	152	186	335	690	173	35
200	199	1920	560	281	1660	458	492	210	244	340	800	173	50

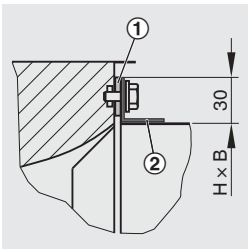
Description



VAV dual duct terminal unit, variant TVM-S-D

- VAV terminal unit with acoustic cladding for the control of variable supply air volume flows
- Connecting spigots for warm and cold air arranged at an angle of 60°
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular ducts for the room under consideration must have adequate acoustic insulation (provided by others) on the fan end
- Acoustic cladding cannot be retrofitted

Dimensions

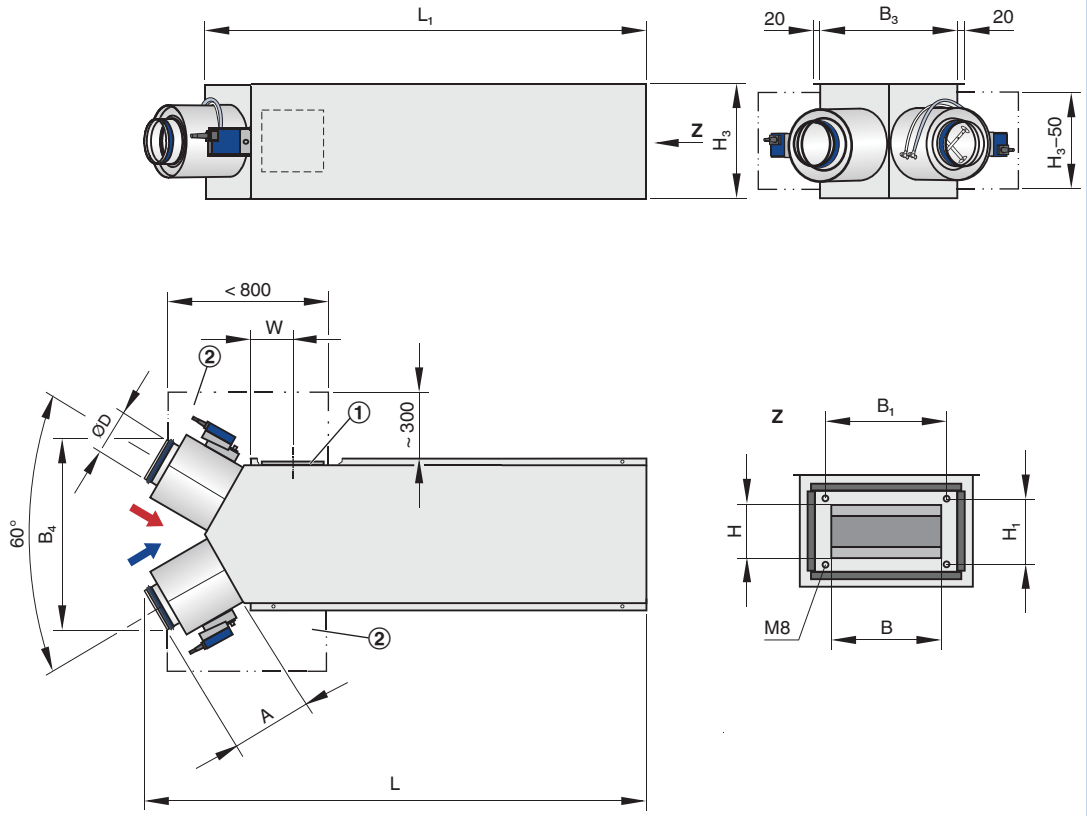


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TVM-S-D



① Inspection access
② Keep clear to provide access to attachments

Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	L_1	B	B_1	H	H_1	A	B_4	W	m
	mm												kg
125	124	1385	380	316	1215	198	232	152	186	225	525	160	45
160	159	1630	490	316	1410	308	342	152	186	295	690	180	55
200	199	1920	640	361	1710	458	492	210	244	300	800	180	80

1

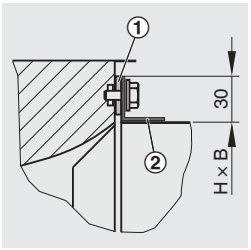
Description



VAV dual duct terminal unit, variant TVM

- VAV terminal unit for the control of variable supply air volume flows
- Connecting spigots for warm and cold air arranged at an angle of 90°

Dimensions

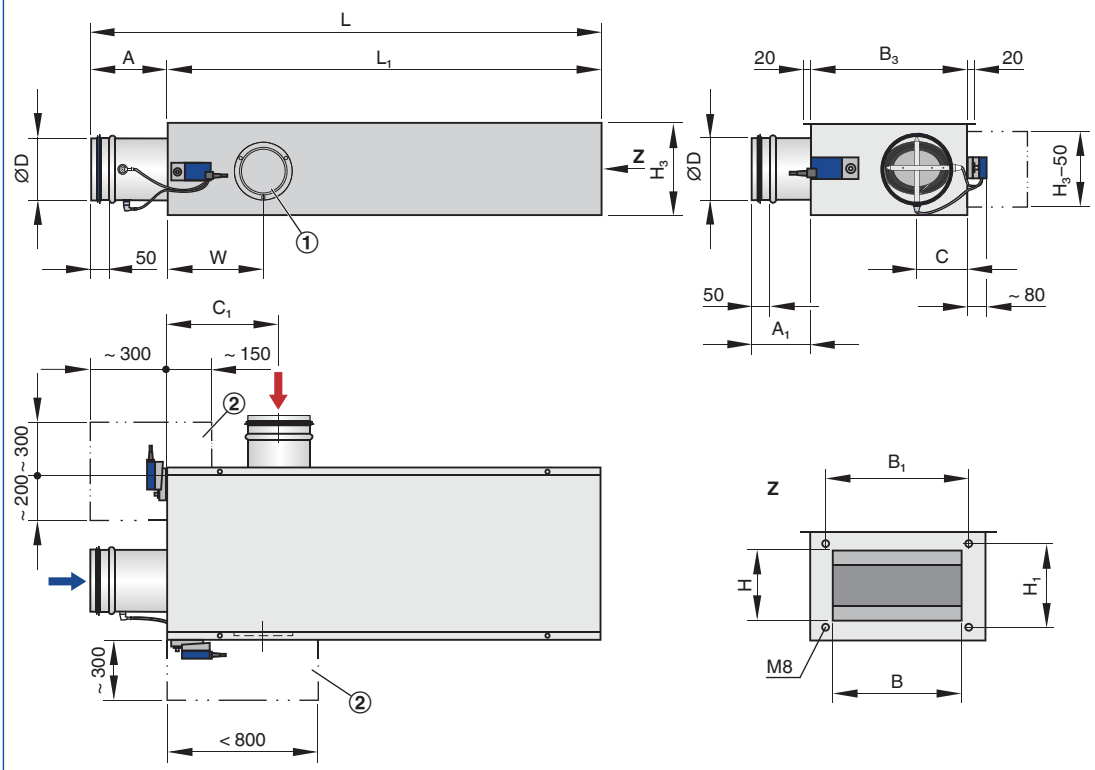


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TVM



① Inspection access
② Keep clear to provide access to attachments

Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	L_1	B	B_1	H	H_1	A	A_1	C	C_1	W	m
	mm														kg
125	124	1355	300	236	1205	198	232	152	186	150	170	125	240	265	28
160	159	1455	410	236	1255	308	342	152	186	200	150	145	295	265	34
200	199	1790	560	281	1590	458	492	210	244	200	125	170	350	265	50
250	249	2015	700	311	1765	598	632	201	235	250	160	200	415	540	65
315	314	2575	900	361	1840	798	832	252	286	250	130	240	535	540	90
400	399	2090	1000	446	2325	898	932	354	388	250	180	290	625	540	130

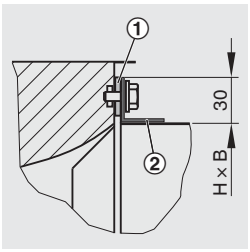
Description



VAV dual duct terminal unit, variant TVM-D

- VAV terminal unit with acoustic cladding for the control of variable supply air volume flows
- Connecting spigots for warm and cold air arranged at an angle of 90°
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular ducts for the room under consideration must have adequate acoustic insulation (provided by others) on the fan end
- Acoustic cladding cannot be retrofitted

Dimensions

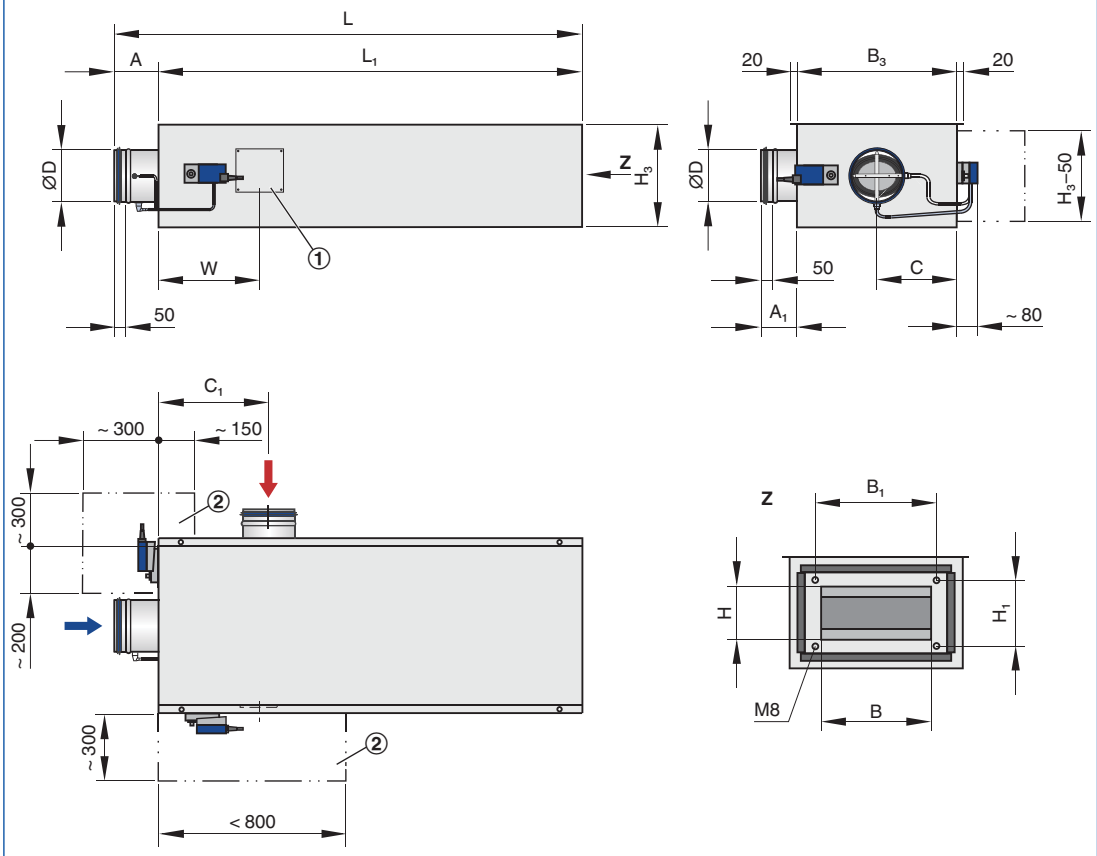


Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TVM-D



① Inspection access
② Keep clear to provide access to attachments

Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	L_1	B	B_1	H	H_1	A	A_1	C	C_1	W	m
	mm														kg
125	124	1355	380	316	1245	198	232	152	186	110	130	165	280	305	42
160	159	1455	490	316	1295	308	342	152	186	160	110	185	335	305	51
200	199	1790	640	361	1630	458	492	210	244	160	85	210	390	305	78
250	249	2015	780	391	1805	598	632	201	235	210	120	240	455	580	105
315	314	2575	980	441	1880	798	832	252	286	210	90	280	575	580	140
400	399	2090	1080	526	2365	898	932	354	388	210	140	330	665	580	200

1

Standard text

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

Rectangular VAV dual duct terminal units for dual duct systems with variable and constant volume flows, available in 6 nominal sizes.
Connecting spigots for warm and cold air arranged at an angle of 90°. Up to nominal size 200 an angle of 60° is also possible, hence ideal for for the refurbishment of older systems with dual duct units.
High control accuracy (even with upstream bend R = 1D).
Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains two averaging differential pressure sensors for volume flow rate measurement, one in the cold air flow and one in the total air flow, two damper blades, and an integral attenuator. Factory-assembled control components complete with wiring and tubing. Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
On the fan end, spigot with groove for lip seal, suitable for connecting ducts to EN 1506 or EN 13180.
Room end suitable for the connection of air duct profiles.
Two baffle plates, one fitted after each damper blade for optimum acoustic and aerodynamic performance.
Casing with acoustic and thermal insulation.
Position of the damper blade indicated externally at shaft extension.
Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).
Casing air leakage to EN 1751, class B.
Complies with VDI 2083, clean room class 3, and US standard 209E, class 100.
Hygiene complies with VDI 6022, DIN 1946, part 4, as well as EN 13779 and VDI 3803.

Special characteristics

- Integral differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary
- Inspection access for cleaning to VDI 6022

Materials and surfaces

- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)
- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 45 to 1680 l/s or 162 to 6048 m^3/h
- Volume flow rate control range: approx. 30 – 100 % of the nominal volume flow rate
- Minimum differential pressure: 120 Pa
- Maximum differential pressure: 1000 Pa

Attachments

Variable volume flow control with electronic Compact controller to switch an external control signal and an actual value signal for integration into the central BMS.
- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC or 2 – 10 V DC
- Possible override controls with external switches using volt-free contacts: CLOSED, OPEN, $\dot{V}_{min}$ and $\dot{V}_{max}$
- Volume flow rate control range: approx. 30 – 100 % of the nominal volume flow rate

Sizing data

- $\dot{V}_{warm,\,min}$ – $\dot{V}_{warm,\,max}$[m^3/h]
- $\dot{V}_{cold,\,min}$ – $\dot{V}_{cold,\,max}$[m^3/h]
- Δp_{st}[Pa]
- L_{PA} air-regenerated noise[dB(A)]
- L_{PA} Case-radiated noise[dB(A)]

Order options

VARYCONTROL

1 Type
TVM Dual duct terminal unit

2 Spigot arrangement
No entry: 90°
☐ **S** 60° (up to nominal size 200)

3 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

4 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

5 Accessories
No entry: none
☐ **D2** Lip seal

6 Attachments (control component)
Example
☐ **BF0** Compact controller
☐ **B27** Universal controller

7 Operating mode
☐ **E** Single
☐ **M** Master
☐ **F** Constant value

8 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

9 Volume flow rates [m³/h or l/s]
$\dot{V}_{warm,\ min}$ – $\dot{V}_{warm,\ max}$ / $\dot{V}_{cold,\ min}$ – $\dot{V}_{cold,\ max}$
for factory setting

1

VAV terminal units
Type TVRK





Easy cleaning of sensor tubes



Variant with flange



Tested to VDI 6022

For contaminated air

Plastic circular VAV terminal units for aggressive extract air in variable air volume systems

- Casing and damper blade made of flame-resistant polypropylene
- Slide-out differential pressure sensor allows for easy cleaning
- Suitable for the control of volume flow rate, room pressure or duct pressure
- Electronic control components for different applications (Universal and LABCONTROL)
- Suitable for airflow velocities up to 13 m/s
- Closed blade air leakage to EN 1751, class 3
- Casing air leakage to EN 1751, class B

Optional equipment and accessories

- With flanges on both ends
- Matching flanges for both ends
- Plastic secondary silencer Type CAK for the reduction of air-regenerated noise

1

Type		Page
TVRK	General information	1.1 – 165
	Order code	1.1 – 168
	Aerodynamic data	1.1 – 172
	Quick sizing	1.1 – 173
	Dimensions and weight – TVRK	1.1 – 174
	Dimensions and weight – TVRK-FL	1.1 – 176
	Installation details	1.1 – 178
	Specification text	1.1 – 180
	Basic information and nomenclature	1.5 – 1

Variants

Product examples

VAV terminal unit, variant TVRK



VAV terminal unit, variant TVRK-FL



Description

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- Circular VARYCONTROL VAV terminal units of Type TVRK, made of plastic, preferably for the extract air flow control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- Suitable for contaminated air
- Shut-off by means of switching (equipment supplied by others)

Variants
- TVRK: VAV terminal unit
- TVRK-FL: VAV terminal unit with flanges on both ends

Nominal sizes
- 125, 160, 200, 250, 315, 400

Attachments
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Accessories
- Matching flanges for both ends, including seals

Useful additions
- Plastic secondary silencer Type CAK for demanding acoustic requirements

Special characteristics
- Integral slide-out differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement; can be removed for cleaning
- Damper blade
- 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 with upstream bend R = 1D)

Construction features
- Circular casing
- Spigot suitable for ducts according to DIN 8077
- Both spigots with same diameter
- Position of the damper blade indicated externally at shaft extension

Materials and surfaces
- Casing and damper blade made of flame-resistant polypropylene (PPs)
- Differential pressure sensor and plain bearings made of polypropylene (PP)
- Damper blade seal made of chloroprene rubber (CR)

Installation and commissioning
- Installation orientation must be as shown on the sticker

Standards and guidelines
- Hygiene conforms to VDI 6022
- Closed blade air leakage to EN 1751, class 3
- 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 B

Maintenance
- Maintenance-free as construction and materials are not subject to wear
- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

Attachments: VARYCONTROL control components for Type TVRK

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo		Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3				Spring return actuator
BR3	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, integral 100 Pa	Actuator
BRB				Spring return actuator
BRG				Fast-running actuator
BS3			Static, integral 600 Pa	Actuator
BSB				Spring return actuator
BSG				Fast-running actuator
BG3		Differential pressure controller TROX/Belimo	Static, integral 100 Pa	Actuator
BGB				Spring return actuator
BH3			Static, integral 600 Pa	Actuator
BHB				Spring return actuator
XE1		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE3				Spring return actuator
XF1			Static, integral 600 Pa	Actuator
XF3				Spring return actuator

Attachments: LABCONTROL control components for Type TVRK

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room supply air Room extract air Room pressure Fume cupboard Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room supply air Room extract air Room pressure Fume cupboard	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

Technical data

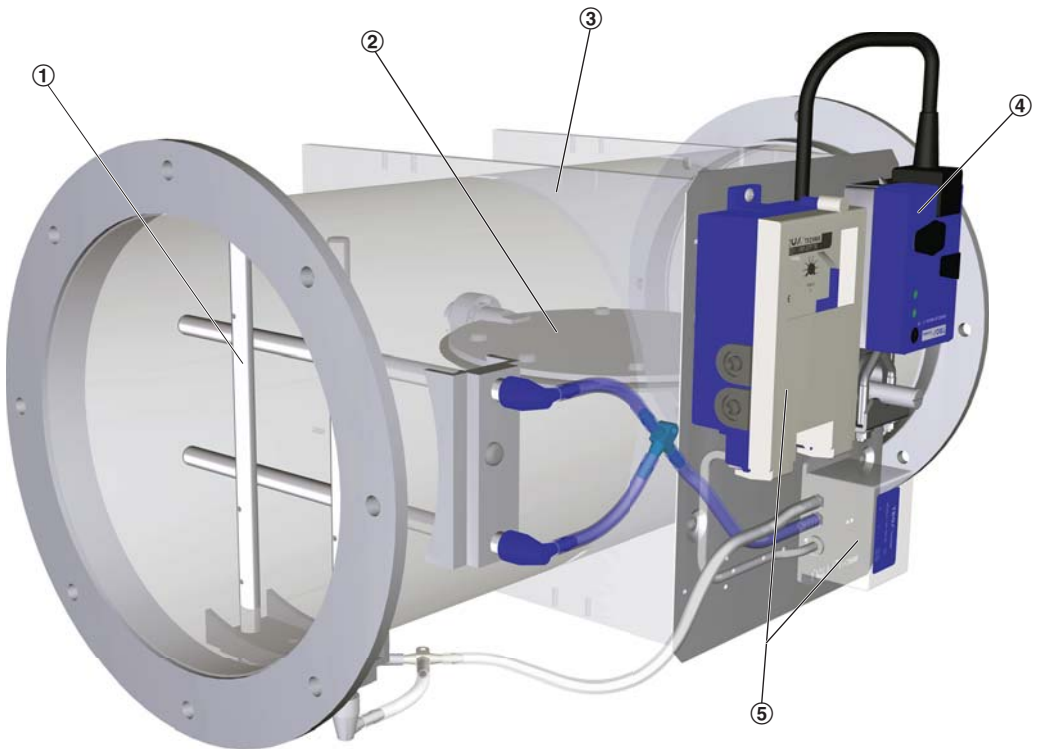
Nominal sizes	125 – 400 mm
Volume flow rate range	25 – 1680 l/s or 90 – 6048 m^3/h
Volume flow rate control range	Approx. 17 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 90 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

1 Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator; the control functions can be achieved with individual components (Universal or LABCONTROL).
For most applications, the setpoint value comes from an external setpoint adjuster. The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values.

Schematic illustration of the TVRK



① Differential pressure sensor
② Damper blade
③ Casing
④ Actuator
⑤ Control components, e.g. a Universal controller

Order code
VARYCONTROL

TVRK

TVRK – FL / 160 / GK / BB3 / E 2 / 200 – 900 / NO
1 2 3 4 5 6 7 8 9

1 Type
TVRK VAV terminal unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (control component)
Example
BB3 Universal controller with static differential pressure transducer

6 Operating mode
E Single
M Master
S Slave
F Constant value
Z Differential pressure control – supply air
A Differential pressure control – extract air

7 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC
2 2 – 10 V DC

8 Volume flow rates [m³/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating modes A, Z)

9 Damper blade position
Only with spring return actuators
NO Power off to OPEN
NC Power off to CLOSE

Order example
VARYCONTROL

TVRK/160/BB3/E2/200–900 m³/h

Nominal size	160 mm
Attachment	Universal controller with static differential pressure transducer
Operating mode	Single
Signal voltage range	2 – 10 V DC
Volume flow rate	200 – 900 m³/h

1 Order code
LABCONTROL
EASYLAB

TVRK with EASYLAB for room control and single operation

TVRK – FL / 160 / GK / ELAB / RE / ULZ / LAB / ...
1 2 3 4 5 6 8 9 10

TVRK – FL / 160 / GK / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 8 10

1 Type
TVRK VAV terminal unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachment (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Room control
RE Extract air control (Room Exhaust)
PC Differential pressure control

Single operation
EC Extract air controller

7 External volume flow rate setting
Only for single operation
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions
Only for room control (equipment function)
Raum management function has been deactivated
LAB Extract air led system (laboratories)
CLR Supply air led system (clean rooms)
Raum management function is active
LAB-RMF Extract air led system (LAB)
CLR-RMF Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa
For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure (only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions
Room control panel (only for room control)
BE-LCD-01 40-character display

Order code
LABCONTROL
EASYLAB

TVRK with EASYLAB for fume cupboard control

TVRK – FL / 160 / GK / ELAB / FH – VS / ULZS / 200 – 900
1 2 3 4 5 6 7 8

1 Type
TVRK VAV terminal unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
With face velocity transducer
FH-VS Face velocity control
With sash distance sensor
FH-DS Linear control strategy
FH-DV Safety-optimised control strategy
With switching steps for on-site switch contacts
FH-2P 2 switching steps
FH-3P 3 switching steps
Without signalling
FH-F Volume flow rate constant value

7 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
S EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

8 Operating values [m³/h or l/s]
Depending on the equipment function
VS: $\dot{V}_{min} – \dot{V}_{max}$
DS: $\dot{V}_{min} – \dot{V}_{max}$
DV: $\dot{V}_{min} – \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
BE-SEG-** OLED display
BE-LCD-01 40-character display

Order example
LABCONTROL
EASYLAB

TVRK/200/ELAB/FH-2P/TZ/600/1200

Nominal size	200 mm
Attachment	EASYLAB controller TCU3 with fast-running actuator
Equipment function	Two switching steps
Expansion modules	EM-TRF for 230 V AC, EM-AUTOZERO Solenoid valve for automatic zero point correction
Operating values	600 – 1200 m³/h

1

Order code

LABCONTROL

TCU-LON-II

TVRK with TCU-LON-II

TVRK – FL / 160 / GK / TMA / RE / 1500 / 750 / 100

1 2 3 4 5 6 7

1 Type
TVRK VAV terminal unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (control component)
TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function
FH Fume cupboard
RE Room extract air
PE Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]
Depending on equipment function
FH: $\dot{V}_{min} - \dot{V}_{max}$
RE: $\dot{V}_{day} / \dot{V}_{night} / \dot{V}_{constant}$
PE: $\dot{V}_{Tag} / \dot{V}_{night} / \dot{V}_{constant} / \Delta p_{setpoint}$
The room control volume flow rates (RS, RE, PS, PE) are related to the total extract air volume flow rate for the room

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
BE-TCU-LON-II Control panel

Order example

LABCONTROL

TCU-LON-II

TVRK/160/TMB/RE/2000/750/100

Nominal size	160 mm
Attachment	TCU-LON-II with fast-running actuator (brushless motor)
Equipment function	Room extract air
Operating values	Total extract air – day-time operation 2000 m³/h, total extract air – night-time operation 750 m³/h, constant volume flow rate 100 m³/h

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m^3/h	Pa				± %
125	**25**	**90**	5	5	5	5	9
	60	**216**	15	20	20	20	7
	105	**378**	45	50	55	60	6
	150	**540**	90	100	110	115	5
160	**40**	**144**	5	5	5	5	9
	80	**288**	10	10	10	15	8
	145	**522**	30	30	35	35	7
	250	**900**	80	90	95	100	5
200	**65**	**234**	5	5	5	5	9
	180	**648**	15	15	20	20	7
	310	**1116**	45	45	50	50	5
	405	**1458**	70	75	80	85	5
250	**95**	**342**	5	5	5	5	9
	270	**972**	10	15	15	15	7
	470	**1692**	30	35	35	40	5
	615	**2214**	50	55	60	65	5
315	**155**	**558**	5	5	5	5	9
	425	**1530**	5	10	10	10	7
	740	**2664**	5	25	25	30	6
	1030	**3708**	5	45	50	50	5
400	**255**	**918**	5	5	5	5	9
	715	**2574**	10	10	10	10	7
	1250	**4500**	25	25	25	30	6
	1680	**6048**	40	45	45	50	5

① TVRK
② TVRK with secondary silencer CAK, insulation thickness 50 mm, length 500 mm
③ TVRK with secondary silencer CAK, insulation thickness 50 mm, length 1000 mm
④ TVRK with secondary silencer CAK, insulation thickness 50 mm, length 1500 mm

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.

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
			L_{PA}	L_{PA1}			L_{PA2}
	l/s	m^3/h	dB(A)				
125	**25**	**90**	34	19	<15	<15	17
	60	**216**	44	30	25	20	27
	105	**378**	51	38	32	28	32
	150	**540**	55	41	35	31	37
160	**40**	**144**	36	23	18	<15	21
	80	**288**	42	31	27	23	28
	145	**522**	49	37	34	30	33
	250	**900**	53	41	38	34	40
200	**65**	**234**	44	33	28	25	33
	180	**648**	44	33	28	25	34
	310	**1116**	43	33	29	26	35
	405	**1458**	41	33	30	29	35
250	**95**	**342**	39	29	23	19	28
	270	**972**	45	35	31	27	35
	470	**1692**	44	35	30	27	37
	615	**2214**	44	35	31	29	39
315	**155**	**558**	39	29	24	21	29
	425	**1530**	46	37	33	29	40
	740	**2664**	50	41	37	33	45
	1030	**3708**	53	44	40	37	50
400	**255**	**918**	37	29	25	22	30
	715	**2574**	44	37	33	30	40
	1250	**4500**	49	42	38	36	46
	1680	**6048**	51	44	40	38	50

① TVRK
② TVRK with secondary silencer CAK, insulation thickness 50 mm, length 500 mm
③ TVRK with secondary silencer CAK, insulation thickness 50 mm, length 1000 mm
④ TVRK with secondary silencer CAK, insulation thickness 50 mm, length 1500 mm

Description

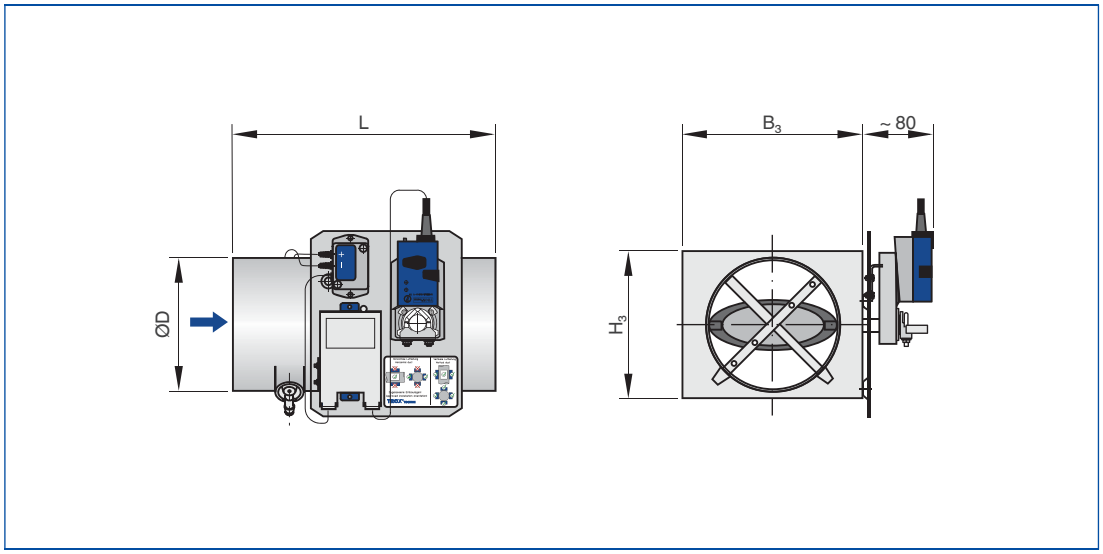
- VAV terminal unit for the control of variable air volume flow rates
- Spigot to make connections to the ducting



VAV terminal unit, variant TVRK, nominal sizes 125 – 200

Dimensions

TVRK, Nominal sizes 125 – 200



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	m
	mm				kg
125	125	394	195	145	4.5
160	160	394	230	180	4.8
200	200	394	270	220	5.2

1

Description

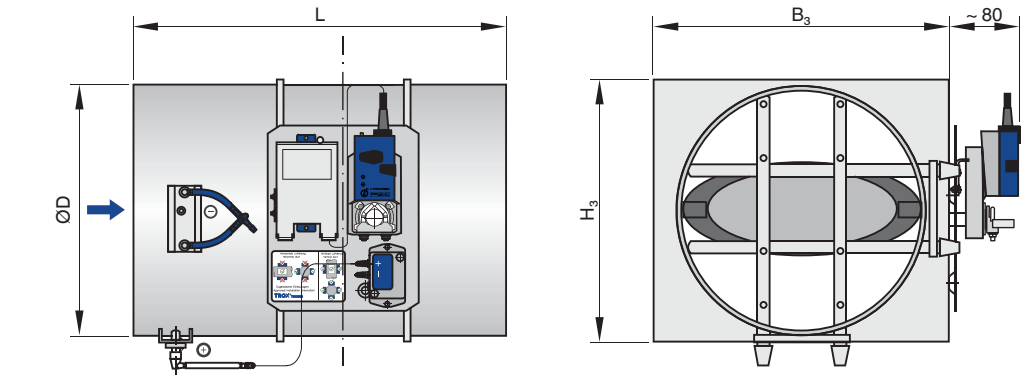
- VAV terminal unit for the control of variable air volume flow rates
- Spigot to make connections to the ducting



VAV terminal unit, variant TVRK

Dimensions

TVRK, Nominal sizes 250 – 400



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	m
	mm				kg
250	250	394	320	270	6.4
315	315	594	385	335	8.5
400	400	594	470	420	10.7

Description

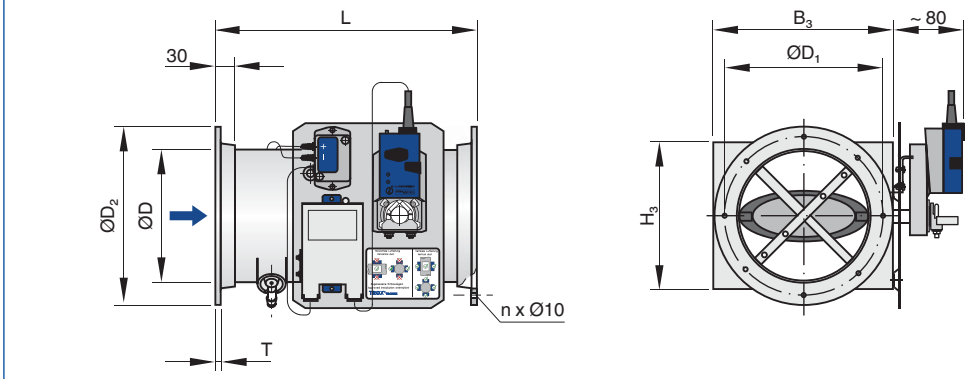
- VAV terminal unit for the control of variable air volume flow rates
- With flanges to make detachable connections to the ductwork



VAV terminal unit, variant TVRK-FL, nominal sizes 125 – 200

Dimensions

TVRK-FL, nominal sizes 125 – 200



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	$ØD_1$	$ØD_2$	n	T	m
	mm							mm	kg
125	125	400	195	145	165	185	8	8	4.7
160	160	400	230	180	200	230	8	8	5.2
200	200	400	270	270	240	270	8	8	5.7

1

Description

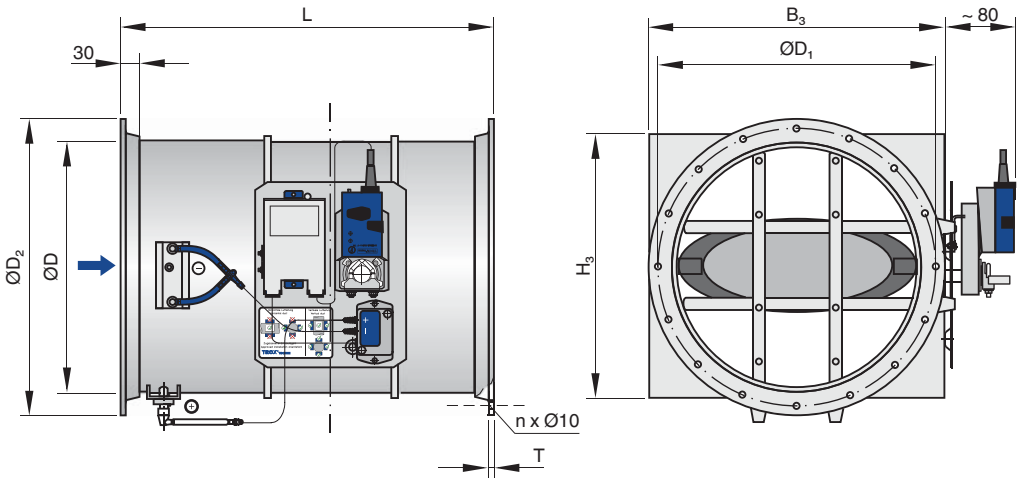


VAV terminal unit, variant TVRK-FL

- VAV terminal unit for the control of variable air volume flow rates
- With flanges to make detachable connections to the ductwork

Dimensions

TVRK-FL, nominal sizes 250 – 400



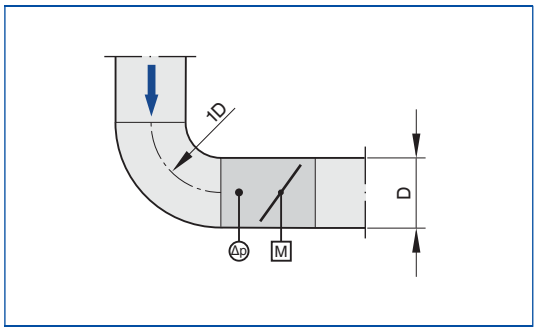
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	$ØD_1$	$ØD_2$	n	T	m
	mm							mm	kg
250	250	400	320	270	290	320	12	8	7.0
315	315	600	385	335	350	395	12	10	9.4
400	400	600	470	420	445	475	16	10	11.9

Upstream conditions

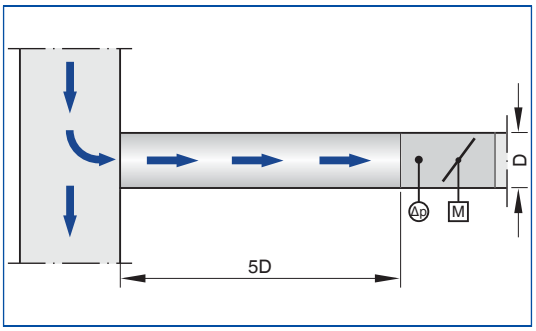
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

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

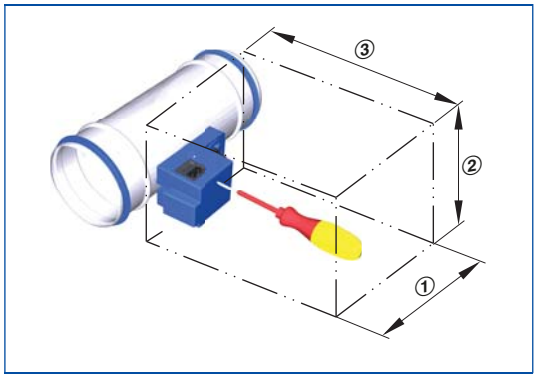


A junction causes strong turbulence.
The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 5D upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

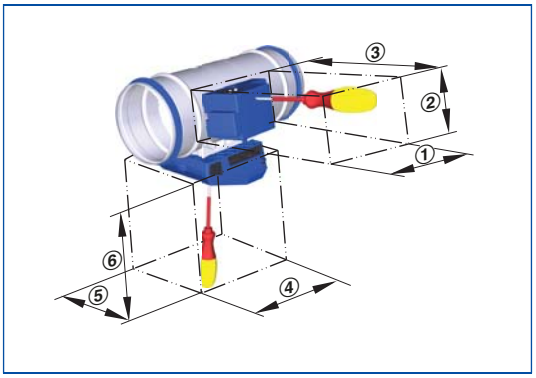
Space requirement for commissioning and maintenance

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



Access to attachments



Space required

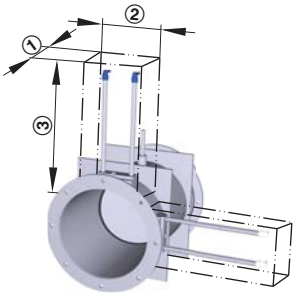
Attachments	①	②	③
	mm		
VARYCONTROL			
Universal controller	300	320	300

Space required

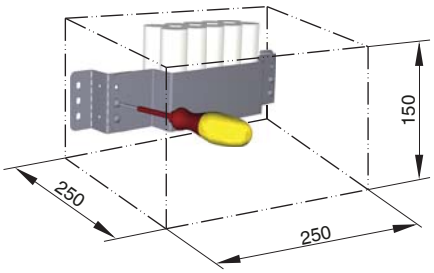
Attachments	①	②	③	④	⑤	⑥
	mm					
LABCONTROL						
EASYLAB	300	250	300	350	350	400
TCU-LON-II	250	200	250	320	250	300

1

Access to sensor tubes for cleaning



Access to attachments



Separate space for fixing and accessing the battery pack
(LABCONTROL EASYLAB accessory)

Space required

Nominal size	①	②	③
	mm		
125 – 200	100	100	D
250 – 400	100	160	D

D: Casing diameter

Standard text

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 made of PPs plastic, for variable and constant air volume systems, suitable for extract air, available in 6 nominal sizes.
High control accuracy
(even with upstream bend R = 1D).
Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement and a damper blade.
Factory-assembled control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Spigot, suitable for ducts according to DIN 8077.
Position of the damper blade indicated externally at shaft extension.
Closed blade air leakage to EN 1751, class 3.
Casing air leakage to EN 1751, class B.
Hygiene conforms to VDI 6022

Special characteristics
- Integral slide-out differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool may be necessary

Materials and surfaces
- Casing and damper blade made of flame-resistant polypropylene (PPs)
- Differential pressure sensor and plain bearings made of polypropylene (PP)
- Damper blade seal made of chloroprene rubber (CR)

Technical data
- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 25 to 1680 l/s or 90 to 6048 m^3/h
- Volume flow rate control range: approx. 17 – 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 90 Pa
- Maximum differential pressure: 1000 Pa

Attachments
Variable volume flow control with electronic Universal controller to switch an external control signal and an actual value signal for integration into the central BMS.
- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC or 2 – 10 V DC
- Possible override controls with external switches using volt-free contacts: CLOSED, OPEN, $\dot{V}_{min}$ and $\dot{V}_{max}$
- Volume flow rate control range: approx. 17 – 100 % of the nominal volume flow rate

Sizing data
- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

VARYCONTROL

1 Type
TVRK VAV terminal unit, plastic

2 Flange
No entry: none
☐ **FL** Flanges on both ends

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **GK** Matching flanges for both ends

5 Attachments (control component)
Example
☐ **BB3** Universal controller with static differential pressure transducer

6 Operating mode
☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value
☐ **Z** Differential pressure control – supply air
☐ **A** Differential pressure control – extract air

7 Signal voltage range
For the actual and setpoint value signals
☐ **0** 0 – 10 V DC
☐ **2** 2 – 10 V DC

8 Volume flow rates [m^3/h or l/s], differential pressure [Pa]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting
Δp_{min} for factory setting
(operating modes A, Z)

9 Damper blade position
Only with spring return actuators
☐ **NO** Power off to OPEN
☐ **NC** Power off to CLOSE

1 Order options

LABCONTROL

EASYLAB

1 Type

TVRK VAV terminal unit, plastic

2 Flange

No entry: none

☐ **FL** Flanges on both ends

3 Nominal size [mm]

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories

No entry: none

☐ **GK** Matching flanges for both ends

5 Attachment (control component)

ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function

Room control

☐ **RE** Extract air control (Room Exhaust)
☐ **PC** Differential pressure control

Single operation

☐ **EC** Extract air controller

7 External volume flow rate setting

Only for single operation

☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC
☐ **2P** On-site switch contacts for 2 switching steps
☐ **3P** On-site switch contacts for 3 switching steps
☐ **F** Volume flow rate constant value, without signalling

8 Module expansions

Option 1: Power supply
No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none

☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Additional functions

Only for room control (equipment function)
Raum management function has been deactivated

☐ **LAB** Extract air led system (laboratories)
☐ **CLR** Supply air led system (clean rooms)
Raum management function is active
☐ **LAB-RMF** Extract air led system (LAB)
☐ **CLR-RMF** Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa

For equipment function 'room control' with additional function RMF
Total room extract air/supply air
$\dot{V}_1$: Standard mode
$\dot{V}_2$: Reduced operation
$\dot{V}_3$: Increased operation
$\dot{V}_4$: Constant room supply air
$\dot{V}_5$: Constant room extract air
$\dot{V}_6$: Supply air/extract air difference
$\Delta p_{setpoint}$: Setpoint pressure
(only with differential pressure control)
For equipment function 'single operation'
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Useful additions

Room control panel
(only for room control)

☐ **BE-LCD-01** 40-character display

Order options

LABCONTROL

EASYLAB

1 Type

TVRK VAV terminal unit, plastic

2 Flange

No entry: none

☐ **FL** Flanges on both ends

3 Nominal size [mm]

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories

No entry: none

☐ **GK** Matching flanges for both ends

5 Attachments (control component)

ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function

With face velocity transducer

☐ **FH-VS** Face velocity control

With sash distance sensor

☐ **FH-DS** Linear control strategy
☐ **FH-DV** Safety-optimised control strategy

With switching steps for on-site switch contacts

☐ **FH-2P** 2 switching steps
☐ **FH-3P** 3 switching steps

Without signalling

☐ **FH-F** Volume flow rate constant value

7 Expansion modules

Option 1: Supply voltage
No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none

☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none

☐ **S** EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

8 Operating values [m³/h or l/s]

Depending on the equipment function
VS: $\dot{V}_{min} - \dot{V}_{max}$
DS: $\dot{V}_{min} - \dot{V}_{max}$
DV: $\dot{V}_{min} - \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions

Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175

☐ **BE-SEG-**** OLED display
☐ **BE-LCD-01** 40-character display

1 Order options

LABCONTROL

TCU-LON-II

1 Type

TVRK VAV terminal unit, plastic

2 Flange

No entry: none

☐ **FL** Flanges on both ends

3 Nominal size [mm]

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories

No entry: none

☐ **GK** Matching flanges for both ends

5 Attachments (control component)

☐ **TMA** TCU-LON-II with fast-running actuator
☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function

☐ **FH** Fume cupboard
☐ **RE** Room extract air
☐ **PE** Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]

Depending on equipment function
FH: $\dot{V}_{min} - \dot{V}_{max}$
RE: $\dot{V}_{day} / \dot{V}_{night} / \dot{V}_{constant}$
PE: $\dot{V}_{Tag} / \dot{V}_{night} / \dot{V}_{constant} / \Delta p_{setpoint}$
The room control volume flow rates (RS, RE, PS, PE) are related to the total extract air volume flow rate for the room

Useful additions

Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175

☐ **BE-TCU-LON-II** Control panel

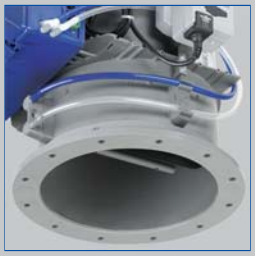
VAV terminal units
Type TVLK



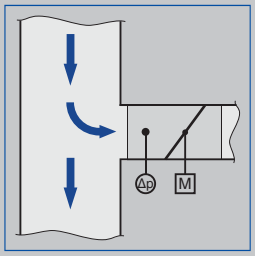
Easy cleaning of sensor tubes



Variant with nozzle
and connecting circular spigot



Variant with bluff body
and flange



For all upstream conditions



Tested to VDI 6022



Optimised for use in laboratories and on fume cupboards

Plastic circular VAV terminal units for aggressive extract air in laboratories and production facilities

- Casing and damper blade made of flame-resistant polypropylene
- Compact construction, only 400 mm long
- High control accuracy even in case of unfavourable upstream conditions
- Combination with fast-running actuators (air management systems)
- Volume flow rate measurement with bluff body or nozzle
- Slide-out sensor tubes allow for easy cleaning
- Closed blade air leakage to EN 1751, class 4
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- With flanges on both ends
- Plastic secondary silencer Type CAK for the reduction of air-regenerated noise

1

Type		Page
TVLK	General information	1.1 – 185
	Order code	1.1 – 189
	Aerodynamic data	1.1 – 193
	Quick sizing	1.1 – 195
	Dimensions and weight – TVLK	1.1 – 196
	Dimensions and weight – TVLK-FL	1.1 – 197
	Installation details	1.1 – 198
	Specification text	1.1 – 199
	Basic information and nomenclature	1.5 – 1

Variants

Product examples

VAV terminal unit, variant TVLK, with bluff body and connecting circular spigot



VAV terminal unit, variant TVLK, with bluff body and flange



VAV terminal unit, variant TVLK, with nozzle and connecting circular spigot



VAV terminal unit, variant TVLK, with nozzle and flange



1

Description

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

For detailed information on control components see Chapter K5 – 1.3.

Application
- Circular LABCONTROL VAV terminal units of Type TVLK, made of plastic, to control the volume flow rate of fume cupboards and fume hoods
- Suitable for contaminated air
- Closed-loop volume flow control using an external power supply
- Shut-off by means of switching (equipment supplied by others)

Variants
- TVLK: VAV terminal unit
- TVLK-FL: VAV terminal unit with flanges on both ends

Nominal sizes
- Bluff body: 250 – 100, 250 – 160
- Nozzle: 250 – D08, 250 – D10, 250 – D16
- Bluff body available in two sizes and nozzle available in three sizes for different volume flow rate ranges

Attachments
- LABCONTROL: Control components (attachments) for air management systems
- Universal controller: Controller, differential pressure transducer and actuators for special applications

Accessories
- Matching flanges for both ends, including seals

Useful additions
- Plastic secondary silencer Type CAK for demanding acoustic requirements

Special characteristics
- High control accuracy even in case of unfavourable upstream conditions
- Integral slide-out differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- No metal parts come into contact with the airflow
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool or configuration software may be necessary

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components (attachments)
- Averaging differential pressure sensor for volume flow rate measurement; can be removed for cleaning
- Damper blade
- Factory assembled control components (attachments) complete with wiring and tubing
- Aerodynamic functional testing on a special test rig prior to shipping of each unit
- Unit carries test label with relevant data

Construction features
- Circular casing
- Short casing: 392 mm without flange, 400 mm with flange
- Spigot suitable for ducts according to DIN 8077
- Both spigots with same diameter (250 mm)
- Position of the damper blade indicated externally at shaft extension

Materials and surfaces
- Casing and damper blade made of flame-resistant polypropylene (PP), flammability to UL 94, V-0
- Differential pressure sensor (with bluff body, or nozzle) and plain bearing made of polypropylene (PP)
- Damper blade seal made of thermoplastic elastomers (TPE)

Installation and commissioning
- Installation orientation must be as shown on the sticker

Standards and guidelines
- Hygiene conforms to VDI 6022
- Closed blade air leakage to EN 1751, class 4
- Meets the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class C

Maintenance
- Maintenance-free as construction and materials are not subject to wear
- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

1

Attachments: VARYCONTROL control components for Type TVLK

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static, integral	Actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo		Actuator

Attachments: LABCONTROL control components for Type TVLK

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Fume cupboard Room supply air Room extract air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Fume cupboard Room supply air Room extract air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

Technical data

Nominal sizes	250 mm
Volume flow rate range	30 – 515 l/s or 108 – 1854 m^3/h
Volume flow rate control range	Approx. 15 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 130 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Function

Functional description

For measuring the volume flow rate the VAV terminal unit is fitted either with a bluff body and a differential pressure sensor or with a nozzle. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator.

- Fume cupboard control: The volume flow rate setpoint depends on the control strategy for the fume cupboard and is based on the face velocity, the sash position, or a constant value.
- Volume flow control: The volume flow rate setpoint comes from an external unit.

The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values.

Schematic illustration of the TVLK



① Nozzle (optional)
② EASYLAB control component
③ Casing
④ Actuator
⑤ Bluff body and sensor tubes

1

Order code
VARYCONTROL

TVLK with Universal controller

TVLK – FL / 250 – 100 / GK / BB3 / E0 / 200 – 900
1 2 3 4 5 6 7 8

1 Type
TVLK VAV terminal unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size
250 – 100 Bluff body 100
250 – 160 Bluff body 160
250 – D08 Nozzle D08
250 – D10 Nozzle D10
250 – D16 Nozzle D16

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (control component)
Example
BB3 Universal controller with static differential pressure transducer
BPG Universal controller with MP bus interface and static differential pressure transducer, fast-running actuator

6 Operating mode
E Single
M Master
S Slave
F Constant value

7 Signal voltage range
For the actual and setpoint value signals
0 0 – 10 V DC (only BP3 and BPG)
2 2 – 10 V DC

8 Volume flow rates [m³/h or l/s]
$\dot{V}_{min}$ – $\dot{V}_{max}$ for factory setting

Order example
VARYCONTROL

TVLK/250-D16/BPG/E2/150-650

Nominal size	250 with nozzle D16
Attachment	Universal controller with MP bus interface and static differential pressure transducer, fast-running actuator
Operating mode	Single
Operating values	150 – 650 m³/h

Order code
LABCONTROL
EASYLAB

TVLK with EASYLAB for fume cupboard control

TVLK – FL / 250 – 100 / GK / ELAB / FH – VS / ULZS / 200 – 900
1 2 3 4 5 6 7 8

1 Type
TVLK VAV terminal unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size
250 – 100 Bluff body 100
250 – 160 Bluff body 160
250 – D08 Nozzle D08
250 – D10 Nozzle D10
250 – D16 Nozzle D16

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
With face velocity transducer
FH-VS Face velocity control
With sash distance sensor
FH-DS Linear control strategy
FH-DV Safety-optimised control strategy
With switching steps for on-site switch contacts
FH-2P 2 switching steps
FH-3P 3 switching steps
Without signalling
FH-F Volume flow rate constant value

7 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
S EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

8 Operating values [m³/h or l/s]
Depending on the equipment function
VS: $\dot{V}_{min} – \dot{V}_{max}$
DS: $\dot{V}_{min} – \dot{V}_{max}$
DV: $\dot{V}_{min} – \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
BE-SEG-** OLED display
BE-LCD-01 40-character display

Order example
LABCONTROL
EASYLAB

TVLK/250–100/ELAB/FH–VS/200–900 m³/h

Nominal size	250 with bluff body 100
Attachment	EASYLAB controller with fast-running actuator
Equipment function	Fume cupboard control with face velocity transducer
Volume flow rates	200 – 900 m³/h

1

Order code
LABCONTROL
EASYLAB

TVLK with EASYLAB for single controllers

TVLK – FL / 250 – 100 / GK / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 8 9

1 Type
TVLK VAV terminal unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size
250 – 100 Bluff body 100
250 – 160 Bluff body 160
250 – D08 Nozzle D08
250 – D10 Nozzle D10
250 – D16 Nozzle D16

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Control with single controller
EC Extract air controller

7 External volume flow rate setting
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

8 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Operating values [m³/h or l/s, Pa]
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Order example
LABCONTROL
EASYLAB

TVLK/250-D08/ELAB/E2/400-1600

Nominal size	250 with nozzle D08
Attachment	EASYLAB controller TCU3 with fast-running actuator
External volume flow rate setting	Voltage signal 2 – 10 V DC
Operating values	400 – 1600 m³/h

Order code

LABCONTROL

TCU-LON-II

TVLK with TCU-LON-II

TVLK – FL / 250 – 100 / GK / TMB / FH / 200 – 900

1 2 3 4 5 6 7

1 Type

TVLK VAV terminal unit made of plastic

2 Flange

No entry: none

FL Flanges on both ends

3 Nominal size [mm]

250 – 100 Bluff body 100
250 – 160 Bluff body 160
250 – D08 Nozzle D08
250 – D10 Nozzle D10
250 – D16 Nozzle D16

4 Accessories

No entry: none

GK Matching flanges for both ends

5 Attachments (control component)

TMA TCU-LON-II with fast-running actuator
TMB TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function

FH Fume cupboard
Face velocity control
with face velocity transducer

RE Extract air controller (Room Extract)

7 Operating values [m³/h or l/s]

FH: $\dot{V}_{min} – \dot{V}_{max}$
RE: $\dot{V}_{day} / \dot{V}_{night} / \dot{V}_{constant}$

Useful additions

Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175

BE-TCU-LON-II Control panel

Order example

LABCONTROL

TCU-LON-II

TVLK-FL/250–D16/GK/TMA/FH/250–700 m³/h

Flange	Both ends
Nominal size	250 with Venturi nozzle D16
Accessories	Matching flanges
Attachment	TCU-LON-II with fast-running actuator
Equipment function	Fume cupboard
Volume flow rate	250 – 700 m³/h

1

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.

Volume flow ranges and minimum pressure differences for the TVLK with EASYLAB or TCU-LON II

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m³/h	Pa				± %
250-100	55	198	5	5	5	5	10
	140	504	15	15	15	15	7
	220	792	35	35	35	35	6
	360	1296	85	85	85	90	5
250-160	30	108	5	5	5	5	10
	80	288	25	25	25	25	7
	120	432	50	50	50	50	6
	195	702	130	130	130	130	5
250-D08	95	342	5	5	5	5	10
	210	756	10	10	10	10	7
	315	1134	20	20	20	20	6
	515	1854	45	50	55	55	5
250-D10	55	198	5	5	5	5	10
	140	504	10	10	10	10	7
	220	792	20	20	20	20	6
	360	1296	50	50	55	55	5
250-D16	30	108	5	5	5	5	10
	80	288	15	15	15	15	7
	120	432	30	30	30	30	6
	195	702	70	70	75	75	5

① TVLK
② TVLK with circular silencer CAK, insulation thickness 50 mm, length 500 mm
③ TVLK with circular silencer CAK, insulation thickness 50 mm, length 1000 mm
④ TVLK with circular silencer CAK, insulation thickness 50 mm, length 1500 mm

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.

Volume flow rate ranges and minimum differential pressure values for the TVLK with VARYCONTROL Universal controller

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m^3/h	Pa				± %
250-100	**65**	**234**	5	5	5	5	10
	180	**648**	25	25	25	25	7
	290	**1044**	55	55	55	60	6
	360	**1296**	85	85	85	90	5
250-160	**35**	**126**	5	5	5	5	10
	100	**360**	35	35	35	35	7
	160	**576**	90	90	90	90	6
	195	**702**	130	130	130	130	5
250-D08	**95**	**342**	5	5	5	5	10
	210	**756**	10	10	10	10	7
	315	**1134**	20	20	20	20	6
	515	**1854**	45	50	55	55	5
250-D10	**65**	**234**	5	5	5	5	10
	180	**648**	15	15	15	15	7
	290	**1044**	35	35	35	35	6
	360	**1296**	50	50	55	55	5
250-D16	**35**	**126**	5	5	5	5	10
	100	**360**	20	20	20	20	7
	160	**576**	50	50	50	50	6
	195	**702**	70	70	75	75	5

① TVLK
② TVLK with circular silencer CAK, insulation thickness 50 mm, length 500 mm
③ TVLK with circular silencer CAK, insulation thickness 50 mm, length 1000 mm
④ TVLK with circular silencer CAK, insulation thickness 50 mm, length 1500 mm

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.

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa TVLK with EASYLAB or TCU-LON-II

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
			L_{PA}	L_{PA1}			L_{PA2}
	l/s	m³/h	dB(A)				
250-100	55	198	40	33	29	26	26
	140	504	46	38	34	31	33
	220	792	47	39	35	31	37
	360	1296	48	39	35	32	42
250-160	30	108	37	32	28	25	22
	80	288	41	35	31	28	29
	120	432	43	37	33	30	32
	195	702	49	42	38	35	40
250-D08	95	342	36	26	23	20	23
	210	756	40	31	27	24	29
	315	1134	41	32	29	26	33
	515	1854	44	34	31	28	38
250-D10	55	198	36	28	24	21	24
	140	504	42	34	30	27	31
	220	792	43	35	31	28	35
	360	1296	45	37	33	29	38
250-D16	30	108	33	28	24	22	21
	80	288	39	33	30	28	28
	120	432	42	36	33	30	31
	195	702	47	42	38	36	38

① TVLK
② TVLK with circular silencer CAK, insulation thickness 50 mm, length 500 mm
③ TVLK with circular silencer CAK, insulation thickness 50 mm, length 1000 mm
④ TVLK with circular silencer CAK, insulation thickness 50 mm, length 1500 mm

Quick sizing: Sound pressure level at differential pressure 150 Pa, TVLK with VARYCONTROL Universal controller

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
			L_{PA}	L_{PA1}			L_{PA2}
	l/s	m³/h	dB(A)				
250-100	65	234	41	34	30	27	27
	180	648	46	38	34	31	35
	290	1044	47	39	35	31	40
	360	1296	48	39	35	32	42
250-160	35	126	38	33	29	26	23
	100	360	42	36	32	29	30
	160	576	45	37	34	31	34
	195	702	49	42	38	35	40
250-D08	95	342	36	26	23	20	23
	210	756	40	31	27	24	29
	315	1134	41	32	29	26	33
	515	1854	44	34	31	28	38
250-D10	65	234	37	30	26	22	25
	180	648	43	35	31	28	33
	290	1044	44	36	32	29	36
	360	1296	45	37	33	29	38
250-D16	35	126	34	29	25	23	22
	100	360	41	35	32	29	30
	160	576	43	37	34	32	32
	195	702	47	42	38	36	38

① TVLK
② TVLK with circular silencer CAK, insulation thickness 50 mm, length 500 mm
③ TVLK with circular silencer CAK, insulation thickness 50 mm, length 1000 mm
④ TVLK with circular silencer CAK, insulation thickness 50 mm, length 1500 mm

1

Description

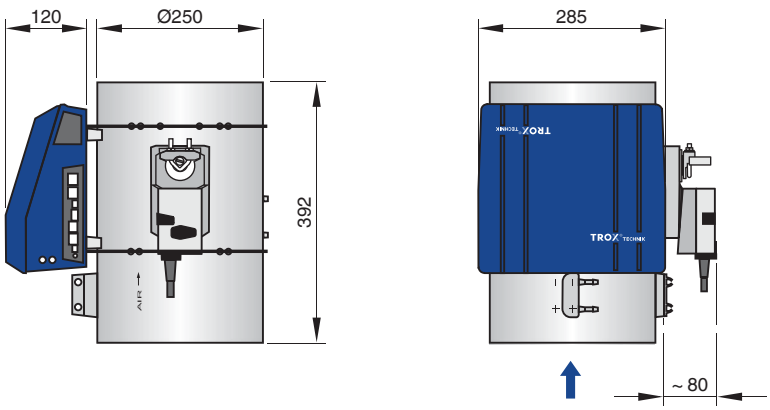
- VAV terminal unit for the control of variable air volume flow rates
- Spigot to make connections to the ducting



VAV terminal unit, variant TVLK, with connecting circular spigot

Dimensions

TVLK



Weight

Nominal size	m
	kg
250	5.1

Description

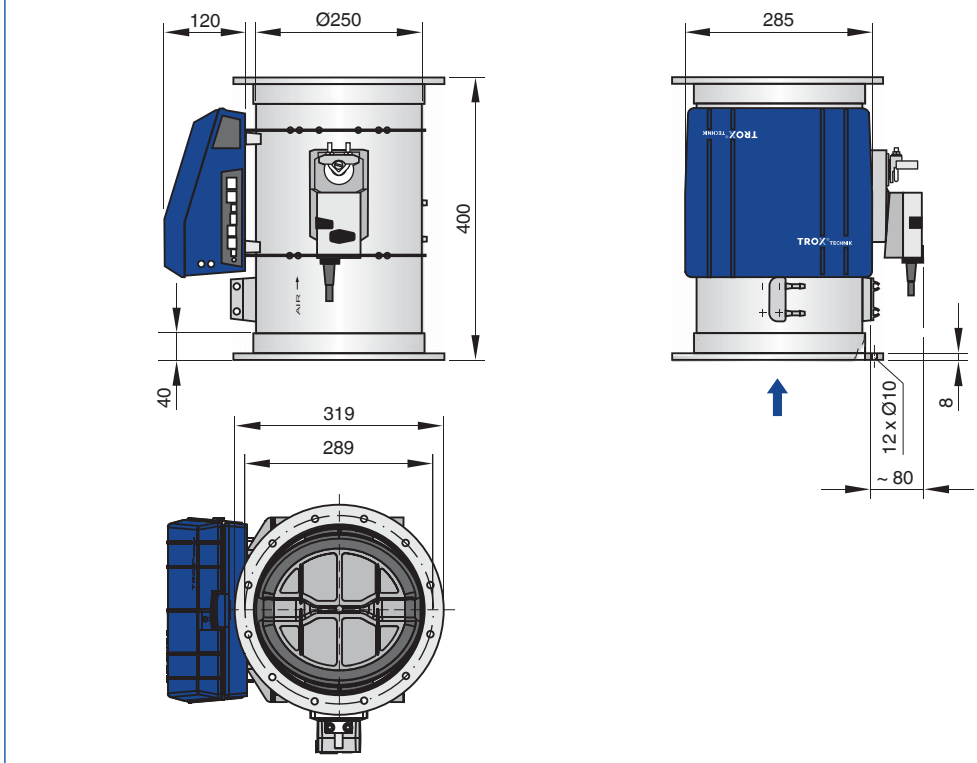
- VAV terminal unit for the control of variable air volume flow rates
- With flanges to make detachable connections to the ductwork



VAV terminal unit, variant TVLK, with flange

Dimensions

TVLK-FL



Weight

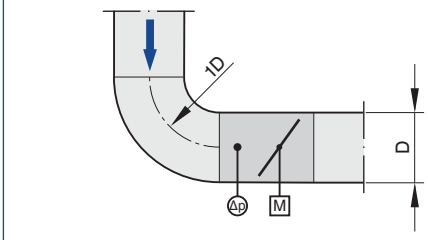
Nominal size	m
	kg
250	5.7

1

Upstream conditions

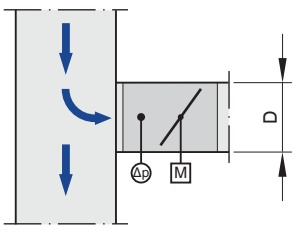
The volume flow rate accuracy ΔV̇ applies to all upstream conditions.

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

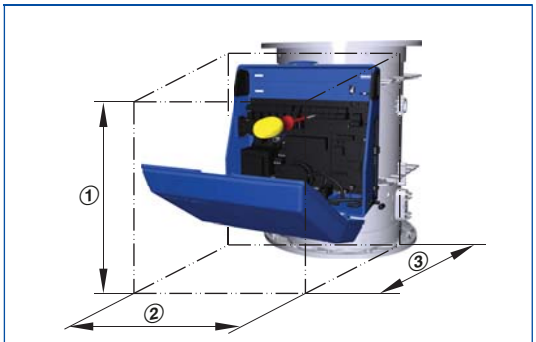


The stated volume flow rate accuracy ΔV̇ will be achieved even when the VAV terminal unit is installed in a branch just off the main duct. Even the installation on the dome of a fume cupboard will have no adverse effect.

Space requirement 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.

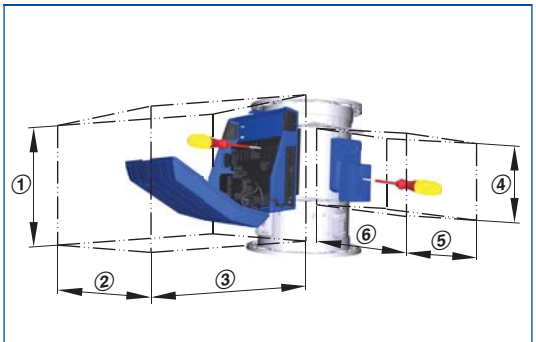
Access to attachments



Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Universal controller	300	320	300

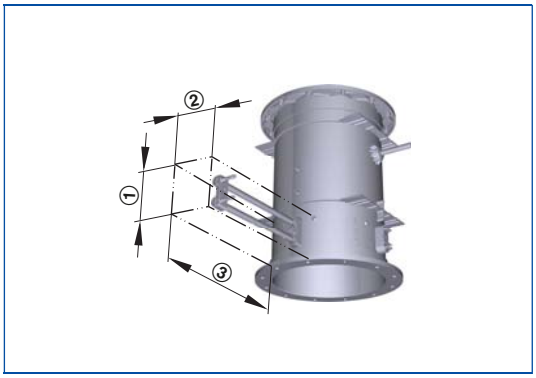
Access to attachments



Space required

Attachments	①	②	③	④	⑤	⑥
	mm					
LABCONTROL						
EASYLAB	350	350	400	300	250	300
TCU-LON-II	320	250	300	250	200	250

Access to sensor tubes for cleaning

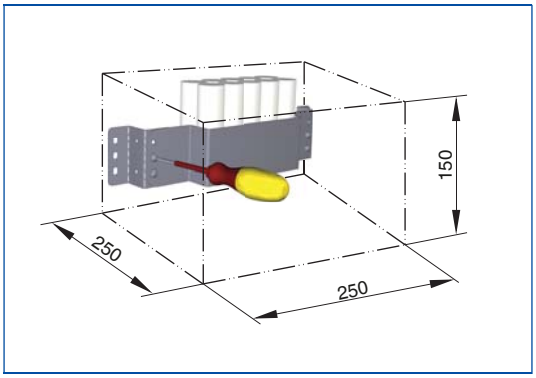


Space required

Nominal size	①	②	③
	mm		
250-1 Bluff body**	100	160	D
250-D Nozzle**	100	160	100

D: Casing diameter

Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

1

Standard text

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 made of flame-resistant plastic, for variable air volume systems and fume cupboards. Suitable for the control of extract air containing aggressive media since all components coming into contact with the airflow are made of plastic (no interior metal parts). Ready-to-commission unit which consists of the mechanical parts and the electronic control components (attachments). Each unit contains an averaging differential pressure sensor with bluff body or a nozzle for volume flow rate measurement, and a damper blade. Factory assembled control components (attachments) complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Spigot, suitable for ducts according to DIN 8077.
Position of the damper blade indicated externally at shaft extension.
Closed blade air leakage to EN 1751, class 4.
Casing air leakage to EN 1751, class C.

Special characteristics

- High control accuracy even in case of unfavourable upstream conditions
- Integral slide-out differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- No metal parts come into contact with the airflow
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can be measured and subsequently adjusted on site; additional adjustment tool or configuration software may be necessary

Materials and surfaces

- Casing and damper blade made of flame-resistant polypropylene (PP), flammability to UL 94, V-0
- Differential pressure sensor (with bluff body, or nozzle) and plain bearing made of polypropylene (PP)
- Damper blade seal made of thermoplastic elastomers (TPE)

Technical data

- Nominal sizes: 250 mm
- Volume flow rate range: 30 to 515 l/s or 108 to 1854 m^3/h
- Volume flow rate control range: approx. 15 – 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 130 Pa
- Maximum differential pressure: 10 – 50 °C

Attachments

Variable volume flow control with electronic EASYLAB controller for fume cupboards.

- Supply voltage 24 V AC
- Fast and stable control
- Static differential pressure measurement
- Fast-running actuator
- Easy commissioning due to plug and play communication system
- Controller is a modular system and can be expanded
- Volume flow rate monitoring

Sizing data

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

VARYCONTROL

1 Type

TVLK VAV terminal unit, plastic

2 Flange

No entry: none
☐ **FL** Flanges on both ends

3 Nominal size

☐ **250 – 100** Bluff body 100
☐ **250 – 160** Bluff body 160
☐ **250 – D08** Nozzle D08
☐ **250 – D10** Nozzle D10
☐ **250 – D16** Nozzle D16

4 Accessories

No entry: none
☐ **GK** Matching flanges for both ends

5 Attachments (control component)

Example
☐ **BB3** Universal controller with static differential pressure transducer
☐ **BPG** Universal controller with MP bus interface and static differential pressure transducer, fast-running actuator

6 Operating mode

☐ **E** Single
☐ **M** Master
☐ **S** Slave
☐ **F** Constant value

7 Signal voltage range

For the actual and setpoint value signals
☐ **0** 0 – 10 V DC (only BP3 and BPG)
☐ **2** 2 – 10 V DC

8 Volume flow rates [m^3/h or l/s]

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

Order options

LABCONTROL

EASYLAB

1 Type
TVLK VAV terminal unit, plastic

2 Flange
No entry: none
☐ **FL** Flanges on both ends

3 Nominal size
☐ **250 – 100** Bluff body 100
☐ **250 – 160** Bluff body 160
☐ **250 – D08** Nozzle D08
☐ **250 – D10** Nozzle D10
☐ **250 – D16** Nozzle D16

4 Accessories
No entry: none
☐ **GK** Matching flanges for both ends

5 Attachments (control component)
ELAB EASYLAB controller TCU3
with fast-running actuator

6 Equipment function
With face velocity transducer
☐ **FH-VS** Face velocity control
With sash distance sensor
☐ **FH-DS** Linear control strategy
☐ **FH-DV** Safety-optimised control strategy
With switching steps
for on-site switch contacts
☐ **FH-2P** 2 switching steps
☐ **FH-3P** 3 switching steps
Without signalling
☐ **FH-F** Volume flow rate constant value

7 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
☐ **S** EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

8 Operating values [m^3/h or l/s]
Depending on the equipment function
VS: $\dot{V}_{min} – \dot{V}_{max}$
DS: $\dot{V}_{min} – \dot{V}_{max}$
DV: $\dot{V}_{min} – \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
☐ **BE-SEG-**** OLED display
☐ **BE-LCD-01** 40-character display

1

Order options
LABCONTROL
EASYLAB

1 Type
TVLK VAV terminal unit, plastic

2 Flange
No entry: none
☐ **FL** Flanges on both ends

3 Nominal size
☐ **250 – 100** Bluff body 100
☐ **250 – 160** Bluff body 160
☐ **250 – D08** Nozzle D08
☐ **250 – D10** Nozzle D10
☐ **250 – D16** Nozzle D16

4 Accessories
No entry: none
☐ **GK** Matching flanges for both ends

5 Attachments (control component)
ELAB EASYLAB controller TCU3 with fast-running actuator

6 Equipment function
Control with single controller
EC Extract air controller

7 External volume flow rate setting
☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC
☐ **2P** On-site switch contacts for 2 switching steps
☐ **3P** On-site switch contacts for 3 switching steps
☐ **F** Volume flow rate constant value, without signalling

8 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

9 Operating values [m³/h or l/s, Pa]
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Order options
LABCONTROL
TCU-LON-II

1 Type
TVLK VAV terminal unit made of plastic

2 Flange
No entry: none
☐ **FL** Flanges on both ends

3 Nominal size [mm]
☐ **250 – 100** Bluff body 100
☐ **250 – 160** Bluff body 160
☐ **250 – D08** Nozzle D08
☐ **250 – D10** Nozzle D10
☐ **250 – D16** Nozzle D16

4 Accessories
No entry: none
☐ **GK** Matching flanges for both ends

5 Attachments (control component)
☐ **TMA** TCU-LON-II with fast-running actuator
☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function
☐ **FH** Fume cupboard
Face velocity control with face velocity transducer
☐ **RE** Extract air controller (Room Extract)

7 Operating values [m³/h or l/s]
FH: $\dot{V}_{min}$ – $\dot{V}_{max}$
RE: $\dot{V}_{day}$ / $\dot{V}_{night}$ / $\dot{V}_{constant}$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
☐ **BE-TCU-LON-II** Control panel

VAV terminal units
Type TVR-Ex



For the control of variable air volume flows in potentially explosive atmospheres (ATEX)

Circular VAV terminal units for variable air volume systems, approved and certified for potentially explosive atmospheres (ATEX)

- ATEX-compliant construction and parts
- Approved for all gases, mists and vapours in zones 1 and 2, with electronic control additionally for dusts in zones 21 and 22
- Suitable for the control of supply or extract air as well as for differential pressure control
- Electronic or pneumatic control components
- Closed blade air leakage to EN 1751, up to class 4
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Spring return actuator
- Auxiliary switch with adjustable switching points for capturing the end positions



ATEX-compliant parts and units



ATEX-Zertifizierung

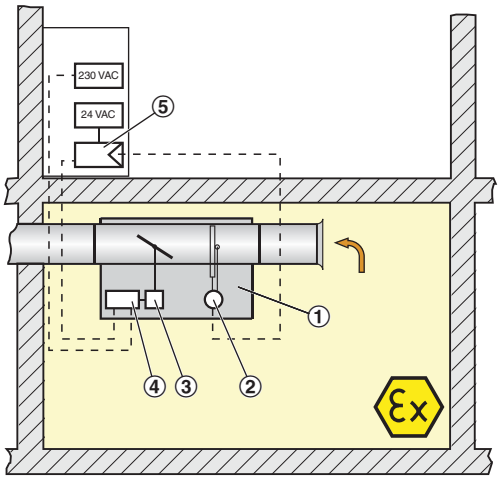
1

Type		Page
TVR-Ex	General information	1.1 – 203
	Order code	1.1 – 207
	Aerodynamic data – Electronic	1.1 – 209
	Aerodynamic data – Pneumatic	1.1 – 210
	Quick sizing – Electronic	1.1 – 211
	Quick sizing – Pneumatic	1.1 – 212
	Dimensions and weight	1.1 – 213
	Installation details	1.1 – 214
	Specification text	1.1 – 215
	Basic information and nomenclature	1.5 – 1

Variants

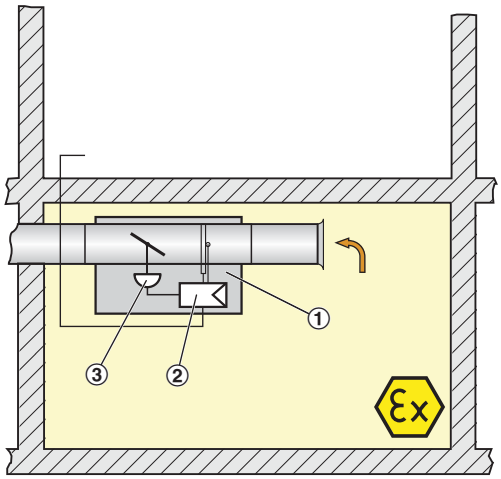
Product examples

Schematic illustration of the TVR-Ex with electronic control



① VAV terminal unit
② Static differential pressure transducer
③ Actuator
④ Terminal box
⑤ Electronic volume flow controller

Schematic illustration of the TVR-Ex with pneumatic control



① VAV terminal unit
② Pneumatic volume flow controller
③ Pneumatic actuator

Description



VAV terminal unit
Type TVR-Ex

Application

- Circular EXCONTROL VAV terminal units of Type TVR-Ex for the precise supply air or extract air flow control in variable air volume systems
- For use in potentially explosive atmospheres (ATEX)
- Closed-loop volume flow control using an external power supply
- Electronic or pneumatic volume flow control
- Shut-off by means of switching (equipment supplied by others)

Classification

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

Pneumatic control: Equipment group II
- Zones 1 and 2 (atmosphere: gases): II 2 G c II T5/T6

Construction

- Galvanised sheet steel
- P1: Inner duct powder-coated, silver grey (RAL 7001)
- A2: Inner duct in stainless steel

Nominal sizes

- 125, 160, 200, 250, 315, 400

Attachments

- Electronic control
- Pneumatic control

Accessories

- Actuator with auxiliary switch for capturing the end positions
- Spring return actuator

Useful additions

- Secondary silencer Type CA for demanding acoustic requirements

Special features
- ATEX mark and certification
- ATEX equipment group II, approved for use in zones 1 and 2; electronic control also for zones 21 and 22
- Volume flow rate can later be measured and adjusted on site; configuration is possible using personal computer software

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blade
- Connection for equipotential bonding
- Cable bushings suitable for use in potentially explosive atmospheres
- ATEX-compliant control components, factory assembled and complete with wiring and tubing
- Aerodynamic functional testing on a special test rig prior to shipping of each unit
- Unit carries test label with relevant data
- High control accuracy (even with upstream bend R = 1D)

Construction features
- Construction and materials comply with the EU directive and guidelines for use in potentially explosive atmospheres (ATEX)
- Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180

Materials and surfaces
- Casing and inner tube made of galvanised sheet steel
- Control components made of die cast aluminium (pneumatic control: plastic)
- Plastic bearings
- Damper blade of stainless steel and with TPE seal (thermoplastic elastomer)
- Differential pressure sensor made of aluminium
- Air duct (inner tube) in stainless steel or powder-coated as options

Installation and commissioning
- Connections for equipotential bonding: Suitable cables must be connected by others

Electronic control
- Any installation orientation
- Zero point correction required

Pneumatic control
- Installation orientation must be as shown on the sticker

Standards and guidelines
- Directive 94/9/EC: Equipment and protective systems intended for use in potentially explosive atmospheres
- Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3)
- Nominal sizes 125 and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class C

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

Electronic control
- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

1

Attachments: EXCONTROL Electric control components for Type TVR-Ex

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
Internal controller				
S1S	Volume flow rate	Universal controller (use in areas with potentially explosive atmospheres) Schischek	Static, integral	Actuator
S1F				Spring return actuator
S1X				Actuator with auxiliary switches
S1Y				Spring return actuator with auxiliary switch
External controller				
TES	Volume flow rate	Volume flow rate controller TCU3 (use in areas with potentially explosive atmospheres) TROX/Schischek	Static	Actuator
TEF				Spring return actuator
TEX				Actuator with auxiliary switches
TEY				Spring return actuator with auxiliary switch

Attachments: EXCONTROL Pneumatic control components for Type TVR-Ex

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
Volume flow controllers				
PG5	Volume flow rate	Volume flow controller Sauter	Integral	Actuator
Pressure and volume flow cascade				
PJ5	Room pressure	Room pressure controller ± 20 Pa Volume flow controller Sauter	Integral	Actuator
PL5		Room pressure controller ± 50 Pa Volume flow controller Sauter		

Technical data

Nominal sizes	125 – 400 mm
Volume flow rate range	15 – 1680 l/s or 54 – 6048 m^3/h
Volume flow rate control range	Approx. 15 to 100 % of the nominal volume flow rate
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Electronic

Supply voltage (AC)	24 V AC ± 10 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 10 %
Power rating (AC)	20 VA max.
Power rating (DC)	20 W max.
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	ATEX to 94/9/EG, EMC to 2004/108/EG, low voltage to 2006/95/EG

Pneumatic

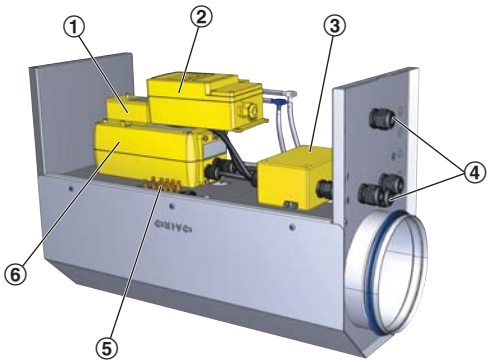
Operating pressure	1.3 bar ± 0.1 bar
Air consumption – volume flow control	50 ln/h
Air consumption – pressure and volume flow cascade	100 ln/h
Control pressure	0.2 – 1.0 bar
Maximum pressure	1.5 bar
Compressed air	Compressed air for instruments, free of oil, water and dust
Protection level	IP 42

Function

Functional description

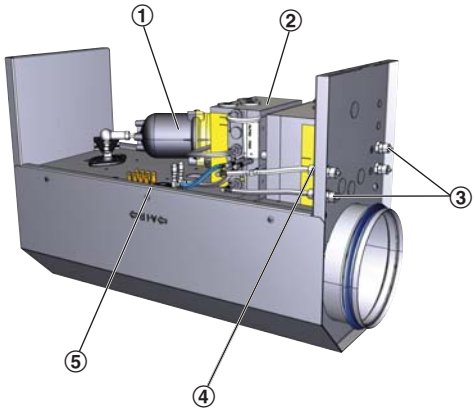
The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator. For most applications, the setpoint value comes from a room temperature controller which is installed outside of the potentially explosive atmosphere. The controller compares the actual value with the setpoint value and alters the control signal of the damper actuator if there is a difference between the two values. The connections for the supply voltage and for the voltage signals are made in a terminal box that is suitable for use in potentially explosive atmospheres.

Schematic illustration of the TVR-Ex with electronic control



① Auxiliary switch
② Static differential pressure transducer
③ Terminal box
④ Cable bushing
⑤ Equipotential bonding
⑥ Actuator

Schematic illustration of the TVR-Ex with pneumatic control



① Actuator
② Room pressure controller
③ Pneumatic connections
④ Volume flow controller
⑤ Equipotential bonding

1

Order code

EXCONTROL

TVR-Ex

TVR–Ex – P1 / 125 / S1S / 200 – 400 / NO

1 2 3 4 5 6

1 Type

TVR-Ex VAV terminal unit for use in potentially explosive atmospheres

2 Material

No entry: galvanised sheet steel
P1 Inner duct powder-coated, silver grey (RAL 7001)
A2 Inner duct in stainless steel

3 Nominal size [mm]

125
160
200
250
315
400

4 Attachments (control component)

For example
Electronic control
S1S Internal controller and actuator

Pneumatic control
PG5 Volume flow controller with actuator
PJ5 Pressure and volume flow cascade (±20 Pa)

5 Operating values [m³/h or l/s, Pa]

Electronic control
$\dot{V}_{min} - \dot{V}_{max}$

Pneumatic control
Volume flow rate $\dot{V}_{min} - \dot{V}_{max}$
Pressure and volume flow cascade
$\dot{V}_{min} - \dot{V}_{max} / \Delta p_{setpoint}$

6 Damper blade position

Only for spring return actuators and pneumatic actuators
NO Pressure off/power off to OPEN
NC Power off/Pressure off to close

Order examples

EXCONTROL

TVR-Ex/200/S1S/400–1200 m³/h

Material	Galvanised sheet steel
Nominal size	200 mm
Attachments	Electronic controller, internal, pressure transducer and actuator
Volume flow rate	400 – 1200 m³/h

TVR-Ex/160/PG5/200–500 m³/h/NO

Material	Galvanised sheet steel
Nominal size	160 mm
Attachments	Pneumatic volume flow controller with actuator
Volume flow rate	200 – 500 m³/h
Damper blade position	Pressure off to OPEN

Order code
LABCONTROL
EASYLAB

TVR-Ex with EASYLAB for single operation

TVR–Ex – P1 / 160 / TES / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 8

1 Type
TVR-Ex VAV terminal unit for use in potentially explosive atmospheres

2 Material
No entry: galvanised sheet steel
P1 Inner duct powder-coated, silver grey (RAL 7001)
A2 Inner duct in stainless steel

3 Nominal size [mm]
125
160
200
250
315
400

4 Attachments (control component)
For example
Electronic control
TES External controller, pressure transducer and actuator

5 Equipment function
Single operation
SC Supply air controller
EC Extract air controller

6 External volume flow rate setting
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P On-site switch contacts for 2 switching steps
3P On-site switch contacts for 3 switching steps
F Volume flow rate constant value, without signalling

7 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

8 Operating values [m³/h or l/s, P]
E0, E2: $\dot{V}_{min}$ / $\dot{V}_{max}$
2P: $\dot{V}_1$ / $\dot{V}_2$
3P: $\dot{V}_1$ / $\dot{V}_2$ / $\dot{V}_3$
F: $\dot{V}_1$

Order example
LABCONTROL
EASYLAB

TVR-Ex/160/TEX/SC–E0/T/200–900 m³/h

Material	Galvanised sheet steel
Nominal size	160 mm
Attachments	Electronic controller, external, pressure transducer and actuator with auxiliary switch
Equipment function	Supply air controller
Expansion modules	EM-TRF for 230 V AC
Volume flow rate	200 – 900 m³/h

1

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m^3/h	Pa				± %
125	**22**	**79**	5	5	5	5	15
	60	**216**	15	20	20	20	7
	105	**378**	45	50	55	60	6
	150	**540**	90	100	110	115	5
160	**35**	**126**	5	5	5	5	15
	100	**360**	15	15	15	15	8
	175	**630**	35	40	45	45	7
	250	**900**	70	80	85	95	5
200	**60**	**216**	5	5	5	5	15
	160	**576**	15	15	15	15	7
	280	**1008**	35	35	40	40	5
	405	**1458**	65	70	75	80	5
250	**90**	**324**	5	5	5	5	15
	245	**882**	10	10	10	10	7
	430	**1548**	25	25	30	35	5
	615	**2214**	45	50	55	65	5
315	**145**	**522**	5	5	5	5	15
	410	**1476**	5	10	10	10	7
	720	**2592**	15	20	20	20	6
	1030	**3708**	30	35	40	40	5
400	**240**	**864**	5	5	5	5	15
	670	**2412**	5	5	5	5	7
	1175	**4230**	15	15	15	15	6
	1680	**6048**	25	30	30	35	5

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

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.

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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m^3/h	Pa				± %
125	**15**	**54**	5	5	5	5	15
	40	**144**	10	10	10	10	10
	70	**252**	20	25	25	25	7
	100	**360**	40	45	50	55	5
160	**25**	**90**	5	5	5	5	15
	75	**270**	10	10	10	10	10
	125	**450**	20	20	25	25	7
	175	**630**	35	40	45	45	5
200	**40**	**144**	5	5	5	5	15
	125	**450**	10	10	10	10	10
	210	**756**	20	20	25	25	7
	300	**1080**	40	40	45	45	5
250	**60**	**216**	5	5	5	5	15
	200	**720**	5	10	10	10	10
	340	**1224**	15	15	20	20	7
	475	**1710**	30	30	35	40	5
315	**105**	**378**	5	5	5	5	15
	330	**1188**	5	5	5	5	10
	555	**1998**	10	10	15	15	7
	775	**2790**	20	20	25	25	5
400	**170**	**612**	5	5	5	5	15
	545	**1962**	5	5	5	5	10
	920	**3312**	10	10	10	10	7
	1300	**4680**	15	20	20	20	5

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

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.

1

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
			L_{PA}	L_{PA1}			L_{PA2}
	l/s	m^3/h	dB(A)				
125	**22**	**79**	36	25	16	<15	16
	60	**216**	45	36	30	28	25
	105	**378**	49	40	34	32	31
	150	**540**	52	41	34	32	35
160	**35**	**126**	41	30	22	19	22
	100	**360**	47	39	34	31	28
	175	**630**	50	42	37	34	32
	250	**900**	53	44	39	36	37
200	**60**	**216**	41	32	24	22	21
	160	**576**	47	40	34	33	29
	280	**1008**	50	44	40	38	32
	405	**1458**	54	45	39	38	38
250	**90**	**324**	38	30	24	22	22
	245	**882**	47	40	34	32	35
	430	**1548**	48	42	38	37	37
	615	**2214**	52	44	38	37	42
315	**145**	**522**	43	36	29	26	29
	410	**1476**	47	42	35	34	39
	720	**2592**	49	44	39	38	42
	1030	**3708**	53	48	42	41	46
400	**240**	**864**	43	36	29	26	31
	670	**2412**	44	38	32	30	37
	1175	**4230**	47	42	36	35	41
	1680	**6048**	50	44	38	37	46

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

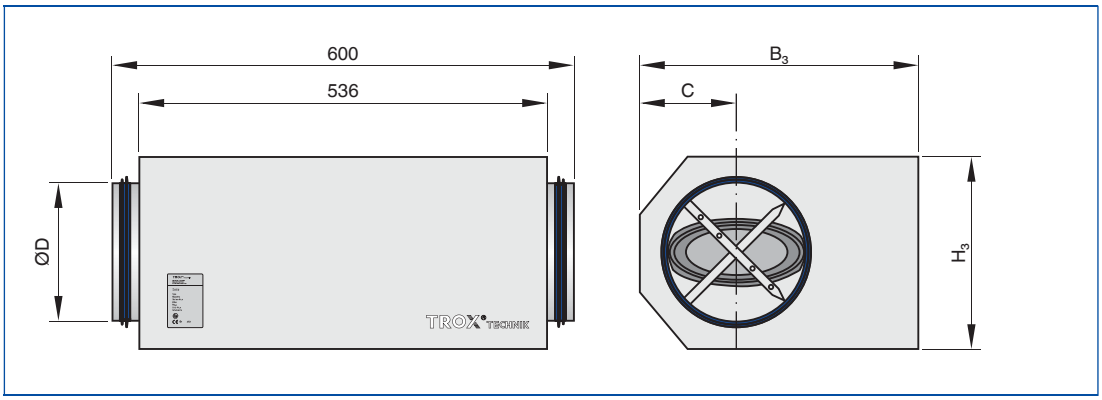
Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
			L_{PA}	L_{PA1}			L_{PA2}
	l/s	m³/h	dB(A)				
125	15	54	33	22	<15	<15	<15
	40	144	39	29	22	19	20
	70	252	46	37	31	29	26
	100	360	49	40	34	32	31
160	25	90	40	28	20	16	20
	75	270	45	35	29	26	25
	125	450	49	41	36	33	29
	175	630	50	42	37	34	32
200	40	144	40	31	23	20	20
	125	450	46	37	31	30	26
	210	756	48	41	36	35	30
	300	1080	51	44	40	38	33
250	60	216	41	32	24	22	21
	200	720	44	36	31	29	30
	340	1224	47	40	35	34	36
	475	1710	49	42	38	37	38
315	105	378	42	35	28	25	28
	330	1188	45	40	33	31	35
	555	1998	47	42	36	35	40
	775	2790	50	44	39	38	43
400	170	612	43	36	30	26	30
	545	1962	43	37	31	29	35
	920	3312	45	40	34	33	39
	1300	4680	48	42	37	35	43

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

1

Dimensions

TVR-Ex



Dimensions

Nominal size	ØD	B_3	H_3	C
	mm			
125	124	372	221	129
160	159	372	221	111
200	199	463	311	182
250	249	463	311	157
315	314	627	461	289
400	399	627	461	246

Weight

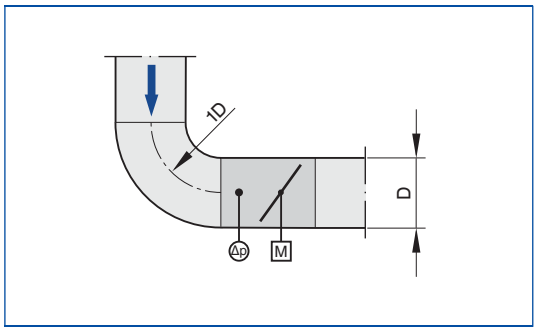
Nominal size	TVR-Ex/.../TEx	TVR-Ex/.../Pxx
	m	
	kg	
125	17.5	15.5
160	17.5	15.5
200	19.0	17.0
250	19.0	17.0
315	23.0	21.0
400	23.0	21.0

TVR-Ex/.../TEx: Electronic control
TVR-Ex/.../Pxx: Pneumatic control

Upstream conditions

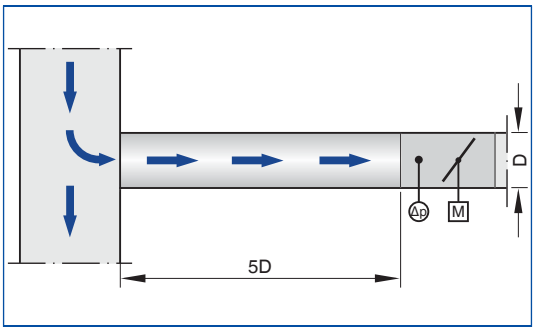
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

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

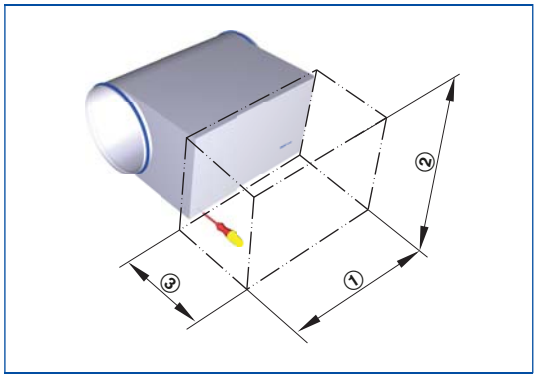


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 5D upstream. Shorter upstream sections require a perforated plate in the branch and before the VAV terminal unit. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Space requirement 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



Space required

Nominal size	①	②	③
	mm		
125	600	220	300
160	600	220	300
200	600	310	300
250	600	310	300
315	600	460	300
400	600	460	300

1

Standard text

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

VAV terminal units for variable and constant air volume systems in potentially explosive atmospheres, suitable for supply or extract air, available in 6 nominal sizes.
High control accuracy
(even with upstream bend R = 1D).
Ready-to-commission unit which consists of the mechanical parts, the electronic control components, and parts for equipotential bonding and for use in potentially explosive atmospheres.
Each unit contains an averaging differential pressure sensor for volume flow rate measurement and a damper blade.
Factory-assembled control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180.
Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).
Casing air leakage to EN 1751, class C.

Special features

- ATEX mark and certification
- ATEX equipment group II, approved for use in zones 1 and 2; electronic control also for zones 21 and 22
- Volume flow rate can later be measured and adjusted on site; configuration is possible using personal computer software

Materials and surfaces

- Casing and inner tube made of galvanised sheet steel
- Control components made of die cast aluminium (pneumatic control: plastic)
- Plastic bearings
- Damper blade of stainless steel and with TPE seal (thermoplastic elastomer)
- Differential pressure sensor made of aluminium
- Air duct (inner tube) in stainless steel or powder-coated as options

Construction

- Galvanised sheet steel
- P1: Inner duct powder-coated, silver grey (RAL 7001)
- A2: Inner duct in stainless steel

Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 15 to 1680 l/s or 54 to 6048 m^3/h
- Volume flow rate control range: approx. 15 – 100 % of the nominal volume flow rate
- Maximum differential pressure: 1000 Pa

Attachments

Variable volume flow control with electronic controller to switch a control signal and an actual value signal for integration into the central BMS.

- Supply voltage 24 V AC
- Supply voltage for actuator: 230 V AC
- Signal voltages 0 – 10 V DC
- 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. 15 – 100 % of the nominal volume flow rate
- Actuator with adjustable running time, 7.5 – 120 s

Sizing data

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

EXCONTROL

1 Type

TVR-Ex VAV terminal unit for use in potentially explosive atmospheres

2 Material

No entry: galvanised sheet steel

☐ **P1** Inner duct powder-coated, silver grey (RAL 7001)

☐ **A2** Inner duct in stainless steel

3 Nominal size [mm]

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Attachments (control component)

For example

Electronic control

☐ **S1S** Internal controller and actuator

Pneumatic control

☐ **PG5** Volume flow controller with actuator

☐ **PJ5** Pressure and volume flow cascade (±20 Pa)

5 Operating values [m³/h or l/s, Pa]

Electronic control

$\dot{V}_{min} - \dot{V}_{max}$

Pneumatic control

Volume flow rate $\dot{V}_{min} - \dot{V}_{max}$

Pressure and volume flow cascade

$\dot{V}_{min} - \dot{V}_{max} / \Delta p_{setpoint}$

6 Damper blade position

Only for spring return actuators and pneumatic actuators

☐ **NO** Pressure off/power off to OPEN

☐ **NC** Power off/Pressure off to close

Order options

LABCONTROL

EASYLAB

1 Type

TVR-Ex VAV terminal unit for use in potentially explosive atmospheres

2 Material

No entry: galvanised sheet steel

☐ **P1** Inner duct powder-coated, silver grey (RAL 7001)

☐ **A2** Inner duct in stainless steel

3 Nominal size [mm]

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Attachments (control component)

For example

Electronic control

☐ **TES** External controller, pressure transducer and actuator

5 Equipment function

Single operation

☐ **SC** Supply air controller

☐ **EC** Extract air controller

6 External volume flow rate setting

☐ **E0** Voltage signal 0 – 10 V DC

☐ **E2** Voltage signal 2 – 10 V DC

☐ **2P** On-site switch contacts for 2 switching steps

☐ **3P** On-site switch contacts for 3 switching steps

☐ **F** Volume flow rate constant value, without signalling

7 Module expansions

Option 1: Power supply

No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC

☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

☐ **L** EM-LON for LonWorks FTT-10A

☐ **B** EM-BAC-MOD-01 for BACnet MS/TP

☐ **M** EM-BAC-MOD-01 for Modbus RTU

☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver

☐ **R** EM-IP with real time clock

8 Operating values [m³/h or l/s, Pa

E0, E2: $\dot{V}_{min} / \dot{V}_{max}$

2P: $\dot{V}_1 / \dot{V}_2$

3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$

F: $\dot{V}_1$

Secondary silencers for VAV terminal units
Type CA



For the reduction of noise in circular ducts, suitable for all circular VAV terminal units and CAV controllers, galvanised sheet steel construction

Circular silencers Type CA for the reduction of noise in the circular ducts of air conditioning systems

- Absorption material is non-combustible mineral wool with RAL quality mark, biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Mineral wool faced with non-woven glass fibre as protection against erosion due to airflow velocities up to 20 m/s
- Casing and perforated inner duct are galvanised sheet steel
- Variant with spigot has a groove for a lip seal, suitable for circular connecting ducts to EN 1506 or EN 13180
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class B

Optional equipment and accessories

- With flanges on both ends
- With lip seals on both ends

1

Type		Page
CA	General information	1.2 – 2
	Order code	1.2 – 3
	Dimensions and weight – CA	1.2 – 4
	Dimensions and weight – CA/.../VF1	1.2 – 5
	Dimensions and weight – CA/.../VF2	1.2 – 6
	Specification text	1.2 – 7
	Basic information and nomenclature	1.5 – 1

Description



Circular silencer Type CA

Application
- Circular silencers Type CA for the reduction of noise in the circular ducts of air conditioning systems
- For the reduction of air-regenerated noise of air terminal units such as LVC and TVR, and of mechanical self-powered controllers such as RN and VFC
- For the reduction of fan noise
- Can be used as cross talk silencer to reduce the transfer of noise through ducts between neighbouring rooms

Variants
- 050: Circular silencer with 50 mm insulation
- 100: Circular silencer with 100 mm insulation
- VF1: Circular silencer with flange on one end
- VF2: Circular silencer with flanges on both ends
- Special versions upon request

Nominal sizes
- 100, 125, 160, 200, 250, 315, 400, 450, 500, 560, 630, 710, 800 mm

For VAV terminal units and CAV controllers
- 100, 125, 160, 200, 250, 315, 400 mm

Accessories
- GE: Matching flange for one end
- GZ: Matching flanges for both ends
- VD2: Lip seals on both ends (factory fitted)

Special features
- Insertion loss measured according to ISO 7235
- Absorption material is non-combustible
- Insulation thickness 50 mm or 100 mm

Parts and characteristics
- Casing
- Perforated inner tube
- Absorption material

Construction features
- Circular casing
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Operating pressure up to 1000 Pa
- Operating temperature up to 100 °C

Materials and surfaces
- Casing and perforated inner duct are galvanised sheet steel
- 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/EG
- Faced with glass fibre as protection against erosion through airflow velocities up to 20 m/s
- Inert to fungal and bacterial growth

Standards and guidelines
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class B

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

Order code

For available combinations of insulation thickness, nominal size and nominal length see the Weight table.

CA

CA – 050 / 315×1000 / GZ / VF2
1 2 3 4 5 6

1 Type
CA Circular silencer

2 Insulation thickness [mm]
050 50
100 100

3 Nominal size [mm]
100
125
160
200
250
315
400
450
500
560
630
710
800

4 Nominal length [mm]
500
1000
1500

5 Matching flange
No entry: none
GE on one end (only VF1)
GZ on both ends (only VF2)

6 Type of connection
No entry: spigot
VD2 Spigot with lip seal on both ends
VF1 Flange on one end
VF2 Flanges on both ends

Order example

CA-100/315×1500/GE/VF1

Packungsdicke	100 mm
Nenngröße	315 mm
Länge	1500 mm
Gegenflansch	Einseitig
Anschlussvariante	Flansch einseitig

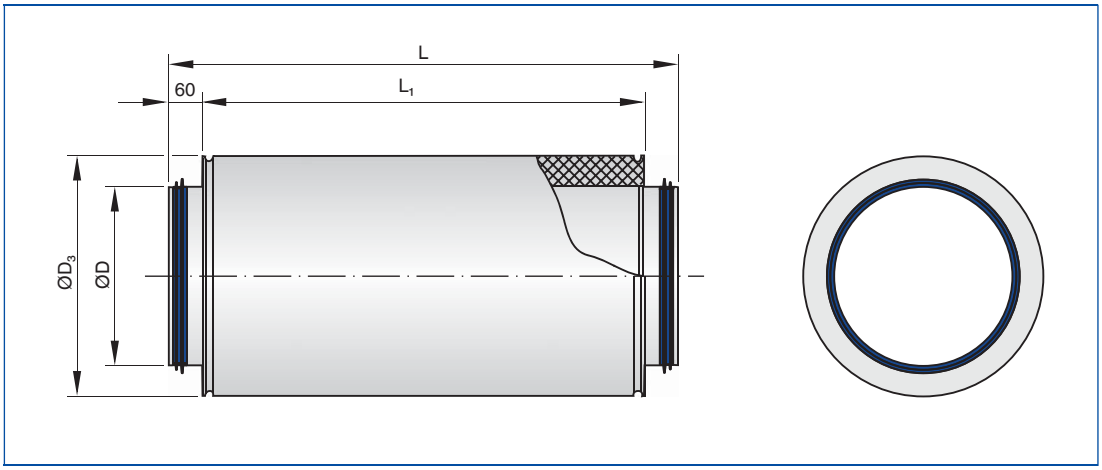
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Application

– Circular silencer for the reduction of noise
– Spigot to make connections to the ducting

Dimensions

CA



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CA-050 $ØD_3$	CA-100 $ØD_3$	ØD
	mm		
100	199	299	99
125	224	324	124
160	259	359	159
200	299	399	199
250	349	449	249
315	414	514	314
400	499	599	399

Dimensions

Nominal length	L	L_1
	mm	
500	500	380
1000	1000	880
1500	1500	1380

The table shows the weight for each nominal size, length and insulation thickness

Weight

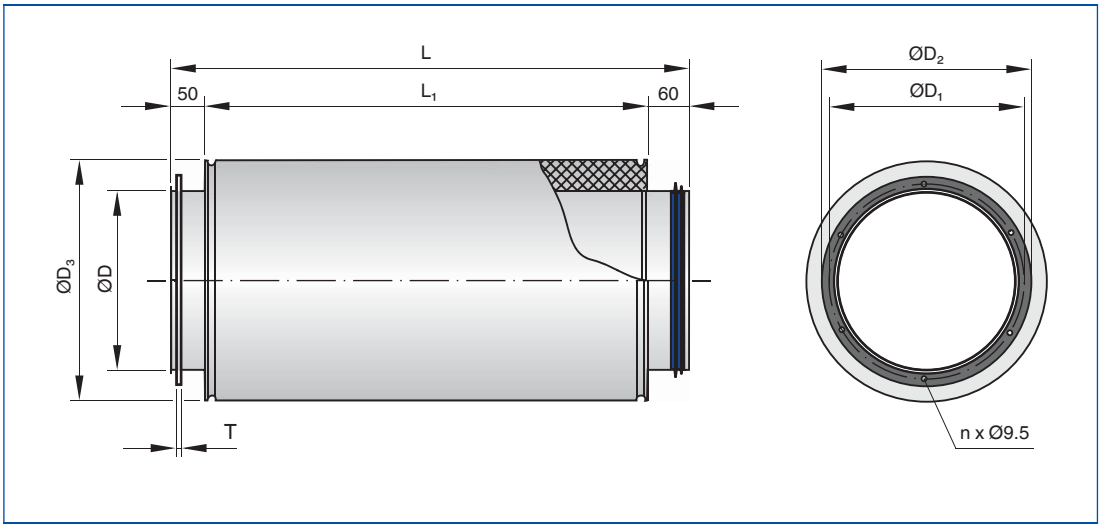
Nominal size	CA-050			CA-100		
	500	1000	1500	500	1000	1500
	m					
	kg					
100	4	7		6	11	
125	5	9		7	13	
160	70	12		9	16	
200	7	13		9	17	
250	9	16	22	11	20	29
315	12	20	28	14	25	35
400	15	25	34	18	30	42

Application

- Circular silencer for the reduction of noise
- Spigot on one end to make connections to the ducting
- With flange on one end to make a detachable connection to the ducting

Dimensions

CA/.../VF1



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CA-050	CA-100	ØD	$ØD_1$	$ØD_2$	n	T
	$ØD_3$	$ØD_3$					
	mm						mm
100	199	299	99	132	152	4	4
125	224	324	124	157	177	4	4
160	259	359	159	192	212	6	4
200	299	399	199	233	253	6	4
250	349	449	249	283	303	6	4
315	414	514	314	352	378	8	4
400	499	599	399	438	464	8	4

Dimensions

Nominal length	L	L_1
	mm	
500	490	380
1000	990	880
1500	1490	1380

The table shows the weight for each nominal size, length and insulation thickness

Weight

Nominal size	CA-050			CA-100		
	500	1000	1500	500	1000	1500
	m					
	kg					
100	4	7		6	11	
125	5	9		7	13	
160	8	13		10	17	
200	8	14		10	18	
250	10	17	23	12	21	30
315	13	21	29	15	26	36
400	16	26	35	19	31	43

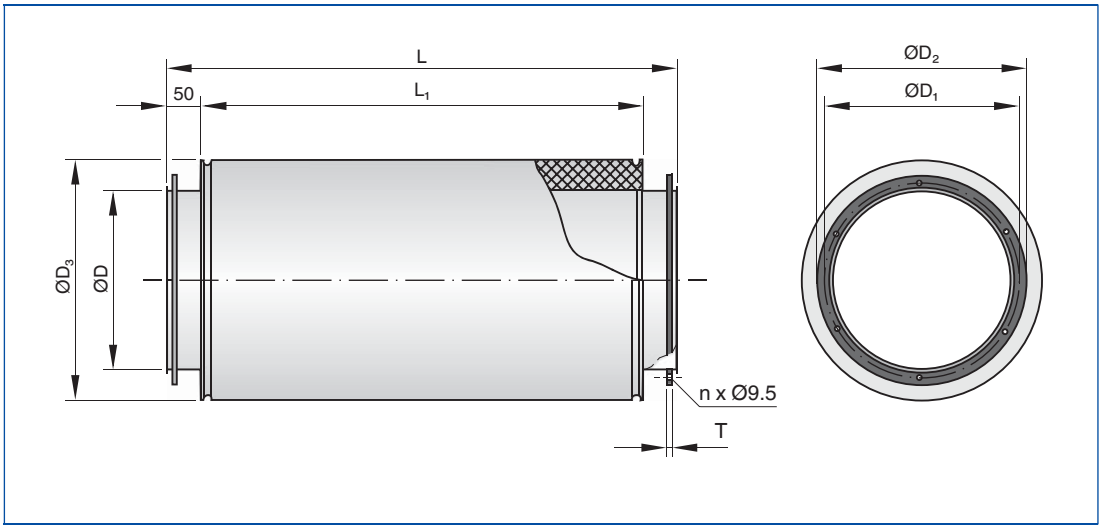
1

Application

- Circular silencer for the reduction of noise
- With flanges on both ends to make detachable connections to the ducting

Dimensions

CA/.../VF2



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CA-050	CA-100	ØD	$ØD_1$	$ØD_2$	n	T
	$ØD_3$	$ØD_3$					
	mm						mm
100	199	299	99	132	152	4	4
125	224	324	124	157	177	4	4
160	259	359	159	192	212	6	4
200	299	399	199	233	253	6	4
250	349	449	249	283	303	6	4
315	414	514	314	352	378	8	4
400	499	599	399	438	464	8	4

Dimensions

Nominal length	L	L_1
	mm	
500	480	380
1000	980	880
1500	1480	1380

The table shows the weight for each nominal size, length and insulation thickness

Weight

Nominal size	CA-050			CA-100		
	500	1000	1500	500	1000	1500
	m					
	kg					
100	4	7		6	11	
125	6	10		8	14	
160	8	13		10	17	
200	8	14		10	18	
250	10	17	23	12	21	30
315	14	22	30	16	27	37
400	18	28	37	21	33	45

Standard text

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

Circular silencers for air conditioning systems, rigid construction, available in 13 nominal sizes. Insertion loss measured according to ISO 7235. Casing with acoustic and thermal insulation. Various types of connection, suitable for circular ducts to EN 1506 or EN 13180. Casing air leakage to EN 15727, class B.

Special features

- Insertion loss measured according to ISO 7235
- Absorption material is non-combustible
- Insulation thickness 50 mm or 100 mm

Materials and surfaces

- Casing and perforated inner duct are galvanised sheet steel
- 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/EG
- Faced with glass fibre as protection against erosion through airflow velocities up to 20 m/s
- Inert to fungal and bacterial growth

Order options

1 Type

CA Circular silencer

2 Insulation thickness [mm]

☐ **050** 50
☐ **100** 100

3 Nominal size [mm]

☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**
☐ **450**
☐ **500**
☐ **560**
☐ **630**
☐ **710**
☐ **800**

4 Nominal length [mm]

☐ **500**
☐ **1000**
☐ **1500**

5 Matching flange

No entry: none
☐ **GE** on one end (only VF1)
☐ **GZ** on both ends (only VF2)

6 Type of connection

No entry: spigot
☐ **VD2** Spigot with lip seal on both ends
☐ **VF1** Flange on one end
☐ **VF2** Flanges on both ends

Secondary silencers for VAV terminal units
Type CS



For the reduction of noise in circular ducts, suitable for all circular VAV terminal units and CAV controllers, aluminium construction

Circular silencers, in rigid aluminium construction,
for the reduction of noise in the circular ducts of air conditioning systems

- Absorption material is non-combustible mineral wool with RAL quality mark, biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Casing and perforated inner duct made of aluminium
- Variant with spigot has a groove for a lip seal, suitable for circular connecting ducts to EN 1506 or EN 13180
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class D

Optional equipment and accessories

- Socket-type spigots on both ends
- Raised edges at both ends
- With lip seals on both ends

1

Type		Page
CS	General information	1.2 – 9
	Order code	1.2 – 10
	Dimensions and weight – CS	1.2 – 11
	Dimensions and weight – CS/.../AS2	1.2 – 12
	Dimensions and weight – CS/.../BK2	1.2 – 13
	Specification text	1.2 – 14
	Basic information and nomenclature	1.5 – 1

Description



Circular silencer Type CS

Application
- Circular silencers Type CS for the reduction of air-regenerated noise in the circular ducts of air conditioning systems
- For the reduction of air-regenerated noise of air terminal units LVC and TVR, and of mechanical self-powered controllers RN and VFC
- For the reduction of fan noise
- Can be used as cross talk silencer to reduce the transfer of noise through ducts between neighbouring rooms

Variants
- 025: Circular silencer with 25 mm insulation
- 050: Circular silencer with 50 mm insulation
- AS2: Circular silencer with socket-type spigots on both ends
- BK2: Circular silencer with raised edges at both ends
- Special versions upon request

Nominal sizes
- 80, 100, 125, 160, 200, 250, 315, 400 mm

Accessories
- VD2: Lip seals on both ends (factory fitted)
- AS2: Socket-type spigots on both ends
- BK2: Raised edges at ends

Special features
- Insertion loss measured according to ISO 7235
- Absorption material is non-combustible
- Insulation thickness 25 mm or 50 mm

Parts and characteristics
- Casing
- Perforated inner tube
- Absorption material

Construction features
- Circular casing
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Maximum operating pressure 1000 Pa
- Maximum operating temperature 100 °C

Materials and surfaces
- Casing and perforated inner duct made of aluminium
- Lining is mineral wool
- End pieces made ABS plastic, flammability to UL 94, V-0 (nominal sizes 80 – 125)
- End pieces made of aluminium (nominal sizes 160 – 400)

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/EG
- Inert to fungal and bacterial growth

Standards and guidelines
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class D

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

Order code

CS

CS – 025 / 160×1000 / VD2

1 2 3 4 5

1 Type
CS Circular silencer

2 Insulation thickness [mm]
025 25
050 50

3 Nominal size [mm]
80
100
125
160
200
250
315
400

4 Nominal length [mm]
500
1000
1500

5 Type of connection
No entry: spigot
VD2 Spigot with lip seal on both ends
AS2 Socket-type spigots on both ends
BK2 Raised edges at both ends

Order example

CS-050/250×1500/VD2

Packungsdicke	50 mm
Nenngröße	250 mm
Länge	1500 mm
Anschlussvariante	Rohrstutzen mit Lippendichtung beidseitig

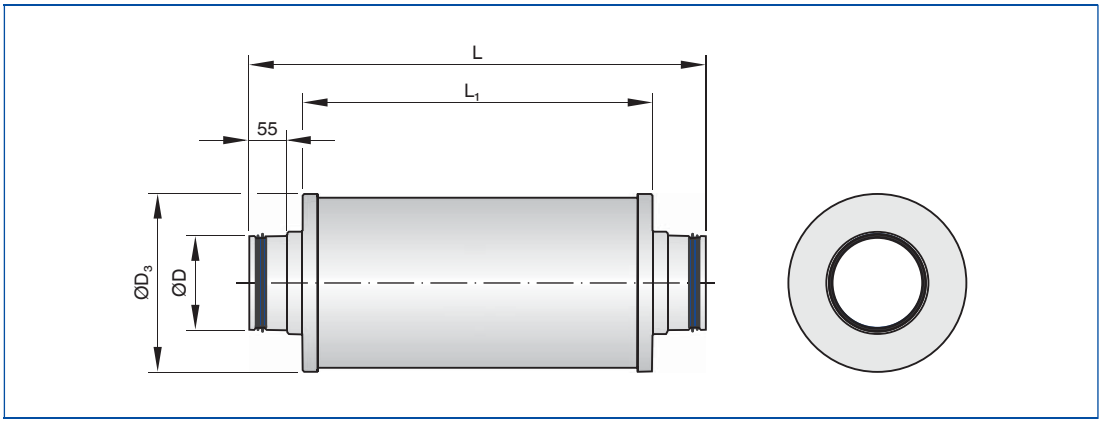
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Application

– Circular silencer for the reduction of noise
– Spigot to make connections to the ducting

Dimensions

CS



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CS-025 $ØD_3$	CS-050 $ØD_3$	ØD
	mm		
80	135	192	79
100	160	212	99
125	191	236	124
160	221	271	159
200	261	311	199
250	311	366	249
315	376	426	314
400	461	511	399

Dimensions

Nominal length	L	L_1
	mm	
500	650	500
1000	1150	1000
1500	1650	1500

The table shows the weight for each nominal size, length and insulation thickness

Weight

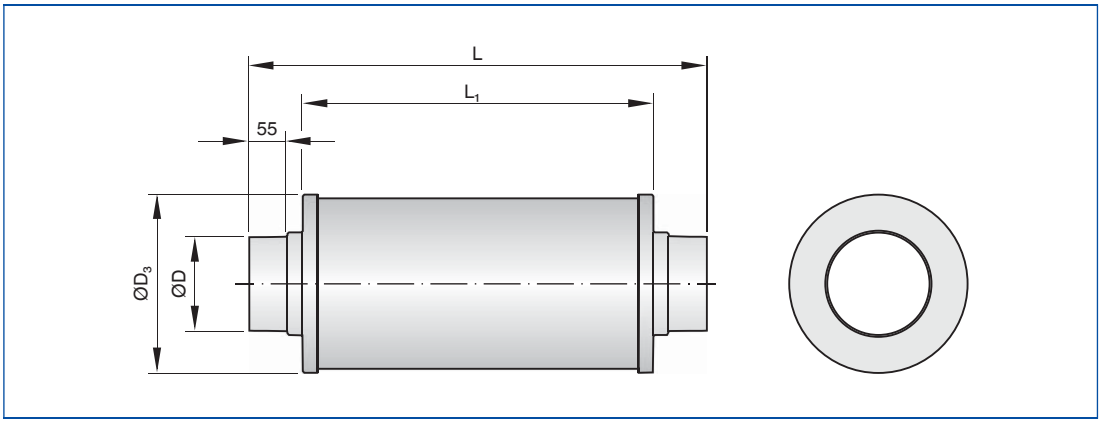
Nominal size	CS-025			CS-050		
	500	1000	1500	500	1000	1500
	m					
	kg					
80	1.0	1.8	2.6	1.4	2.6	3.7
100	1.2	2.1	3.1	1.6	2.9	4.2
125	1.4	2.5	3.7	1.9	3.3	4.7
160	1.6	2.9	4.2	2.1	3.8	5.4
200	2.0	3.6	5.2	2.6	4.6	6.5
250	2.5	4.4	6.2	3.1	5.5	7.8
315	2.9	5.2	7.5	3.5	6.2	8.9
400	3.7	6.6	9.4	4.5	7.9	11.3

Application

- Circular silencer for the reduction of noise
- Socket-type spigots to make connections to the ducting

Dimensions

CS/.../AS2



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CS-025 ØD3	CS-050 ØD3	ØD
	mm		
80	135	192	80
100	160	212	100
125	191	236	125
160	221	271	160
200	261	311	200
250	311	366	250
315	376	426	315
400	461	511	400

Dimensions

Nominal length	L	L1
	mm	
500	650	500
1000	1150	1000
1500	1650	1500

The table shows the weight for each nominal size, length and insulation thickness

Weight

Nominal size	CS-025			CS-050		
	500	1000	1500	500	1000	1500
	m					
	kg					
80	1.0	1.8	2.6	1.4	2.6	3.7
100	1.2	2.1	3.1	1.6	2.9	4.2
125	1.4	2.5	3.7	1.9	3.3	4.7
160	1.6	2.9	4.2	2.1	3.8	5.4
200	2.0	3.6	5.2	2.6	4.6	6.5
250	2.5	4.4	6.2	3.1	5.5	7.8
315	2.9	5.2	7.5	3.5	6.2	8.9
400	3.7	6.6	9.4	4.5	7.9	11.3

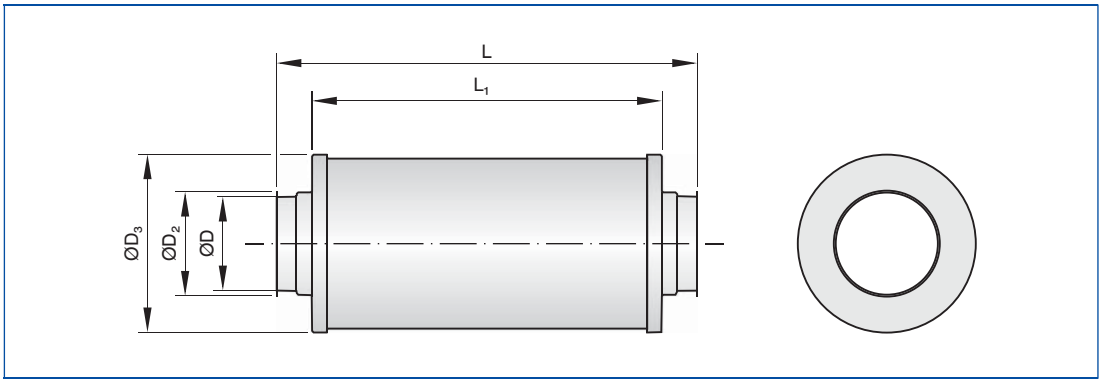
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Application

- Circular silencer for the reduction of noise
- With raised edges to make detachable connections to the ducting

Dimensions

CS/.../BK2



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CS-025 ØD3	CS-050 ØD3	ØD	ØD2
	mm			
80	135	192	79	93
100	160	212	99	113
125	191	236	124	138
160	221	271	159	173
200	261	311	199	213
250	311	366	249	263
315	376	426	314	328
400	461	511	399	413

Dimensions

Nominal length	L	L1
	mm	
500	638	500
1000	1138	1000
1500	1638	1500

The table shows the weight for each nominal size, length and insulation thickness

Weight

Nominal size	CS-025			CS-050		
	500	1000	1500	500	1000	1500
	m					
	kg					
80	1.0	1.8	2.6	1.4	2.6	3.7
100	1.2	2.1	3.1	1.6	2.9	4.2
125	1.4	2.5	3.7	1.9	3.3	4.7
160	1.6	2.9	4.2	2.1	3.8	5.4
200	2.0	3.6	5.2	2.6	4.6	6.5
250	2.5	4.4	6.2	3.1	5.5	7.8
315	2.9	5.2	7.5	3.5	6.2	8.9
400	3.7	6.6	9.4	4.5	7.9	11.3

Standard text

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

Circular silencers for air conditioning systems, rigid construction, available in 8 nominal sizes. Insertion loss measured according to ISO 7235. Casing with acoustic and thermal insulation. Spigot with groove for lip seal, suitable for circular connecting ducts to EN 1506 or EN 13180. Casing air leakage to EN 15727, class D.

Special features

- Insertion loss measured according to ISO 7235
- Absorption material is non-combustible
- Insulation thickness 25 mm or 50 mm

Materials and surfaces

- Casing and perforated inner duct made of aluminium
- Lining is mineral wool
- End pieces made ABS plastic, flammability to UL 94, V-0 (nominal sizes 80 – 125)
- End pieces made of aluminium (nominal sizes 160 – 400)

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/EG
- Inert to fungal and bacterial growth

Order options

1 Type

CS Circular silencer

2 Insulation thickness [mm]

☐ **025** 25
☐ **050** 50

3 Nominal size [mm]

☐ **80**
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Nominal length [mm]

☐ **500**
☐ **1000**
☐ **1500**

5 Type of connection

No entry: spigot
☐ **VD2** Spigot with lip seal on both ends
☐ **AS2** Socket-type spigots on both ends
☐ **BK2** Raised edges at both ends

Secondary silencers for VAV terminal units
Type CF



For the reduction of noise in circular ducts, suitable for all circular VAV terminal units and CAV controllers, flexible aluminium construction

Circular silencers, in flexible aluminium construction,
for the reduction of noise in the circular ducts of air conditioning systems

- Absorption material is non-combustible mineral wool with RAL quality mark, biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Casing and perforated inner duct made of aluminium
- Variant with spigot has a groove for a lip seal, suitable for circular connecting ducts to EN 1506 or EN 13180
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class D

Optional equipment and accessories

- Socket-type spigots on both ends
- Raised edges at both ends
- With lip seals on both ends

1

Type		Page
CF	General information	1.2 – 16
	Order code	1.2 – 17
	Dimensions and weight – CF	1.2 – 18
	Dimensions and weight – CF/.../AS2	1.2 – 19
	Dimensions and weight – CF/.../BK2	1.2 – 20
	Specification text	1.2 – 21
	Basic information and nomenclature	1.5 – 1

Description



Flexible circular silencer Type CF

Application
- Flexible circular silencers Type CF for the reduction of noise in the circular ducts of air conditioning systems
- For the reduction of air-regenerated noise of air terminal units LVC and TVR, and of mechanical self-powered controllers RN and VFC
- For the reduction of fan noise
- Can be used as cross talk silencer to reduce the transfer of noise through ducts between neighbouring rooms

Variants
- 025: Circular silencer with 25 mm insulation
- 050: Circular silencer with 50 mm insulation
- AS2: Circular silencer with socket-type spigots on both ends
- BK2: Circular silencer with raised edges at both ends
- Special versions upon request

Nominal sizes
- 80, 100, 125, 160, 200, 250, 315, 400 mm

Accessories
- VD2: Lip seals on both ends (factory fitted)
- AS2: Socket-type spigots on both ends
- BK2: Raised edges at ends

Special characteristics
- Insertion loss measured according to ISO 7235
- Very flexible and consequently suitable for installation in complicated duct systems and restricted spaces
- Absorption material is non-combustible
- Insulation thickness 25 or 100 mm
- Minimum bend radius 3 × outer diameter D_3 of the silencer

Parts and characteristics
- Casing
- Perforated inner tube
- Absorption material

Construction features
- Circular casing
- Flexible construction
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot connections with groove for lip seal
- Maximum operating pressure 1000 Pa
- Maximum operating temperature 100 °C

Materials and surfaces
- Casing and perforated inner duct made of aluminium
- Lining is mineral wool
- End pieces made ABS plastic, flammability to UL 94, V-0 (nominal sizes 80 – 125)
- End pieces made of aluminium (nominal sizes 160 – 400)

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/EG
- Inert to fungal and bacterial growth

Standards and guidelines
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class D

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

Order code

CF

CF – 025 / 160×1000 / VD2
1 2 3 4 5

1 Type
CF Flexible circular silencer

2 Insulation thickness [mm]
025 25
050 50

3 Nominal size [mm]
80
100
125
160
200
250
315
400

4 Nominal length [mm]
500
1000
1500
2000

5 Type of connection
No entry: spigot
VD2 Spigot with lip seal on both ends
AS2 Socket-type spigots on both ends
BK2 Raised edges at both ends

Order example

CF-050/160×1000/VD2

Packungsdicke	50 mm
Nenngröße	160 mm
Länge	1000 mm
Anschlussvariante	Rohrstutzen mit Lippendichtung beidseitig

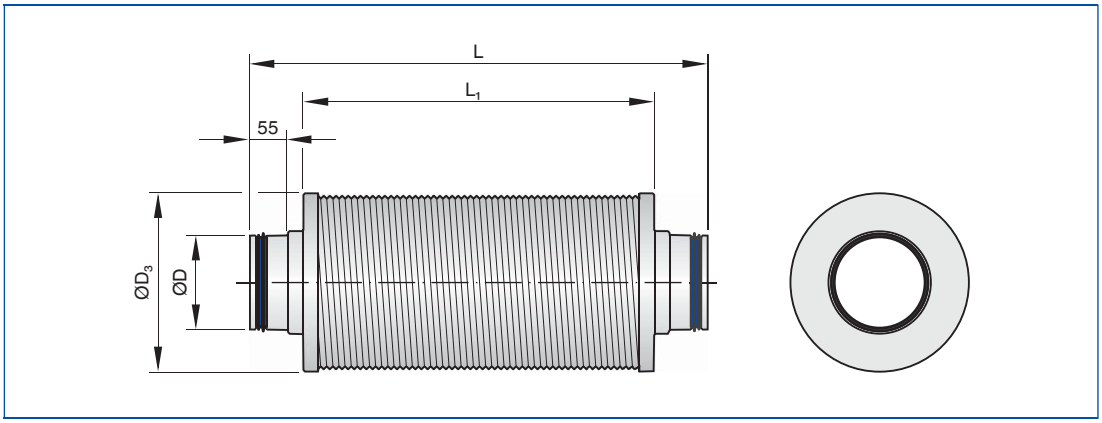
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Application

– Circular silencer for the reduction of noise
– Spigot to make connections to the ducting

Dimensions

CF



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CF-025 $ØD_3$	CF-050 $ØD_3$	ØD
	mm		
80	135	192	79
100	160	212	99
125	191	236	124
160	221	271	159
200	261	311	199
250	311	366	249
315	376	426	314
400	461	511	399

Dimensions

Nominal length	L	L_1
	mm	
500	650	500
1000	1150	1000
1500	1650	1500
2000	2150	2000

The table shows the weight for each nominal size, length and insulation thickness

Weight

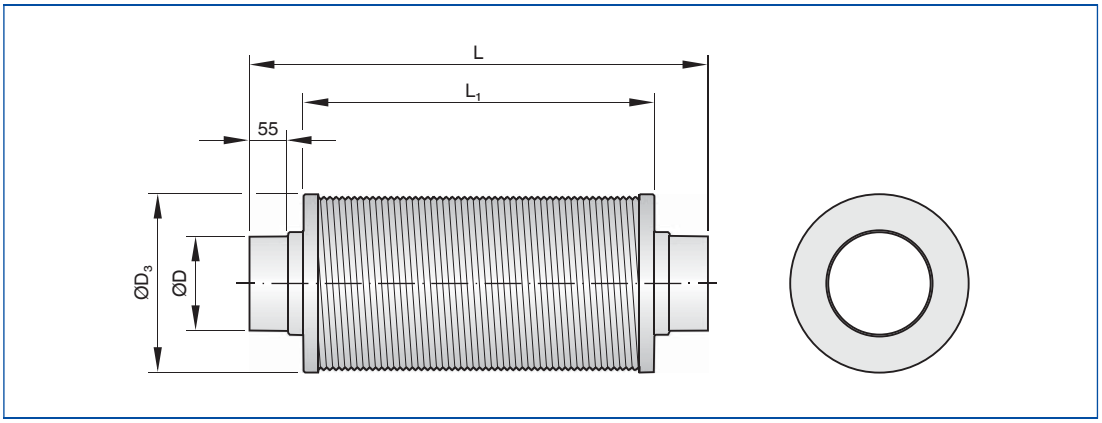
Nominal size	CF-025				CF-050			
	500	1000	1500	2000	500	1000	1500	2000
	m							
	kg							
80	0.6	1.0	1.5	1.9	0.9	1.5	2.2	2.8
100	0.8	1.3	1.7	2.2	1.1	1.8	2.5	3.2
125	0.9	1.5	2.1	2.7	1.2	2.0	2.9	3.7
160	1.1	1.8	2.5	3.2	1.4	2.4	3.3	4.3
200	1.3	2.2	3.0	3.9	1.7	2.9	4.0	5.1
250	1.6	2.7	3.7	4.7	2.1	3.5	4.8	6.2
315	1.9	3.2	4.5	5.7	2.4	4.0	5.6	7.2
400	2.5	4.1	5.6	7.2	3.1	5.1	7.1	9.1

Application

- Circular silencer for the reduction of noise
- Socket-type spigots to make connections to the ducting

Dimensions

CF/.../AS2



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CF-025	CF-050	ØD
	$ØD_3$	$ØD_3$	
	mm		
80	135	192	80
100	160	212	100
125	191	236	125
160	221	271	160
200	261	311	200
250	311	366	250
315	376	426	315
400	461	511	400

Dimensions

Nominal length	L	L_1
	mm	
500	650	500
1000	1150	1000
1500	1650	1500
2000	2150	2000

The table shows the weight for each nominal size, length and insulation thickness

Weight

Nominal size	CF-025				CF-050			
	500	1000	1500	2000	500	1000	1500	2000
	m							
	kg							
80	0.6	1.0	1.5	1.9	0.9	1.5	2.2	2.8
100	0.8	1.3	1.7	2.2	1.1	1.8	2.5	3.2
125	0.9	1.5	2.1	2.7	1.2	2.0	2.9	3.7
160	1.1	1.8	2.5	3.2	1.4	2.4	3.3	4.3
200	1.3	2.2	3.0	3.9	1.7	2.9	4.0	5.1
250	1.6	2.7	3.7	4.7	2.1	3.5	4.8	6.2
315	1.9	3.2	4.5	5.7	2.4	4.0	5.6	7.2
400	2.5	4.1	5.6	7.2	3.1	5.1	7.1	9.1

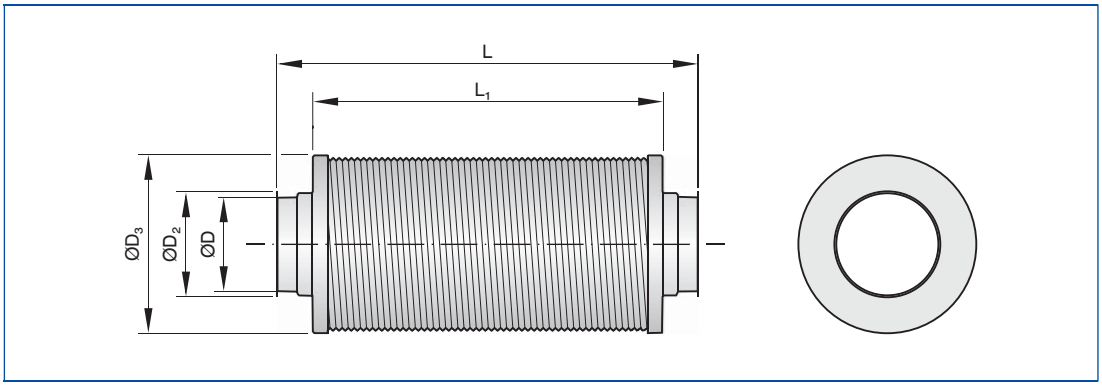
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Application

- Circular silencer for the reduction of noise
- With raised edges to make detachable connections to the ducting

Dimensions

CF/.../BK2



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	CF-025 ØD3	CF-050 ØD3	ØD	ØD2
	mm			
80	135	192	79	93
100	160	212	99	113
125	191	236	124	138
160	221	271	159	173
200	261	311	199	213
250	311	366	249	263
315	376	426	314	328
400	461	511	399	413

Dimensions

Nominal length	L	L1
	mm	
500	638	500
1000	1138	1000
1500	1638	1500
2000	2138	2000

The table shows the weight for each nominal size, length and insulation thickness

Weight

Nominal size	CF-025				CF-050			
	500	1000	1500	2000	500	1000	1500	2000
	m							
	kg							
80	0.6	1.0	1.5	1.9	0.9	1.5	2.2	2.8
100	0.8	1.3	1.7	2.2	1.1	1.8	2.5	3.2
125	0.9	1.5	2.1	2.7	1.2	2.0	2.9	3.7
160	1.1	1.8	2.5	3.2	1.4	2.4	3.3	4.3
200	1.3	2.2	3.0	3.9	1.7	2.9	4.0	5.1
250	1.6	2.7	3.7	4.7	2.1	3.5	4.8	6.2
315	1.9	3.2	4.5	5.7	2.4	4.0	5.6	7.2
400	2.5	4.1	5.6	7.2	3.1	5.1	7.1	9.1

Standard text

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

Circular silencers for air conditioning systems, flexible construction, available in 8 nominal sizes. Insertion loss measured according to ISO 7235. Casing with acoustic and thermal insulation. Spigot with groove for lip seal, suitable for circular connecting ducts to EN 1506 or EN 13180. Casing air leakage to EN 15727, class D.

Special characteristics

- Insertion loss measured according to ISO 7235
- Very flexible and consequently suitable for installation in complicated duct systems and restricted spaces
- Absorption material is non-combustible
- Insulation thickness 25 or 100 mm
- Minimum bend radius 3 × outer diameter D_3 of the silencer

Materials and surfaces

- Casing and perforated inner duct made of aluminium
- Lining is mineral wool
- End pieces made ABS plastic, flammability to UL 94, V-0 (nominal sizes 80 – 125)
- End pieces made of aluminium (nominal sizes 160 – 400)

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/EG
- Inert to fungal and bacterial growth

Order options

1 Type

CF Flexible circular silencer

2 Insulation thickness [mm]

☐ **025** 25
☐ **050** 50

3 Nominal size [mm]

☐ **80**
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Nominal length [mm]

☐ **500**
☐ **1000**
☐ **1500**
☐ **2000**

5 Type of connection

No entry: spigot
☐ **VD2** Spigot with lip seal on both ends
☐ **AS2** Socket-type spigots on both ends
☐ **BK2** Raised edges at both ends

Secondary silencers for VAV terminal units

Type TS



For the reduction of air-regenerated noise of air terminal units Type TVZ, TVA, TZ-Silenzio, TA-Silenzio or TVM

Rectangular secondary silencers for the reduction of air-regenerated noise of air terminal units Type TVZ, TVA, TZ-Silenzio, TA-Silenzio or TVM

- Absorption material is non-combustible mineral wool with RAL quality mark, biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Mineral wool faced with glass fibre fabric as protection against erosion due to airflow velocities up to 20 m/s
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class B

HYGIENISCH GETESTET TROX® TECHNIK VDI 6022

Tested to VDI 6022

1

Type		Page
TS	General information	1.2 – 23
	Basic information and nomenclature	1.5 – 1

Description



Secondary silencer
Type TS

Application
- Secondary silencers of Type TS to reduce the air-regenerated noise of air terminal units
- For air terminal units TVZ, TVA, TZ-Silenzio, TA-Silenzio, and TVM

Nominal sizes
- 125, 160, 200, 250, 315, 400

Parts and characteristics
- Casing
- Absorption material

Construction features
- Rectangular casing
- Connection on the room end suitable for air duct profiles
- Thermal and acoustic insulation (lining)

Materials and surfaces
- Casing made of galvanised sheet steel
- 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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Installation and commissioning
- Connection profiles fit air terminal units TVZ, TVA, TZ-Silenzio, TA-Silenzio, and TVM
- Return edges of the casing with drilled holes suitable for M10 threaded rods

Standards and guidelines
- Hygiene conforms to VDI 6022
- Casing air leakage to EN 15727, class B

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

Order code

TS

TS / 200
1 2

1 Type
TS Secondary silencer

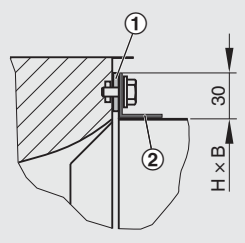
2 Nominal size
125
160
200
250
315
400

Order example

TS/200

Nominal size	200 mm

Dimensions

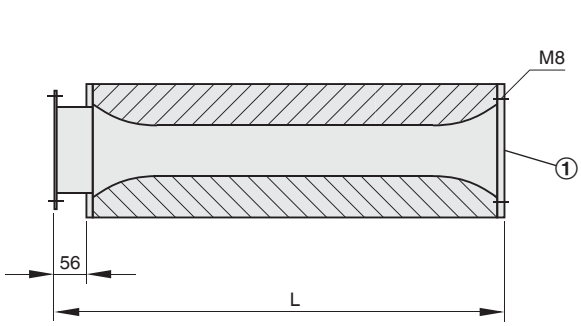


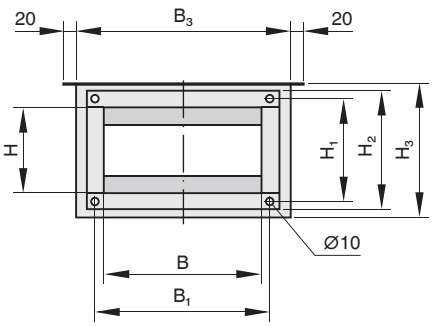
Detail of flange

① Compressible seal, to be provided by others

② Air duct profile

TS





① End facing the room

Dimensions [mm] and weight [kg]

Nominal size	L	B_3	H_3	B	B_1	H	H_1	m
	mm							kg
125	806	300	236	198	232	152	186	10
160	806	410	236	308	342	152	186	15
200	956	560	281	458	492	210	244	22
250	956	700	311	598	632	201	235	37
315	1056	900	361	798	832	252	286	42
400	1306	1000	446	898	932	354	388	50

Specification text

Rectangular secondary silencers for VAV terminal units to reduce the air-regenerated noise, available in 6 nominal sizes
Casing with acoustic and thermal insulation.
Flanges on both sides,
suitable for duct connection.
Casing air leakage to EN 15727, class B.
Complies with VDI 2083, clean room class 3, and US standard 209E, class 100.
Hygiene complies with VDI 6022, DIN 1946, part 4, as well as EN 13779 and VDI 3803.

Materials and surfaces

- Casing made of galvanised sheet steel
- 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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Order options

1 Type

TS Secondary silencer

2 Nominal size

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

Secondary silencers for VAV terminal units
Type TX



For the reduction of air-regenerated noise of air terminal units Type TVJ, TVT or EN

Rectangular secondary silencers for the reduction of air-regenerated noise of air terminal units Type TVJ, TVT or EN

- Absorption material is non-combustible mineral wool with RAL quality mark, biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Mineral wool faced with glass fibre fabric as protection against erosion due to airflow velocities up to 20 m/s
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class A

1

Type		Page
TX	General information	1.2 – 26
	Dimensions and weight	1.2 – 27
	Specification text	1.2 – 29
	Basic information and nomenclature	1.5 – 1

Description



Secondary silencer Type TX

Application
- Secondary silencer Type TX to reduce the air-regenerated noise of air terminal units
- For air terminal units TVJ and TVT, and for mechanical self-powered controllers EN

Nominal sizes
- 43 nominal sizes from 200 × 100 to 1000 × 1000

Parts and characteristics
- Casing
- Sound attenuator splitters without resonating panels

Construction features
- Absorption sound attenuator without resonating panels
- Rectangular casing
- Connection on the room end suitable for 30 mm air duct profiles
- Splitters with aerodynamically profiled frames
- Maximum splitter thickness 100 mm
- Splitter arrangement and number depends on the nominal size
- 50 % free area for all nominal sizes

Materials and surfaces
- Casing and splitter frames made of galvanised sheet steel
- Absorption material 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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Installation and commissioning
- Air duct profiles fit air terminal units TVJ and TVT, and mechanical self-powered controllers EN
- Connect the non-active section of the secondary silencer to the VAV terminal unit

Standards and guidelines
- Casing air leakage to EN 15727, class A

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

Order code

TX

TX / 600×400
1 2

1 Type
TX Secondary silencer

2 Nominal size [mm]
B × H

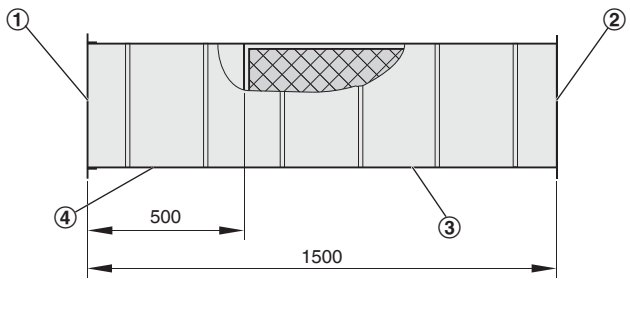
Order example

TX/600×400

Nominal size (B × H)	600 × 400 mm

Dimensions

TX



① End facing the terminal unit
② End facing the room
③ Splitter section
④ Non-active section

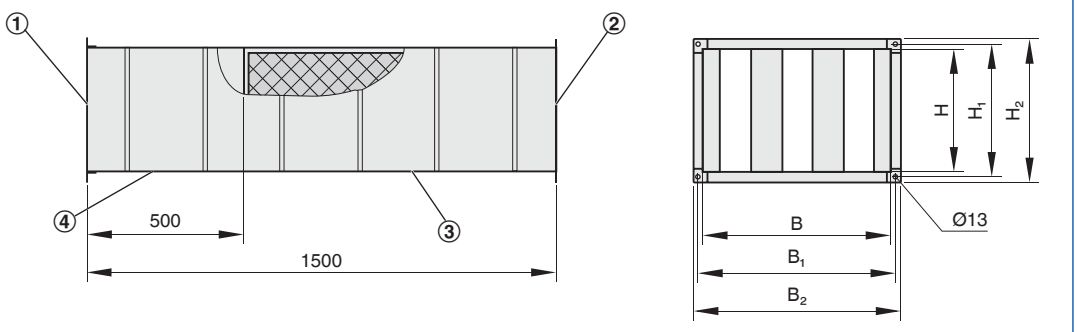
Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	235	260	135	160	10
300 × 100	300	100	335	360	135	160	12
400 × 100	400	100	435	460	135	160	15
500 × 100	500	100	535	560	135	160	17
600 × 100	600	100	635	660	135	160	20
300 × 150	300	150	335	360	185	210	15
200 × 200	200	200	235	260	235	260	16
300 × 200	300	200	335	360	235	260	20
400 × 200	400	200	435	460	235	260	25
500 × 200	500	200	535	560	235	260	29
600 × 200	600	200	635	660	235	260	34
700 × 200	700	200	735	760	235	260	39
800 × 200	800	200	835	860	235	260	44
400 × 250	400	250	435	460	285	310	27
500 × 250	500	250	535	560	285	310	30
600 × 250	600	250	635	660	285	310	36
300 × 300	300	300	335	360	335	360	24
400 × 300	400	300	435	460	335	360	29
500 × 300	500	300	535	560	335	360	34
600 × 300	600	300	635	660	335	360	40
700 × 300	700	300	735	760	335	360	45
800 × 300	800	300	835	860	335	360	50
900 × 300	900	300	935	960	335	360	55
1000 × 300	1000	300	1035	1060	335	360	60

1

Dimensions

TX



① End facing the terminal unit
② End facing the room
③ Splitter section
④ Non-active section

Dimensions [mm] and weight [kg]

Nominal size	B	H	B_1	B_2	H_1	H_2	m
	mm						kg
400 × 400	400	400	435	460	435	460	34
500 × 400	500	400	535	560	435	460	39
600 × 400	600	400	635	660	435	460	45
700 × 400	700	400	735	760	435	460	50
800 × 400	800	400	835	860	435	460	56
900 × 400	900	400	935	960	435	460	61
1000 × 400	1000	400	1035	1060	435	460	67
500 × 500	500	500	535	560	535	560	45
600 × 500	600	500	635	660	535	560	50
700 × 500	700	500	735	760	535	560	56
800 × 500	800	500	835	860	535	560	62
900 × 500	900	500	935	960	535	560	68
1000 × 500	1000	500	1035	1060	535	560	73
600 × 600	600	600	635	660	635	660	55
800 × 600	800	600	835	860	635	660	67
1000 × 600	1000	600	1035	1060	635	660	80
800 × 800	800	800	835	860	835	860	79
1000 × 800	1000	800	1035	1060	835	860	93
1000 × 1000	1000	1000	1035	1060	1035	1060	107

Description

Rectangular secondary silencers
for VAV terminal units to reduce
the air-regenerated noise,
available in 43 nominal sizes
Insertion loss at least 9 dB at 250 Hz
Splitters with aerodynamically profiled frames.
Connecting flanges on both ends,
suitable for 30 mm duct connection
Casing air leakage to EN 15727, class A.
Complies with VDI 2083, clean room class 3,
and US standard 209E, class 100.

Materials and surfaces

- Casing and splitter frames made of galvanised sheet steel
- Absorption material 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/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Order options

1 Type		2 Nominal size [mm]
TX	Secondary silencer	B × H

Secondary silencers for VAV terminal units
Type CAK



For the reduction of noise in plastic circular ducts, suitable for all circular VAV terminal units and CAV controllers, plastic construction for contaminated air

Plastic circular silencers for the reduction of noise in the circular ducts of extract air systems for aggressive media

- Absorption material is non-combustible mineral wool with RAL quality mark, biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Mineral wool faced with non-woven glass fibre as protection against erosion due to airflow velocities up to 20 m/s
- Casing and perforated inner duct are flame-resistant polypropylene (PPs) to DIN 4102, building class B1
- Variant with spigot suitable for circular ducts according to DIN 8077 or DIN 8078
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class D

Optional equipment and accessories

- With flanges on both ends

1

Type		Page
CAK	General information	1.2 – 31
	Order code	1.2 – 32
	Dimensions and weight – CAK	1.2 – 33
	Dimensions and weight – CAK/.../VF2	1.2 – 34
	Specification text	1.2 – 35
	Basic information and nomenclature	1.3 – 1

Description



Circular silencer
Type CAK

Application
- Plastic circular silencers Type CAK for the reduction of noise in the circular ducts of air conditioning systems
- Suitable for contaminated air
- For the reduction of air-regenerated noise of air terminal units TVRK and TVLK
- For the reduction of fan noise

Variants
- CAK: Circular silencer
- VF2: Circular silencer with flanges on both ends

Nominal sizes
- 125, 160, 200, 250, 315, 400 mm

Accessories
- GZ: Matching flanges for both ends

Special features
- Insertion loss measured according to ISO 7235
- Absorption material is non-combustible

Parts and characteristics
- Casing
- Perforated inner tube
- Absorption material

Konstruktionsmerkmale
- Rundes Gehäuse
- Rohrstutzen passend für runde Luftleitungen nach DIN 8077 oder DIN 8078
- Maximaler Betriebsdruck 1000 Pa
- Maximale Betriebstemperatur 100 °C

Materials and surfaces
- Casing and perforated inner duct are flame-resistant polypropylene (PPs) to DIN 4102, building class B1
- Lining is mineral wool

Mineral wool
- To EN 13501, fire rating class A2, 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/EG
- Faced with glass fibre as protection against erosion through airflow velocities up to 20 m/s
- Inert to fungal and bacterial growth

Standards and guidelines
- Insertion loss measured according to ISO 7235
- Casing air leakage to EN 15727, class D

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

Order code

CAK

CAK / 160×1000 / GZ / VF2
1 2 3 4 5

1 Type
CAK Circular silencer

2 Nominal size [mm]
125
160
200
250
315
400

3 Length [mm]
500
1000
1500

4 Matching flange
No entry: none
GZ on both ends (only VF2)

5 Type of connection
No entry: spigot
VF2 Flanges on both ends

Order example

CAK/200×1000

Nominal size	200 mm
Length	1000 mm
Type of connection	Spigot

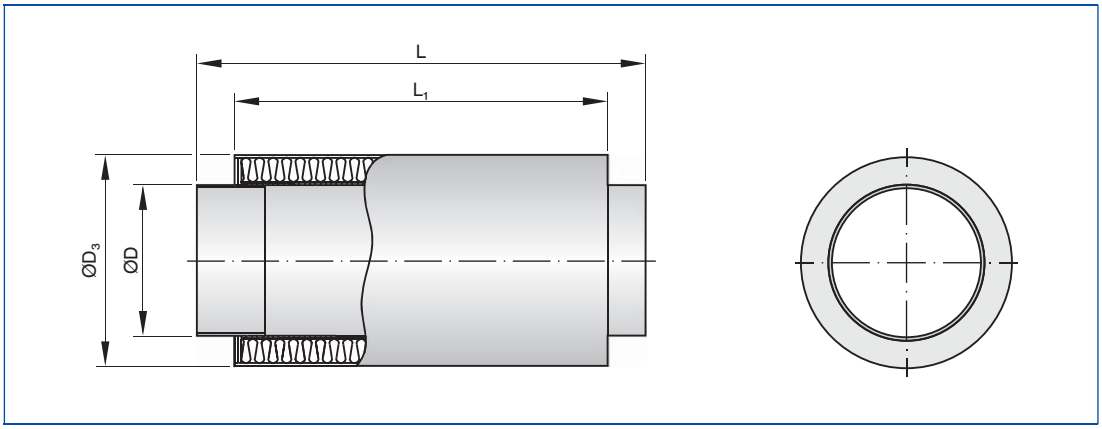
1

Application

- Circular silencer for the reduction of noise
- Spigot to make connections to the ducting

Dimensions

CAK



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	ØD	$ØD_3$
	mm	
125	125	225
160	160	250
200	200	280
250	250	355
315	315	415
400	400	500

Dimensions

Nominal length	L	L_1
	mm	
500	595	495
1000	1095	995
1500	1595	1495

The table shows the weight for each nominal size and length

Weight

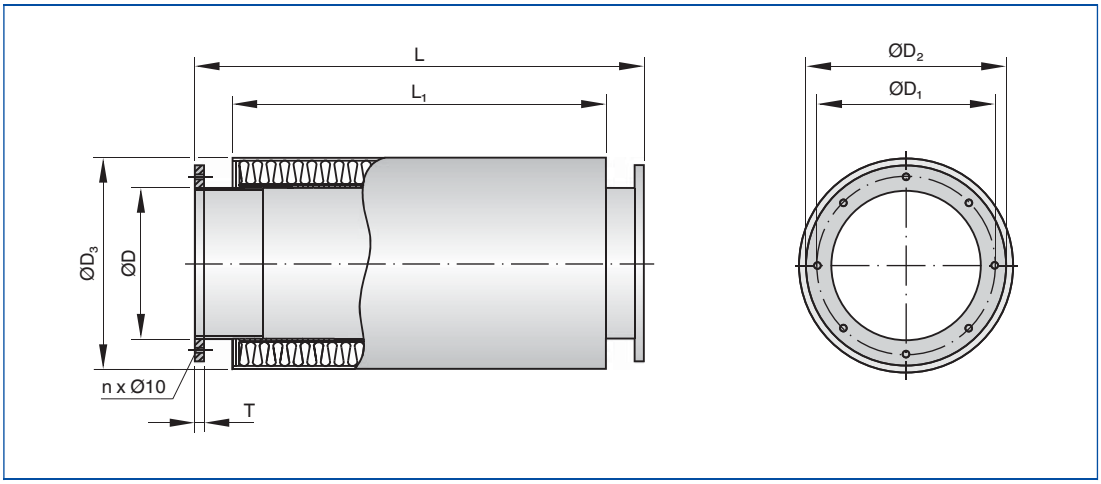
Nominal size	500	1000	1500
	m		
	kg		
125	2.2	4.1	5.9
160	2.6	4.7	6.8
200	3.2	5.8	8.5
250	4.3	7.6	10.9
315	4.6	8.6	12.5
400	5.2	9.3	13.4

Application

- Circular silencer for the reduction of noise
- With flanges to make detachable connections to the ductwork

Dimensions

CAK/.../VF2



For more technical data see the Multileaf Dampers, Sound Attenuators, External Weather Louvres catalogue, chapter K3 – 6.3.

Dimensions

Nominal size	ØD	ØD3	ØD1	ØD2	n	T
	mm					mm
125	125	225	165	185	8	8
160	160	250	200	230	8	8
200	200	280	240	270	8	8
250	250	355	290	320	12	8
315	315	415	350	395	12	10
400	400	500	445	475	16	10

Dimensions

Nominal length	L	L1
	mm	
500	595	495
1000	1095	995
1500	1595	1495

The table shows the weight for each nominal size and length

Weight

Nominal size	500	1000	1500
	m		
	kg		
125	2.5	4.4	6.2
160	3.0	5.1	7.2
200	3.6	6.2	8.9
250	4.9	8.2	11.5
315	5.3	9.3	13.7
400	6.8	10.9	15.0

1

Standard text

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

Plastic circular silencers for use in extract air systems subject to aggressive media; they reduce the air-regenerated noise in plastic ducts (absorption principle). Insertion loss measured according to ISO 7235. Absorption material is mineral wool with RAL quality mark RAL-GZ 388. Spigot, suitable for ducts according to DIN 8077. Casing air leakage to EN 15727, class D.

Special features

- Insertion loss measured according to ISO 7235
- Absorption material is non-combustible

Materials and surfaces

- Casing and perforated inner duct are flame-resistant polypropylene (PPs) to DIN 4102, building class B1
- Lining is mineral wool

Mineral wool

- To EN 13501, fire rating class A2, 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/EG
- Faced with glass fibre as protection against erosion through airflow velocities up to 20 m/s
- Inert to fungal and bacterial growth

Order options

1 Type
CAK Circular silencer

2 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

3 Length [mm]
☐ **500**
☐ **1000**
☐ **1500**

4 Matching flange
No entry: none
☐ **GZ** on both ends (only VF2)

5 Type of connection
No entry: spigot
☐ **VF2** Flanges on both ends

Control components for VAV terminal units

Type Easy



Quick and easy handling

Control components for VAV terminal units,
to be mounted on the terminal unit for easy operation

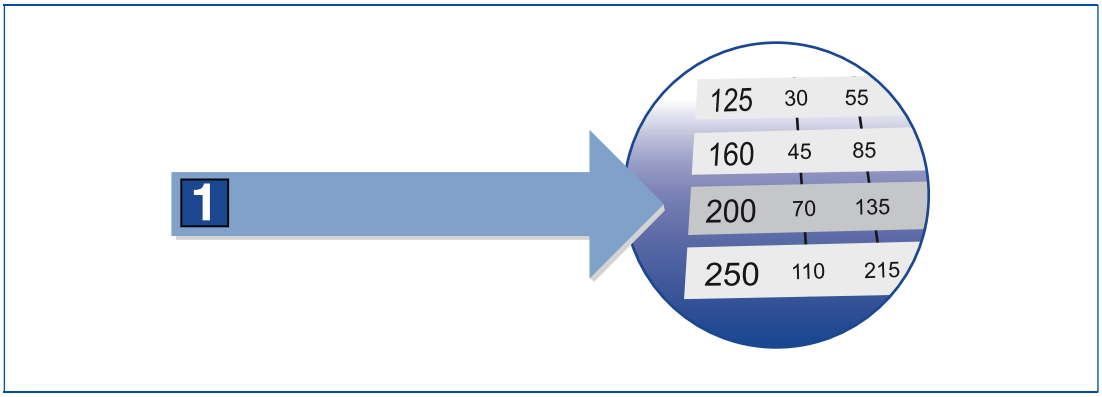
- Simplified ordering and on-site assignment to rooms as selection is based on the nominal size of the duct
- Rapid volume flow rate setting without additional device
- Indicator light simplifies functional checking
- Proven technology of the Compact volume flow controllers
- Suitable for constant and variable volume flows as well as for $\dot{V}_{min}$ / $\dot{V}_{max}$ switching

1

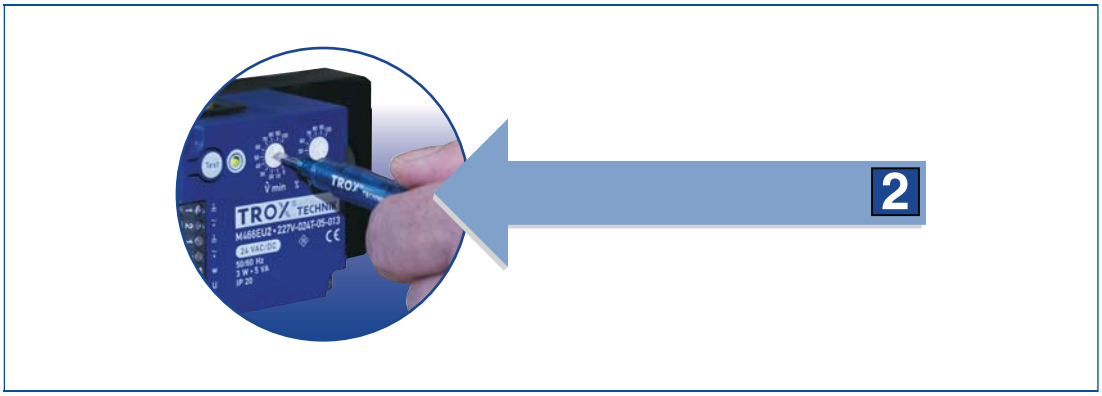
Type		Page
Easy	General information	1.3 – 2
	Wiring and commissioning	1.3 – 6
	Basic information and nomenclature	1.5 – 1

The Easy principle

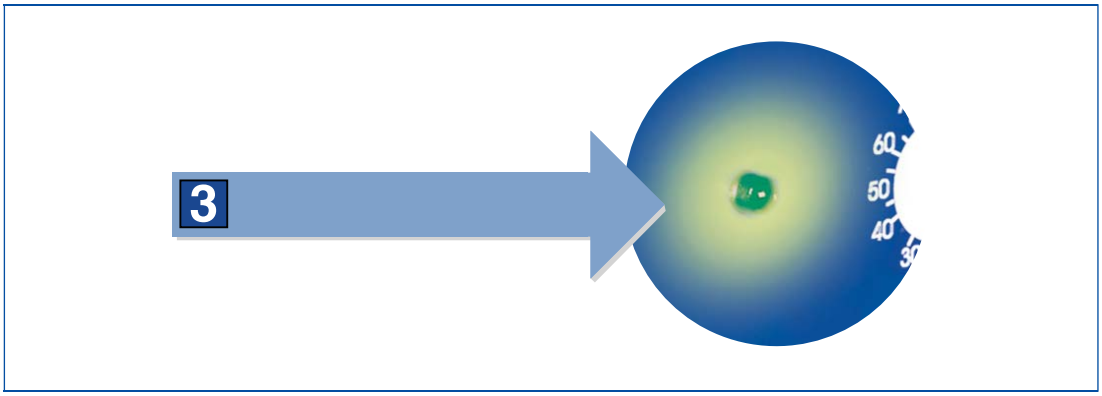
Select nominal size



Set flow rates



Green light: Ready!



Description



Easyregler LMV-D3A

Example

Application

- Electronic volume flow controllers of Type Easy are compact, all-in-one control devices for VAV terminal units
- Dynamic differential pressure transducer, electronic controller, and actuator are fitted together in one casing
- Suitable for different control tasks depending on how the input for the setpoint value signal is used
- The output signals of the room temperature controller, central BMS, air quality controller or similar units control the volume flow rate setpoint
- Override control by means of switches or relays
- Volume flow rate actual value is available as linear voltage signal

Standard filtration in comfort air conditioning systems allows for use of the controller in the supply air without additional dust protection. Since a partial volume flow is passed through the transducer in order to measure the volume flow rate, please note:

- With heavy dust levels in the room, suitable extract air filters must be provided.
- If the air is polluted with fluff or sticky particles, or if it contains aggressive media, Easy controllers cannot be used

Signal voltage range

- 0 – 10 V DC

Operating modes

Variable volume flow

- $\dot{V}_{min}$: minimum volume flow rate
- $\dot{V}_{max}$: maximum volume flow rate

Constant value

- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Commissioning

- Use the potentiometer to set the minimum or maximum volume flow rate (by others)
- Take the adjustment value from the volume flow rate scale (sticker on each VAV terminal unit)
- Comply with the volume flow rate control range, do not set a volume flow rate which is below the minimum flow rate
- Once the VAV terminal unit has been installed and wired, and the volume flow rate has been set, the unit is ready for operation
- Remove the transparent cover of the Easy controller only temporarily for wiring and commissioning

Easy controllers for VAV terminal units

Part number	Type	Type of VAV terminal unit
M466EU1	LMV-D3AL-F	LVC
M466EU2	227V-024T-05-013	LVC
M466ES1	LMV-D3A-F	TVR
M466DC3	227V-024T-05-002	TVR
M466ES3	SMV-D3A	TVJ, TVT
M466ES2	LMV-D3A	TZ-Silenzio, TA-Silenzio, TVZ, TVA

1

Function

Functional description

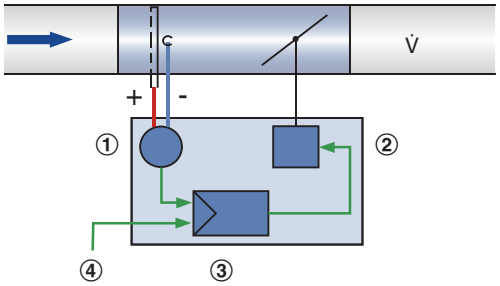
The volume flow rate is determined by measuring the differential pressure (effective pressure). For this purpose the VAV terminal unit is fitted with a differential pressure sensor.
The integral differential pressure transducer transforms the effective pressure into a voltage signal. The volume flow rate actual value is hence available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal volume flow rate ($\dot{V}_{nom}$).
The volume flow rate setpoint value comes from a higher-level controller (e.g. room temperature controller, air quality controller, central BMS) or from switch contacts. Variable volume flow control results in a value between $\dot{V}_{min}$ and $\dot{V}_{max}$.
It is possible to override the room temperature control, e.g. by a complete shut-off of the duct.

The controller compares the volume flow rate setpoint value to the actual value and controls the integral actuator accordingly.
The volume flow rate parameters $\dot{V}_{min}$ and $\dot{V}_{max}$ can be set on potentiometers.

Volume flow control

- The volume flow controller works independent of the duct pressure
- Differential pressure fluctuations do not result in permanent volume flow rate changes
- To prevent the control from becoming unstable, a dead band is allowed within which the damper blade does not move.
- The factory set volume flow rate parameters can be altered by the customer

Principle of operation – Easy and Compact controllers



① Differential pressure transducer
② Actuator
③ Volume flow controller
④ Setpoint value signal

Easy controller

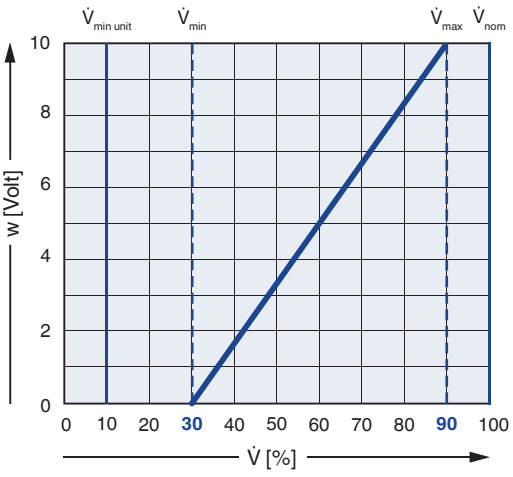


① Easy controller
② $\dot{V}_{max}$ - Potentiometer
③ $\dot{V}_{min}$ - Potentiometer
④ Indicator light
⑤ Service button
⑥ Connections for effective pressure sensor
⑦ Protective cover
⑧ Shaft clamp

Illustration shows LMV-D3A-F

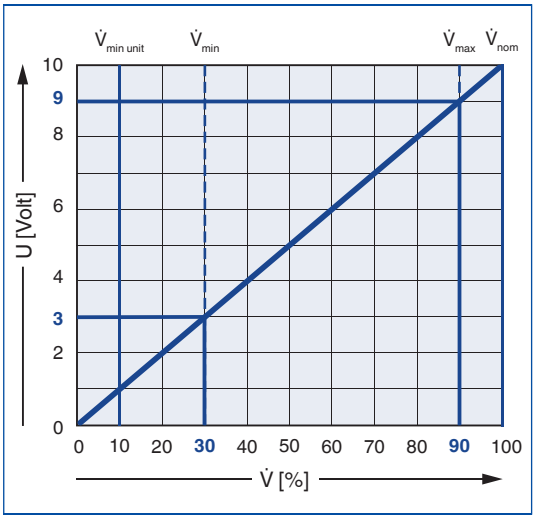
Characteristics

Characteristic of the setpoint value signal



$$\dot{V}_{Soll} = \frac{w}{10} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$$

Characteristic of the actual value signal



$$\dot{V}_{Ist} = \frac{U}{10} \dot{V}_{Nenn}$$

Technical data



Easy controller LMV-D3AL-F

Easy controller LMV-D3AL-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	3.5 VA max.
Power rating (DC)	2 W max.
Running time for 90°	120 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 20
EC conformity	EMC to 2004/108/EC, low voltage to 2006/95/EC



Easy controller 227V-024T-05-013

Easy controller 227V-024T-05-013

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	5 VA max.
Power rating (DC)	3 W max.
Running time for 90°	100 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 20
EC conformity	EMC according to 2004/108/EC



Easy controller LMV-D3A-F

Easy controller LMV-D3A und LMV-D3A-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	5 VA max.
Power rating (DC)	2.5 W max.
Running time for 90°	110 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 20
EC conformity	EMC according to 2004/108/EC



Easy controller 227V-024T-05-002

Easy controller 227V-024T-05-002

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	5 VA max.
Power rating (DC)	3 W max.
Running time for 90°	100 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 20
EC conformity	EMC according to 2004/108/EC



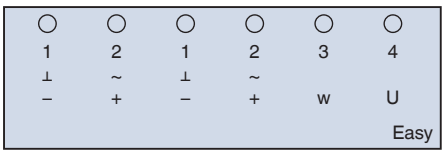
Easy controller SMV-D3A

Easy controller SMV-D3A

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	6 VA max.
Power rating (DC)	3 W max.
Running time for 90°	110 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 20
EC conformity	EMC according to 2004/108/EC

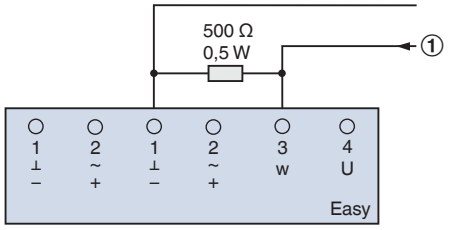
Electrical connection

Terminal connections



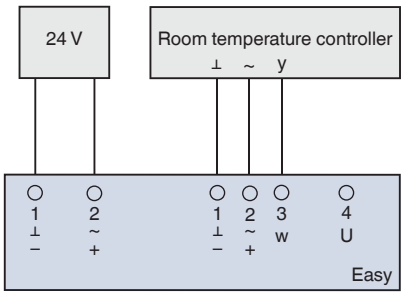
1 ⊥, –: Ground
2 ~, +: Supply voltage 24 V
3 w: Setpoint value signal 0 – 10 V DC
4 U: Actual value signal 0 – 10 V DC

Setpoint value signal 0 – 20 mA



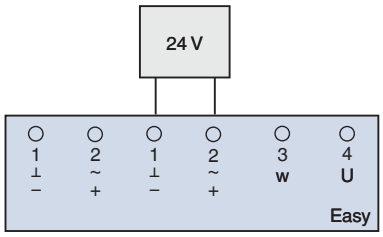
① Setpoint value signal 0 – 20 mA

Variable volume flow control



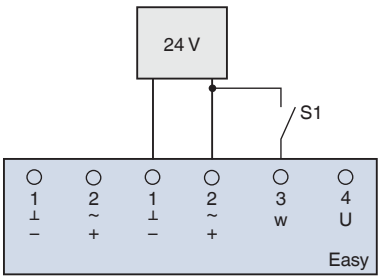
The supply voltage and the remote room temperature controller must be connected as shown.

Constant volume flow control



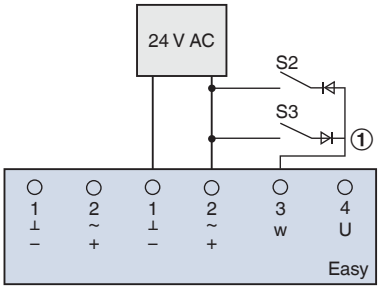
As soon as the 24 V supply voltage is applied, the controller runs the set $\dot{V}_{min}$ value as a constant volume flow rate.

$\dot{V}_{min}/\dot{V}_{max}$ switching for one controller



Switch S1 enables switching between the two constant volume flow rates $\dot{V}_{min}$ and $\dot{V}_{max}$.

Override control OPEN/CLOSED

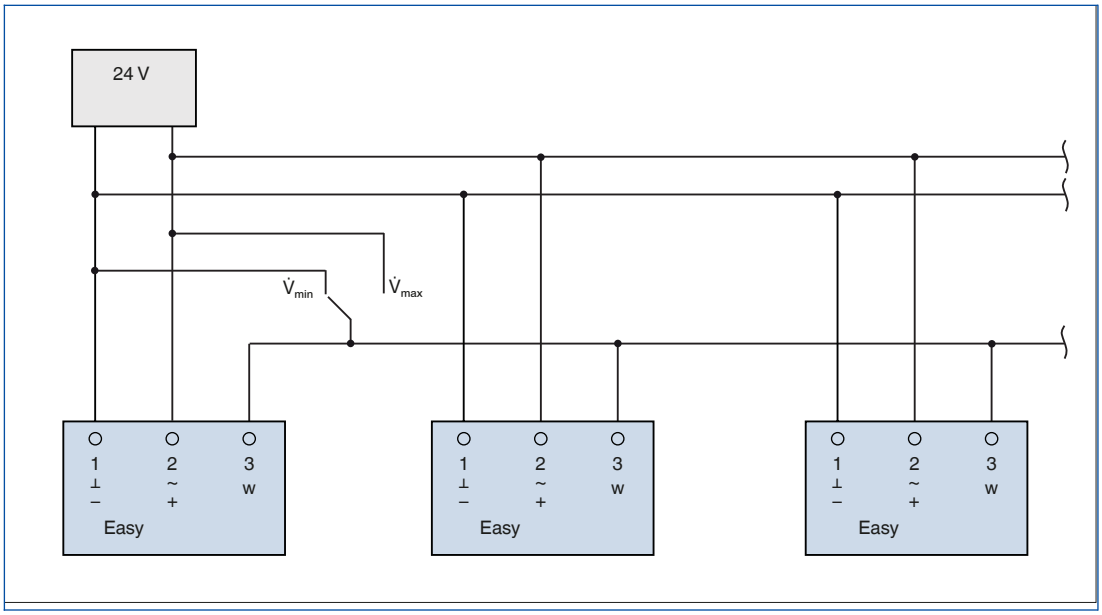


① Diode 1N 4007

External switches (volt-free contacts) can be used to OPEN or CLOSE the damper blade, thereby overriding other control settings (only for AC voltage).
Switch S2 closed:.....Damper blade CLOSED
Switch S3 closed:..... Damper blade OPEN
All override controls can be combined both with each other and with the different switching options.

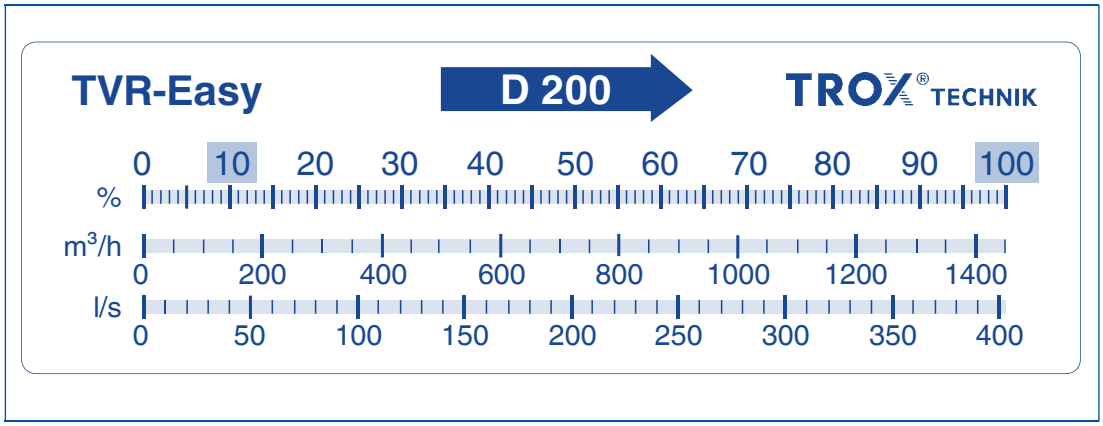
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Easy controllers connected in parallel



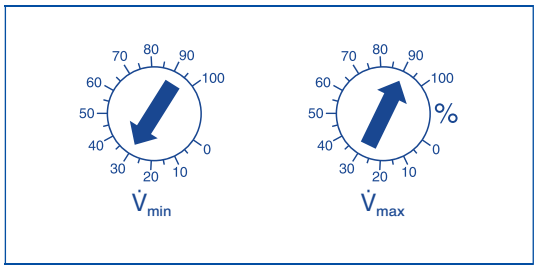
Commissioning

Volume flow rate scale for TVR-Easy



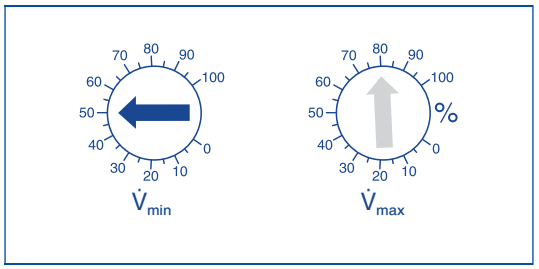
Each VAV terminal unit with Easy controller carries a sticker with a volume flow rate scale to determine the setting values at the customer's site (see example: TVR Easy, nominal size 200).
The percentages refer to the control range that can be used.

Variable volume flow control



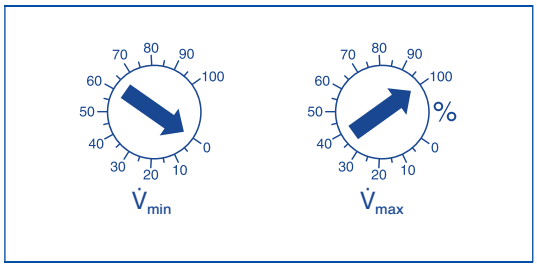
The required volume flow rates must be set by others. If $\dot{V}_{min}$ is set higher than $\dot{V}_{max}$, $\dot{V}_{min}$ is provided as a constant volume flow rate even if a setpoint value signal is transmitted.

Constant volume flow control



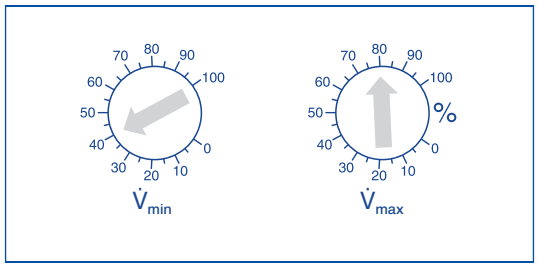
The constant volume flow rate is set using the $\dot{V}_{min}$ potentiometer. The setting of the $\dot{V}_{max}$ potentiometer is in this case irrelevant.

Control input signal from the central BMS



To have the central BMS determine the volume flow rate, the $\dot{V}_{min}$ potentiometer must be set to 0 % and the $\dot{V}_{max}$ potentiometer to 100 %. If the setpoint value signal falls below 0.1 V DC, the damper blade closes (shut-off). Since the setpoint signal may or may not fall below 0.1 V DC, override control is recommended for shut-off.

Factory setting



Units are delivered with settings $\dot{V}_{min}$ = 40 % and $\dot{V}_{max}$ = 80 %.

Control components for VAV terminal units

Type Compact



With service interface and bus communication facility

Compact device for use with VAV terminal units

- Controller, differential pressure transducer, and actuator are fitted together in one casing
- Volume flow rates $\dot{V}_{min}$ and $\dot{V}_{max}$ are factory set as parameters
- Ideal for carrying out service from the switch cabinet or control panel
- Change of parameters using adjustment devices
- Suitable for constant and variable volume flows as well as for $\dot{V}_{min}$ / $\dot{V}_{max}$ switching
- Bus communication is possible due to MP bus or LonWorks interfaces

1

Type		Page
Compact	General information	1.3 – 10
	Special information – BC0, BF0	1.3 – 12
	Special information – BL0	1.3 – 18
	Special information – XB0, XG0	1.3 – 21
	Special information – LN0, LY0	1.3 – 26
	Basic information and nomenclature	1.5 – 1

Description



Compact controller
LMV-D3-MP-F

Example

Application

- Electronic volume flow controllers of Type Compact are compact, all-in-one control devices for VAV terminal units
- Dynamic differential pressure transducer, electronic controller, and actuator are fitted together in one casing
- Suitable for different control tasks depending on how the input for the setpoint value signal is used
- The output signals of the room temperature controller, central BMS, air quality controller or similar units control the volume flow rate setpoint
- Override control by means of switches or relays
- Volume flow rate actual value is available as linear voltage signal
- Controller parameters are factory set

Standard filtration in comfort air conditioning systems allows for use of the controller in the supply air without additional dust protection. Since a partial volume flow is passed through the transducer in order to measure the volume flow rate, please note:

- With heavy dust levels in the room, suitable extract air filters must be provided.
- If the air is polluted with fluff or sticky particles or contains aggressive media, Compact controllers cannot be used

Commissioning

- On-site adjusting is not required
- Integration of voltage signals into the central BMS
- If data transmission via bus interfaces is required, a system integrator should be involved in commissioning

Any attachments must be defined with the order code of the VAV terminal unit.

Compact controllers for VAV terminal units

Order code detail	Part number	Type	Type of VAV terminal unit
BC0	M466BA0	LMV-D3L-MP-F	①
BC0	A00000043141	LMV-D3-MP-F	②
BC0	A00000043140	LMV-D3-MP	④
BC0	A00000043142	NMV-D3-MP	③
BF0	A00000043140	LMV-D3-MP	⑤
BL0	M466ES7	LMV-D3LON	② ④
BL0	M466ES8	NMV-D3LON	③
XB0	M466DC1	227V-024-10	② ③ ④
XG0	M466DC1	227V-024-10	⑤
LN0	M466EG7	GLB181.1E/3	② ③ ④
LY0	M466EG7	GLB181.1E/3	⑤

① LVC
② TVR
③ TVJ, TVT
④ TZ-Silenzio, TA-Silenzio, TVZ, TVA
⑤ TVM

Function

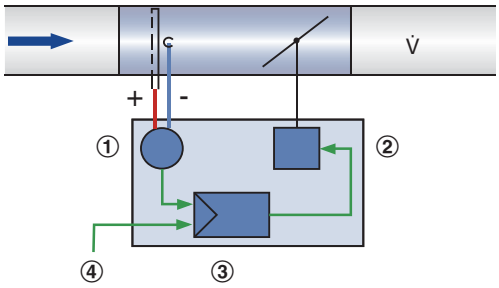
Functional description

The volume flow rate is determined by measuring the differential pressure (effective pressure). For this purpose the VAV terminal unit is fitted with a differential pressure sensor.
The integral differential pressure transducer transforms the effective pressure into a voltage signal. The volume flow rate actual value is hence available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal volume flow rate ($\dot{V}_{nom}$).
The volume flow rate setpoint value comes from a higher-level controller (e.g. room temperature controller, air quality controller, central BMS) or from switch contacts. Variable volume flow control results in a value between $\dot{V}_{min}$ and $\dot{V}_{max}$.
It is possible to override the room temperature control, e.g. by a complete shut-off of the duct.
The controller compares the volume flow rate setpoint value to the actual value and controls the integral actuator accordingly.
Volume flow rate parameters and voltage ranges are factory stored in the controller. Changes on the customer's site can easily be carried out using an adjustment device, a notebook with service tool, or a bus interface.

Volume flow control

- The volume flow controller works independent of the duct pressure
- Differential pressure fluctuations do not result in permanent volume flow rate changes
- To prevent the control from becoming unstable, a dead band is allowed within which the damper blade does not move.

Principle of operation – Easy and Compact controllers



① Differential pressure transducer
② Actuator
③ Volume flow controller
④ Setpoint value signal

1

Description

... / **BC0** / ...

Order code detail

... / **BF0** / ...

Order code detail

For detailed information on adjustment devices see chapter K5 – 1.4

Application

- Electronic volume flow controller LMV-D3L-MP-F, LMV-D3-MP, LMV-D3-MP-F or NMV-D3-MP as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC
- MP bus interface: Up to eight users can be addressed on an MP bus (LAN). This allows for the integration with higher-level systems (LonWorks, EIB-Konex, Modbus RTU and BACnet); as an alternative, a DDC controller with MP bus interface can control the Compact controller.
- Controller with NFC technology, i.e. settings and operating values can be read out using a smartphone app

Construction

- BC0: LMV-D3L-MP-F für LVC
- BC0: LMV-D3-MP-F for TVR
- BC0: NMV-D3-MP for TVJ, TVT
- BC0: LMV-D3-MP for TZ-Silenzio, TA-Silenzio, TVZ, TVA
- BF0: LMV-D3-MP for TVM

Useful additions

- AT-VAV-B: Adjustment device

Signal voltage range

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.1 V DC)

Operating modes

E: Single and M: Master
- $\dot{V}_{min}$: minimum volume flow rate
- $\dot{V}_{max}$: maximum volume flow rate

S: Slave
- $\dot{V}_{min}$: 0 %
- $\dot{V}_{max}$: Volume flow rate ratio to the master controller

F: Constant value
- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use on the analog interface
- If the MP bus interface is used, additional commissioning steps are required

Technical data

Compact controller LMV-D3L-MP-F



Compact controller LMV-D3L-MP-F

Supply voltage (AC	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	3.5 VA max.
Power rating (DC)	2 W max.
Torque	5 Nm
Running time for 90°	120 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC to 2004/108/EC, low voltage to 2006/95/EC
Weight	0.5 kg



Compact controller
LMV-D3-MP-F

Compact controller LMV-D3-MP und LMV-D3-MP-F

Supply voltage (AC	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	4 VA max.
Power rating (DC)	2 W max.
Torque	5 Nm
Running time for 90°	110 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.5 kg



Compact controller
NMV-D3-MP

Compact controller NMV-D3-MP

Supply voltage (AC	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	5.5 VA max.
Power rating (DC)	3 W max.
Torque	10 Nm
Running time for 90°	110 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.7 kg

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Function

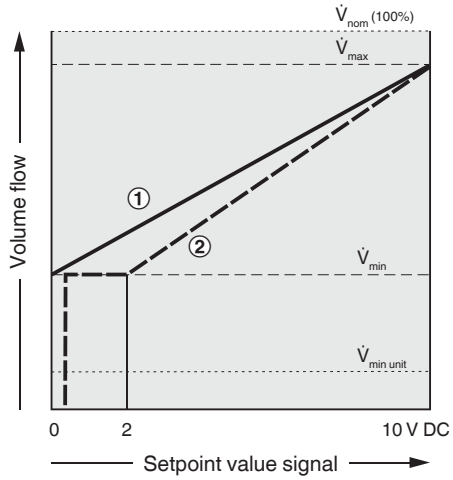
VAV-Compact



① VAV-Compact
② Gear release button
③ Connections for differential pressure sensor
④ Service socket
⑤ Blade shaft clamp
⑥ Rotation stop
⑦ Indicator lights
⑧ Connecting cable

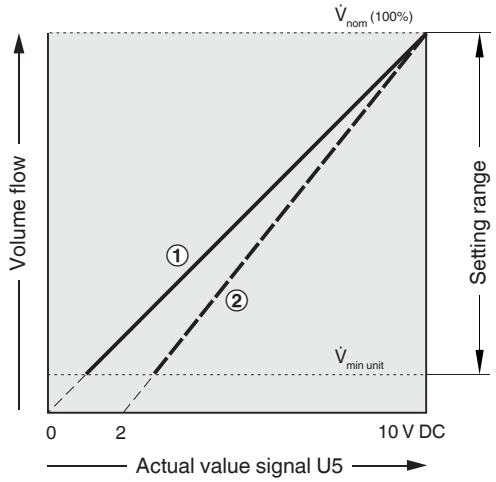
Characteristics

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC
$\dot{V}_{setpoint} = \frac{w}{10} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$

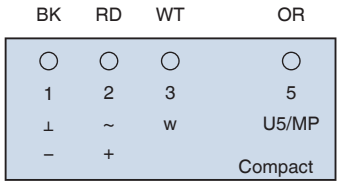
0 – 10 V DC
$\dot{V}_{actual} = \frac{U5}{10} \dot{V}_{nom}$

2 – 10 V DC
$\dot{V}_{setpoint} = \frac{w - 2}{8} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$

2 – 10 V DC
$\dot{V}_{actual} = \frac{U5 - 2}{8} \dot{V}_{nom}$

Electrical connection

Connecting cable core identification



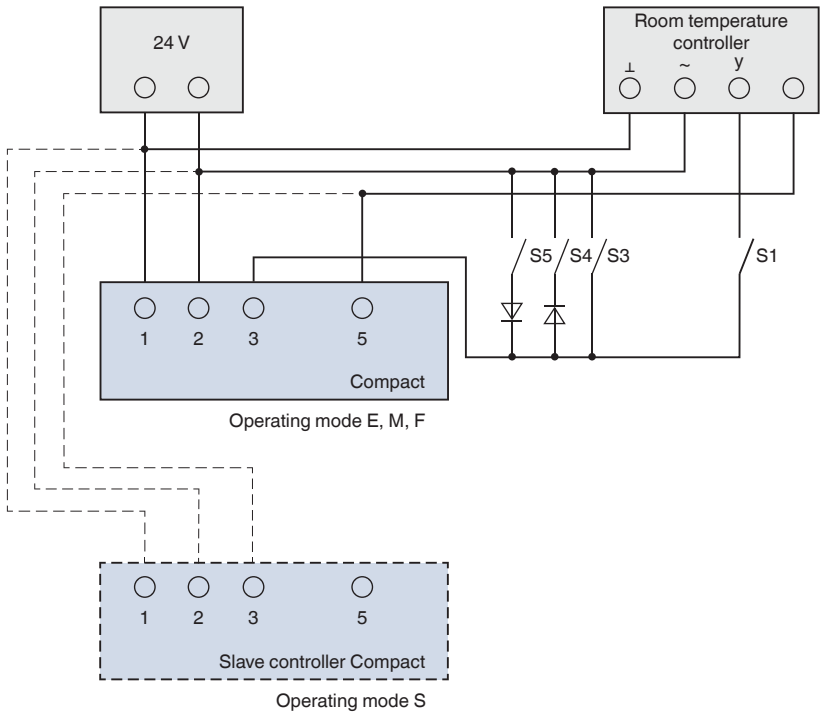
1 ⊥, –: Ground, neutral
2 ~, +: Supply voltage
3 w: Setpoint value signal and override control
5 U5/MP: Actual value signal and communication

Compact: LMV-D3-MP, LMV-D3-MP-F,
NMV-D3-MP, LMV-D3L-MP-F

... / **BC0** / ...

Order code detail

Variable volume flow control and override control, voltage signal 0 to 10 V DC



Switch functions
S1 Room temperature control
S3 Maximum volume flow rate $\dot{V}_{max}$
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC)
All OPEN: Minimum volume flow rate $\dot{V}_{min}$

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

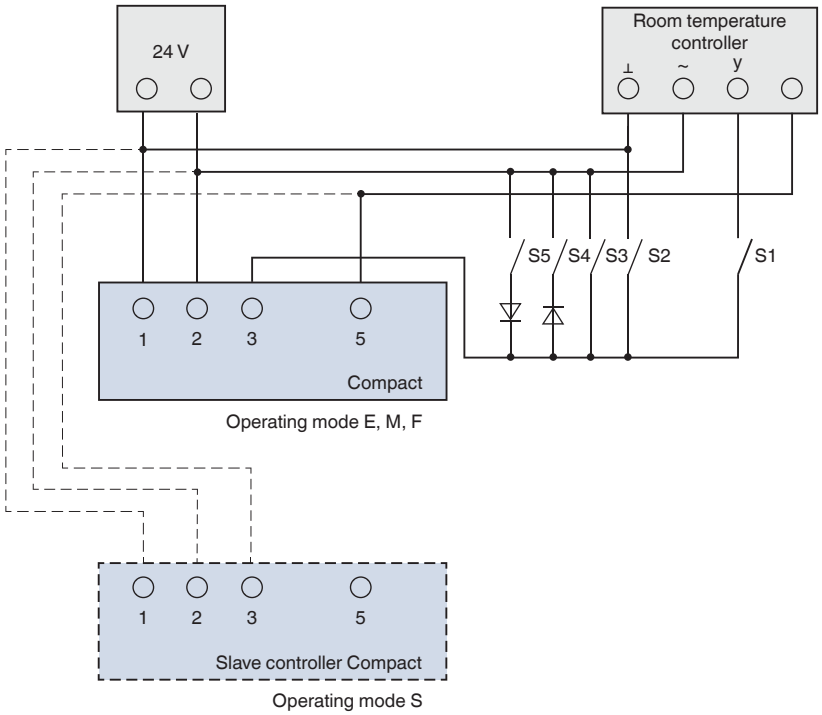
Compact: LMV-D3-MP, LMV-D3-MP-F, NMV-D3-MP, LMV-D3L-MP-F

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… / **BC0** / …

Order code detail

Variable volume flow control and override control, voltage signal 2 to 10 V DC



Switch functions
S1 Room temperature control
S2 Shut-off CLOSED
S3 Maximum volume flow rate $\dot{V}_{max}$
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC)
All OPEN: Minimum volume flow rate $\dot{V}_{min}$

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

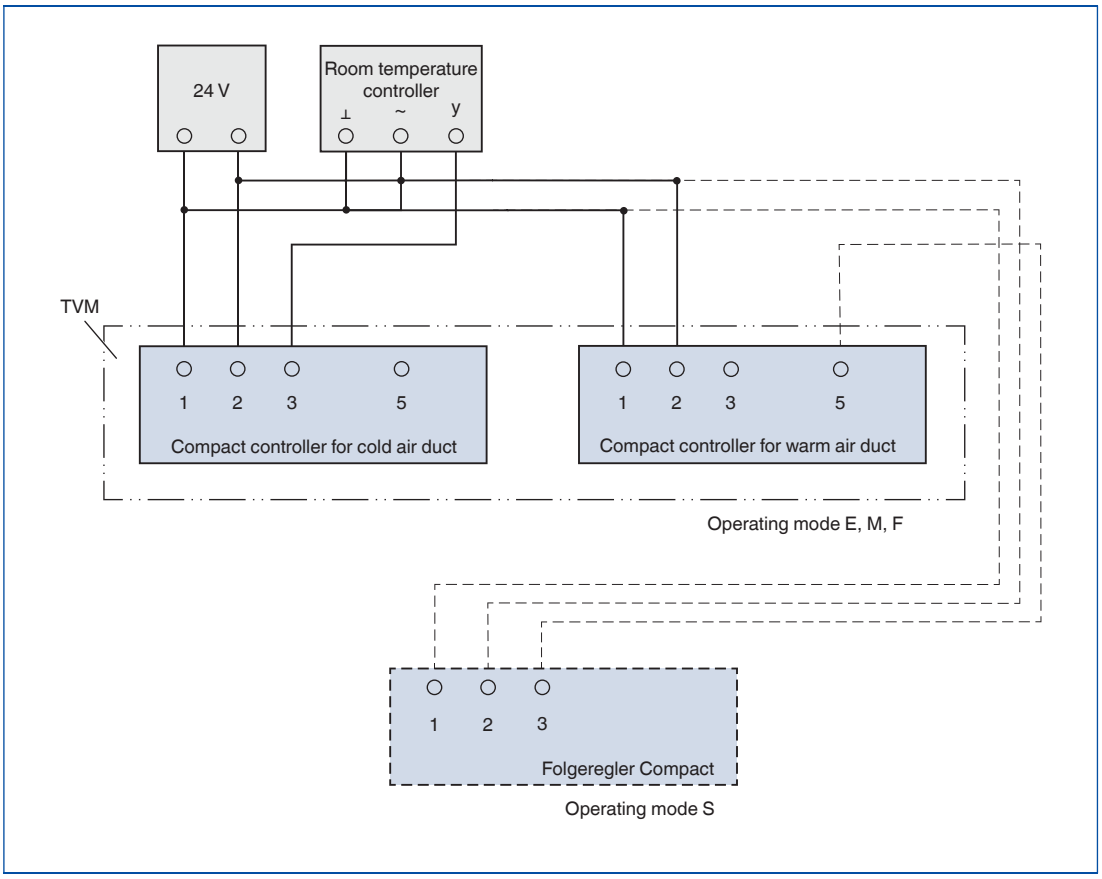
Compact: LMV-D3-MP, LMV-D3-MP-F, NMV-D3-MP, LMV-D3L-MP-F

1

... / **BF0** / ...

Order code detail

Dual duct terminal units Type TVM



Compact: LMV-D3-MP, LMV-D3-MP-F, NMV-D3-MP, LMV-D3L-MP-F

1

Description

... / **BL0**

Order code detail

For detailed information on adjustment devices see chapter K5 – 1.4

Application

- Electronic volume flow controller LMV-D3LON or NMV-D3LON as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual value signal 2 – 10 V DC
- Volume flow controller with LonMark certification
- LonWorks interfaces for the transmission of standard network variables
- Functional profiles: Node-Object #0, Damper-Actuator-Object #8110, Open-Loop-Sensor-Object #1 and Thermostat-Object #8060
- The Thermostat-Object #8060 enables individual room control
- A plug-in for all LNS-based network integration tools (LNS version 3.3 and higher) is available for configuration

Construction

- BL0: LMV-D3LON for TVR, TZ-Silenzio, TA-Silenzio, TVZ, TVA
- BL0: NMV-D3LON for TVJ, TVT

Useful additions

- AT-VAV-B: Adjustment device

Signal voltage range

Actual value signal

- 2: 2 – 10 V DC

Commissioning

- A trained LonWorks systems integrator must carry out the integration into the overall system

Technical data



Compact controller LMV-D3LON

Compact controller LMV-D3LON

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	4.5 VA max.
Power rating (DC)	2.5 W max.
Torque	5 Nm
Running time for 90°	110 – 150 s
Communication	LonWorks-Transceiver FTT-10A, free topology, twisted pair
Actual value signal output	2 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.5 kg



Compact controller
NMV-D3LON

Compact controller NMV-D3LON

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	6 VA max.
Power rating (DC)	3,5 W max.
Torque	10 Nm
Running time for 90°	110 – 150 s
Communication	LonWorks-Transceiver FTT-10A, free topology, twisted pair
Actual value signal output	2 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.7 kg

Function

VAV-Compact

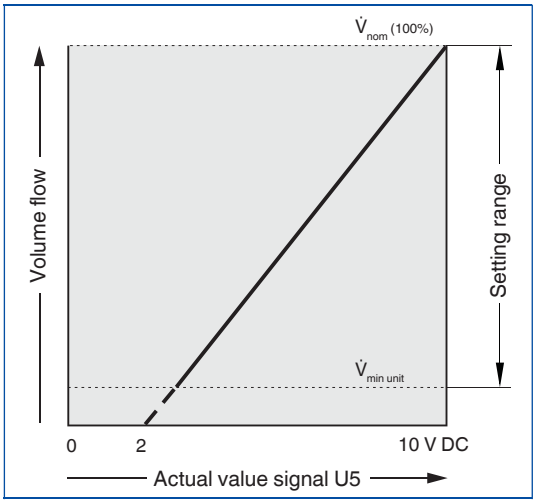


① VAV-Compact
② Gear release button
③ Connections for differential pressure sensor
④ Service socket
⑤ Blade shaft clamp
⑥ Rotation stop
⑦ Indicator lights and LonWorks service button
⑧ Connecting cable

1

Characteristics

Characteristic of the actual value signal

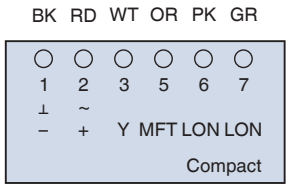


2 – 10 V DC

$$\dot{V}_{actual} = \frac{U5 - 2}{8}\ \dot{V}_{nom}$$

Electrical connection

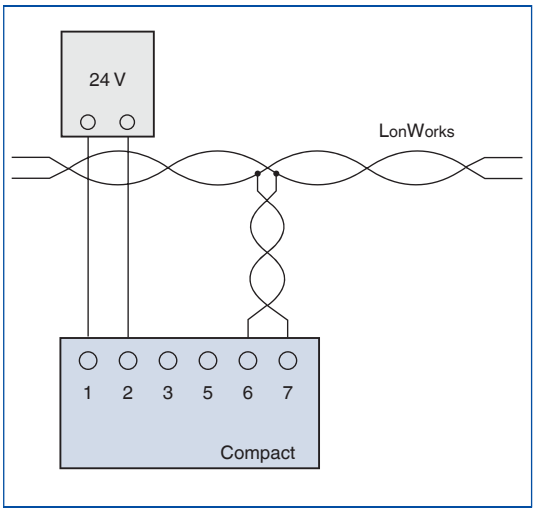
Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Supply voltage
3 Y: Connection of external sensor or switch
5 MFT: Actual value signal and communication
6, 7 LON: LonWorks

Compact: LMV-D3LON, NMV-D3LON

Volume flow control



Compact: LMV-D3LON, NMV-D3LON

1

Description

... / **XB0** / ...

Order code detail

... / **XG0** / ...

Order code detail

For detailed information on adjustment devices see chapter K5 – 1.4

Application

- Electronic volume flow controller 227V-024-10 as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC

Construction

- XB0: 227V-024-10 for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA
- BG0: 227V-024-10 for TVM

Useful additions

- AT-VAV-G: Adjustment device

Signal voltage range

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.8 V DC)

Operating modes

E: Single and M: Master
- $\dot{V}_{min}$: Minimum volume flow rate
- $\dot{V}_{max}$: Maximum volume flow rate

S: Slave operation
- $\dot{V}_{min}$: 0 %
- $\dot{V}_{max}$: Volume flow rate ratio to the master controller

F: Constant value
- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use

Technical data



Compact controller 227V-024-10

Compact controller 227V-024-10

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ±20 %
Power rating (AC)	5.5 VA max.
Power rating (DC)	3 W max.
Torque	10 Nm
Running time for 90°	100 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC
Weight	0.570 kg

Function

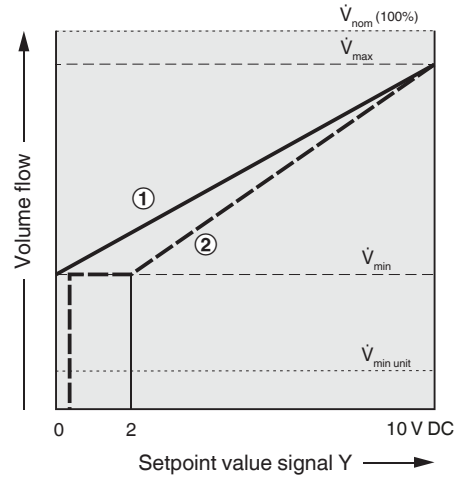
VAV-Compact



① VAV-Compact
② Connections for differential pressure sensor
③ Gear release button
④ Service socket
⑤ Connecting cable

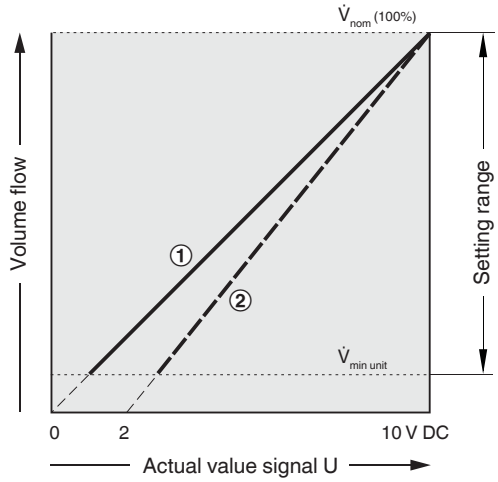
Characteristics

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC
$\dot{V}_{setpoint} = \frac{Y}{10} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$

0 – 10 V DC
$\dot{V}_{actual} = \frac{U}{10} \dot{V}_{nom}$

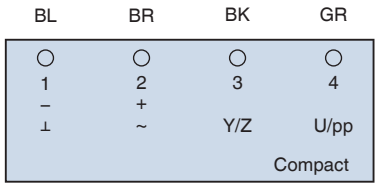
2 – 10 V DC
$\dot{V}_{setpoint} = \frac{Y - 2}{8} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$

2 – 10 V DC
$\dot{V}_{actual} = \frac{U - 2}{8} \dot{V}_{nom}$

1

Electrical connection

Connecting cable core identification



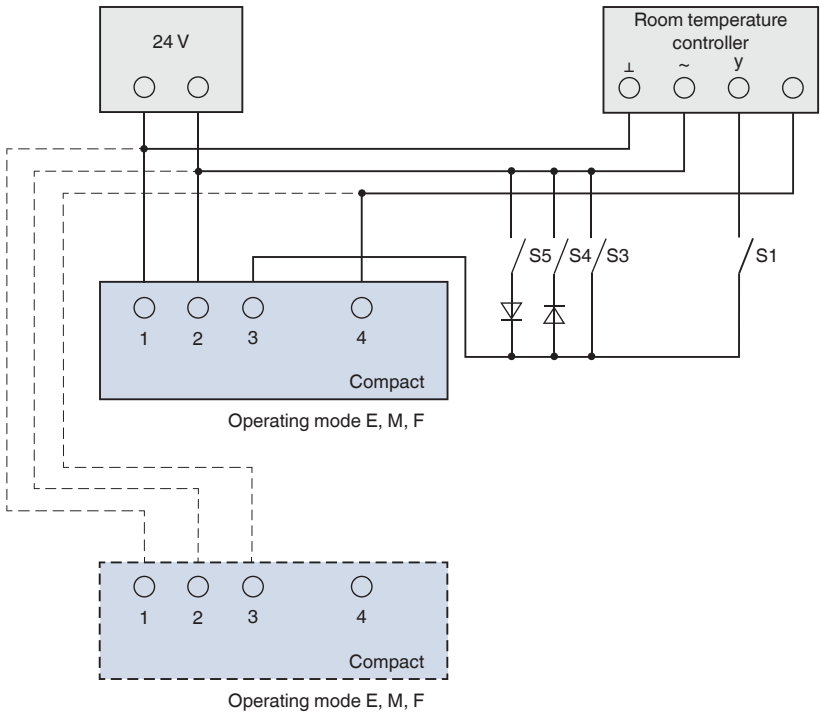
1 ⊥, –: Ground, neutral
2 ~, +: Supply voltage
3 Y/Z: Setpoint value signal and override control
4 U/pp: Actual value signal and communication

Compact: 227V-024-10

... / **XB0** / ...

Order code detail

Variable volume flow control and override control, voltage signal 0 to 10 V DC



Switch functions
All OPEN: Minimum volume flow rate $\dot{V}_{min}$
S1 Room temperature control
S3 Maximum volume flow rate $\dot{V}_{max}$
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC)

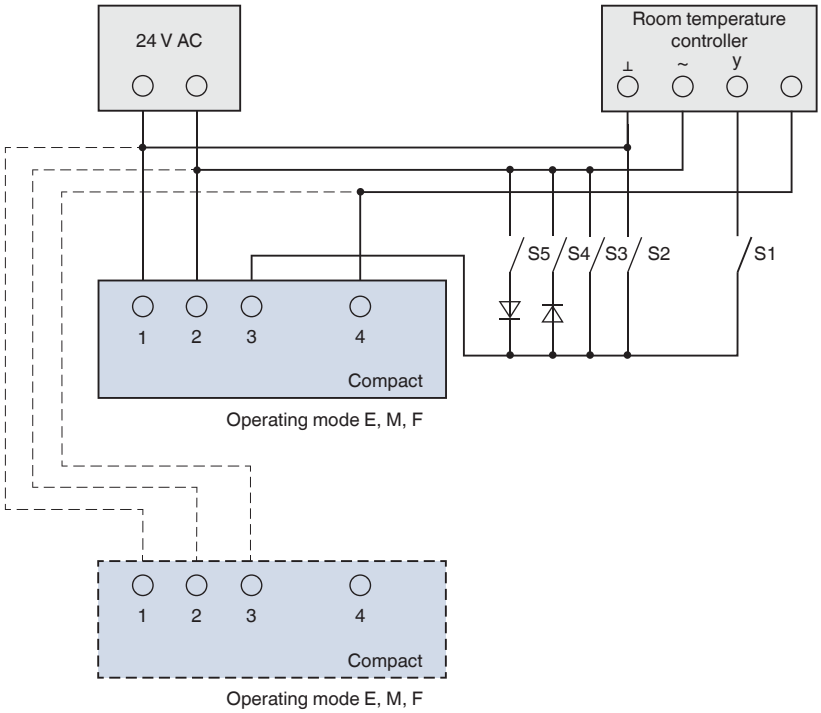
When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Compact: 227V-024-10

... / **XB0** / ...

Order code detail

Variable volume flow control and override control, voltage signal 2 to 10 V DC



Switch functions
S1 Room temperature control
S2 Shut-off CLOSED
S3 Maximum volume flow rate $\dot{V}_{max}$
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC)
All OPEN: Minimum volume flow rate $\dot{V}_{min}$

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

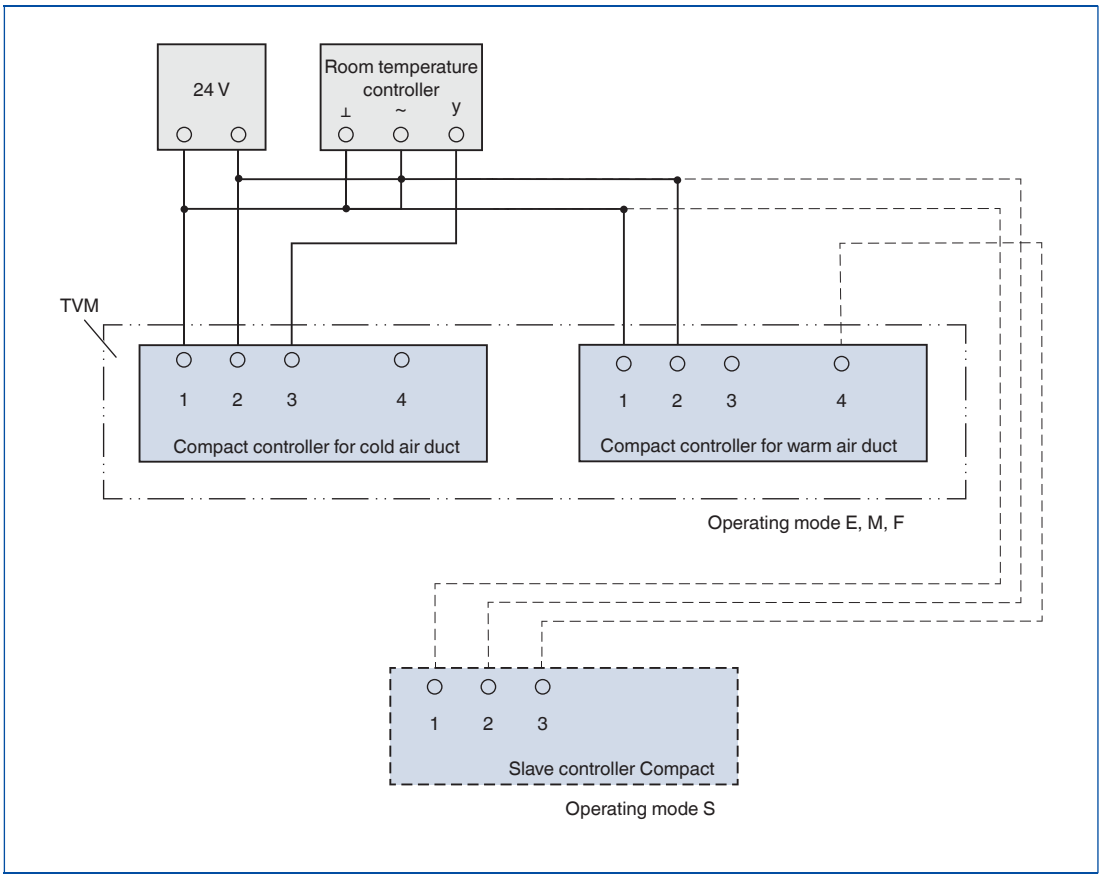
Compact: 227V-024-10

1

... / **XG0** / ...

Order code detail

Dual duct terminal units Type TVM



Compact: 227V-024-10

Description

... / **LN0** / ...

Order code detail

... / **LY0** / ...

Order code detail

For detailed information on adjustment devices see chapter K5 – 1.4

Application
- Electronic volume flow controller GLB181.1E/3 as Compact controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC
- For room temperature controllers with output signal 0 – 10 V DC

Construction
- LN0: GLB181.1E/3 for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA
- LY0: GLB181.1E/3 for TVM

Useful additions
- AT-VAV-S: Adjustment device

Signal voltage range
- 0: 0 – 10 V DC

Operating modes
E: Single and M: Master
- $\dot{V}_{min}$: Minimum volume flow rate
- $\dot{V}_{max}$: Maximum volume flow rate

S: Slave
- $\dot{V}_{min}$: 0 %
- $\dot{V}_{max}$: Volume flow rate ratio to the master controller

F: Constant value
- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning
- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use

Technical data



Compact controller GLB 181.1E/3

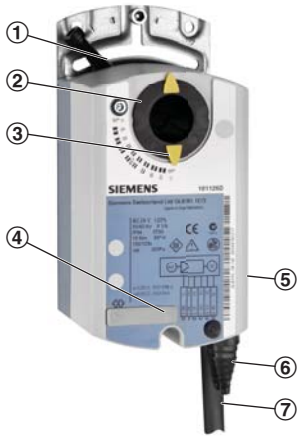
Compact controller GLB181.1E/3

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Power rating (AC)	3 VA max.
Torque	10 Nm
Running time for 90°	125 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, max. 1 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.6 kg

1

Function

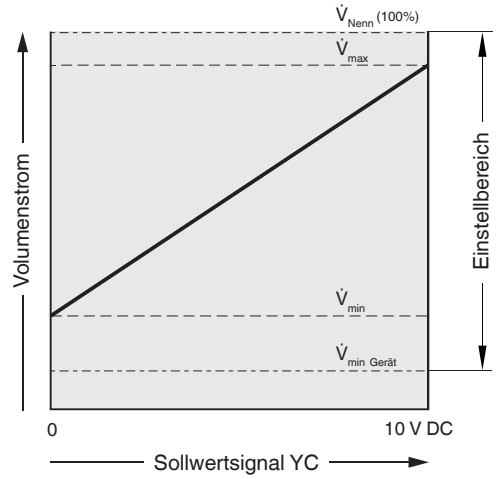
VAV-Compact



① Rotation stop
② Blade shaft clamp
③ Position indicator
④ Service socket
⑤ Gear release button
⑥ Connections for differential pressure sensor
⑦ Connecting cable

Characteristics

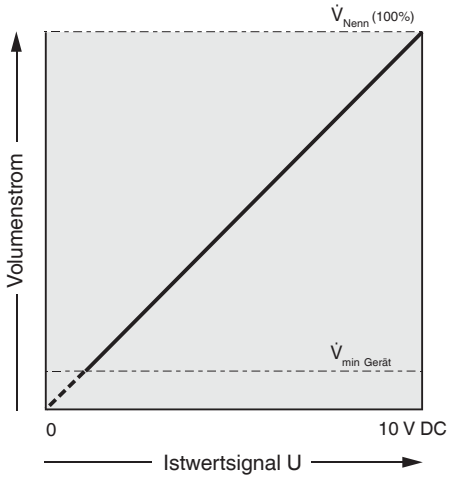
Characteristic of the setpoint value signal



① 0 – 10 V DC

0 – 10 V DC
$\dot{V}_{setpoint} = \frac{YC}{10} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$

Characteristic of the actual value signal



① 0 – 10 V DC

0 – 10 V DC
$\dot{V}_{actual} = \frac{U}{10} \dot{V}_{nom}$

Electrical connection

Connecting cable core identification



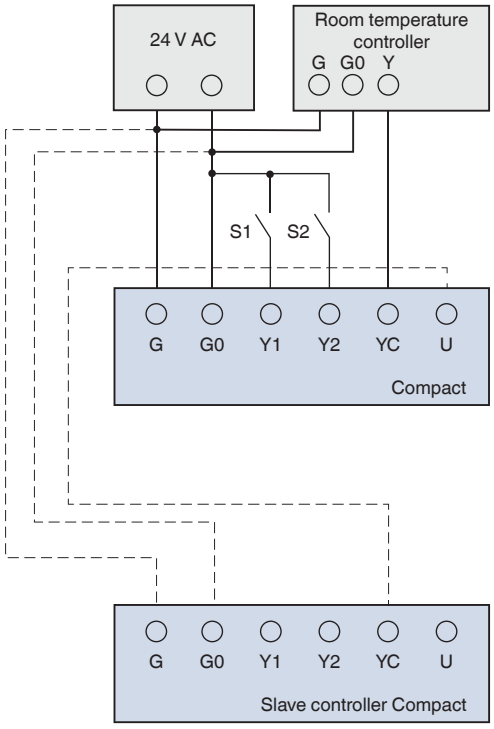
1 G: Supply voltage
2 G0: Ground, neutral
6 Y1: Override control
7 Y2: Override control
8 YC: Setpoint value signal and communication
9 U: Actual value signal

Compact: GLB181.1E/3

... / **LN0** / ...

Order code detail

Variable volume flow control and override control



Switch functions
S1 Damper blade OPEN
S2 Damper blade CLOSED
S1 und S2 Maximum volume flow rate $\dot{V}_{max}$
All OPEN: Room temperature control
or minimum volume flow rate $\dot{V}_{min}$

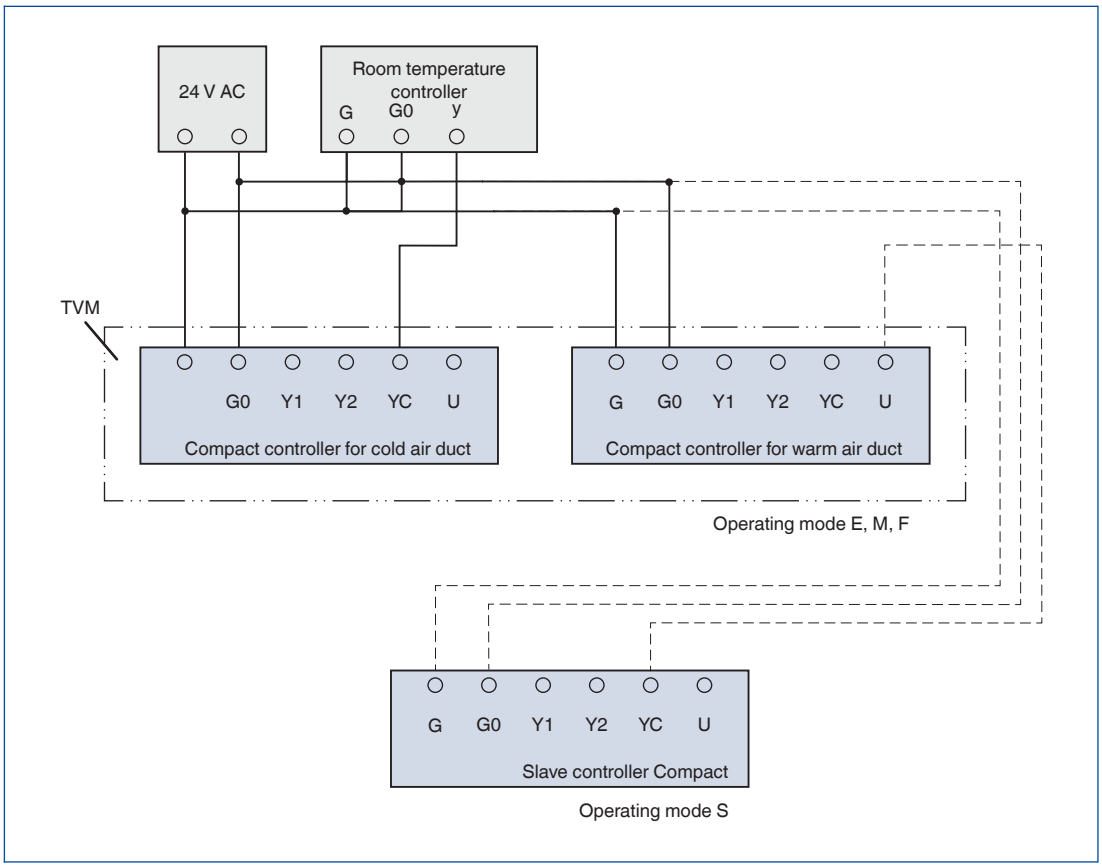
Compact: GLB181.1E/3

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... / **LN0** / ...

Order code detail

Dual duct terminal unit Type TVM



Compact: GLB181.1E/3

Control components for VAV terminal units

Type Universal, dynamic



For different actuators

Modular control components for VAV terminal units

- Module selection based on application
- Actuators with selected actuator forces

Options

- Actuators with safety function for 'damper blade OPEN' and 'damper blade CLOSED' (spring return actuators)

1

Type		Page
Universal, dynamic	General information	1.3 – 34
	Special information – B1*, B27	1.3 – 36
	Special information – XC3	1.3 – 42
	Basic information and nomenclature	1.5 – 1

Description



Universalregler VRD3

Example

Application

- Electronic volume flow controllers of Type Universal (dynamic) are designed for use with VAV terminal units.
- Dynamic differential pressure transducer and electronic controller are fitted together in one casing
- Actuator or spring return actuator is separate
- The output signals of the room temperature controller, central BMS, air quality controller or similar units control the volume flow rate setpoint
- Override control by means of switches or relays
- Volume flow rate actual value is available as linear voltage signal
- Controller parameters are factory set
- On-site adjusting is not required

Standard filtration in comfort air conditioning systems allows for use of the controller in the supply air without additional dust protection. Since a partial volume flow is passed through the transducer in order to measure the volume flow rate, please note:

- With heavy dust levels in the room, suitable extract air filters must be provided
- If the air is polluted with fluff or sticky particles or contains aggressive media, Universal (dynamic) controllers cannot be used

Any attachments must be defined with the order code of the VAV terminal unit.

Universal controller, dynamic, for VAV terminal units

Order code detail	Controller		Actuator		Type of VAV terminal unit
	Part number	Type	Part number	Type	
B13	M546GA4	VRD3	M466DJ8	NM24A-V	① ② ④
B11	M546GA4	VRD3	M466DG8	SM24A-V	③
B1B	M546GA4	VRD3	M466DR1	NF24A-V (spring return actuator)	① ② ③ ④
B27	M546GA4	VRD3	M466DJ8	NM24A-V	⑤
XC3	M546ED4	GUAC-D3	A00000051738	361C-024-20-V/ST07 (spring return actuator)	① ② ③ ④

① TVR
② TVJ
③ TVT
④ TZ-Silenzio, TA-Silenzio, TVZ, TVA
⑤ TVM

Function

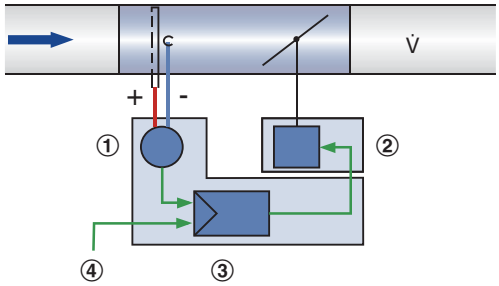
Functional description

The volume flow rate is determined by measuring the differential pressure (effective pressure). For this purpose the VAV terminal unit is fitted with a differential pressure sensor.
The integral differential pressure transducer transforms the effective pressure into a voltage signal. The volume flow rate actual value is hence available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal volume flow rate ($\dot{V}_{nom}$).
The volume flow rate setpoint value comes from a higher-level controller (e.g. room temperature controller, air quality controller, central BMS) or from switch contacts. Variable volume flow control results in a value between $\dot{V}_{min}$ and $\dot{V}_{max}$.
It is possible to override the room temperature control, e.g. by a complete shut-off of the duct.
The controller compares the volume flow rate setpoint value to the actual value and controls the integral actuator accordingly.
The volume flow rate parameters $\dot{V}_{min}$ and $\dot{V}_{max}$ are factory set on potentiometers. Voltage ranges are factory stored in the controller. Changes on the customer's site can easily be carried out using an adjustment device or a notebook with service tool.

Volume flow control

- The volume flow controller works independent of the duct pressure
- Differential pressure fluctuations do not result in permanent volume flow rate changes
- To prevent the control from becoming unstable, a dead band is allowed within which the damper blade does not move.
- The factory set volume flow rate parameters can be altered by the customer

Principle of operation – Universal



① Differential pressure transducer
② Actuator
③ Volume flow controller
④ Setpoint value signal

1

Description

... / **B1*** / ...

Order code detail

... / **B27** / ...

Order code detail

Application

- Electronic volume flow controller VRD3 as Universal controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers

Construction

Volume flow controller VRD3 with

- B13: Actuator NM24A-V for TVR, TVJ, TZ-Silenzio, TA-Silenzio TVZ, TVA
- B11: Actuator SM24A-V for TVT
- B1B: Spring return actuator NF24A-V for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio TVZ, TVA
- B27: Actuator NM24A-V for TVM

Useful additions

- AT-VAV-B: Adjustment device

Signal voltage range

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.1 V DC)

Operating modes

E: Single and M: Master

- $\dot{V}_{min}$: Minimum volume flow rate
- $\dot{V}_{max}$: Maximum volume flow rate

S: Slave operation

- $\dot{V}_{min}$: 0 %
- $\dot{V}_{max}$: Volume flow rate ratio to the master controller

F: Constant value

- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering. The jumper for input w is factory set to VRD3.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use
- The volume flow rate parameters $\dot{V}_{min}$ and $\dot{V}_{max}$ can be adjusted at a later stage using a potentiometer or an adjustment device

Technical data



Universal controller VRD3

Volume flow controller VRD3

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	without actuator max. 3.5 VA
Power rating (DC)	without actuator max. 2 W
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 40
EC conformity	EMC according to 2004/108/EC
Weight	0.440 kg



Actuator NM24A-V

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	5.5 VA max.
Power rating (DC)	4 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.710 kg



Actuator NM24A-V

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.910 kg

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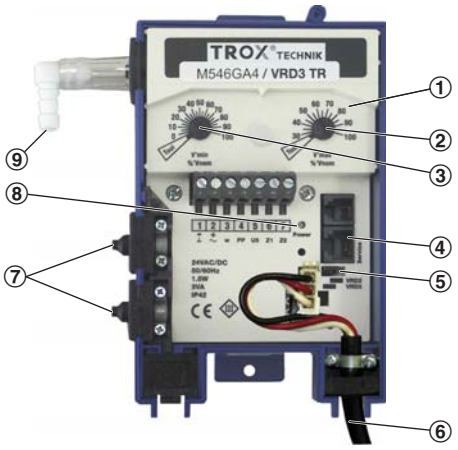
Spring return actuator
NF24A

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	< 75 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	1.91 kg

Function

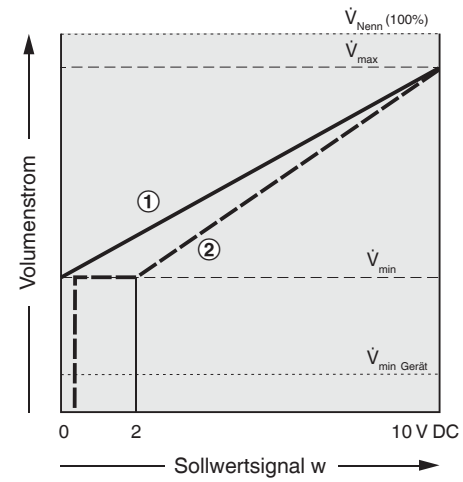
VRD3



① Controller VRD3
② $\dot{V}_{max}$ potentiometer
③ $\dot{V}_{min}$ potentiometer
④ Service socket
⑤ Jumper for input w
⑥ Actuator cable
⑦ Cable bushings for supply voltage, setpoint value signal and actual value signal
⑧ Indicator light
⑨ Connections for differential pressure sensor

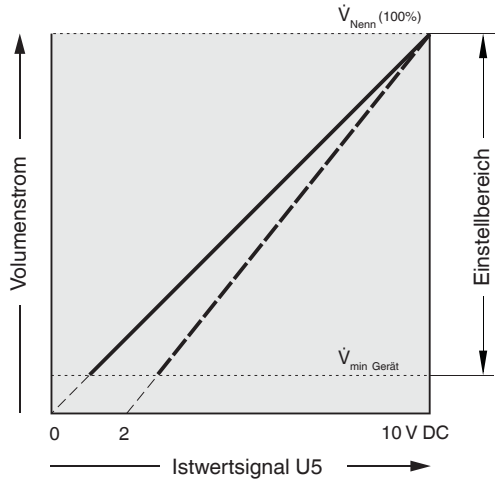
Characteristics

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC

$$\dot{V}_{Soll} = \frac{w}{10} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$$

0 – 10 V DC

$$\dot{V}_{Ist} = \frac{U5}{10} \dot{V}_{Nenn}$$

2 – 10 V DC

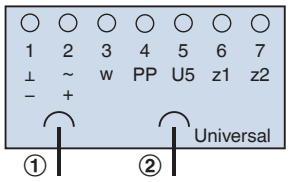
$$\dot{V}_{Soll} = \frac{w - 2}{8} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$$

2 – 10 V DC

$$\dot{V}_{Ist} = \frac{U5 - 2}{8} \dot{V}_{Nenn}$$

Wiring

Terminal connections



① Plug connection for actuator
② Plug connection for adjustment device

1	⊥, –:	Ground, neutral
2	~, +:	Supply voltage
3	w:	Setpoint value signal
4	PP:	Connection for adjustment device
5	U5:	Actual value signal
6	z1:	Override control 1 (OPEN)
7	z2:	Override control 2 (CLOSE, $\dot{V}_{min}$, $\dot{V}_{max}$)

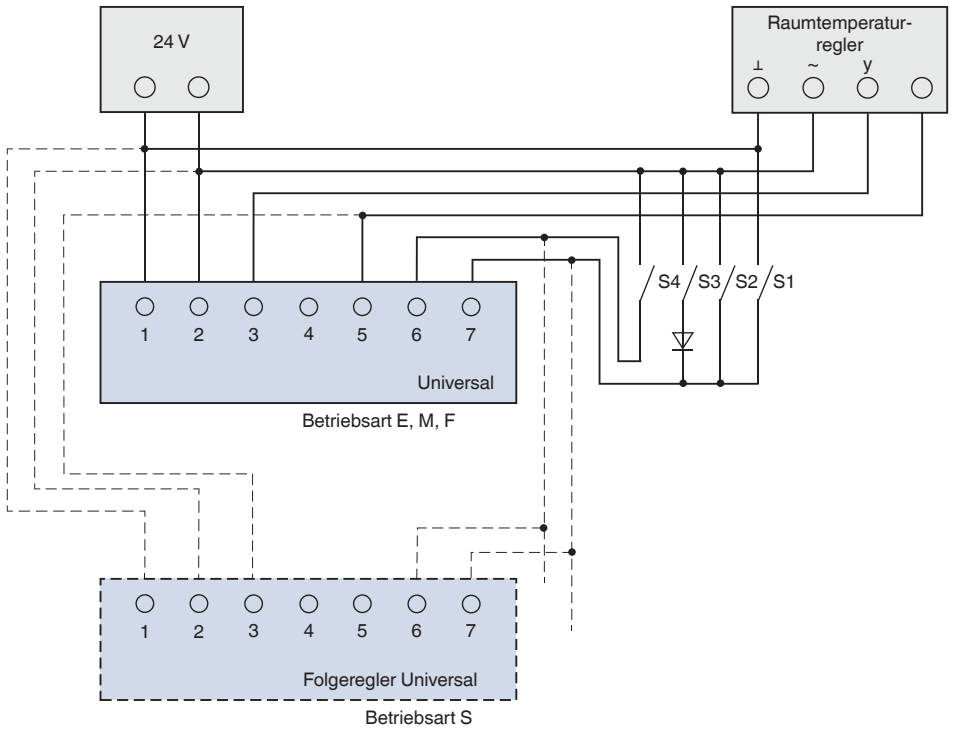
Universal: VRD3

1

... / **B1*** / ...

Order code detail

Variable volume flow control and override control



Switch functions
S1 Shut-off CLOSED
S2 Maximum volume flow rate $\dot{V}_{max}$
S3 Minimum volume flow rate $\dot{V}_{min}$
(only with supply voltage 24 V AC)
S4 Damper blade OPEN
All OPEN: Variable volume flow

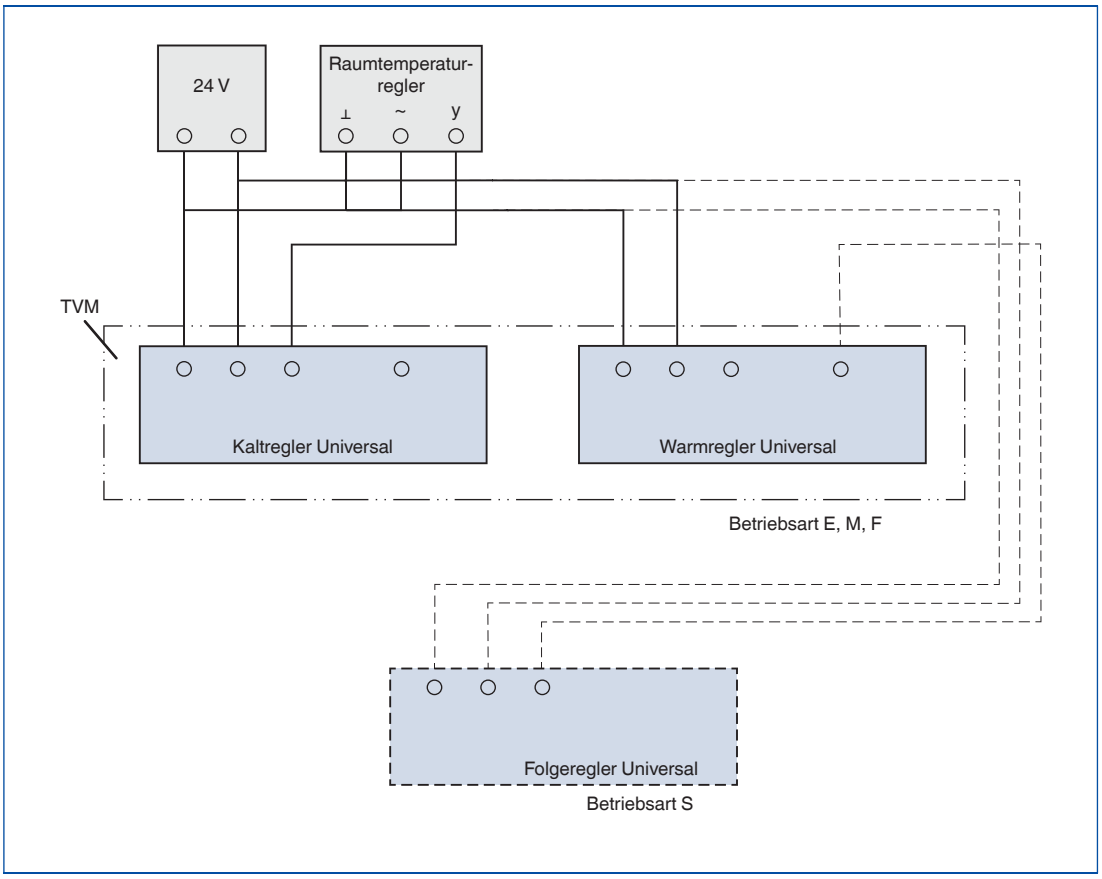
When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Universal: VRD3

... / **B27** / ...

Order code detail

Dual duct terminal units Type TVM



Universal: VRD3

1

Description

... / **XC3** / ...

Order code detail

Application

- Electronic volume flow controller GUAC-D3 as Universal controller
- Variable air or constant air volume flow control
- The flow rate is measured using the dynamic measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC

Construction

XC3: Volume flow controller GUAC-D3 with spring return actuator 361C-024-20-V/ST07 for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA

Useful additions

- AT-VAV-G: Adjustment device

Signal voltage range

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.8 V DC)

Operating modes

E: Single and M: Master
- $\dot{V}_{min}$: Minimum volume flow rate
- $\dot{V}_{max}$: Maximum volume flow rate

S: Slave operation
- $\dot{V}_{min}$: 0 %
- $\dot{V}_{max}$: Volume flow rate ratio to the master controller

F: Constant value
- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use
- The volume flow rate parameters $\dot{V}_{min}$ and $\dot{V}_{max}$ can be adjusted at a later stage using a potentiometer or an adjustment device

Technical data



Universal controller GUAC-D3

Volume flow controller GUAC-D3

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	without actuator max. 1.2 VA
Power rating (DC)	without actuator max. 0.6 W
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Spring return actuator 361C-024-20-V/ST07

Spring return actuator 361C-024-20-V/ST07

Supply voltage	from the controller
Power rating (AC)	10 VA max.
Power rating (DC)	8 W max.
Torque	20 Nm
Running time for 90°	150 s
Spring return time	< 15 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2004/108/EC
Weight	1.8 kg

Function

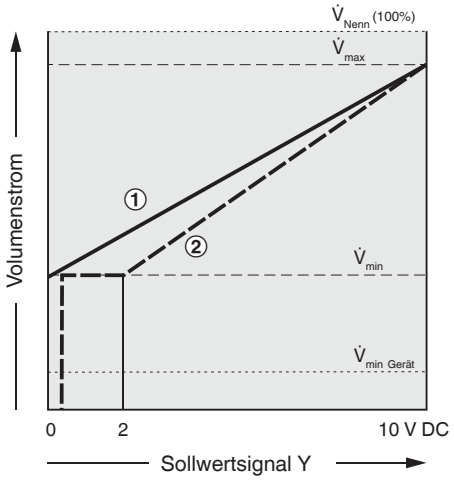
Universal controller GUAC-D3



① Connection for actuator
② Service socket
③ Connection of supply voltage, setpoint value signal and actual value signal
④ Connections for differential pressure sensor

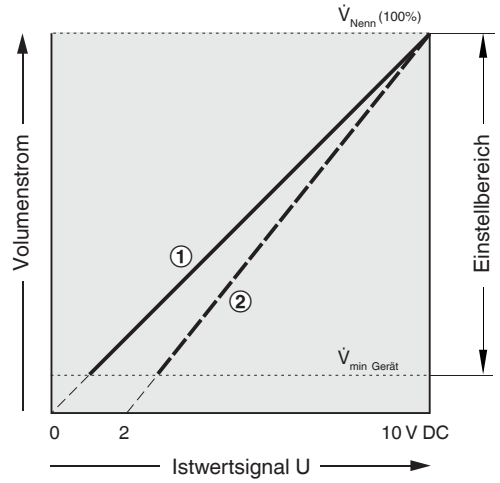
Characteristics

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC
$\dot{V}_{Soll} = \frac{Y}{10} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$

0 – 10 V DC
$\dot{V}_{Ist} = \frac{U}{10} \dot{V}_{Nenn}$

2 – 10 V DC
$\dot{V}_{Soll} = \frac{Y - 2}{8} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$

2 – 10 V DC
$\dot{V}_{Ist} = \frac{U - 2}{8} \dot{V}_{Nenn}$

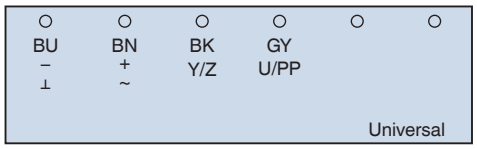
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Wiring

... / **XC3** / ...

Order code detail

Terminal connections



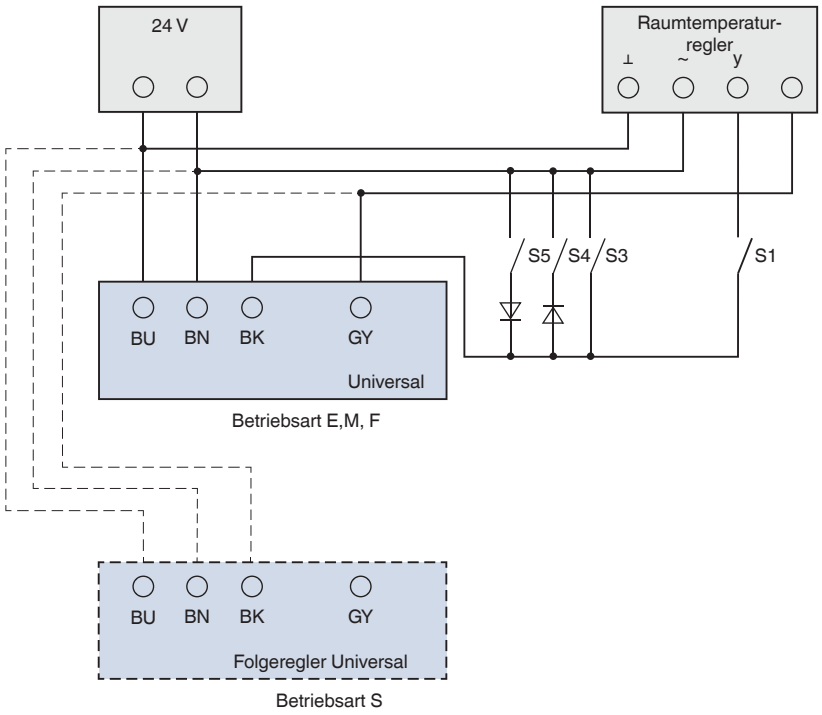
BU ⊥, –: Ground, neutral
BN ~, +: Supply voltage
BK Y/Z: Setpoint value signal and override control
GY U/PP: Actual value signal and communication

Universal: GUAC-D3, GUAC-S3, GUAC-P1, GUAC-P6

... / **XC3** / ...

Order code detail

Variable volume flow control and override control, voltage signal 0 to 10 V DC



Switch functions
S1 Room temperature control
S3 Maximum volume flow rate $\dot{V}_{max}$
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC);
takes priority over all other override controls
All OPEN: Minimum volume flow rate $\dot{V}_{min}$

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

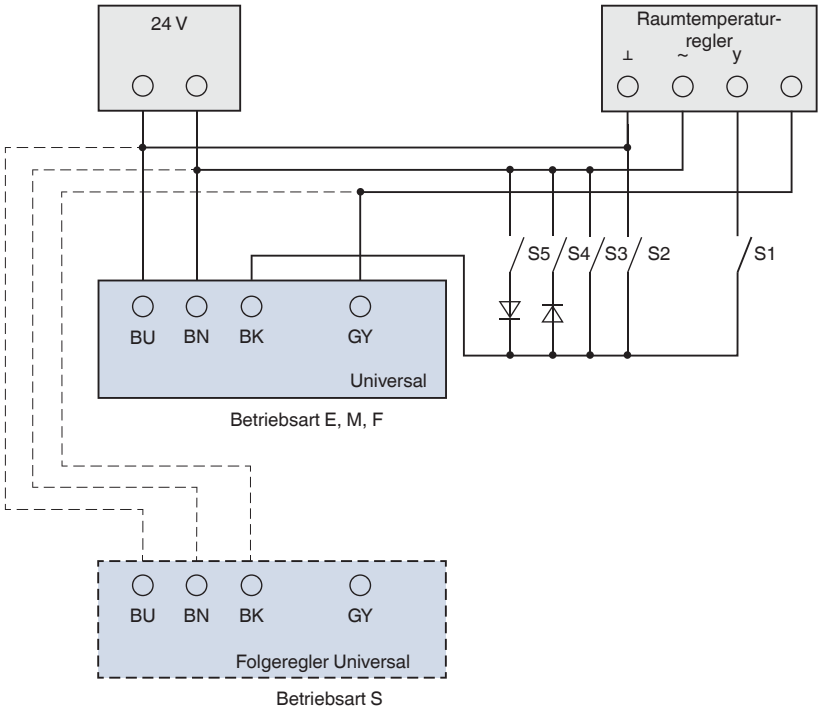
Universal: GUAC-D3, GUAC-S3

1

... / **XC3** / ...

Order code detail

Variable volume flow control and override control, voltage signal 2 to 10 V DC



Switch functions
S1 Room temperature control
S2 Shut-off CLOSED
S3 Maximum volume flow rate $\dot{V}_{max}$
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC);
takes priority over all other override controls
All OPEN: Minimum volume flow rate $\dot{V}_{min}$

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Universal: GUAC-D3, GUAC-S3

Control components for VAV terminal units

Type Universal, static



For contaminated extract air or for pressure control

Modular control components for VAV terminal units, especially for aggressive media in extract air systems

- Module selection based on application
- Actuators with selected actuator forces

Options

- Actuators with safety function for 'damper blade OPEN' and 'damper blade CLOSED' (spring return actuators)

1

Type		Page
Universal, static	General information	1.3 – 48
	Volume flow control – BP*	1.3 – 53
	Volume flow control – BB*	1.3 – 59
	Volume flow control – XD*	1.3 – 64
	Differential pressure control – BR*, BS*	1.3 – 69
	Differential pressure control – BG*, BH*	1.3 – 75
	Differential pressure control – XE*, XF*	1.3 – 81
	Basic information and nomenclature	1.5 – 1

Description



Universal controller VRP-M

Example

Application

- Electronic volume flow controllers of Type Universal (static) are designed for use with VAV terminal units.
- Volume flow control or differential pressure control based on static differential pressure measurement
- Dynamic differential pressure transducer and electronic controller can be fitted together in one casing or in separate casings
- Actuator or spring return actuator is separate
- The output signals of the room temperature controller, central BMS, air quality controller or similar units control the volume flow rate setpoint
- Override control by means of switches or relays
- Volume flow rate actual value or differential pressure actual value is available as linear voltage signal
- Controller parameters are factory set
- On-site adjusting is not required
- Please note that in critical cases, material compatibility testing must be carried out on the air terminal unit and the differential pressure transducer, taking into consideration the harmful substances involved and the concentrations in which they occur.

Maintenance

- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

Universal controller, static, for VAV terminal units, volume flow control

Order code detail	Controller		Static differential pressure transducer		Actuator		VAV terminal units
	Part number	Type	Part number	Type	Part number	Type	
BP3	M466EN6	VRP-M	M546EJ1	VFP-300	M466EQ9	NM24A-V-ST	① ② ③ ⑤ ⑥ ⑦ ⑧
BP1	M466EN6	VRP-M	M546EJ1	VFP-300	M466ER0	SM24A-V-ST	④
BPB	M466EN6	VRP-M	M546EJ1	VFP-300	M466DR2	NF24A-V-ST spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦
BPG	M466EN6	VRP-M	M546EJ1	VFP-300	M466EQ2	LMQ24A-SRV-ST fast-running actuator	① ⑥ ⑧
BPG	M466EN6	VRP-M	M546EJ1	VFP-300	M466EQ3	NMQ24A-SRV-ST fast-running actuator	② ③ ④ ⑤ ⑦
BB3	M546EG2	VRP	M546EJ1	VFP-300	M466DJ8	NM24A-V	① ② ③ ⑤ ⑥ ⑦ ⑧
BB1	M546EG2	VRP	M546EJ1	VFP-300	M466DG8	SM24A-V	④
BBB	M546EG2	VRP	M546EJ1	VFP-300	M466DR1	NF24A-V spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦
XD1	M546ED5	GUAC-S3	–	Included with GUAC-S3	M466EL7	227-024-08-V	① ② ③ ④ ⑤ ⑥ ⑦
XD3	M546ED5	GUAC-S3	–	Included with GUAC-S3	A00000051738	361C-024-20-V/ST07 spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦

① TVR, TVZ, TVA up to nominal size 250
② TVR, TVZ, TVA from nominal size 315
③ TVJ
④ TVT
⑤ TZ-Silenzio, TA-Silenzio
⑥ TVRK up to nominal size 250
⑦ TVRK from nominal size 315
⑧ TVLK

1

Universal controller, static, for VAV terminal units, differential pressure control

Order code detail	Controller		Static differential pressure transducer		Actuator		VAV terminal units
	Part number	Type	Part number	Type	Part number	Type	
BR3	M466EN6	VRP-M	M546EJ6	VFP-100	M466EQ9	NM24A-V-ST	① ② ③ ⑤ ⑥ ⑦ ⑧ ⑨
BR1	M466EN6	VRP-M	M546EJ6	VFP-100	M466ER0	SM24A-V-ST	④
BRB	M466EN6	VRP-M	M546EJ6	VFP-100	M466DR2	NF24A-V-ST spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
BRG	M466EN6	VRP-M	M546EJ6	VFP-100	M466EQ2	LMQ24A-SRV-ST fast-running actuator	① ⑥ ⑧
BRG	M466EN6	VRP-M	M546EJ6	VFP-100	M466EQ3	NMQ24A-SRV-ST fast-running actuator	② ⑤ ⑦ ⑨
BS3	M466EN6	VRP-M	M546EJ7	VFP-600	M466EQ9	NM24A-V-ST	① ② ③ ⑧ ⑨
BS1	M466EN6	VRP-M	M546EJ7	VFP-600	M466ER0	SM24A-V-ST	④
BSB	M466EN6	VRP-M	M546EJ7	VFP-600	M466DR2	NF24A-V-ST spring return actuator	① ② ③ ④ ⑧ ⑨
BSG	M466EN6	VRP-M	M546EJ7	VFP-600	M466EQ2	LMQ24A-SRV-ST fast-running actuator	① ⑧
BSG	M466EN6	VRP-M	M546EJ7	VFP-600	M466EQ3	NMQ24A-SRV-ST fast-running actuator	② ③ ④ ⑨
BG3	M546ED1	VRP-STP	M546EJ6	VFP-100	M466DJ8	NM24A-V	① ② ③ ⑤ ⑥ ⑦ ⑧ ⑨
BG1	M546ED1	VRP-STP	M546EJ6	VFP-100	M466DG8	SM24A-V	④
BGB	M546ED1	VRP-STP	M546EJ6	VFP-100	M466DR1	NF24A-V spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
BH3	M546ED1	VRP-STP	M546EJ7	VFP-600	M466DJ8	NM24A-V	① ② ③ ⑧ ⑨
BH1	M546ED1	VRP-STP	M546EJ7	VFP-600	M466DG8	SM24A-V	④
BHB	M546ED1	VRP-STP	M546EJ7	VFP-600	M466DR1	NF24A-V spring return actuator	① ② ③ ④ ⑧ ⑨
XE1	M546ED6	GUAC-P1	–	Included with GUAC-P1	M466EL7	227-024-08-V	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
XE3	M546ED6	GUAC-P1	–	Included with GUAC-P1	A00000051738	361C-024-20-V/ST07 spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
XF1	M546ED7	GUAC-P6	–	Included with GUAC-P6	M466EL7	227-024-08-V	① ② ③ ④ ⑧ ⑨
XF3	M546ED7	GUAC-P6	–	Included with GUAC-P6	A00000051738	361C-024-20-V/ST07 spring return actuator	① ② ③ ④ ⑧ ⑨

① TVR up to nominal size 250
② TVR from nominal size 315
③ TVJ
④ TVT
⑤ TZ-Silenzio, TA-Silenzio
⑥ TVRK up to nominal size 250
⑦ TVRK from nominal size 315
⑧ TVRK up to nominal size 250
⑨ TVRK from nominal size 315

Any attachments are defined with the order code of the VAV terminal unit.

Function
Volume flow control

Functional description

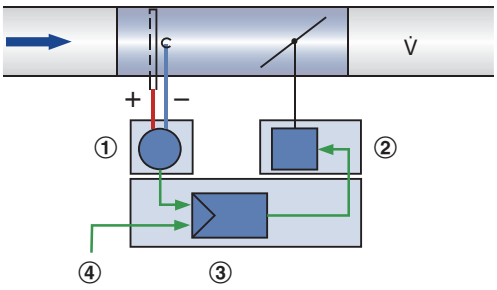
The volume flow rate is determined by measuring the differential pressure (effective pressure). For this purpose the VAV terminal unit is fitted with a differential pressure sensor.
The static differential pressure transducer transforms the effective pressure into a voltage signal. The volume flow rate actual value is hence available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal volume flow rate ($\dot{V}_{nom}$).
The volume flow rate setpoint value comes from a higher-level controller (e.g. room temperature controller, air quality controller, central BMS) or from switch contacts. Variable volume flow control results in a value between $\dot{V}_{min}$ and $\dot{V}_{max}$.
It is possible to override the room temperature control, e.g. by a complete shut-off of the duct.
The controller compares the volume flow rate setpoint value to the actual value and controls the actuator accordingly if there is a difference.
The volume flow rate parameters $\dot{V}_{min}$ and $\dot{V}_{max}$ are set on potentiometers (VRP) or stored in the controller. Voltage ranges are factory stored in the controller. Changes on the customer's site can easily be carried out using a potentiometer, an adjustment device or a notebook with service tool.

Volume flow control

- The volume flow controller works independent of the duct pressure
- Differential pressure fluctuations do not result in permanent volume flow rate changes
- To prevent the control from becoming unstable, a dead band is allowed within which the damper blade does not move.
- The factory set volume flow rate parameters can be altered by the customer

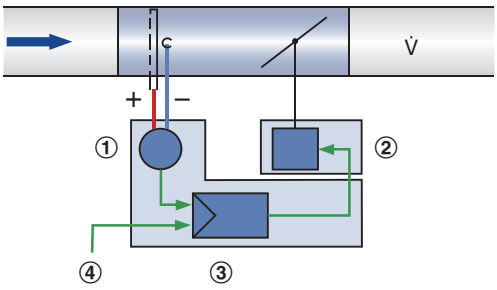
1

Principle of operation – Universal TROX/ Belimo



① Differential pressure transducer
② Actuator
③ Volume flow controller
④ Setpoint value signal

Principle of operation – Universal TROX/ Gruner



① Differential pressure transducer
② Actuator
③ Volume flow controller
④ Setpoint value signal

1 Differential pressure control

Functional description

The static differential pressure transducer transforms the differential pressure into a voltage signal. The differential pressure actual value is available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal differential pressure (Δp_{nom}).
The differential pressure setpoint value is either a constant value or it comes from a setpoint adjuster or from switch contacts.
The controller compares the differential pressure setpoint value to the actual value and controls the actuator accordingly.
The differential pressure parameters are set on a potentiometer (VRP-STP) or stored in the controller. Voltage ranges are factory stored in the controller. Changes on the customer's site can easily be carried out using a potentiometer, an adjustment device or a notebook with service tool.

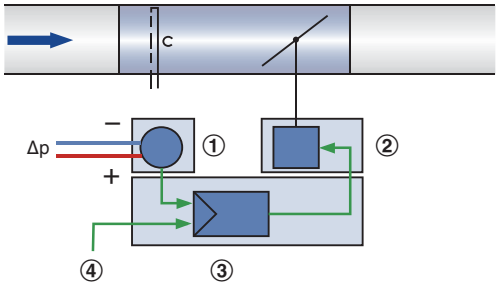
Constant pressure control

- The differential pressure controller works independent of the duct pressure
- Pressure fluctuations do not result in permanent differential pressure changes
- To prevent the control from becoming unstable, a dead band is allowed within which the damper blade does not move.
- The factory set differential pressure parameters can be altered by the customer

Variable pressure control

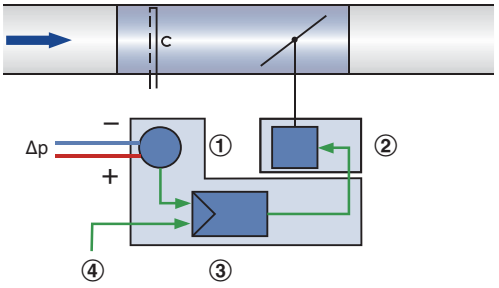
- Relays or switch contacts connected to the control signal input Y/Z can be used to achieve constant pressures Δp_{min} and Δp_{max} or to override various control settings.

Principle of operation – Universal TROX/ Belimo



① Differential pressure transducer
② Actuator
③ Differential pressure controller
④ Setpoint value signal
Δp Differential pressure connection

Principle of operation – Universal TROX/ Gruner



① Differential pressure transducer
② Actuator
③ Differential pressure controller
④ Setpoint value signal
Δp Differential pressure connection

Description

... / **BP*** / ...

Order code detail

Application

- Electronic volume flow controller VRP-M, combined with a static differential pressure transducer VFP-300, as Universal controller
- Variable air or constant air volume flow control
- The flow rate is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers
- With MP bus interface: Up to eight users, such as VRP-M, can be addressed on an MP bus (LAN). This allows for the integration with higher-level systems. DDC controller with MP bus interface to control the Universal controller. Belimo interface UK24LON for LonWorks systems; UK24EIB for EIB systems; UK24MOD for Modbus systems; UK24BAC for BACnet
- When the MP bus interface is used, the analog 0 – 10 V or 2 – 10 V interface cannot be used at the same time.
- The MP bus interface cannot be used with fast-running actuators

Construction

Volume flow controller VRP-M with static differential pressure transducer VFP-300

- BP3: Actuator NM24A-V-ST for TVR, TVJ, TZ-Silenzio, TA-Silenzio TVZ, TVA, TVLK
- BP1: Actuator SM24A-V-ST for TVT
- BPB: Spring return actuator NF24A-V-ST for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio TVZ, TVA, TVRK
- BPG: Fast-running actuator LMQ24A-SRV-ST for TVR, TVZ, TVA, TVRK up to nominal size 250, and TVLK or NMQ24A-SRV-ST for TVR, TVZ, TVA, TVRK from nominal size 315 and TVJ, TVT, TZ-Silenzio, TA-Silenzio

Useful additions

- AT-VAV-B: Adjustment device

Signal voltage ranges

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.1 V DC)

Operating modes

E: Single and M: Master
- $\dot{V}_{min}$: Minimum volume flow rate
- $\dot{V}_{max}$: Maximum volume flow rate

S: Slave operation
- $\dot{V}_{min}$: 0 %
- $\dot{V}_{max}$: Volume flow rate ratio to the master controller

F: Constant value
- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use
- Carry out zero point correction for the controller and adapt the actuator.
- The volume flow rate parameters $\dot{V}_{min}$ and $\dot{V}_{max}$ can be adjusted at a later stage using an adjustment device

Technical data



Universal controller VRP-M

Volume flow and differential pressure controller VRP-M

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 10 %
Power rating (AC)	including differential pressure transducer, without actuator max. 2.6 VA
Power rating (DC)	including differential pressure transducer, without actuator max. 1.1 VA
Setpoint value signal input	0 – 10 V DC, R_a > 200 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC

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Static differential pressure transducer VFP-300

Static differential pressure transducer VFP-300

Supply voltage	from the controller
Measuring range	0 – 300 Pa
Linearity	± 3 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Actuator NM24A-V-ST

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	5.5 VA max.
Power rating (DC)	4 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.710 kg



Actuator SM24A-V-ST

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.910 kg



Spring return actuator
NF24A-V-ST

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	< 75 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	1.91 kg



Fast-running actuator
LMQ24A-SRV-ST

Fast-running actuator LMQ24A-SRV-ST

Supply voltage	from controller VRP-M
Power rating (AC)	23 VA max.
Power rating (DC)	13 W max.
Torque	4 Nm
Running time for 90°	2.5 s
Control signal	from controller VRP-M
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.810 kg

1



Fast-running actuator
NMQ24A-SRV-ST

Fast-running actuator NMQ24A-SRV-ST

Supply voltage	from controller VRP-M
Power rating (AC)	23 VA max.
Power rating (DC)	13 W max.
Torque	8 Nm
Running time for 90°	4 s
Control signal	from controller VRP-M
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.970 kg

Function

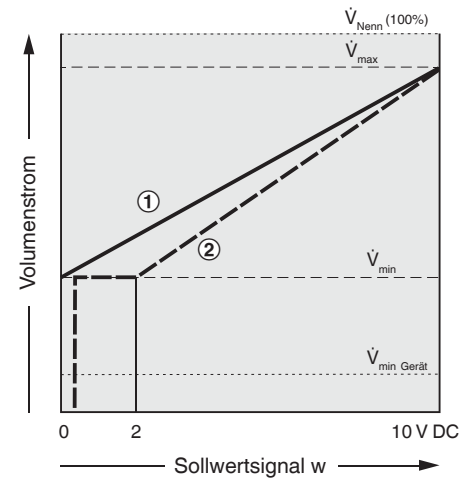
VRP-M



① Controller VRP-M
② Cable for differential pressure transducer
③ Actuator cable
④ Indicator lights

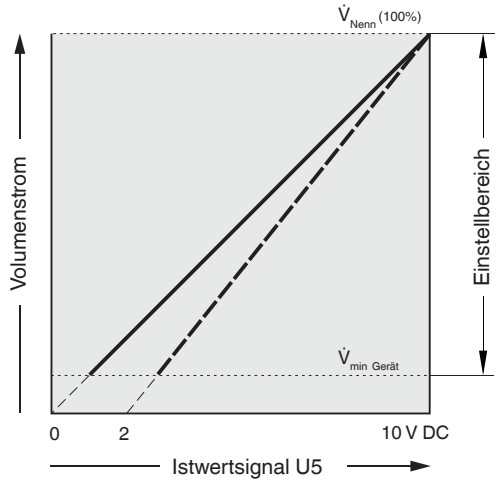
Characteristics

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC

$$\dot{V}_{Soll} = \frac{w}{10} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$$

0 – 10 V DC

$$\dot{V}_{Ist} = \frac{U5}{10} \dot{V}_{Nenn}$$

2 – 10 V DC

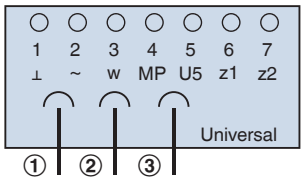
$$\dot{V}_{Soll} = \frac{w - 2}{8} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$$

2 – 10 V DC

$$\dot{V}_{Ist} = \frac{U5 - 2}{8} \dot{V}_{Nenn}$$

Wiring

Terminal connections



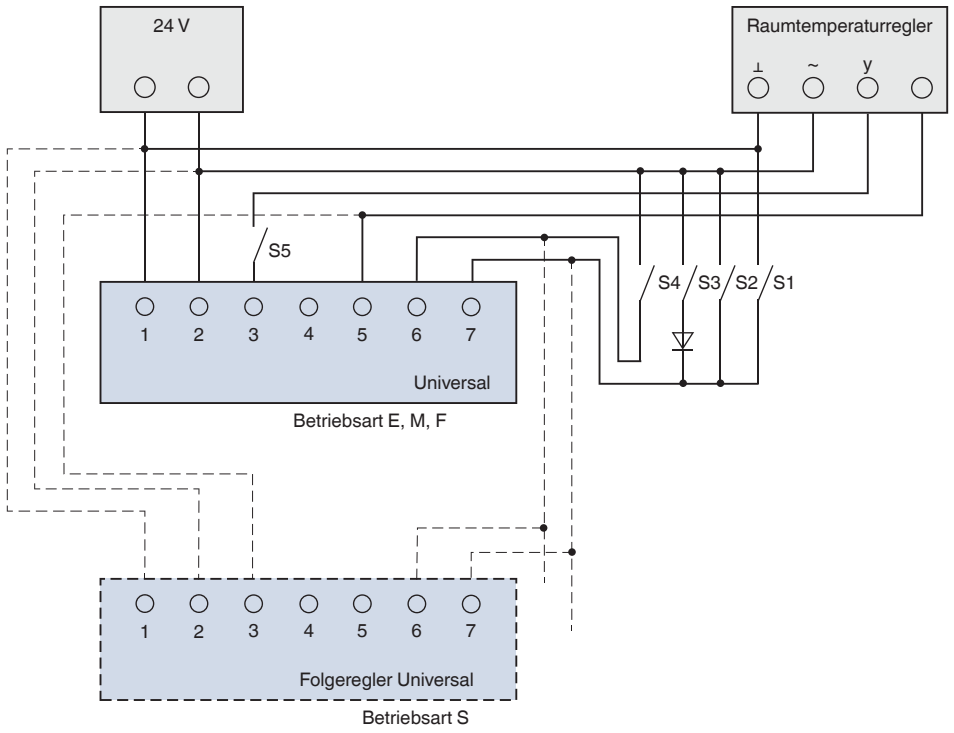
① Plug connection for differential pressure transducer
② Plug connection for actuator
③ Plug connection for adjustment device

1 ⊥:	Ground, neutral
2 ~:	Supply voltage
3 w:	Setpoint value signal
4 MP:	MP bus
5 U5:	Actual value signal
6 z1:	Override control 1
7 z2:	Override control 2

Universal: VRP-M

1

Variable volume flow control and override control



Switch functions
S1 Shut-off CLOSED
S2 Maximum volume flow rate $\dot{V}_{max}$
S3 Intermediate flow rate $\dot{V}_{mid}$
(only with supply voltage 24 V AC)
S4 Damper blade OPEN;
takes priority over all other override controls
All OPEN: Variable volume flow or $\dot{V}_{min}$ (S5)
S5 Variable volume flow, when open $\dot{V}_{min}$

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Universal: VRP-M

Description

... / **BB*** / ...

Order code detail

Application

- Electronic volume flow controller VRP, combined with a static differential pressure transducer VFP-300, as Universal controller
- Variable air or constant air volume flow control
- The flow rate is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers

Construction

Volume flow controller VRP with static differential pressure transducer VFP-300

- BB3: Actuator NM24A-V-ST for TVR, TVJ, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK, TVLK
- BB1: Actuator SM24A-V-ST for TVT
- BBB: Spring return actuator NF24A-V-ST for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK

Signal voltage range

- 2: 2 – 10 V DC

Operating modes

E2: Single and M2: Master

- $\dot{V}_{min}$: Minimum volume flow rate
- $\dot{V}_{max}$: Maximum volume flow rate

S2: Slave operation

- $\dot{V}_{min}$: 0 %
- $\dot{V}_{max}$: Volume flow rate ratio to the master controller

F2: Constant value

- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use
- Carry out zero point correction for the controller and adapt the actuator
- The volume flow rate parameters $\dot{V}_{min}$ and $\dot{V}_{max}$ can be adjusted at a later stage using potentiometers

Technical data



Universal controller VRP

Volume flow controller VRP

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Power rating (AC)	without actuator max. 2.6 VA
Setpoint value signal input	2 – 10 V DC, R_a >100 kΩ
Actual value signal output	2 – 10 V DC linear, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Static differential pressure transducer VFP-300

Static differential pressure transducer VFP-300

Supply voltage	from the controller
Measuring range	0 – 300 Pa
Linearity	± 3 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC

1



Actuator NM24A-V

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	5.5 VA max.
Power rating (DC)	4 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.710 kg



Actuator NM24A-V

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.910 kg



Spring return actuator
NF24A

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	< 75 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	1.91 kg

Function

VRP

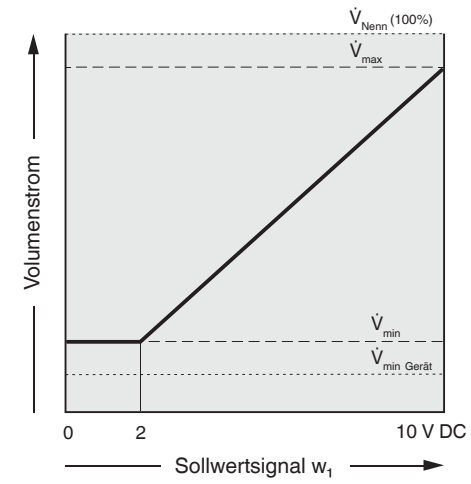


① Controller VRP
② $\dot{V}_{min}$ potentiometer
③ $\dot{V}_{max}$ potentiometer
④ Cable for differential pressure transducer
⑤ Actuator cable

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Characteristics

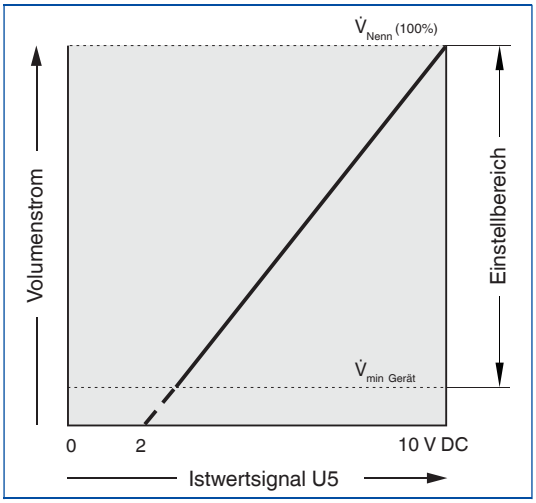
Characteristic of the setpoint value signal



2 – 10 V DC

$$\dot{V}_{Soll} = \frac{w_1 - 2}{8} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$$

Characteristic of the actual value signal

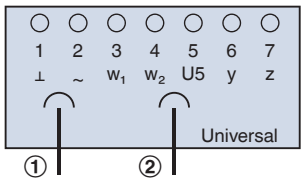


2 – 10 V DC

$$\dot{V}_{Ist} = \frac{U5 - 2}{8} \dot{V}_{Nenn}$$

Wiring

Terminal connections

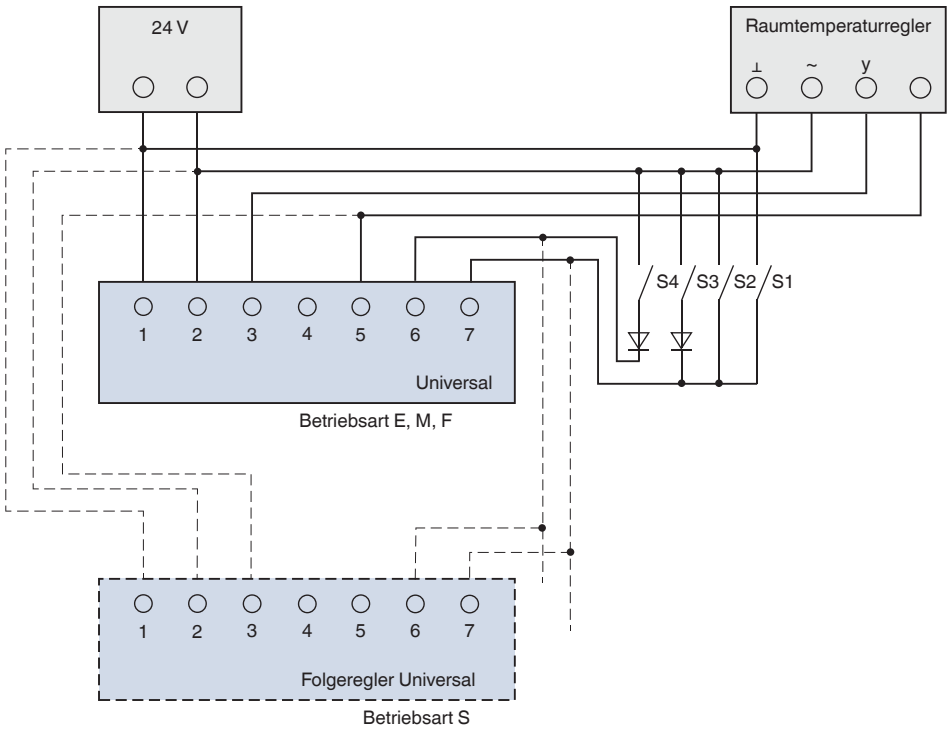


① Plug connection
for differential pressure transducer VFP
② Plug connection for actuator

1	⊥:	Ground, neutral
2	~:	Supply voltage
3	w_1:	Setpoint value signal
4	w_2:	Setpoint value signal (0 – 20 V phase cut)
5	U5:	Actual value signal
6	y:	Actuator signal
7	z:	Override control

Universal: VRP

Variable volume flow control and override control, voltage signal 2 – 10 V DC



Switch functions
S1 Shut-off CLOSED
S2 Maximum volume flow rate $\dot{V}_{max}$
S3 Minimum volume flow rate $\dot{V}_{min}$
S4 Damper blade OPEN
All OPEN: Variable volume flow

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Universal: VRP

1

Description

... / **XD*** / ...

Order code detail

Application

- Electronic volume flow controller GUAC-S3 as Universal controller with integral differential pressure transducer
- Variable air or constant air volume flow control
- The flow rate is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC

Construction

Volume flow controller GUAC-S3

- XD1: Actuator 227-024-08-V for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK
- XD3: Spring return actuator 361C-024-20-V/ST07 for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK

Useful additions

- AT-VAV-G: Adjustment device

Signal voltage ranges

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.8 V DC)

Operating modes

E: Single and M: Master

- $\dot{V}_{min}$: Minimum volume flow rate
- $\dot{V}_{max}$: Maximum volume flow rate

S: Slave operation

- $\dot{V}_{min}$: 0 %
- $\dot{V}_{max}$: Volume flow rate ratio to the master controller

F: Constant value

- $\dot{V}_{min}$: constant volume flow rate
- $\dot{V}_{max}$: 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use
- Carry out zero point correction for the controller
- The volume flow rate parameters $\dot{V}_{min}$ and $\dot{V}_{max}$ can be adjusted at a later stage using an adjustment device

Technical data



Universal controller GUAC-S3

Volume flow controller GUAC-S3

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	without actuator max. 1.2 VA
Power rating (DC)	without actuator max. 0.6 W
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Actuator 227-024-08-V

Actuator 227-024-08-V

Supply voltage	from the controller
Power rating (AC)	3 VA max.
Power rating (DC)	2 W max.
Torque	8 Nm
Running time for 90°	60 – 120 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2004/108/EC
Weight	0.530 kg



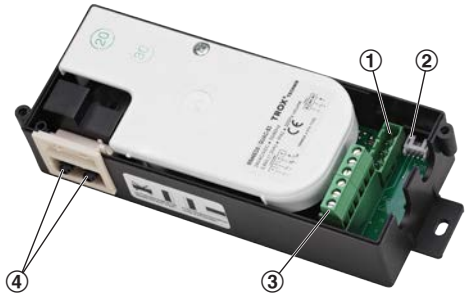
Spring return actuator
361C-024-20-V/ST07

Spring return actuator 361C-024-20-V/ST07

Supply voltage	from the controller
Power rating (AC)	10 VA max.
Power rating (DC)	8 W max.
Torque	20 Nm
Running time for 90°	150 s
Spring return time	< 15 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2004/108/EC
Weight	1.8 kg

Function

Universal controller GUAC-S3

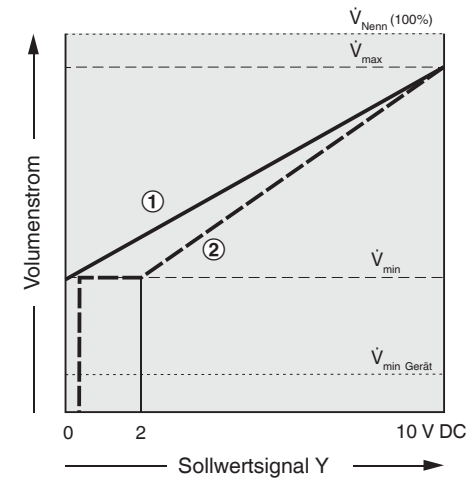


① Connection for actuator
② Service socket
③ Connection of supply voltage,
setpoint value signal and actual value signal
④ Connections for differential pressure sensor

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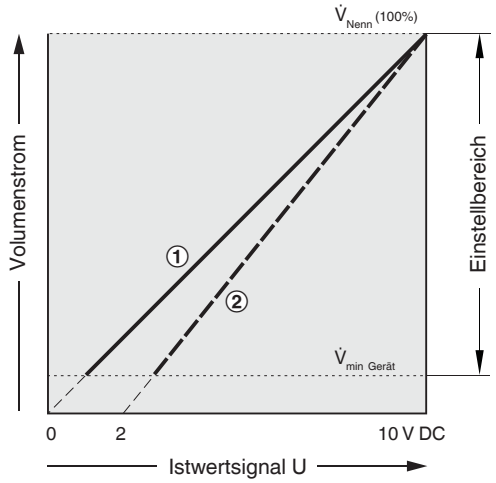
Characteristics

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC

$$\dot{V}_{Soll} = \frac{Y}{10} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$$

0 – 10 V DC

$$\dot{V}_{Ist} = \frac{U}{10} \dot{V}_{Nenn}$$

2 – 10 V DC

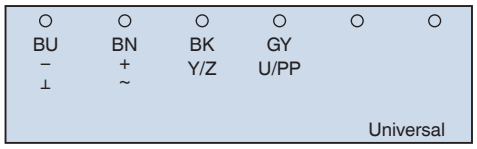
$$\dot{V}_{Soll} = \frac{Y - 2}{8} (\dot{V}_{max} - \dot{V}_{min}) + \dot{V}_{min}$$

2 – 10 V DC

$$\dot{V}_{Ist} = \frac{U - 2}{8} \dot{V}_{Nenn}$$

Wiring

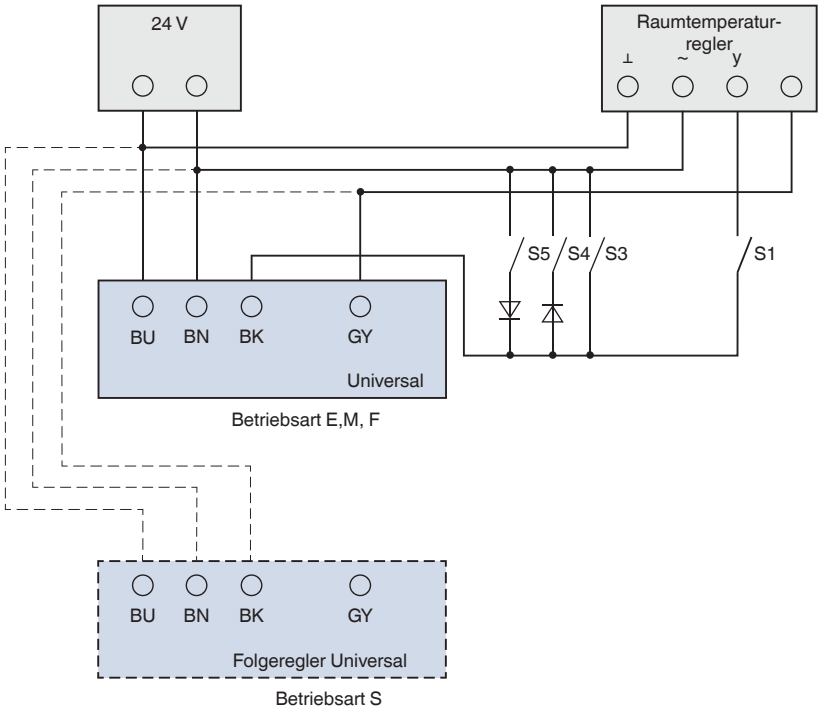
Terminal connections



BU ⊥, –: Ground, neutral
BN ~, +: Supply voltage
BK Y/Z: Setpoint value signal and override control
GY U/PP: Actual value signal and communication

Universal: GUAC-D3, GUAC-S3, GUAC-P1, GUAC-P6

Variable volume flow control and override control, voltage signal 0 to 10 V DC



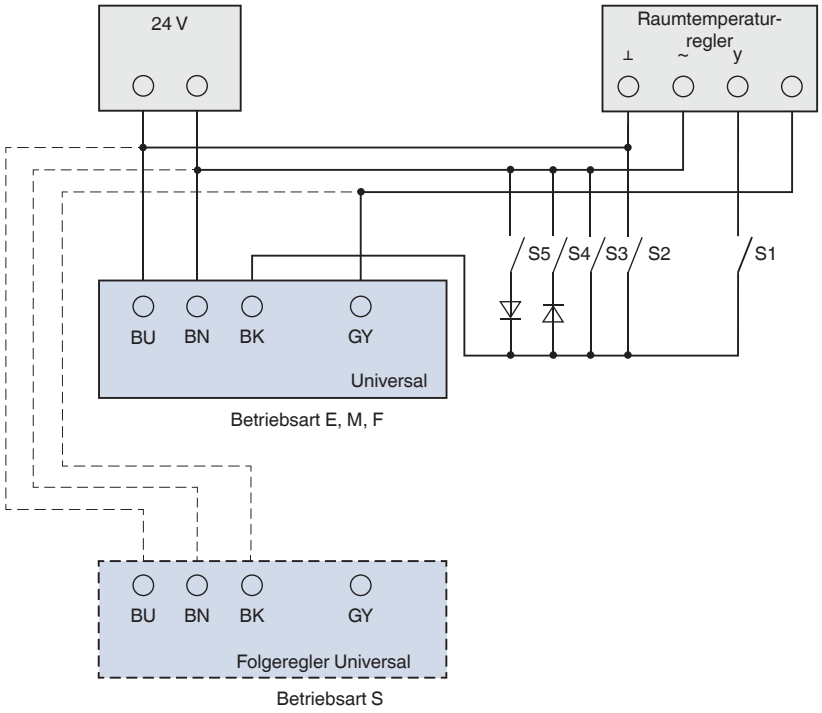
Switch functions
S1 Room temperature control
S3 Maximum volume flow rate $\dot{V}_{max}$
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC);
takes priority over all other override controls
All OPEN: Minimum volume flow rate $\dot{V}_{min}$

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Universal: GUAC-D3, GUAC-S3

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Variable volume flow control and override control, voltage signal 2 to 10 V DC



Switch functions
S1 Room temperature control
S2 Shut-off CLOSED
S3 Maximum volume flow rate $\dot{V}_{max}$
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC);
takes priority over all other override controls
All OPEN: Minimum volume flow rate $\dot{V}_{min}$

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Universal: GUAC-D3, GUAC-S3

Description

... / **BR*** / ...

Order code detail

... / **BS*** / ...

Order code detail

Application

- Electronic differential pressure controller VRP-M, combined with a static differential pressure transducer VFP-100 or VFP-600, as Universal controller
- Variable or constant differential pressure control
- The differential pressure is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers
- With MP bus interface: Up to eight VRP-M users can be addressed on an MP bus (LAN); Belimo-Interface UK24LON for LonWorks systems; UK24EIB for EIB systems; UK24MOD for Modbus systems; UK24BAC for BACnet; DDC controllers with MP bus interface can control the Universal controller via data transfer
- When the MP bus interface is used, the analog 0 – 10 V or 2 – 10 V interface cannot be used at the same time.
- The MP bus interface cannot be used with fast-running actuators

Construction

Differential pressure controller VRP-M with static differential pressure transducer VFP-100

- BR3: Actuator NM24A-V-ST for TVR, TVJ, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK
- BR1: Actuator SM24A-V-ST for TVT
- BRB: Spring return actuator NF24A-V-ST for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK
- BRG: Fast-running actuator LMQ24A-SRV-ST for TVR, TVZ, TVA, TVRK up to nominal size 250, and TVLK or NMQ24A-SRV-ST for TVR, TVZ, TVA, TVRK from nominal size 315

Volume flow controller VRP-M with static differential pressure transducer VFP-600

- BS3: Actuator NM24A-V-ST for TVR, TVJ, TVRK
- BS1: Actuator SM24A-V-ST for TVT
- BSB: Spring return actuator NF24A-V-ST for TVR, TVJ, TVT, TVRK
- BSG: Fast-running actuator LMQ24A-SRV-ST for TVR, TVRK up to nominal size 250, or NMQ24A-SRV-ST for TVJ, TVT and TVR, TVRK from nominal size 315

Useful additions

- AT-VAV-B: Adjustment device

Signal voltage ranges

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.1 V DC)

Operating modes

- Z: Supply air
- A: Extract air

Factory settings are as follows:
Differential pressure Δp_{min} as ordered and for room pressure controllers the adequate Δp_{nom}. The effective pressure sensor of the VAV terminal unit is short circuited.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered differential pressures
- Tubing of the static differential pressure transducer by others
- For positive room pressure: Connect room pressure to Plus, reference room to Minus
- For negative room pressure: Connect room pressure to Minus, reference room to Plus
- For supply air duct pressure: Connect static pressure of the duct to Plus
- For extract air duct pressure: Connect static pressure of the duct to Minus
- After successful installation, tubing and wiring the controller is ready for use
- Carry out zero point correction for the controller and adapt the actuator.
- The differential pressure settings can be adjusted at a later stage using an adjustment device

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Technical data

Volume flow and differential pressure controller VRP-M



Universal controller VRP-M

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 10 %
Power rating (AC)	including differential pressure transducer, without actuator max. 2.6 VA
Power rating (DC)	including differential pressure transducer, without actuator max. 1.1 VA
Setpoint value signal input	0 – 10 V DC, R_a > 200 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC

Static differential pressure transducer VFP-100



Static differential pressure transducer VFP-100

Supply voltage	from the controller
Measuring range	0 – 100 Pa
Linearity	± 1 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC

Static differential pressure transducer VFP-600



Static differential pressure transducer VFP-600

Supply voltage	from the controller
Measuring range	0 – 600 Pa
Linearity	± 6 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Actuator NM24A-V-ST

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	5.5 VA max.
Power rating (DC)	4 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.710 kg



Actuator SM24A-V-ST

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.910 kg



Spring return actuator
NF24A-V-ST

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	< 75 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	1.91 kg

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Fast-running actuator
NMQ24A-SRV-ST

Fast-running actuator NMQ24A-SRV-ST

Supply voltage	from controller VRP-M
Power rating (AC)	23 VA max.
Power rating (DC)	13 W max.
Torque	8 Nm
Running time for 90°	4 s
Control signal	from controller VRP-M
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.970 kg

Function

Constant pressure control

The differential pressure setpoint value as given in the order code is stored as Δp_{min} in the controller. The nominal differentia pressure Δp_{nom} is the reference unit.
To maximise the control accuracy, different pressure ranges with the corresponding nominal differential pressures are used. The correct range is factory set. It is possible to change Δp_{min} at a later stage but only within the factory set pressure range.

Variable pressure control

A setpoint value signal enables variable pressure control. The control range is Δp_{min} to Δp_{max}, based on the setpoint value signal 0 (2) – 10 V.

VRP-M



① Controller VRP-M
② Cable for differential pressure transducer
③ Actuator cable
④ Indicator lights

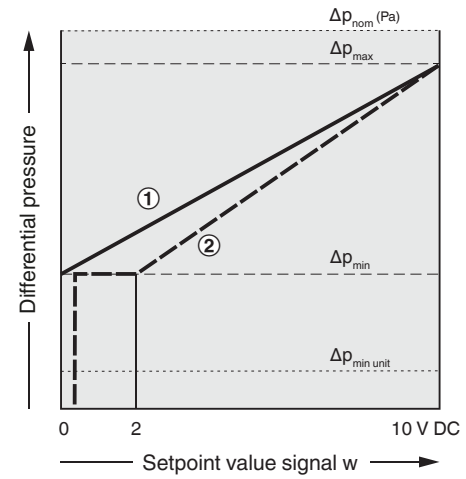
Pressure ranges

Differential pressure transducer	Δp_{limit}	Min ①	Max ②	Δp_{nom}
VFP 100	2.5	30	80	100
	2.5	15	40	50
	2.5	7.5	20	25
VFP 600	15	180	480	600
	7.5	90	240	300

① Min: Minimum value for Δp_{min} and Δp_{max}
② Max: Maximum value for Δp_{min} and Δp_{max}
Using a control signal also setpoint values < 30 % of Δp_{nom} can be set. Pressure values smaller than Δp_{limit} will be set to zero because they cannot be precisely controlled.

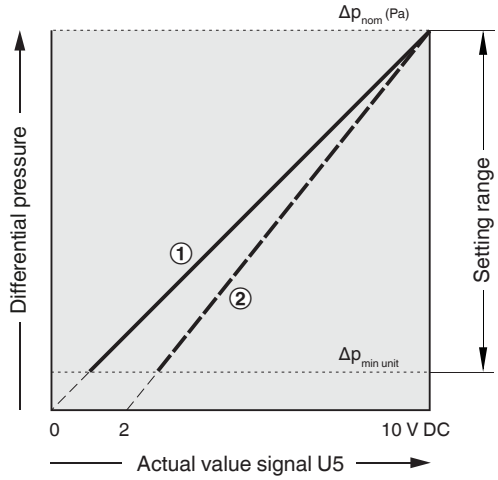
Characteristics

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC

$$\Delta p_{setpoint} = \frac{w}{10} (\Delta p_{max} - \Delta p_{min}) + \Delta p_{min}$$

0 – 10 V DC

$$\Delta p_{actual} = \frac{U5}{10} \Delta p_{nom}$$

2 – 10 V DC

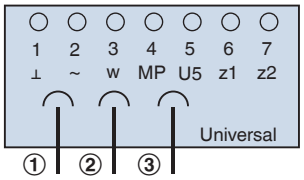
$$\Delta p_{setpoint} = \frac{w - 2}{8} (\Delta p_{max} - \Delta p_{min}) + \Delta p_{min}$$

2 – 10 V DC

$$\Delta p_{actual} = \frac{U5 - 2}{8} \Delta p_{nom}$$

1 Wiring

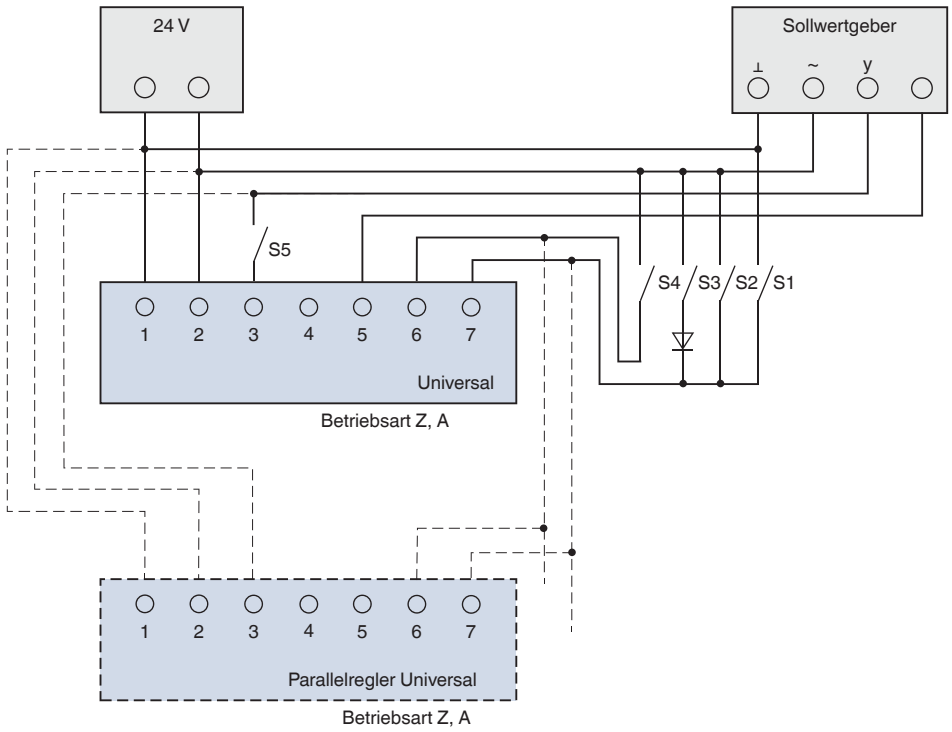
Terminal connections



① Plug connection for differential pressure transducer
② Plug connection for actuator
③ Plug connection for adjustment device
1 ⊥: Ground, neutral
2 ~: Supply voltage
3 w: Setpoint value signal
4 MP: MP bus
5 U5: Actual value signal
6 z1: Override control 1
7 z2: Override control 2

Universal: VRP-M

Differential pressure control and override control



Switch functions
S1 Shut-off CLOSED
S2 Maximum differential pressure Δp_{max}
S3 Stop actuator (only with supply voltage 24 V AC)
S4 Damper blade OPEN;
takes priority over all other override controls
All OPEN: Variable differential pressure or Δp_{min} (S5)
S5 Variable differential pressure, when OPEN Δp_{min}

When combining several override controls the switches must be interlocked to prevent short-circuits.

Diode: e.g. 1N 4007

Universal: VRP-M

Description

... / **BG*** / ...

Order code detail

... / **BH*** / ...

Order code detail

Application

- Electronic differential pressure controller VRP-STP, combined with a static differential pressure transducer VFP-100 or VFP-600, as Universal controller
- Variable or constant differential pressure control
- The differential pressure is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers

Construction

Differential pressure controller VRP-STP with static differential pressure transducer VFP-100

- BG3: Actuator NM24A-V for TVR, TVJ, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK
- BG1: Actuator SM24A-V-ST for TVT
- BGB: Spring return actuator NF24A-V for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK

Differential pressure controller VRP-STP with static differential pressure transducer VFP-600

- BH3: Actuator NM24A-V for TVR, TVJ, TVRK
- BH1: Actuator SM24A-V-ST for TVT
- BHB: Spring return actuator NF24A-V for TVR, TVJ, TVT, TVRK

Signal voltage ranges

- 2: 2 – 10 V DC

Operating modes

- Z: Supply air
- A: Extract air

Factory settings are as follows: Differential pressure Δp_{min} as ordered and for room pressure controllers the adequate Δp_{nom}. The effective pressure sensor of the VAV terminal unit is short circuited.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered differential pressures
- Tubing of the static differential pressure transducer by others
- For positive room pressure: Connect room pressure to Plus, reference room to Minus
- For negative room pressure: Connect room pressure to Minus, reference room to Plus
- For supply air duct pressure: Connect static pressure of the duct to Plus
- For extract air duct pressure: Connect static pressure of the duct to Minus
- After successful installation, tubing and wiring the controller is ready for use
- Carry out zero point correction for the controller and adapt the actuator.
- The differential pressure settings can be adjusted at a later stage using a potentiometer

Technical data



Differential pressure controller VRP-STP

Differential pressure controller VRP-STP

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Power rating (AC)	including static differential pressure transducer, without actuator max. 2.6 VA
Setpoint value signal input	2 – 10 V DC, R_a >100 kΩ
Actual value signal output	2 – 10 V DC linear, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Static differential pressure transducer VFP-100

Static differential pressure transducer VFP-100

Supply voltage	from the controller
Measuring range	0 – 100 Pa
Linearity	± 1 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC

1



Static differential pressure transducer VFP-600

Static differential pressure transducer VFP-600

Supply voltage	from the controller
Measuring range	0 – 600 Pa
Linearity	± 6 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Actuator NM24A-V-ST

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	5.5 VA max.
Power rating (DC)	4 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.710 kg



Actuator SM24A-V-ST

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.910 kg



Spring return actuator
NF24A-V-ST

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	< 75 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	1.91 kg

Function

Constant pressure control

The differential pressure setpoint value that has been ordered (order code) is factory set as Δp in the controller. The nominal differential pressure Δp_{nom} is the reference unit.
To maximise the control accuracy, different pressure ranges with the corresponding nominal differential pressures are used. The correct range is factory set. It is possible to change Δp at a later stage but only within the factory set pressure range.

Variable pressure control

A setpoint value signal enables variable pressure control. The control range is from Δp_{limit} to Δp_{max}.

VRP-STP



① Controller VRP-STP
② Actuator cable
③ Δp potentiometer
④ Cable for differential pressure transducer

Setting Δp
The Δp potentiometer is used to set the required differential pressure. For variable control the pressure can be limited to the maximum value Δp; this value is maintained as long as the input signal is 10 V DC. The percentages relate to the nominal differential pressure (Δp_{nom}). The setting range is from 30 – 80 %.

Pressure ranges

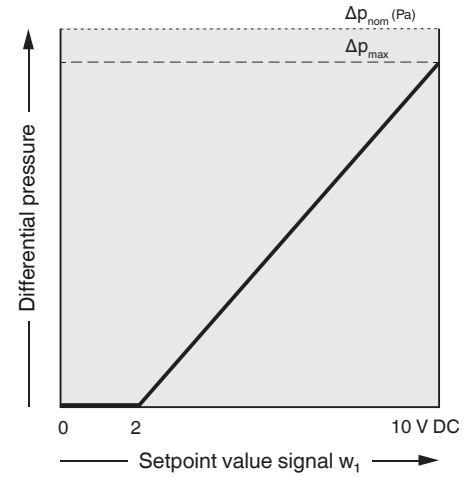
Differential pressure transducer	Δp_{limit}	Min ①	Max ②	Δp_{nom}
VFP 100	2.5	30	80	100
	2.5	15	40	50
	2.5	7.5	20	25
VFP 600	15	180	480	600
	7.5	90	240	300

① Min: Minimum value (10 V) for Δp
② Max: Maximum value (10 V) for Δp
Using a control signal also setpoint values < 30 % of Δp_{nom} can be set. Pressure values smaller than Δp_{limit} will be set to zero because they cannot be precisely controlled.
Variable pressure control requires that the link between terminals 2 and 4 is removed.

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Characteristics

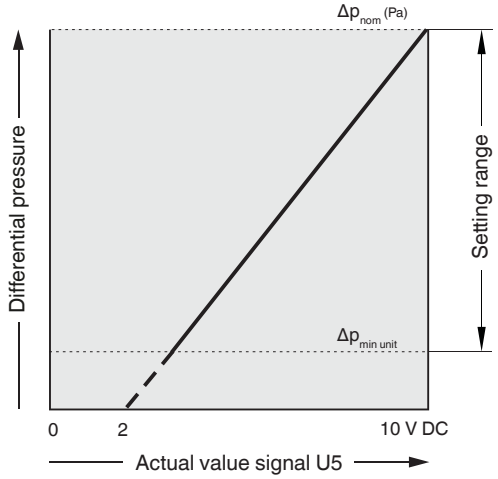
Characteristic of the setpoint value signal



① 2 – 10 V DC
w_1 < 2 V DC may lead to unstable control behaviour

2 – 10 V DC
$\Delta p_{setpoint} = \frac{w_1 - 2}{8} \Delta p_{max}$

Characteristic of the actual value signal

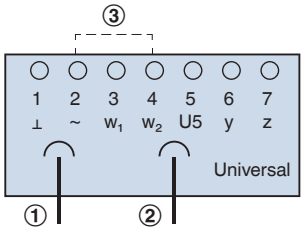


① 2 – 10 V DC

2 – 10 V DC
$\Delta p_{actual} = \frac{U5 - 2}{8} \Delta p_{nom}$

Wiring

Terminal connections

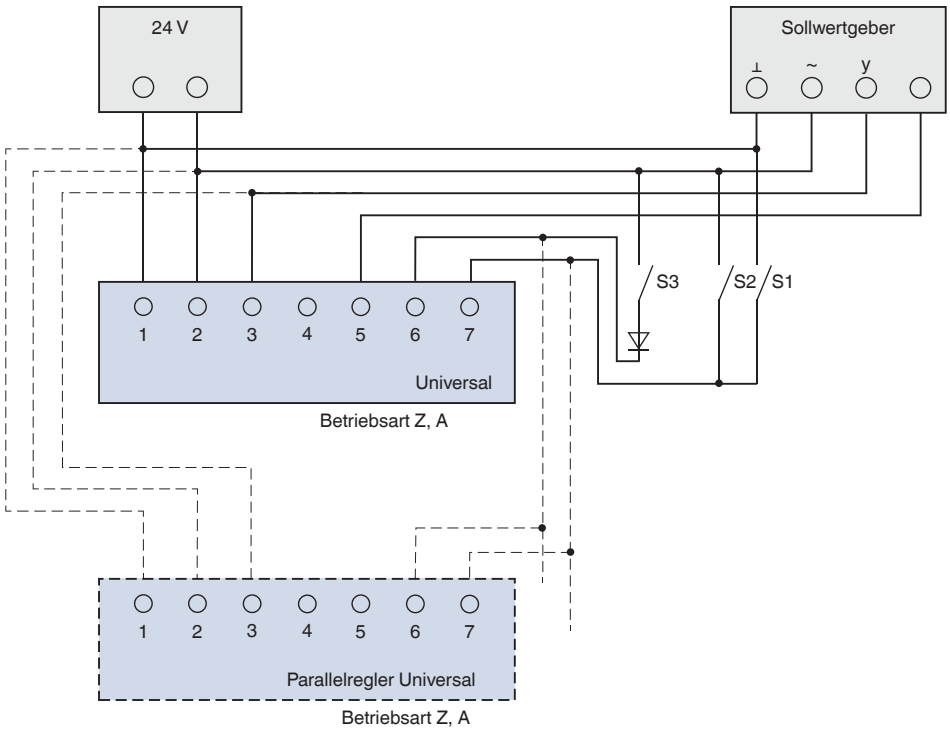


① Plug connection for differential pressure transducer VFP
② Plug connection for actuator
③ Wire link, factory mounted (constant pressure control)
To connect a setpoint adjuster the control signal must be connected to the controller with a two-wire cable. The link (2 – 4) must then be removed.

1 ⊥:	Ground, neutral
2 ~:	Supply voltage
3 w_1:	Setpoint value signal
4 w_2:	Setpoint value signal (0 – 20 V phase cut)
5 U5:	Actual value signal
6 y:	Actuator signal
7 z:	Override control

Universal: VRP-STP

Differential pressure control including parallel control and override control



Switch functions
S1 Shut-off CLOSED
S2 Maximum differential pressure Δp_{max}
S3 Damper blade OPEN
All OPEN: Variable differential pressure
When combining several override controls the switches must be interlocked to prevent short-circuits.

Diode: e.g. 1N 4007

Universal: VRP-STP

Description

... / **XE*** / ...

Order code detail

... / **XF*** / ...

Order code detail

Application

- Electronic volume flow controller GUAC-S3 with integral static differential pressure transducer
- Variable or constant differential pressure control
- The differential pressure is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC

Construction

Volume flow controller GUAC-P1

- XE1: Actuator 227-024-08-V for TVR, TVJ, TVT, TVRK
- XE3: Spring return actuator 361C-024-20-V/ST07 for TVR, TVJ, TVT, TVRK

Volume flow controller GUAC-P6

- XF1: Actuator 227-024-08-V for TVR, TVJ, TVT, TVRK
- XF3: Spring return actuator 361C-024-20-V/ST07 for TVR, TVJ, TVT, TVRK

Useful additions

- AT-VAV-G: Adjustment device

Signal voltage ranges

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.8 V DC)

Operating modes

- Z: Supply air
- A: Extract air

The required differential pressure is set at the factory. The effective pressure sensor of the VAV terminal unit is short circuited.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered differential pressures
- Tubing of the static differential pressure transducer by others
- For positive room pressure: Connect room pressure to Plus, reference room to Minus
- For negative room pressure: Connect room pressure to Minus, reference room to Plus
- For supply air duct pressure: Connect static pressure of the duct to Plus
- For extract air duct pressure: Connect static pressure of the duct to Minus
- After successful installation, tubing and wiring the controller is ready for use
- Carry out zero point correction for the controller
- The differential pressure settings can be adjusted at a later stage using an adjustment device

Technical data



Differential pressure controller GUAC-P1

Differential pressure controller GUAC-P1

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	without actuator max. 1.2 VA
Power rating (DC)	without actuator max. 0.6 W
Measuring range	0 – 100 Pa
Linearity	± 1 Pa
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Differential pressure controller GUAC-P6

Differential pressure controller GUAC-P6

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	without actuator max. 1.2 VA
Power rating (DC)	without actuator max. 0.6 W
Measuring range	0 – 600 Pa
Linearity	± 6 Pa
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC

1



Actuator 227-024-08-V

Actuator 227-024-08-V

Supply voltage	from the controller
Power rating (AC)	3 VA max.
Power rating (DC)	2 W max.
Torque	8 Nm
Running time for 90°	60 – 120 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2004/108/EC
Weight	0.530 kg



Spring return actuator
361C-024-20-V/ST07

Spring return actuator 361C-024-20-V/ST07

Supply voltage	from the controller
Power rating (AC)	10 VA max.
Power rating (DC)	8 W max.
Torque	20 Nm
Running time for 90°	150 s
Spring return time	< 15 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2004/108/EC
Weight	1.8 kg

Function

Constant pressure control

The differential pressure setpoint value as given in the order code is stored as Δp_{min} in the controller. The nominal differential pressure Δp_{nom} is the reference unit.
To maximise the control accuracy, different pressure ranges with the corresponding nominal differential pressures are used. The correct range is factory set. It is possible to change Δp_{min} at a later stage but only within the factory set pressure range.

Variable pressure control

A setpoint value signal enables variable pressure control. The control range is Δp_{min} to Δp_{max}, based on the setpoint value signal 0 (2) – 10 V.

Universal controller GUAC-P1



① Connection for actuator
② Service socket
③ Connection of supply voltage, setpoint value signal and actual value signal
④ Connections for differential pressure sensor

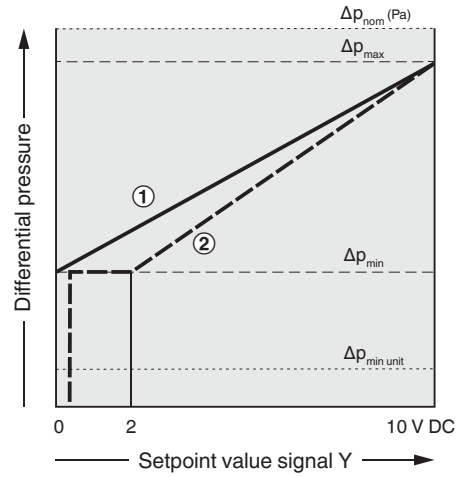
Pressure ranges

Differential pressure transducer	Δp_{limit}	Min ①	Max ②	Δp_{nom}
GUAC-P1	2.5	30	80	100
	2.5	15	40	50
	2.5	7.5	20	25
GUAC-P6	15	180	480	600
	7.5	90	240	300

① Min: Minimum value for Δp_{min}
② Max: Maximum value for Δp_{min} and Δp_{max}
Using a control signal also setpoint values < 30 % of Δp_{nom} can be set. Pressure values smaller than Δp_{limit} will be set to zero because they cannot be precisely controlled.

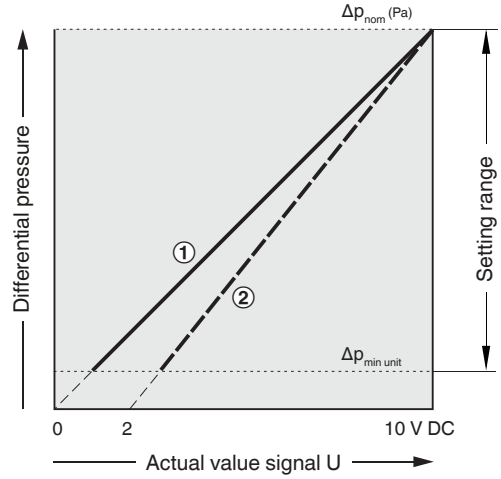
Characteristics

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC

$$\Delta p_{setpoint} = \frac{Y}{10} (\Delta p_{max} - \Delta p_{min}) + \Delta p_{min}$$

0 – 10 V DC

$$\Delta p_{actual} = \frac{U}{10} \Delta p_{nom}$$

2 – 10 V DC

$$\Delta p_{setpoint} = \frac{Y - 2}{8} (\Delta p_{max} - \Delta p_{min}) + \Delta p_{min}$$

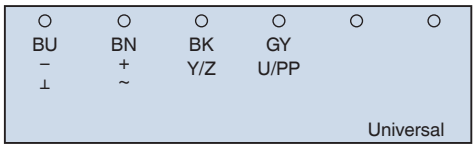
2 – 10 V DC

$$\Delta p_{actual} = \frac{U - 2}{8} \Delta p_{nom}$$

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Wiring

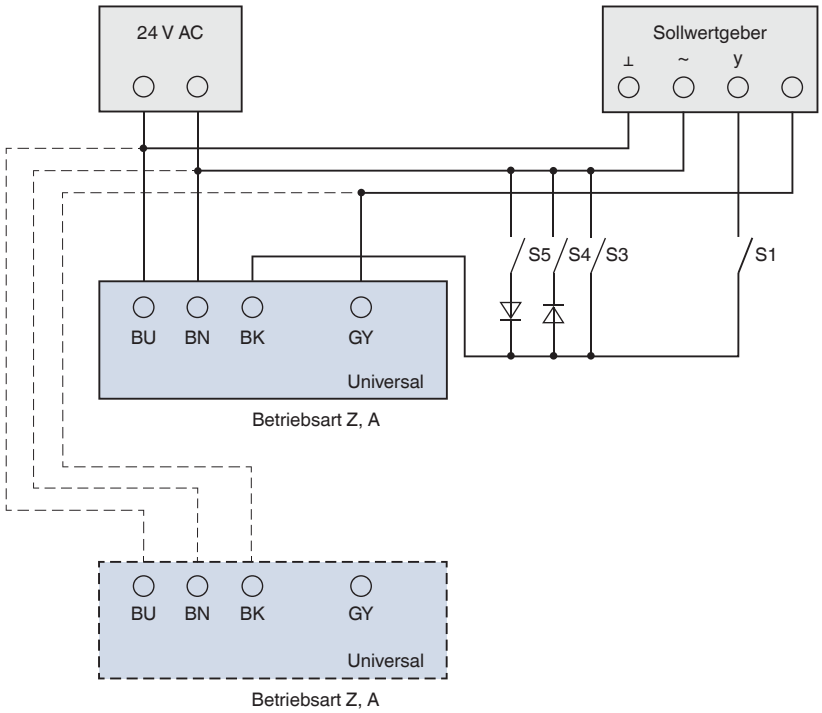
Terminal connections



BU ⊥, –: Ground, neutral
BN ~, +: Supply voltage
BK Y/Z: Setpoint value signal and override control
GY U/PP: Actual value signal and communication

Universal: GUAC-D3, GUAC-S3, GUAC-P1, GUAC-P6

Differential pressure control and override control, voltage signal 0 – 10 V DC

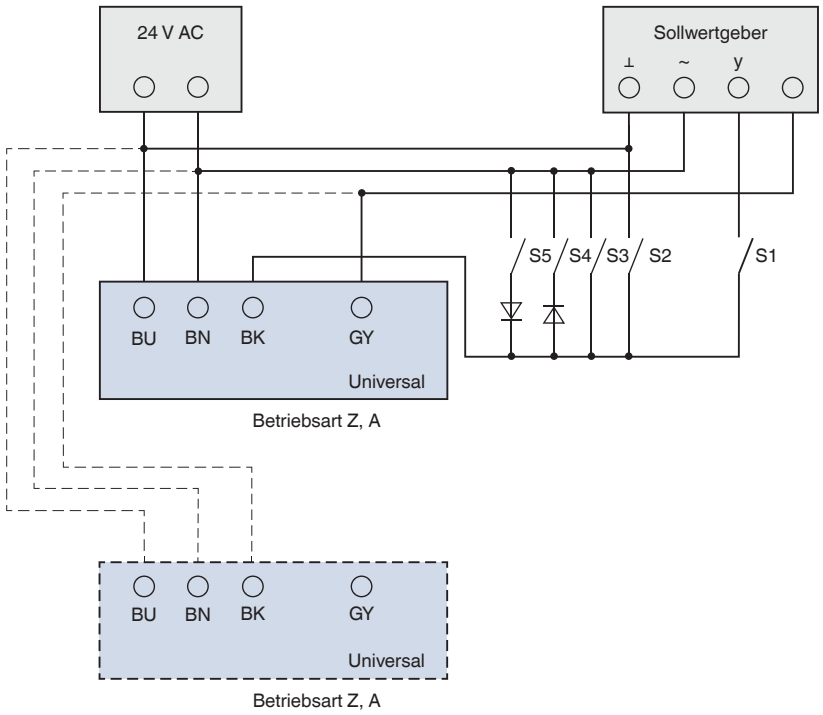


Switch functions
S1 Differential pressure control
S3 Maximum differential pressure Δp_{max}
S4 Damper blade CLOSED
(only with supply voltage 24 V AC)
S5 Damper blade OPEN
(only with supply voltage 24 V AC)
All OPEN: Minimum differential pressure Δp_{min}

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Universal: GUAC-P1, GUAC-P6

Differential pressure control and override control, voltage signal 2 – 10 V DC

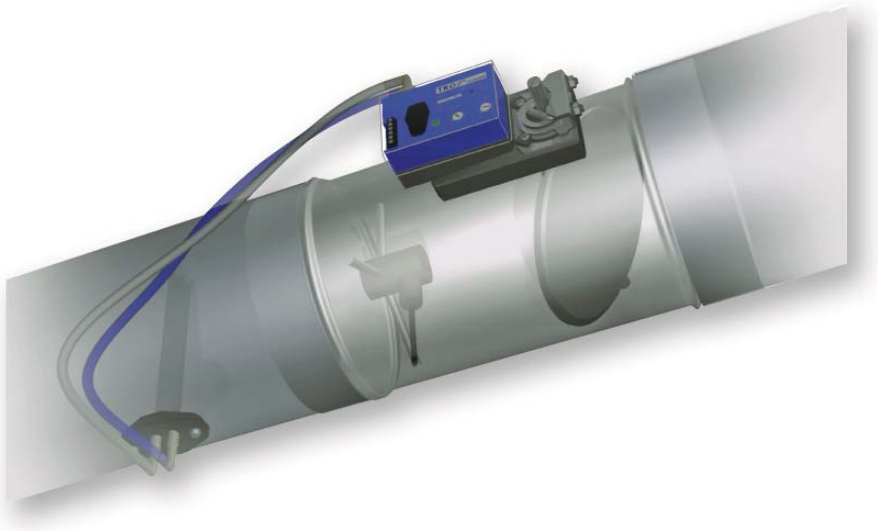


Switch functions
S1 Differential pressure control
S2 Shut-off CLOSED
S3 Maximum differential pressure Δp_{max}
S4 Damper blade CLOSED
(only with supply voltage 24 V AC);
takes priority over all other override controls
S5 Damper blade OPEN
(only with supply voltage 24 V AC)
All OPEN: Minimum differential pressure Δp_{min}

When combining several override controls the switches must be interlocked to prevent short-circuits.
Diode: e.g. 1N 4007

Universal: GUAC-P1, GUAC-P6

Control components for VAV terminal units
Type RETROFIT



Rapid replacement without interruption of system operation

Control components for VAV terminal units as a replacement for previous types while the VAV terminal unit remains installed

- Easy alternative to replacing a complete unit
- Replacement in case of modernisation
- Extended range of functions
- Installation without interruption of system operation
- For circular ducts of nominal sizes 100 to 400 mm

Retrofit parts kit consists of:

- Control components Easy, Compact or Universal
- Differential pressure sensor
- Accessories

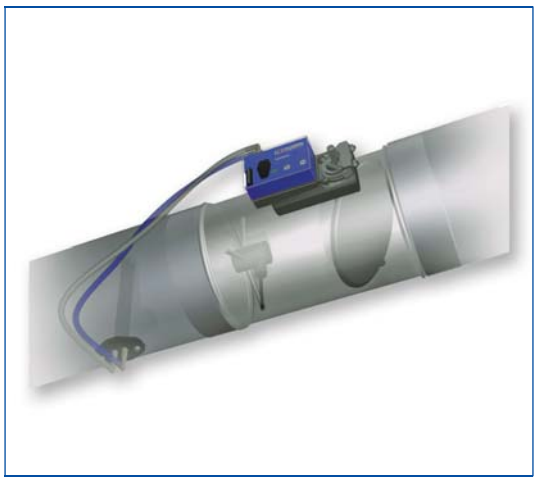
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Type		Page
RETROFIT	General information	1.3 – 81
	Order code	1.3 – 82
	Quick selection	1.3 – 83
	Special information – EasySet	1.3 – 85
	Special information – CompactSet	1.3 – 86
	Specification text	1.3 – 88
	Basic information and nomenclature	1.5 – 1

RETROFIT



RETROFIT EasySet



Description

Application
- RETROFIT parts kits for the replacement or modernisation of control components in existing VAV terminal units
- Ideal for cases where it is not possible to replace the entire VAV terminal unit
- Replacement of faulty or dirty electronic or pneumatic units
- Replacement of faulty units with airflow velocity sensors
- Conversion of a constant air to a variable air volume system
- Extension of range of functions to save energy, for more comfort, or for integration with the central BMS
- No changes to ductwork necessary since the existing unit continues to be used

Variants
- EasySet
- CompactSet
- UniversalSet

Nominal sizes
- For circular ducts with nominal size 100, 112, 125, 140, 160, 180, 200, 225, 250, 280, 315, 355, or 400

Accessories
- 1: Special adapter for EasySet and CompactSet
- 2: Special adapter for UniversalSet

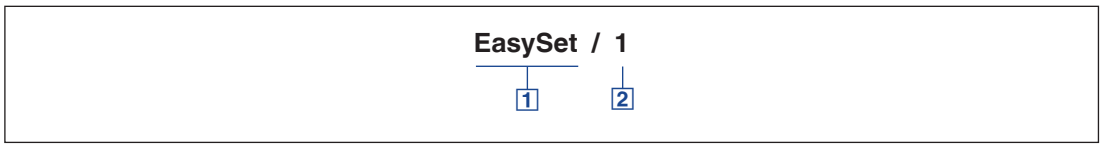
Special features
- Quick replacement
- Low modernisation cost, quick return on investment
- No interruption of system operation
- Low costs of disposal
- Electronic compatibility remains unchanged

Parts and characteristics
- Kits consist of control components and accessories
- Electronic volume flow controller and actuator
- Differential pressure sensor for volume flow rate measurement
- Stickers for VAV terminal unit and for inspection or maintenance documents

Installation and commissioning
- Remove the control components; the damper blade continues to be used
- Installing the differential pressure sensor where suitable
- Install the RETROFIT control components
- Connect the tubes of the differential pressure sensor to the control components
- Do the wiring
- Set the volume flow rates $\dot{V}_{min}$ and $\dot{V}_{max}$ (EasySet and UniversalSet: potentiometer; CompactSet: adjustment device to be supplied by others)
- Functional test

Order code

RETROFIT



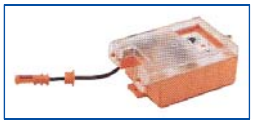
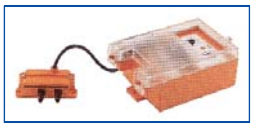
1 Parts kit

EasySet
CompactSet
UniversalSet

2 Accessories

No entry: none
Special adapters are available for units with 8 x 8 mm square shafts or with short circular shafts
1 For EasySet and CompactSet
2 For UniversalSet

1

Selection of parts kit	Existing controller	Signal voltage range	RETROFIT solution
	VR1 	– 0 – 10 V DC	– EasySet – CompactSet – UniversalSet
	VR2 	– 2 – 10 V DC	– CompactSet – UniversalSet
	VRD 	– 2 – 10 V DC	– EasySet (only 0 – 10 V DC) – CompactSet – UniversalSet
	VRD2 	– 0 – 10 V DC – 2 – 10 V DC	– CompactSet – UniversalSet
	NMV24-V 	– 0 – 10 V DC	– EasySet – CompactSet – UniversalSet
	NMV24-D 	– 0 – 10 V DC	– EasySet – CompactSet – UniversalSet
	NMV-D2 	– 0 – 10 V DC – 2 – 10 V DC	– EasySet (only 0 – 10 V DC) – CompactSet – UniversalSet
	NMV-D2M 	– 0 – 10 V DC – 2 – 10 V DC	– CompactSet – UniversalSet

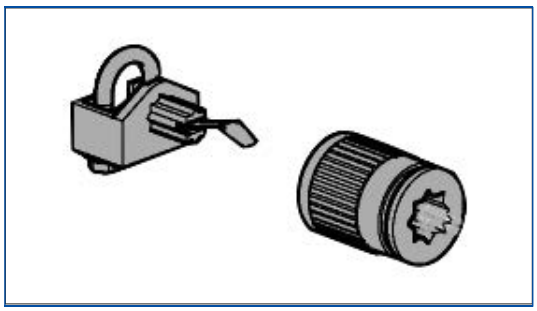
Criteria for the selection of the kit

- The selection of the required RETROFIT parts kit depends on the existing control components
- A further criterion is the voltage range of the existing system
- The following overview shows which of the 3 RETROFIT kits are suitable to replace the existing control components and will provide the same range of functions
- CompactSet and UniversalSet are suitable for all existing controllers and may even provide an extended range of functions
- EasySet and CompactSet are suitable for Ø 10 – 20 mm circular shafts and for 8 – 16 mm square shafts with the shaft end projecting at least 45 mm
- UniversalSet is suitable for Ø 8 – 20 mm circular shafts and for 8 – 18 mm square shafts with the shaft end projecting at least 25 mm
- Other types of shafts require special adapters

Existing controllers VR1, VR2, VRD and VRD2 are combined with actuators KM24-I, SM24-I, NM24-V or SM24-V.

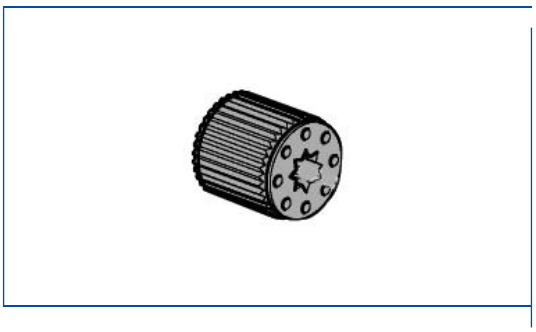
Shaft clamp

Special adapter 1 for EasySet and CompactSet



Existing shaft

Special adapter 2 for UniversalSet



Existing shaft
- 8 mm x 8 mm square shaft (existing actuator KM 24-I)

Volume flow rate ranges

Nominal size	$\dot{V}_{Nenn}$		$\dot{V}_{min}$	
	l/s	m³/h	l/s	m³/h
100	95	342	10	36
112	125	450	13	47
125	155	558	15	54
140	195	702	20	72
160	250	900	25	90
180	315	1134	32	115
200	405	1458	40	144
225	525	1890	53	191
250	615	2214	62	223
280	795	2862	80	288
315	1030	3708	105	378
355	1275	4590	130	468
400	1675	6030	170	612

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Description



RETROFIT EasySet

Application

- RETROFIT parts kit with Easy controller LMV-D3A

Parts and characteristics

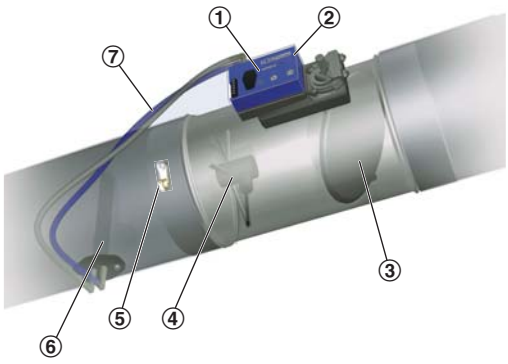
- Differential pressure sensor for the measurement of volume flows using the effective pressure principle
- Easy controller combines volume flow controller and actuator in one casing
- Tubes, small parts, operating manual, sticker

Installation and commissioning

- Set the volume flow rate percentages on scaled potentiometers, without additional adjustment device
- Start the functional test by pressing the function button
- Green indicator light shows the operating state

Function

EasySet



① Easy controller
② Protective cover
③ Existing damper blade
④ Existing sensor
⑤ Wire clamping bracket
⑥ Effective pressure sensor
⑦ Tubing

Technical data

Easy controller LMV-D3A and LMV-D3A-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	5 VA max.
Power rating (DC)	2.5 W max.
Running time for 90°	110 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 20
EC conformity	EMC according to 2004/108/EC

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Description



RETROFIT CompactSet

Application

– RETROFIT parts kit
with Compact controller LMV-D3-MP

Parts and characteristics

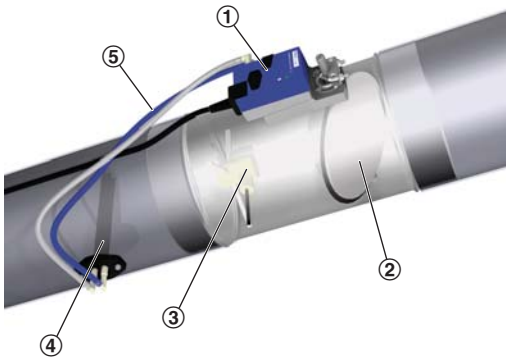
– Differential pressure sensor
for the measurement of volume flows
using the effective pressure principle
– Compact controller combines volume
flow controller and actuator in one casing
– Tubes, small parts, operating manual, sticker

Installation and commissioning

– Set the volume flow rates with an adjustment device or using an interface and dedicated software (to be supplied by others)
– Set the operating mode 0 – 10 V DC
or 2 – 10 V DC
– Carry out a functional test using adjustment device, software or voltage measurement

Function

CompactSet



① Compact controller
② Existing damper blade
③ Existing sensor
④ Effective pressure sensor
⑤ Tubing

Technical data

Compact controller LMV-D3-MP and LMV-D3-MP-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	4 VA max.
Power rating (DC)	2 W max.
Torque	5 Nm
Running time for 90°	110 – 150 s
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.5 kg

Description



RETROFIT UniversalSet

Application

– RETROFIT parts kit with Universal controller VRD3 and actuator NM24A-V

Parts and characteristics

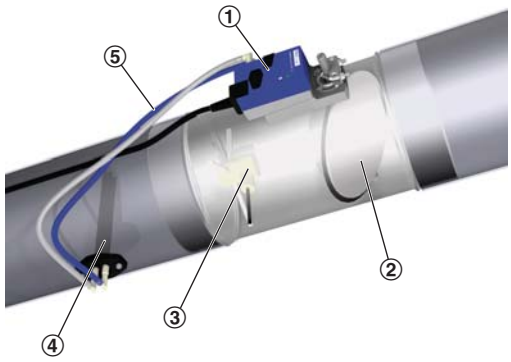
– Differential pressure sensor for the measurement of volume flows using the effective pressure principle
– Universal controller
– Actuator
– Tubes, small parts, operating manual, sticker

Installation and commissioning

– Set the volume flow rate percentages on scaled potentiometers, without additional adjustment device
– Alternatively, set the volume flow rates with an adjustment device or using an interface and dedicated software (to be supplied by others)
– Set the operating mode 0 – 10 V DC or 2 – 10 V DC
– Carry out a functional test using adjustment device, software or voltage measurement

Function

CompactSet



① Compact controller
② Existing damper blade
③ Existing sensor
④ Effective pressure sensor
⑤ Tubing

Technical data

Volume flow controller VRD3

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	without actuator max. 3.5 VA
Power rating (DC)	without actuator max. 2 W
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 40
EC conformity	EMC according to 2004/108/EC
Weight	0.440 kg

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	5.5 VA max.
Power rating (DC)	4 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Weight	0.710 kg

EasySet

Parts kit for the modernisation of VAV terminal units in systems with circular ducts, for nominal sizes 100 to 400 mm, for supply or extract air. Customers can easily set the volume flow rates on the Easy controller using potentiometers with percentage scales. No supply voltage and no additional devices are required.
A transparent protective cover prevents inadvertent resetting and provides general safety. Clearly visible external indicator light for signalling the functions: Set, not set, no supply voltage.

Electrical connections with screw terminals. Double terminal for looping the supply voltage, i.e. for the simple connection of voltage transmission to the next controllers.
Voltage range for control signal and actual value signal 0 to 10 V DC. Possible override controls with external switches using volt-free contacts: CLOSED, OPEN,
switching between $\dot{V}_{min}$ and $\dot{V}_{max}$.
Same, linear characteristic for all sizes.

CompactSet

Parts kit for the modernisation of VAV terminal units in systems with circular ducts, for nominal sizes 100 to 400 mm, for supply or extract air. Customers can easily set the volume flow rates on the Compact controller using the adjustment device or dedicated software.

Voltage range for control and actual value signal 0 – 10 or 2 – 10 V DC. Possible override controls with external switches using volt-free contacts: CLOSED, OPEN,
switching between $\dot{V}_{min}$ and $\dot{V}_{max}$.
Same, linear characteristic for all sizes.

UniversalSet

Parts kit for the modernisation of VAV terminal units in systems with circular ducts, for nominal sizes 100 to 400 mm, for supply or extract air. Customers can easily set the volume flow rates on the Universal controller using the adjustment buttons on the controller, an adjustment device, or dedicated software.

Voltage range for control and actual value signal 0 – 10 or 2 – 10 V DC. Possible override controls with external switches using volt-free contacts: CLOSED, OPEN,
switching between $\dot{V}_{min}$ and $\dot{V}_{max}$.
Same, linear characteristic for all sizes.
Separate actuator.

Special features

- Quick replacement
- Low modernisation cost, quick return on investment
- No interruption of system operation
- Low costs of disposal
- Electronic compatibility remains unchanged

1 Parts kit

☐ **EasySet**
☐ **CompactSet**
☐ **UniversalSet**

2 Accessories

No entry: none
Special adapters are available for units with 8 x 8 mm square shafts or with short circular shafts

☐ **1** For EasySet and CompactSet
☐ **2** For UniversalSet

Control components for VAV terminal units
Type RC



For the individual temperature control in rooms

Lower operating costs due to intelligent sensor technology

- Temperature range 10 – 45 °C
- For variable air volume systems and 2-pipe or 4-pipe air water systems
- With integral temperature sensor

Optional equipment

- Room occupant can select the operating mode
- Remote control for RC/M1



Room temperature controller
ETN-24-VAV-227-P

1

Type		Page
RC	General information	1.3 – 90
	Order code	1.3 – 92
	Special information – RC/B1	1.3 – 93
	Special information – RC/B2	1.3 – 94
	Special information – RC/B3	1.3 – 95
	Special information – RC/M1	1.3 – 96
	Specification text	1.3 – 97
	Basic information and nomenclature	1.5 – 1

Variants

Product examples

Room temperature controller CR24-B1



Room temperature controller ETN-24-VAV-227-P



Description

Application

- Room temperature controller
- Ideally suited for the control of VAV terminal units using Easy, Compact, or Universal controllers
- Comfortable room temperature control
- Low energy consumption due to demand-based operating modes
- Cooling and/or heating
- Device versions with different output sequences for many different ventilation and air conditioning systems, including air-water systems

Variants

- B1: Room temperature controller with one analog output for cooling or heating (changeover)
- B2: Room temperature controller with two analog outputs for cooling or heating (3 point)
- B3: Room temperature controller with three analog outputs for cooling or heating (0 – 10 V DC and 3 point)
- M1: Room temperature controller with two analog outputs for cooling or heating (0 – 10 V DC)

Commissioning

- Configure the control function using a micro switch
- Functional test

Function

Functional description

Room temperature controller and VAV terminal unit, including control components, form a functional unit that allows occupants to control the room temperature individually and at the lowest possible energy consumption. It also allows to control the water valves of hot water or cold water systems.
Room temperature control is a closed loop control. The controller is fitted with a temperature sensor that measures the room temperature. The setpoint can be a constant value or it can be changed by room occupants. The controller compares the actual value with the setpoint value and alters the volume flow rate setpoint value and/or the valve settings accordingly. The room temperature control is P control or PI control. Maximum energy efficiency is achieved because of demand-based operating modes that can be activated by the room occupant or at a higher level.

Operating modes

Energy-saving mode
The room temperature is such that devices will not suffer, i.e. the setpoint temperature for heating is very low, and the setpoint temperature for cooling is very high, for example in a room with an open window.

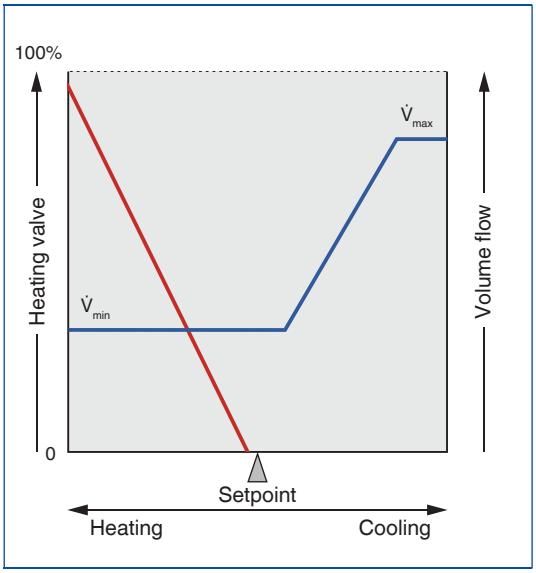
Standby mode
The setpoint temperature for heating is just slightly reduced, and the setpoint temperature for cooling is just slightly increased, e.g. for a room that is currently not used.

Frost mode
If the room temperature falls below 10 °C, the anti-freeze function is activated.

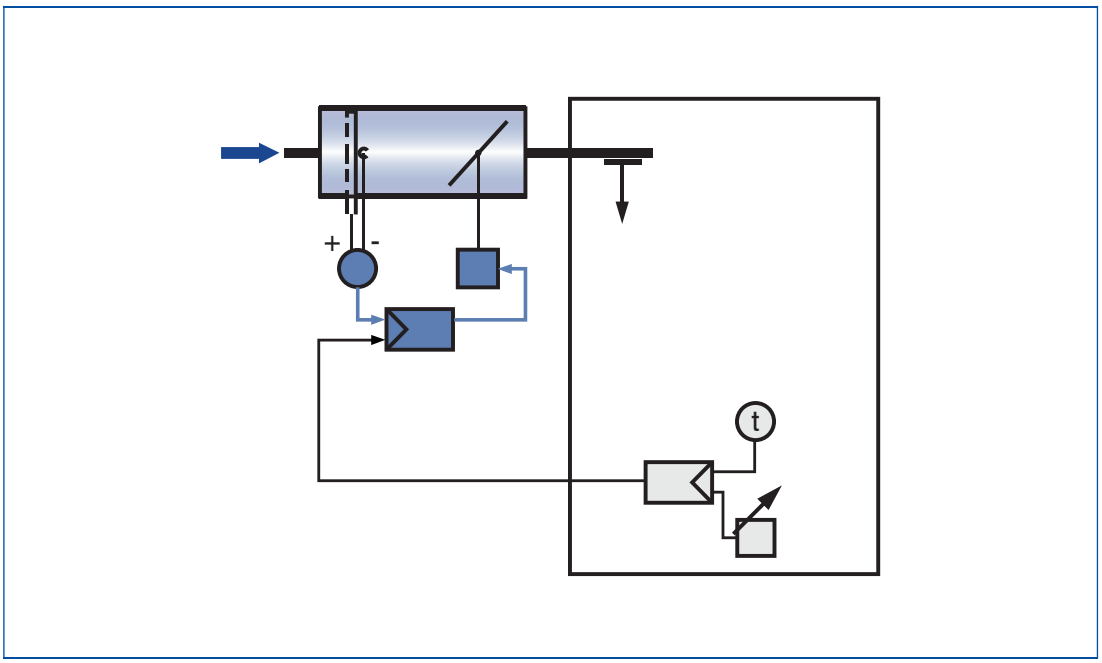
Changeover
Changeover from cooling to heating or from heating to cooling.

Boost
Room ventilation with the maximum volume flow rate ($\dot{V}_{max}$), or maximum heating or cooling.

Control diagram with heating and cooling sequence



Single operation



1

Order code

RC

RC / B1
1 2

1 Type
RC Room temperature controller

2 Type
B1 CR24-B1
B2 CR24-B2
B3 CR24-B3
M1 ETN-24-VAV-277V-P
M2 Remote control for M1

Order example

RC/M1

Type	ETN-24-VAV-277V-P

Description



Room temperature controller CR24-B1

Application

- Room temperature controller CR24-B1 with one output, for room applications
- Cooling or heating (changeover)
- Analog output 0 – 10 V DC for the control of VAV terminal units with Easy, Compact or Universal controllers

Parts and characteristics

- Attractive unit for wall mounting, signal white (RAL 9003)
- Integral temperature sensor
- Setpoint adjuster
- Operating mode push button
- Status indicator light
- Analog output 0 – 10 V DC for variable volume flow control
- Analog inputs 0 – 10 V DC for external temperature sensor and for setpoint changes by an external unit
- Digital inputs for energy-saving mode, standby operation or changeover
- Micro switch for configuration
- Communication connection for adjustment devices

Commissioning

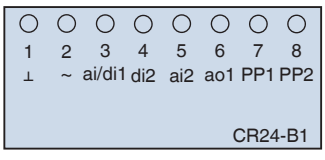
- Configure the control function using a micro switch
- Functional test

Technical data

Supply voltage	24 V AC ± 20 %, 50/60 Hz
Power rating	3 VA
External temperature sensor	NTC, 5 kΩ, 10 – 45 °C
External setpoint changes	0 – 10 V DC corresponding to 0 – 10 K
Output for variable volume flow	0 – 10 V DC, 5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 30
EC conformity	EMC according to 2004/108/EG
Dimensions (B × H × T)	84 × 99 × 32 mm
Weight	0.105 kg

Electrical connection

Terminal connections



1 ⊥:	Neutral
2 ~:	Supply voltage
3 ai/di1:	External temperature sensor or energy-saving mode
4 di2:	Standby/Changeover
5 ai2:	External setpoint changes
6 ao1:	Volume flow controller
7 PP1:	Diagnosis connection 1
8 PP2:	Diagnosis connection 2

1

Description



Room temperature controller CR24-B2

Application

- Room temperature controller CR24-B2 with two outputs, for room applications
- Cooling and heating
- Analog output 0 – 10 V DC for the control of VAV terminal units with Easy, Compact or Universal controllers
- 3-point output for heating

Parts and characteristics

- Attractive unit for wall mounting, signal white (RAL 9003)
- Integral temperature sensor
- Setpoint adjuster
- Operating mode push button
- Status indicator light
- Analog output 0 – 10 V DC for variable volume flow control
- 3-point output for controlling a heating valve
- Analog inputs 0 – 10 V DC for external temperature sensor and for setpoint changes by an external unit
- Digital inputs for energy-saving mode, standby operation or changeover
- Micro switch for configuration
- Communication connection for adjustment devices

Commissioning

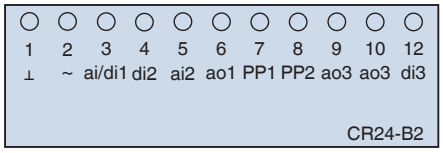
- Configure the control function using a micro switch
- Functional test

Technical data

Supply voltage	24 V AC ± 20 %, 50/60 Hz
Power rating	3 VA
External temperature sensor	NTC, 5 kΩ, 10 – 45 °C
External setpoint changes	0 – 10 V DC corresponding to 0 – 10 K
Output for variable volume flow	0 – 10 V DC, 5 mA max.
Output for heating valve	3-point, 24 V AC, max. 0.5 A, 10 VA, optimised for actuators with a running time of approx. 150 s
IEC protection class	III (protective extra-low voltage)
Protection level	IP 30
EC conformity	EMC according to 2004/108/EG
Dimensions (B × H × T)	84 × 99 × 32 mm
Weight	0.105 kg

Electrical connection

Terminal connections



1 ⊥: Neutral
2 ~: Supply voltage
3 ai/di1: External temperature sensor or energy-saving mode
4 di2: Standby
5 ai2: External setpoint changes
6 ao1: Volume flow controller
7 PP1: Diagnosis connection 1
8 PP2: Diagnosis connection 2
9,10 ao3: Heating valve (3-point)
12 di3: Maximum volume flow rate

Description



Room temperature controller CR24-B3

Application

- Room temperature controller CR24-B3 with three outputs, for room applications
- Cooling and heating
- Analog output 0 – 10 V DC for the control of VAV terminal units with Easy, Compact or Universal controllers
- Analog output 0 – 10 V DC cooling or heating (changeover)
- 3-point output for heating

Parts and characteristics

- Attractive unit for wall mounting, signal white (RAL 9003)
- Integral temperature sensor
- Setpoint adjuster
- Operating mode push button
- Status indicator light
- Analog output 0 – 10 V DC for variable volume flow control
- Analog output 0 – 10 V DC for controlling a water valve
- 3-point output for controlling a heating valve
- Analog inputs 0 – 10 V DC for external temperature sensor and for setpoint changes by an external unit
- Digital inputs for energy-saving mode, standby operation or changeover
- Micro switch for configuration
- Communication connection for adjustment devices

Commissioning

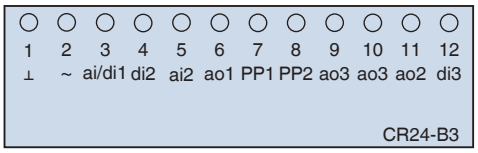
- Configure the control function using a micro switch
- Functional test

Technical data

Supply voltage	24 V AC ± 20 %, 50/60 Hz
Power rating	3 VA
External temperature sensor	NTC, 5 kΩ, 10 – 45 °C
External setpoint changes	0 – 10 V DC corresponding to 0 – 10 K
Output for variable volume flow	0 – 10 V DC, 5 mA max.
Output for heating/cooling	0 – 10 V DC, 5 mA max.
Output for heating valve	3-point, 24 V AC, max. 0.5 A, 10 VA, optimised for actuators with a running time of approx. 150 s
IEC protection class	III (protective extra-low voltage)
Protection level	IP 30
EC conformity	EMC according to 2004/108/EG
Dimensions (B × H × T)	84 × 99 × 32 mm
Weight	0.105 kg

Electrical connection

Terminal connections



1 ⊥: Neutral
2 ~: Supply voltage
3 ai/di1: External temperature sensor or energy-saving mode
4 di2: Standby
5 ai2: External setpoint changes
6 ao1: Volume flow controller
7 PP1: Diagnosis connection 1
8 PP2: Diagnosis connection 2
9,10 ao3: Heating valve (3-point)
11 ao2: Heating/cooling valve (0 –10 V DC)
12 di3: Maximum volume flow rate/changeover or dew point

1

Description



Room temperature controller
ETN-24-VAV-227-P



Remote control for room temperature controller
ETN-24-VAV-227-P

Application
- Room temperature controller ETN-24-VAV-227V-P with two outputs, for room applications
- Cooling and heating
- Analog output 0 – 10 V DC for the control of VAV terminal units with Easy, Compact or Universal controllers (cooling operation)
- Analog output 0 – 10 V DC controlling the reheating

Useful additions
- M2: Remote control

Parts and characteristics
- Attractive unit for wall mounting, white
- Setpoint adjuster
- Operating mode push button
- Integral temperature sensor
- Analog input for external temperature sensor
- Display for temperature and status
- Analog output 0 – 10 V DC for variable volume flow control
- Analog output 0 – 10 V DC controlling a heating valve
- Communication connection for adjustment devices

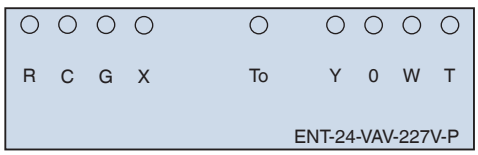
Commissioning
- Configuring the control function
- Functional test

Technical data

Supply voltage	24 V AC, 50/60 Hz
Power rating	1.2 VA
External temperature sensor	Thermistor 50 kΩ at 45 °C
Analog outputs for cooling operation, heating operation	0 – 10 V DC, max. 5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 30
EC conformity	EMC according to 2004/108/EC
Dimensions (B × H × T)	92 × 80 × 22 mm
Weight	0.136 kg

Electrical connection

Terminal connections



R ⊥:	Neutral
C ~:	Supply voltage
0:	Ground
Y:	0 – 10 V output for cooling (volume flow controller)
To, T:	External temperature sensor
X:	Communication (pp)
W:	0 – 10 V output for heating (valve)

1

Standard text

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

Room temperature controller for the control of VAV terminal units Attractive unit for wall mounting, with a setpoint adjuster and a push button to select the operating mode Integral temperature sensor (NTC) and input for external temperature measuring unit. Voltage output 0 – 10 V DC for connection to an electronic volume flow controller for cooling,
or for heating and cooling in changeover mode.

Technical data

- Supply voltage: 24 V AC, 50/60 Hz
- Power rating:3 VA
- External setpoint changes: 0 – 10 V DC
- Output for variable volume flow: 0 – 10 V DC

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1 Type

RC	Room temperature controller

2 Type

☐ **B1**	CR24-B1
☐ **B2**	CR24-B2
☐ **B3**	CR24-B3
☐ **M1**	ETN-24-VAV-277V-P
☐ **M2**	Remote control for M1

Adjustment devices for VAV terminal units

Type Adjustment devices



For service and commissioning

Adjustment devices for the service and commissioning of VAV terminal units. For the display of actual values and parameters, and for functional tests.

- Display of actual and setpoint values
- Display and changing of parameters and operating modes
- Easy plug connection to the controller or terminal connection to the switch cabinet
- Easy operation
- Portable devices for use on site

1

Type		Page
Adjustment devices	General information	1.4 – 2
	Order code	1.4 – 3
	Special information – AT-VAV-B	1.4 – 4
	Special information – AT-VAV-G	1.4 – 6
	Special information – AT-VAV-S	1.4 – 7
	Basic information and nomenclature	1.5 – 1

Description

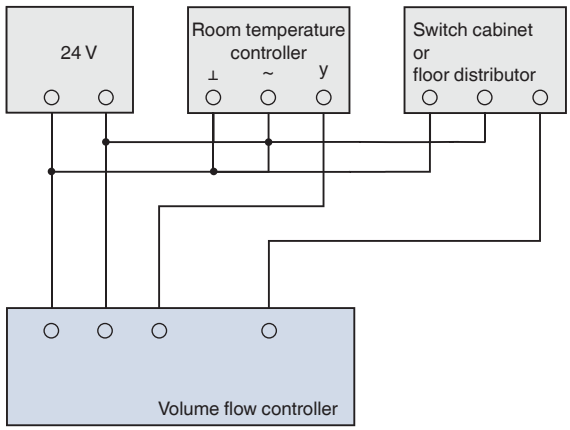
Application

- Adjustment devices for VAV terminal units, used to facilitate service and commissioning
- Read actual values and setpoint values
- Read and change parameters
- Read and set operating modes
- Functional test

Installation and commissioning

- Recommendation: The signal line for the individual adjustment devices should be connected in an easily accessible place; this avoids having to open any false ceilings for inspection or service at a later stage
- Easily accessible places include: switch cabinet, floor distribution box, or an unused terminal on the room temperature controller
- Important: The ground (and perhaps 24 V) must also be available.

Wire connection to an additional service terminal in the switch cabinet

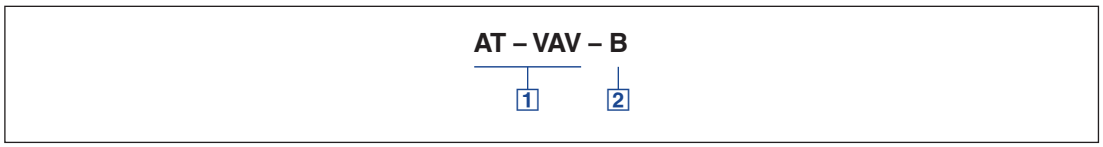


Function

Functional description

The adjustment device communicates with the controller using the voltage signal line for the actual value or setpoint value.
The adjustment device recognises the controller type and allows access to the available operating values and parameters.
The values are displayed.
Operation is with push buttons.

Order code **AT**



1 Type

AT-VAV Adjustment devices for VAV terminal units

2 Variants

B ZTH-EU for TROX/Belimo volume flow controllers
G for TROX/Gruner volume flow controllers
S AST10 for Siemens volume flow controllers

Order example **AT-VAV – S**

Adjustment device for volume flow controllers Siemens

1

Description

Application

- Adjustment device ZTH-EU for VAV terminal units with TROX/Belimo volume flow controllers, used to facilitate service and commissioning
- Read actual values and setpoint values
- Read and change $\dot{V}_{min}$ and $\dot{V}_{max}$
- Read and change signal voltage ranges
- Read and change the operating mode
- Reset parameters to the factory settings
- MP bus test
- Measure and display the supply voltage
- Integral ZIP-USB interface to connect the device to a notebook on which the Belimo PC tool is installed

Compatible volume flow controllers

The volume flow controllers are attachments for VAV terminal units.

- BC0; BF0: LMV-D*-MP, NMV-D*-MP
- BL0: LMV-D3LON
- BM0: LMV-D3-MOD*, NMV-D3-MOD*
- BP1, BP3, BPB, BPG; BR1, BR3, BRB, BRG; BS1, BS3, BSB, BSG: VRP-M
- B11, B13, B1B; B27: VRD3

Parts and characteristics

- Adjustment device ZTH-EU
- Cable 1 (ZK1-GEN) with Belimo plug, for the controller
- Cable 2 (ZK2-GEN) with bare wire ends that can be connected to terminals
- Cable with USB 2.0 plug that can be connected to PCs with the Belimo PC tool

AT-VAV-B



① Display
② OK – confirm selected value
③ Push button – increase value
④ Push button – decrease value
⑤ ESC – cancel / back
⑥ i – display additional information
⑦ MP socket for controller communication with ZK1-GEN, ZK2-GEN
⑧ USB socket for PC communication

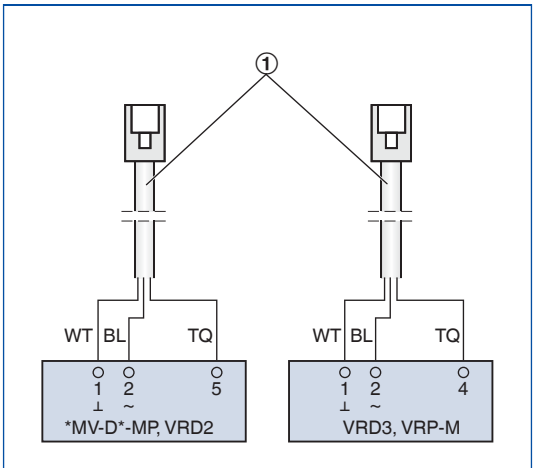
Electrical connection

Plug connection to the controller



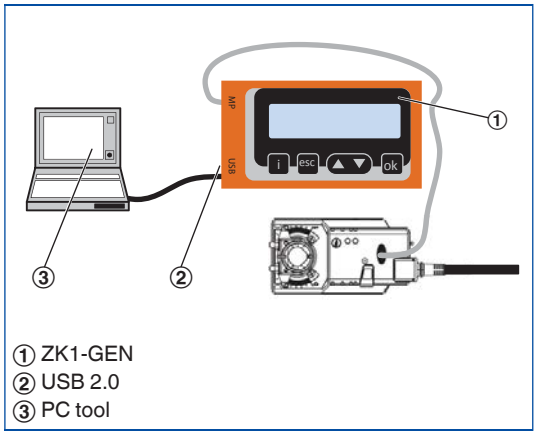
① ZK1-GEN

Terminal connection to the controller or switch cabinet



① Connecting cable

Connection to the PC tool



① ZK1-GEN
② USB 2.0
③ PC tool

1

Description

Application

- Adjustment device GUIV-A for VAV terminal units with TROX/Gruner volume flow controllers, used to facilitate service and commissioning
- Read actual values and setpoint values
- Read and change $\dot{V}_{min}$ and $\dot{V}_{max}$
- Read and change signal voltage ranges
- Read and change the operating mode
- Reset parameters to the factory settings
- Integral interface (replaces GUIV-S) for the connection to a notebook with Gruner VAV Tool Software installed

Compatible volume flow controllers

The volume flow controllers are attachments for VAV terminal units.

- XB0, XG0: 227V-024-**, 227P-024-**
- XC3: GUAC-D3, GUAC-DM3
- XD1, XD3: GUAC-S3, GUAC-SM3
- XE1, XE3: GUAC-P1, GUAC-PM1
- XF1, XF3: GUAC-P6, GUAC-PM6

Parts and characteristics

- Adjustment device
- Cable 1 with plug for the controller
- Connecting cable 2 with two bare wire ends that can be connected to terminals

AT-VAV-G



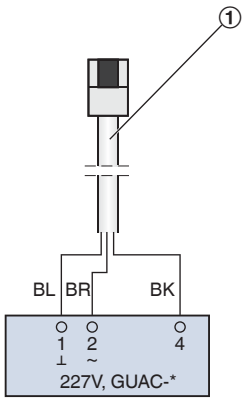
① Display
② +/- push buttons
③ Set (acknowledge)
④ Escape (cancel)
⑤ Menu selection
⑥ Indicator lights
⑦ Connection for personal computer (mini USB)
⑧ Connection for controller

Electrical connection

Plug connection to the controller



Terminal connection to the controller or switch cabinet



① Connecting cable

Description

Application

- Adjustment device Type AST10 for VAV terminal units with Siemens volume flow controllers, used to facilitate service and commissioning
- Read actual values and setpoint values
- Read and change $\dot{V}_{min}$ and $\dot{V}_{max}$
- Read and change the operating mode
- Reset parameters to the factory settings

Compatible volume flow controllers

The volume flow controllers are attachments for VAV terminal units.

- LN0, LY0: GLB181.1E/3
- LK0: GLB181.1E/KN

Parts and characteristics

- Adjustment device
- Cable 1 with 3-pole socket and 6-pole plug connector for controllers up to Type D
- Cable 2 with 3-pole socket and 7-pole plug connector for controllers from Type E
- Cable 3 with 3-pole socket and bare wire ends that can be connected to terminals

AT-VAV-S



① Display
② Increase value
③ Decrease value
④ Select parameters
⑤ Set (acknowledge)
⑥ Activate factory settings
⑦ Display reference value ($\dot{V}_n$) or $\dot{V}_{min}$
⑧ Display $\dot{V}_{max}$ or Y
⑨ 3-pole plug connector as an adapter for the supplied cables

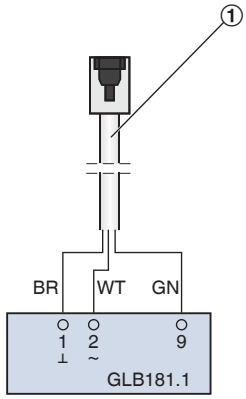
Electrical connection

Plug connection to the controller



① Individual cables

Terminal connection to the controller or switch cabinet



① Connecting cable

Variable volume flow control – VARYCONTROL

Basic information and nomenclature



- Product selection
- Principal dimensions
- Nomenclature
- Construction
- Correction values for system attenuation
- Measurements
- Sizing and sizing example
- Function
- Operating modes

1

Product selection

	Type											
	LVC	TVR	TVJ	TVT	TZ-Silenzio	TA-Silenzio	TVZ	TVA	TVM	TVRK	TVLK	TVR-Ex
Type of system												
Supply air	●	●	●	●	●		●			●		●
Extract air	●	●	●	●		●		●		●	●	●
Dual duct (supply air)									●			
Duct connection, fan end												
Circular	●	●					●	●	●	●	●	●
Rectangular			●	●	●	●						
Volume flow rate range												
Up to [m^3/h]	1080	6050	36360	36360	3025	3025	6050	6050	6050	6050	1295	6050
Up to [l/s]	300	1680	10100	10100	840	840	1680	1680	1680	1680	360	1680
Air quality												
Filtered	●	●	●	●	●	●	●		●	●	●	●
Office extract air	●	●	●	●		●		●		●	●	●
Polluted		○	○	○		○		○		●	●	○
Contaminated										●	●	
Control function												
Variable	●	●	●	●	●	●	●	●	●	●	●	●
Constant	●	●	●	●	●	●	●	●	●	●	●	●
Min/Max	●	●	●	●	●	●	●	●	●	●	●	●
Pressure control		○	○	○	○	○	○	○		○		○
Master/Slave	●	●	●	●	●	●	●	●	Master	●	●	●
Shut-off mode												
Leakage			●									
Low leakage	●	●		●	●	●	●	●	●	●	●	●
Acoustic requirements												
High < 40 dB(A)			○	○	●	●	●	●	○			
Low < 50 dB (A)	●	●	●	●	●	●	●	●	●	●	●	●
Other functions												
Volume flow rate measurement	●	●	●	●	●	●	●	●	●	●	●	●
Special areas												
Areas with explosive atmospheres												●
Labs, clean rooms, operating theatres (EASYLAB, TCU-LON II)		●	●	●			●	●		●	●	

●	Possible
○	Possible under certain conditions: Robust unit variant and/or specific control component (attachment) or useful additional product
	Not possible

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

$ØD_1$ [mm]
Pitch circle diameter of flanges

$ØD_2$ [mm]
Outside diameter of flanges

$ØD_4$ [mm]
Inside diameter of the screw holes of flanges

L [mm]
Length of unit including connecting spigot

L_1 [mm]
Length of casing or acoustic cladding

B [mm]
Duct width

B_1 [mm]
Screw hole pitch of flange (horizontal)

B_2 [mm]
Outside dimension of flange (width)

B_3 [mm]
Width of device

H [mm]
Duct height

H_1 [mm]
Screw hole pitch of flange (vertical)

H_2 [mm]
Outside dimension of flange (height)

H_3 [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)

Nomenclature

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

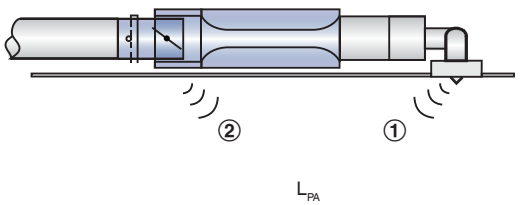
L_{PA1} [dB(A)]
A-weighted sound pressure level of air-regenerated noise of the VAV terminal unit with secondary silencer, system attenuation taken into account

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



① Air-regenerated noise
② Case-radiated noise

1

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

$\dot{V}_{min\ unit}$ [m³/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 $\dot{V}_{min\ unit}$ (if $\dot{V}_{min}$ equals zero) may result in unstable control or shut-off

$\dot{V}_{max}$ [m³/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)

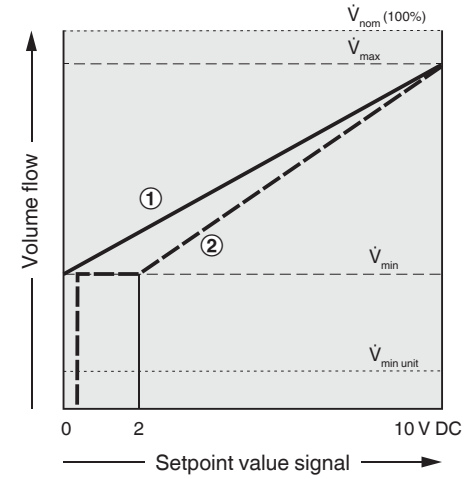
$\dot{V}_{min}$ [m³/h] and [l/s]
Lower limit of the operating range for the VAV terminal unit that can be set by customers
- $\dot{V}_{min}$ should be smaller than or equal to $\dot{V}_{max}$
- Do not set $\dot{V}_{min}$ smaller than $\dot{V}_{min\ unit}$, otherwise the control may become unstable or 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)

$\dot{V}$ [m³/h] and [l/s]
Volume flow rate

$\Delta\dot{V}$ [± %]
Volume flow rate tolerance from setpoint value

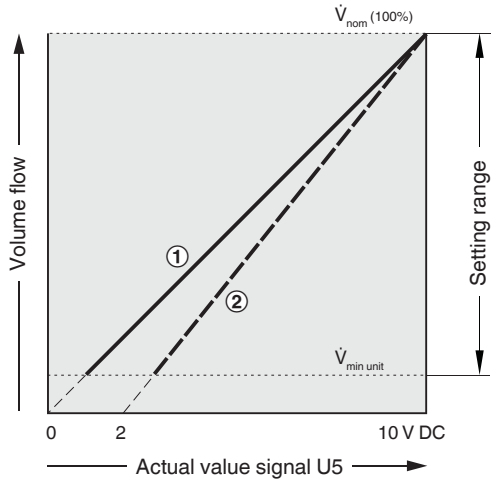
$\Delta\dot{V}_{warm}$ [± %]
Volume flow rate tolerance for the warm air flow of dual duct terminal units

Characteristic of the setpoint value signal



① 0 – 10 V DC
② 2 – 10 V DC

Characteristic of the actual value signal



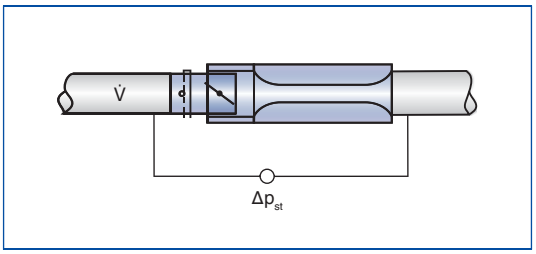
① 0 – 10 V DC
② 2 – 10 V DC

Differential pressure

Δp_{st} [Pa]
Static differential pressure

$\Delta p_{st\ min}$ [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



Constructions

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

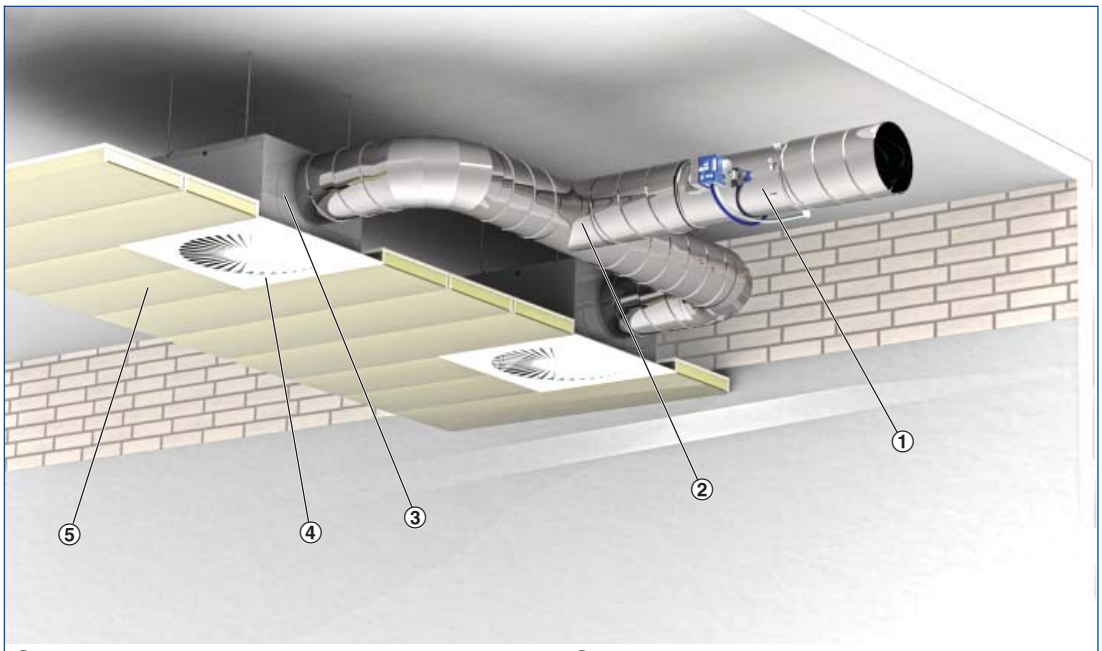
Powder-coated surface (P1)
- Casing made of galvanised sheet steel, powder-coated RAL 7001, silver grey
- Parts in contact with the airflow are powder-coated or made of plastic
- Due to production, some parts that come into contact with the airflow may be stainless steel or aluminium, powder-coated
- 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

1

The quick sizing tables show the sound pressure levels that can be expected in a room both for the air-regenerated noise and for the case-radiated noise. The sound pressure level in a room results from the sound power level of the products – for a given volume flow rate and differential pressure – and the attenuation and insulation on site. Generally accepted attenuation and insulation values have been taken into account.
The distribution of air across the ductwork, changes of direction, end reflection, and room attenuation all affect the sound pressure level of the air-regenerated noise.Ceiling insulation and room attenuation influence the sound pressure level of the case-radiated noise.

Reducing the sound pressure level of the air-regenerated noise



① VAV terminal unit
② Distribution in the ducting
③ Change of direction
④ End reflection
⑤ Ceiling insulation

Correction values for acoustic quick sizing

The correction values for the distribution in the ducting are based on the number of diffusers assigned to any one air terminal unit.
If there is just one diffuser (assumption: 140 l/s or 500 m^3/h), no correction is necessary.

Octave correction for the distribution in the ducting, used to calculate the air-regenerated noise

$\dot{V}$ in [m^3/h]	500	1000	1500	2000	2500	3000	4000	5000
[l/s]	140	280	420	550	700	840	1100	1400
[dB]	0	3	5	6	7	8	9	10

One change of direction, e.g. at the horizontal connection of the diffuser plenum box, has been taken into consideration for the system attenuation values. Vertical connection of the plenum box does not result in a system attenuation. Additional bends result in lower sound pressure levels.

System attenuation per octave to VDI 2081 for the calculation of the air-regenerated noise

Centre frequency [Hz]	63	125	250	500	1000	2000	4000	8000
	ΔL							
	dB							
Change of direction	0	0	1	2	3	3	3	3
Mündungsreflexion	10	5	2	0	0	0	0	0
Room attenuation	5	5	5	5	5	5	5	5

The calculation is based on the end reflection for nominal size 250

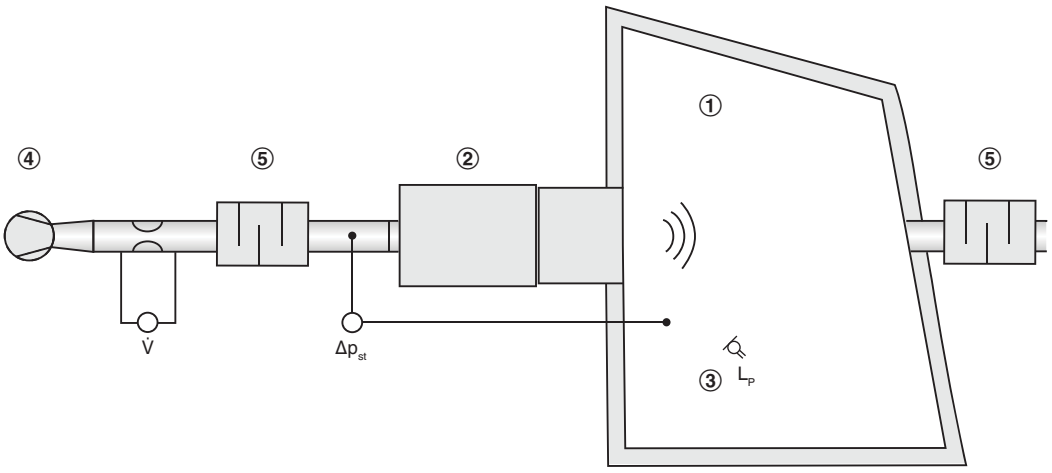
Octave correction for the calculation of case-radiated noise

Centre frequency [Hz]	63	125	250	500	1000	2000	4000	8000
	ΔL							
	dB							
Ceiling insulation	4	4	4	4	4	4	4	4
Room attenuation	5	5	5	5	5	5	5	5

Measurements

The acoustic data for the air-regenerated noise and case-radiated noise are determined according to EN ISO 5135. All measurements are carried out in a reverberation chamber to EN ISO 3741.

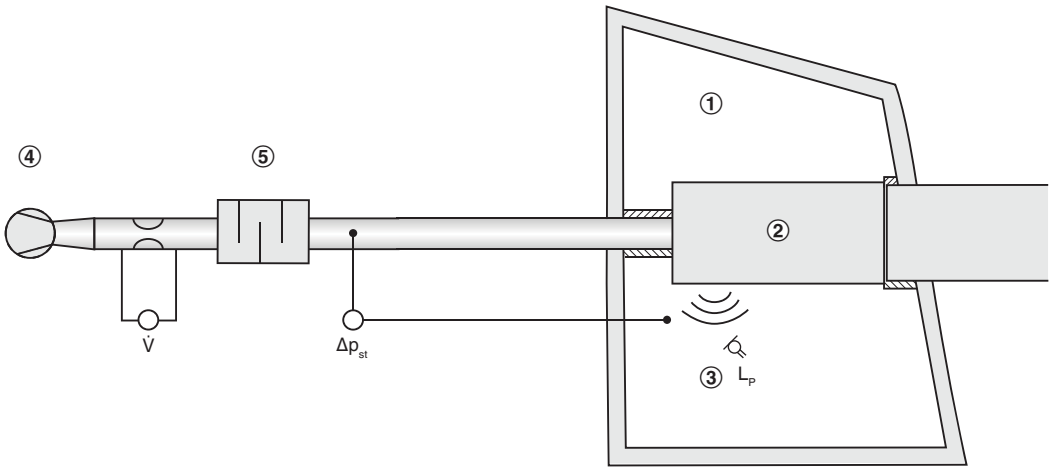
Measuring the air-regenerated noise



① Reverberation chamber
② VAV terminal unit
③ Microphone
④ Fan
⑤ Sound attenuator

The sound pressure levels for air-regenerated noise L_{PA} given by us result from measurements in a reverberation chamber. The sound pressure L_P is measured for the entire frequency range. The evaluation of the measurements, including system attenuation and A-weighting, results in the sound pressure level L_{PA}.

Measuring the case-radiated noise



① Reverberation chamber
② VAV terminal unit
③ Microphone
④ Fan
⑤ Sound attenuator

The sound pressure levels for case-radiated noise L_{PA2} given by us result from measurements in a reverberation chamber. The sound pressure L_P is measured for the entire frequency range. The evaluation of the measurements, including system attenuation and A-weighting, results in the sound pressure level L_{PA2}.

Sizing with the help of this catalogue

This catalogue provides convenient quick sizing tables for VAV terminal units. The sound pressure levels for air-regenerated noise and for case-radiated noise are provided for all nominal sizes. In addition, generally accepted attenuation and insulation values have been taken into account. Sizing data for other volume flow rates and differential pressures can be determined quickly and precisely using the Easy Product Finder design programme.

Sizing example

Given data

$\dot{V}_{max}$ = 280 l/s (1010 m³/h)
Δp_{st} = 150 Pa
Required sound pressure level in the room 30 dB(A)

Quick sizing

TVZ-D/200
Air-regenerated noise L_{PA} = 23 dB(A)
Case-radiated noise L_{PA3} = 24 dB(A)

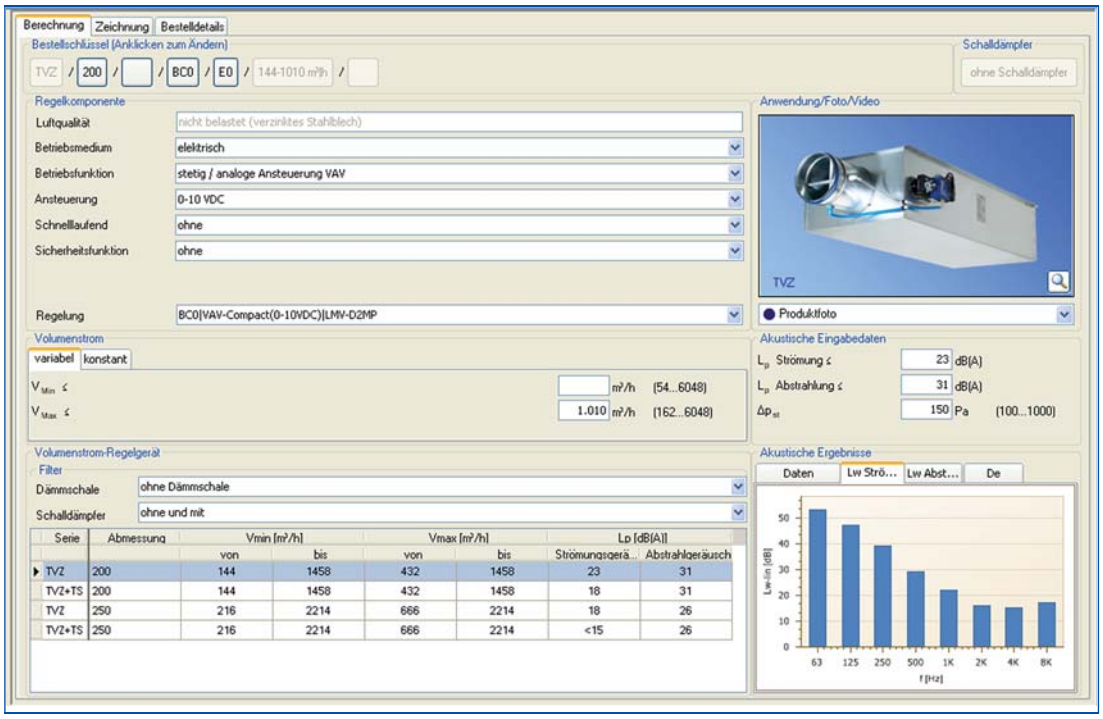
Sound pressure level in the room = 27 dB(A)
(logarithmic addition since the terminal unit is installed in the suspended ceiling of the room)

Easy Product Finder



The Easy Product Finder allows you to size products using your project-specific data.

You will find the Easy Product Finder on our website.



1

Function

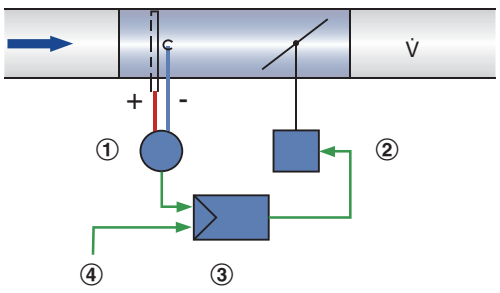
Volume flow control
The volume flow rate is controlled in a closed loop. The controller receives from the transducer the actual value that results from the effective pressure. For most applications, the setpoint value comes from a room temperature controller. The controller compares the actual value with the setpoint value and alters the command signal of the actuator if there is a difference between the two values.

Correction of duct pressure changes
The controller detects and corrects changes of the duct pressure that may occur, for example, due to volume flow rate changes from other units. Pressure changes will therefore not affect the room temperature.

Variable volume flow
If the input signal is changed, the controller adjusts the volume flow rate to the new setpoint. The variable volume flow rate range is limited, i.e. there is a minimum value and a maximum value. This control strategy can be overridden, e.g. by shutting off the duct.

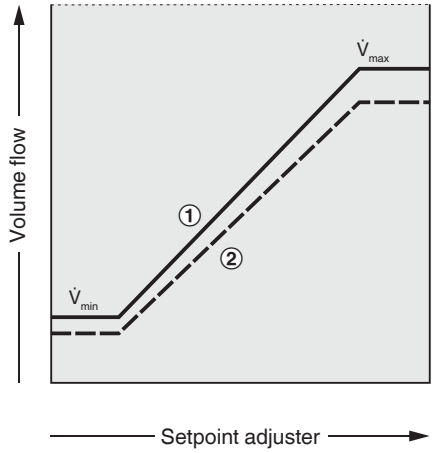
Supply/extract air tracking control
In individual rooms and closed-off office areas, where the balance between supply and extract air flow rate has to be maintained. Otherwise, annoying whistling noises can occur at door gaps, and the doors can be difficult to open.
For this reason, the extract air should also have variable control in a VAV system.
The supply air actual value (for dual duct terminal units the actual value signal of the warm air controller) is signalled to the extract air controller (slave controller) as setpoint signal. As a consequence, the extract air always follows the supply air.

Control loop



① Effective pressure transducer
② Actuator
③ Volume flow controller
④ Setpoint value signal

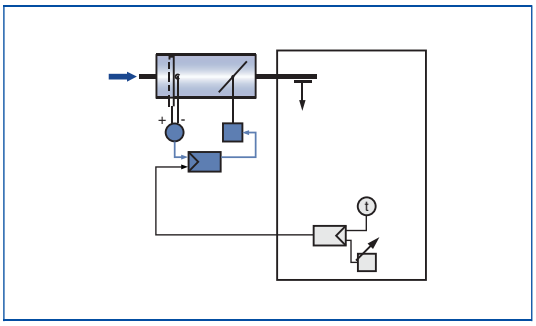
Control diagram



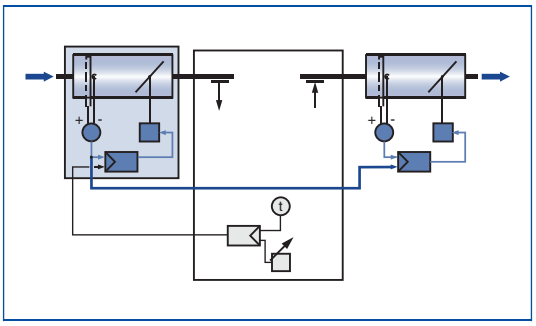
① Supply air
② Extract air

Operating modes

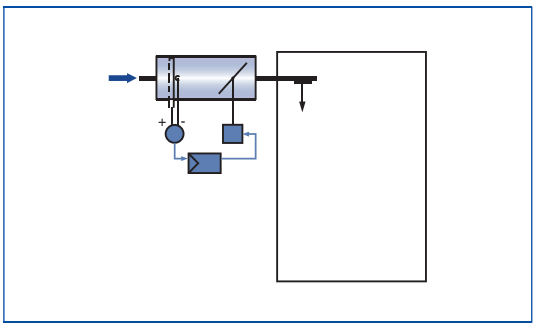
Single operation



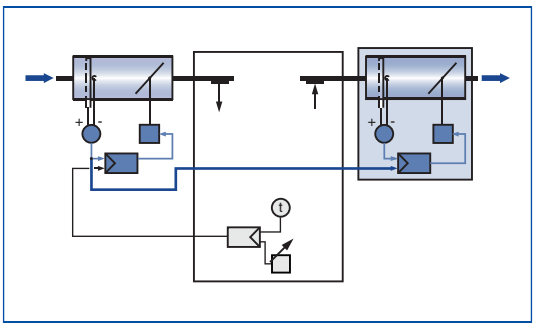
Slave operation (master)



Constant value



Slave operation (slave)





2. Constant volume flow control – CONSTANTFLOW
CONSTANTFLOW volume flow controllers are mechanical self-powered controllers for the control of supply air or extract air in constant air volume systems. The controllers work basically without external power supply. For special applications they can be fitted with actuators.

2

	2.1 CAV controllers		**Type**	**Page**
Circular		For the precise control of constant volume flow rates	**RN**	**2.1 – 1**
		For low airflow velocities	**VFC**	**2.1 – 17**
		Volume flow limiter for insertion into ducting	**VFL**	**2.1 – 26**
Rectangular		For the precise control of normal and high constant volume flows	**EN**	**2.1 – 35**
Acoustically optimised		For the precise control of constant volume flows in potentially explosive atmospheres (ATEX)	**RN-Ex**	**2.1 – 48**
		For the precise control of normal and high constant volume flows in potentially explosive atmospheres (ATEX)	**EN-Ex**	**2.1 – 59**
	2.2 Actuators for CAV controllers			
		For constant volume flows with $\dot{V}_{min}/\dot{V}_{max}$ switching in air conditioning systems	**Min/Max actuators**	**2.2 – 1**
		For variable volume flows in air conditioning systems	**Modulating actuators**	**2.2 – 11**
		For variable volume flows or $\dot{V}_{min}/\dot{V}_{max}$ switching in room air conditioning systems	**Retrofit kits**	**2.2 – 17**
	2.3 Basic information and nomenclature			
		Constant volume flow control – CONSTANTFLOW		**2.3 – 1**

CAV controllers
Type RN



For the precise control of constant volume flow rates

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

- Volume flow rate can be set using an external scale, no tools required
- High control accuracy
- No on-site test measurements required for commissioning
- Suitable for airflow velocities of up to 12 m/s
- Any installation orientation; maintenance-free
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Acoustic cladding for the reduction of case-radiated noise
- 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
- Actuator for switching between setpoint values



Actuator for switching between setpoint values



Tested to VDI 6022

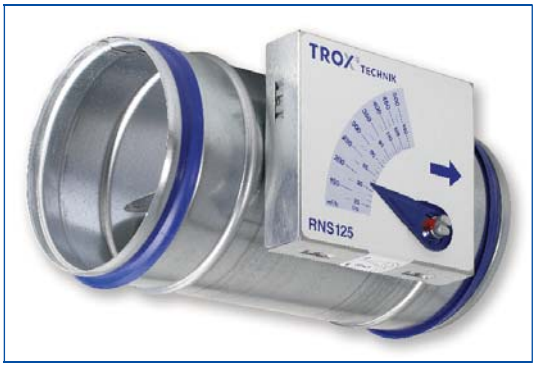
Type		Page
RN	General information	2.1 – 2
	Order code	2.1 – 6
	Aerodynamic data	2.1 – 7
	Quick sizing	2.1 – 8
	Dimensions and weight – RN-S	2.1 – 9
	Dimensions and weight – RN	2.1 – 10
	Dimensions and weight – RN-D	2.1 – 11
	Dimensions and weight – RN-FL	2.1 – 12
	Dimensions and weight – RN-D-FL	2.1 – 13
	Installation details	2.1 – 14
	Specification text	2.1 – 15
	Basic information and nomenclature	2.3 – 1

2

Variants

Product examples

CAV controller variant RN-S, compact height



CAV controller variant RN



CAV controller variant RN-D



CAV controller variant RN, with actuator for switching between setpoint values



Description

For detailed information on actuators see Chapter K5 – 2.2.

Application

- Circular CONSTANTFLOW CAV controllers of Type RN 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
- Simplified project handling with orders based on nominal size
- Volume flow rate setpoint can be set on external scale
- Switching between $\dot{V}_{min}$ and $\dot{V}_{max}$ using optional actuator

Variants

- RN-S: Compact-height volume flow controller
- RN: Volume flow controller
- RN-D: Volume flow controller with acoustic cladding
- RN-FL: Volume flow controller with flanges on both ends
- RN-D-FL: Volume flow controller with acoustic cladding and flanges on both ends
- Units with acoustic cladding and/or a secondary silencer Type CA, CS or CF for demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Nominal sizes
- RN-S: 80, 100, 125
- RN: 80, 100, 125, 160, 200, 250, 315, 400
- RN-FL: 100, 125, 160, 200, 250, 315, 400

Attachments
- Min/Max actuators: Actuators for switching between minimum and maximum volume flow rate setpoint values
- Modulating actuators: Actuators for the stepless adjustment of volume flow rates or to switch between minimum and maximum volume flow rate setpoint values
- Retrofit kits: Actuators and installation accessories
- Variant RN-S cannot be combined with an actuator

Accessories
- Lip seals on both ends (factory fitted)
- Matching flanges for both ends

Useful additions
- Secondary silencer Type CA, CS or CF
- Heat exchanger Type WL
- Electric air heater Type EL

Special features
- Volume flow rate can be set using an external scale; no tools required
- High volume flow rate control accuracy
- Any installation orientation

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
- Scale with pointer to set the volume flow rate setpoint
- Aerodynamic function testing of each unit on a special test rig prior to shipping
- Correct operation even under unfavourable upstream conditions (1.5 D straight section required upstream)

Construction features
- Circular casing
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal (RN-P1/80 without groove)
- RN-FL: Circular flanges to EN 12220

Materials and surfaces
Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Interior parts, nominal sizes 80 – 125: stainless steel 1.4301, nominal sizes 160 – 400: galvanised sheet steel
- Polyurethane bellows
- Plain bearings with PTFE coating
- Leaf spring made of stainless steel

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Interior parts, nominal sizes 80 – 125: stainless steel 1.4301, nominal sizes 160 – 400: galvanised sheet steel, powder-coated

Stainless steel construction (A2)
- Casing made of stainless steel 1.4301
- Interior parts made of stainless 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/EG

Installation and commissioning
- Any installation orientation
- Volume flow rate can be set using an external scale; no tools required
- No repeat measurements or adjustments by an air conditioning engineer are necessary
- RN-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines
- Hygiene conforms to VDI 6022
- Casing air leakage to EN 1751, class C

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

Attachments

Order code detail	Actuator	Supply voltage	Auxiliary switch
Min/Max actuators			
B50	Actuator with mechanical stops TROX/Belimo	24 V AC/DC	–
B52			2
B60		230 V AC	–
B62			2
Modulating actuators			
B70	Actuator with mechanical stops TROX/Belimo	24 V AC/DC	–
B72			2

2

Technical data

Nominal sizes	80 – 400 mm
Volume flow rate range	11 – 1400 l/s or 40 – 5040 m^3/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 – 50 °C

Function

Functional description

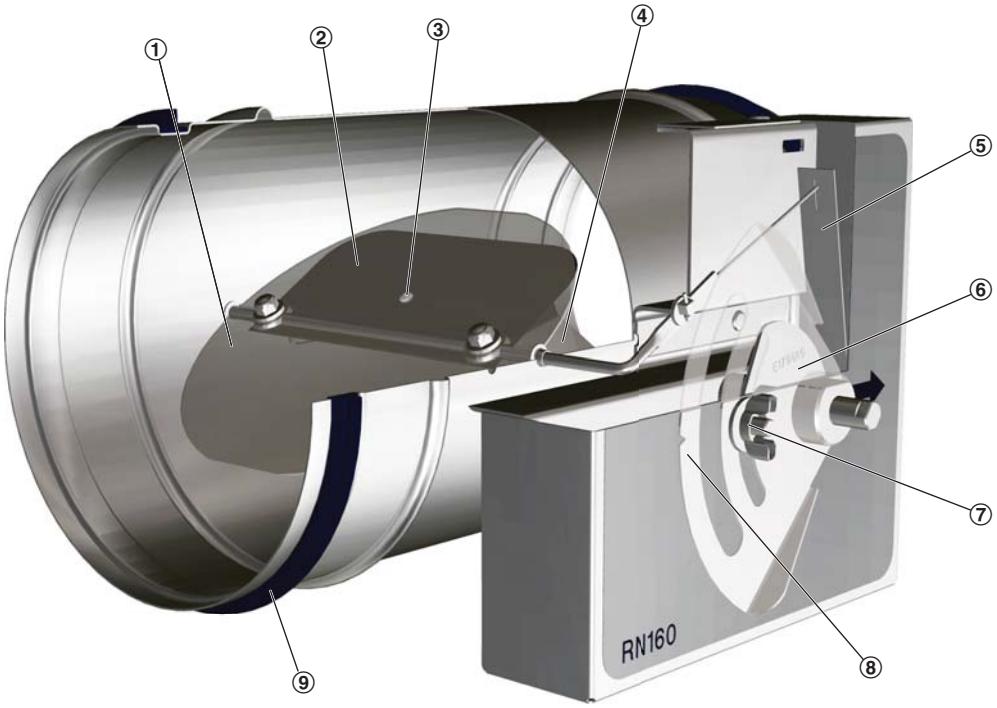
The volume flow controller is a mechanical self-powered unit and works without external power supply. A damper blade with low-friction bearings is adjusted by aerodynamic forces such that the set volume flow rate is maintained within the differential pressure range.
The aerodynamic forces of the airflow create a closing torque on the damper blade.
The bellows extends and increases 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.

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.

2

Schematic illustration of the RN



① Damper blade
② Bellows
③ Bellows inlet
④ Crossbar
⑤ Leaf spring
⑥ Cam plate
⑦ Volume flow rate scale lock
⑧ Volume flow rate scale
⑨ Lip seal

2

Order code

RN-S

RN-S – P1 / 100 / D2
1 2 3 4

1 Type
RN-S Volume flow controller

2 Material
No entry: galvanised sheet steel
P1 Powder-coated (RAL 7001), silver grey
A2 Stainless steel

3 Nominal size [mm]
80
100
125

4 Accessories
No entry: none
D2 Lip seals on both ends

Order code

RN

RN – D – P1 – FL / 160 / G2 / B50 / 300 – 800
1 2 3 4 5 6 7 8

1 Type
RN 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
A2 Stainless steel

4 Flange
No entry: none
FL Flanges on both ends

5 Nominal size [mm]
80
100
125
160
200
250
315
400

6 Accessories
No entry: none
D2 Lip seals on both ends
G2 Matching flanges for both ends

7 Actuator
No entry: without
For example
B50 24 V AC/DC, 3-point
B52 24 V AC/DC, 3-point, with auxiliary switch
B70 24 V AC/DC, modulating 2 – 10 V DC

8 Volume flow rates [m³/h or l/s]
only actuators 7
$\dot{V}_{min}$ – $_{max}$ for factory setting

Order examples

RN/160/D2

Nominal size	160
Material	Galvanised sheet steel
Accessories	Lip seal on both ends

RN-D-FL/250/G2/B50

Acoustic cladding	With
Flange	Both ends
Material	Galvanised sheet steel
Nominal size	250
Accessories	Matching flanges for both ends
Actuator	B50

2

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 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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m³/h	Pa				± %
80	11	40	100	105	105	105	20
	20	72	100	105	105	105	15
	40	144	100	110	115	120	10
	45	162	100	110	120	125	8
100	22	79	50	55	55	55	10
	40	144	50	55	55	60	8
	70	252	50	60	65	70	6
	90	324	50	60	70	80	5
125	35	126	50	55	55	55	10
	60	216	50	55	55	55	8
	115	414	50	60	65	70	6
	140	504	50	60	70	80	5
160	60	216	50	55	55	55	10
	105	378	50	55	55	55	8
	190	684	50	55	60	60	6
	240	864	50	55	65	70	5
200	90	324	50	55	55	55	10
	160	576	50	55	55	55	8
	300	1080	50	55	60	65	6
	360	1296	50	55	60	65	5
250	145	522	50	55	55	55	10
	255	918	50	55	55	55	8
	470	1692	50	55	60	60	6
	580	2088	50	55	60	65	5
315	230	828	50	55	55	55	10
	400	1440	50	55	55	55	8
	750	2700	50	55	60	60	6
	920	3312	50	55	60	65	5
400	350	1260	50	55	55	55	10
	610	2196	50	55	55	55	8
	1130	4068	50	55	55	55	6
	1400	5040	50	55	55	60	5

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

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise	
			①	②	③	④	①	⑤
			L_{PA}	L_{PA1}			L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)					
80	11	40	37	24	17	15	22	<15
	20	72	39	27	19	17	24	<15
	40	144	47	34	24	22	31	<15
	45	162	48	35	25	24	32	<15
100	22	79	37	24	17	15	22	<15
	40	144	40	47	22	20	21	<15
	70	252	47	47	27	26	29	<15
	90	324	50	50	30	29	33	<15
125	35	126	37	27	21	18	15	<15
	60	216	43	34	27	25	19	<15
	115	414	50	41	35	33	27	<15
	140	504	52	44	39	37	30	<15
160	60	216	40	32	26	24	29	<15
	105	378	45	37	32	29	33	<15
	190	684	49	41	35	33	39	<15
	240	864	50	41	36	34	41	16
200	90	324	40	31	24	22	28	<15
	160	576	43	35	28	26	32	<15
	300	1080	48	40	33	32	40	17
	360	1296	49	41	35	33	42	20
250	145	522	41	32	24	22	29	15
	255	918	42	34	28	26	33	<15
	470	1692	46	39	33	31	40	19
	580	2088	48	41	35	34	43	22
315	230	828	39	33	26	23	30	<15
	400	1440	42	35	29	27	35	<15
	750	2700	44	38	32	31	40	19
	920	3312	46	41	35	34	43	23
400	350	1260	46	39	33	29	45	<15
	610	2196	48	42	36	32	49	18
	1130	4068	50	44	38	35	54	24
	1400	5040	51	45	40	37	56	27

① RN
② RN with secondary silencer CS/CF, insulation thickness 50 mm, length 500 mm
③ RN with secondary silencer CS/CF, insulation thickness 50 mm, length 1000 mm
④ RN with secondary silencer CS/CF, insulation thickness 50 mm, length 1500 mm
⑤ RN-D

Description

– Compact-height volume flow controller for constant volume flow rate control
– Spigot to make connections to the ducting

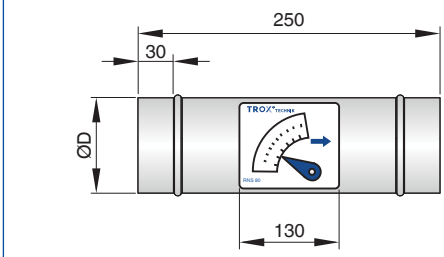


CAV controller variant RN-S, compact height

2

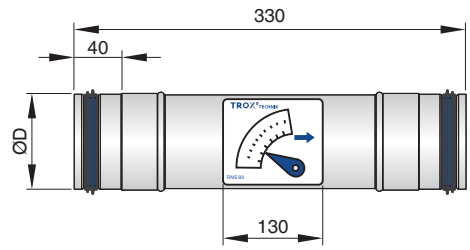
Dimensions

RN-S, nominal size 80



RN-S/80, RN-S-P1/80, RN-S-A2/80

RN-S, nominal size 80, lip seal

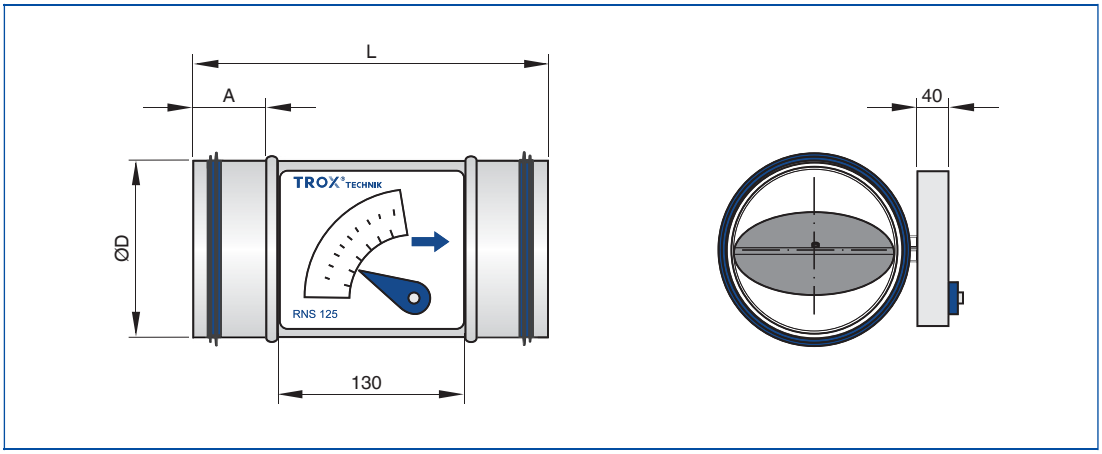


RN-S/80/D2, RN-S-P1/80/D2

Dimensions [mm] and weight [kg]

Nominal size	ØD	m
	mm	kg
80	79	1.4

RN-S, nominal size 100, 125



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	A	m
	mm			kg
100	99	250	50	1.8
125	124	250	50	2.0

Description

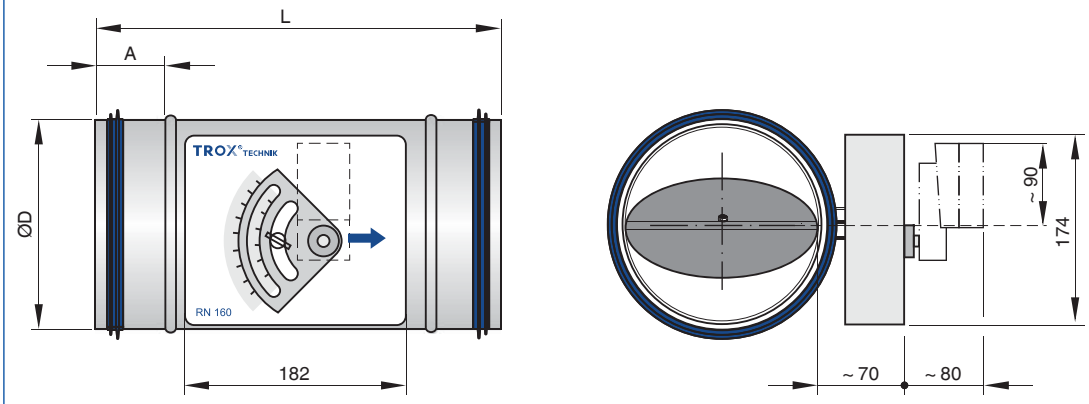
- Volume flow controller for constant air volume flow control
- Spigot to make connections to the ducting



CAV controller variant RN

Dimensions

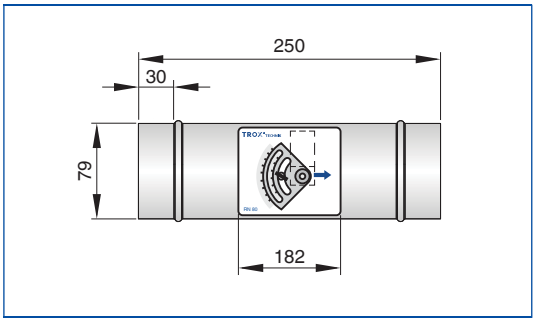
RN



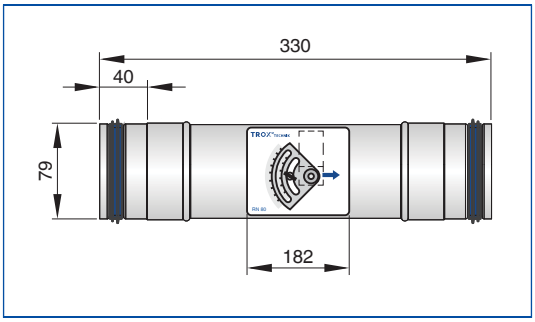
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	A	m
	mm			kg
80	79	310	50	1.4
100	99	310	50	1.8
125	124	310	50	2.0
160	159	310	50	2.5
200	199	310	50	3.0
250	249	400	50	3.5
315	314	400	50	4.8
400	399	400	50	5.7

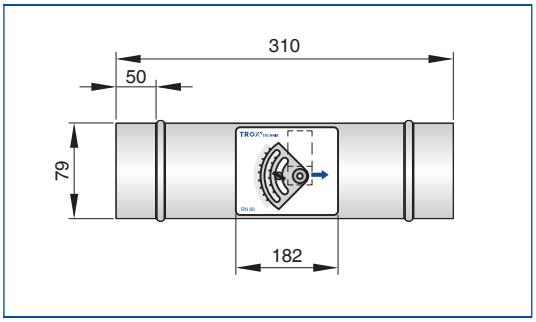
RN-P1/80



RN-P1/80/D2



RN-A2/80



Description

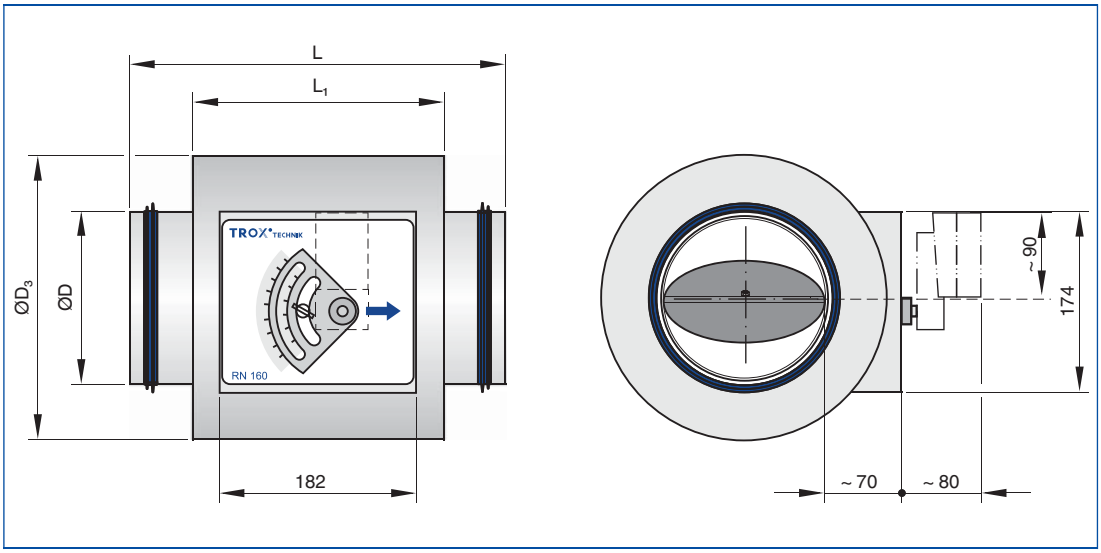
- Volume flow controller with acoustic cladding for constant air volume flow control
- Spigot to make connections to the ducting
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular ducts for the room under consideration must have adequate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



CAV controller variant RN-D

Dimensions

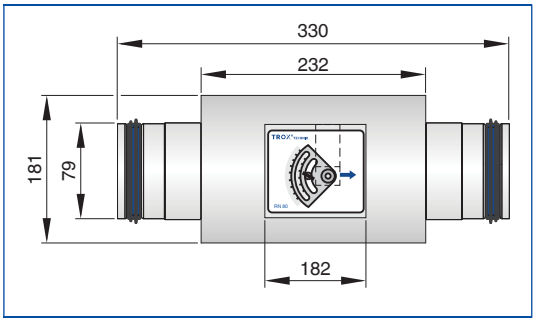
RN-D



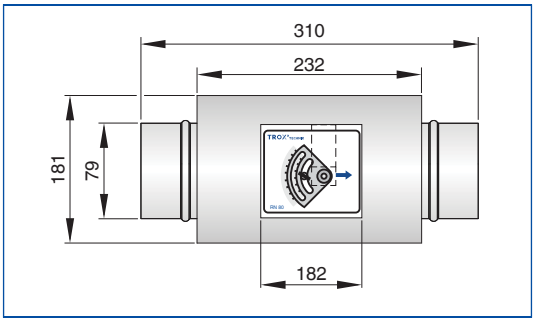
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	$ØD_3$	L_1	m
	mm				kg
80	79	310	181	232	2.2
100	99	310	200	232	3.6
125	124	310	220	232	4.0
160	159	310	262	232	5.0
200	199	310	300	232	6.0
250	249	400	356	312	7.3
315	314	400	418	312	9.8
400	399	400	500	312	11.8

RN-D-P1/80/D2



RN-D-A2/80

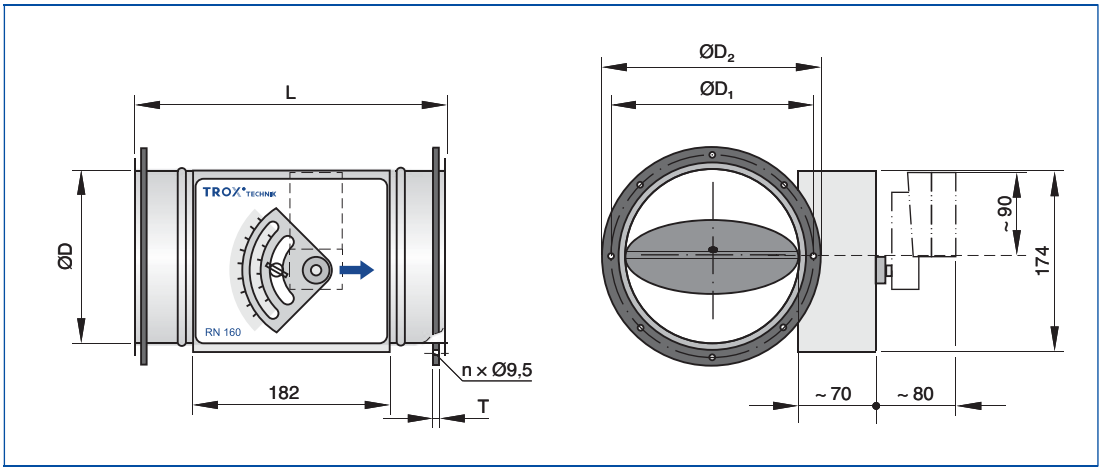


Description

- Volume flow controller for constant air volume flow control
- With flanges to make detachable connections to the ductwork

Dimensions

RN-FL



Dimensions [mm] and weight [kg]

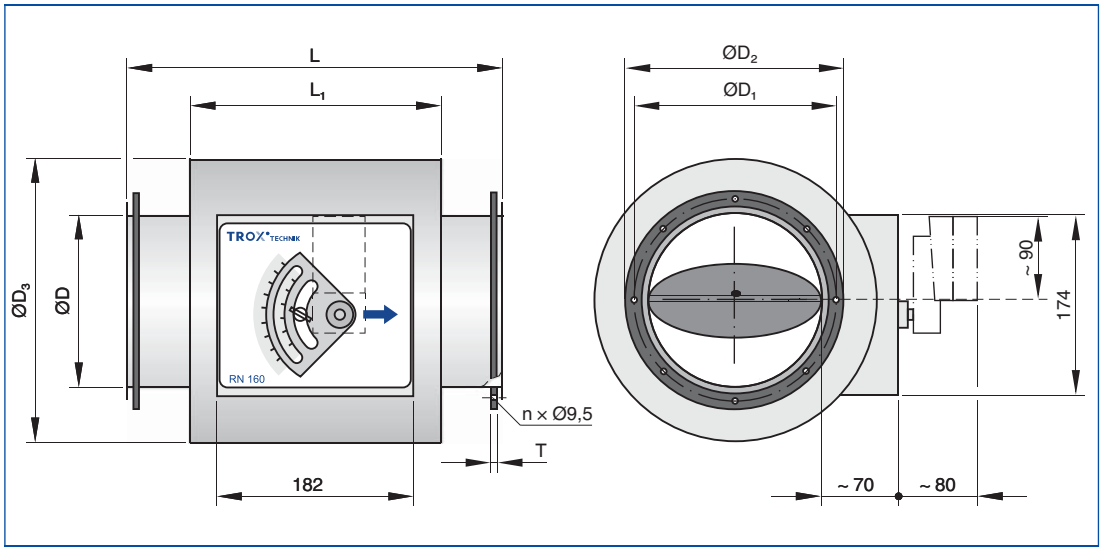
Nominal size	ØD	L	$ØD_1$	$ØD_2$	n	T	m
	mm					mm	kg
100	99	290	132	152	4	4	2.4
125	124	290	157	177	4	4	2.7
160	159	290	192	212	6	4	3.5
200	199	290	233	253	6	4	4.4
250	249	380	283	303	6	4	5.3
315	314	380	352	378	8	4	7.3
400	399	380	438	464	8	4	9.6

Description

- Volume flow controller with acoustic cladding for constant air volume flow control
- With flanges to make detachable connections to the ductwork
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular 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
- Powder-coated surface (P1) or stainless steel construction (A2) not possible

Dimensions

RN-D-FL



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	$ØD_1$	$ØD_2$	$ØD_3$	L_1	n	T	m
	mm							mm	kg
100	99	370	132	152	200	232	4	4	4.2
125	124	370	157	177	220	232	4	4	4.7
160	159	370	192	212	262	232	6	4	6.0
200	199	370	233	253	300	232	6	4	7.4
250	249	460	283	303	356	312	6	4	9.1
315	314	460	352	378	418	312	8	4	12.3
400	399	460	438	464	500	312	8	4	15.7

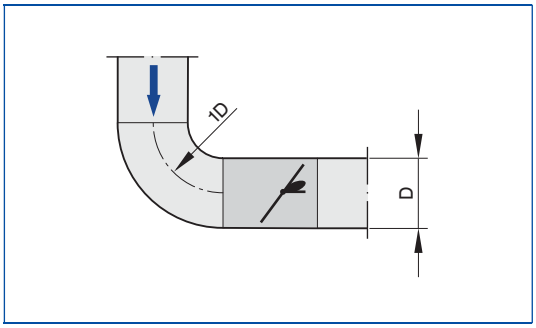
2

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.

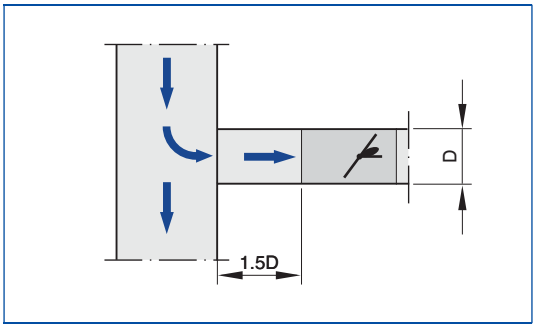
Free air intake only with a straight duct section of 1D upstream.

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

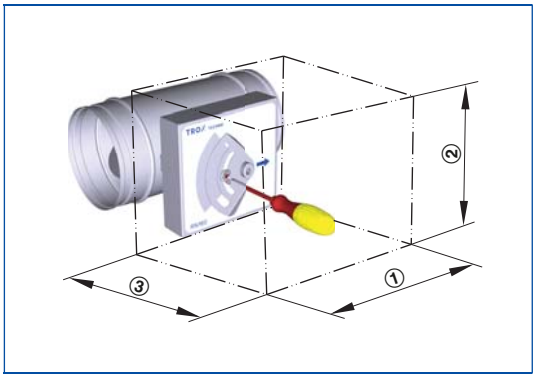


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 1.5D upstream. Shorter upstream sections require a perforated plate in the branch and before the CAV controller. If there is no straight upstream section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

Space requirement 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 for commissioning and maintenance



Space required

Attachments	①	②	③
	mm		
Without actuator	200	200	200
With actuator	200	320	300

Standard text

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 controllers for constant air volume systems, mechanical self-powered, without external power supply, suitable for supply or extract air, available in 8 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.
Volume flow controllers without actuators are factory set to a reference volume flow rate (customers can set the required volume flow rate on site).
Spigot with groove for lip seal, suitable for connecting ducts according to EN 1506 or EN 13180.
Casing air leakage to EN 1751, class C.

Special features
- Volume flow rate can be set using an external scale; no tools required
- High volume flow rate control accuracy
- Any installation orientation

Materials and surfaces
Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Interior parts, nominal sizes 80 – 125: stainless steel 1.4301, nominal sizes 160 – 400: galvanised sheet steel
- Polyurethane bellows
- Plain bearings with PTFE coating
- Leaf spring made of stainless steel

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Interior parts, nominal sizes 80 – 125: stainless steel 1.4301, nominal sizes 160 – 400: galvanised sheet steel, powder-coated

Stainless steel construction (A2)
- Casing made of stainless steel 1.4301
- Interior parts made of stainless 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/EG

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Technical data
- Nominal sizes: 80 to 400 mm
- Volume flow rate range: 11 to 1400 l/s or 40 to 5040 m^3/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

Sizing data
- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

1 Type
RN-S Volume flow controller

2 Material
No entry: galvanised sheet steel
☐ **P1** Powder-coated (RAL 7001), silver grey
☐ **A2** Stainless steel

3 Nominal size [mm]
☐ **80**
☐ **100**
☐ **125**

4 Accessories
No entry: none
☐ **D2** Lip seals on both ends

2

Order options

1 Type
RN 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
☐ **A2** Stainless steel

4 Flange
No entry: none
☐ **FL** Flanges on both ends

5 Nominal size [mm]
☐ **80**
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

6 Accessories
No entry: none
☐ **D2** Lip seals on both ends
☐ **G2** Matching flanges for both ends

7 Actuator
No entry: without
For example
☐ **B50** 24 V AC/DC, 3-point
☐ **B52** 24 V AC/DC, 3-point, with auxiliary switch
☐ **B70** 24 V AC/DC, modulating 2 – 10 V DC

8 Volume flow rates [m³/h or l/s]
only actuators 7
$\dot{V}_{min}$ – $_{max}$ for factory setting

CAV controllers
Type VFC





Variant with rotary knob


Actuator
with mechanical stops


Actuator
with potentiometers



Tested to VDI 6022

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

- 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
- Actuator for variable volume flows or for $\dot{V}_{min}$ / $\dot{V}_{max}$ switching

2

Type		Page
VFC	General information	2.1 – 18
	Order code	2.1 – 21
	Quick sizing	2.1 – 22
	Dimensions and weight	2.1 – 23
	Installation details	2.1 – 24
	Specification text	2.1 – 25
	Basic information and nomenclature	2.3 – 1

VFC system



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

Description



CAV controller variant VFC, with rotary knob

For detailed information on actuators see Chapter K5 – 2.2.

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

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

Attachments
- Min/Max actuators: Actuators for switching between minimum and maximum volume flow rate setpoint values
- Modulating actuators: Actuators for the stepless adjustment of volume flow rates

Useful additions
- Secondary silencer Type CA, CS or CF
- Heat exchanger Type WL
- Electric air heater Type EL

Special features
- Volume flow rate can be set using an external scale; no tools required
- Simple retrofit of an actuator is possible
- Correct operation even under unfavourable upstream or downstream conditions (1.5 D straight section required upstream)
- Any installation orientation
- Aerodynamic function testing of each unit on a special test rig prior to shipping

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

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, material classification B2
- Leaf spring made of stainless steel
- Polyurethane bellows

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

Standards and guidelines
- Hygiene conforms to VDI 6022
- Casing air leakage to EN 1751, class C

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

Attachments

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

Technical data

Nominal sizes	80 – 250 mm
Volume flow rate range	6 – 370 l/s or 22 – 1332 m^3/h
Volume flow rate control range	Approx. 10 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	500 Pa
Operating temperature	10 – 50 °C

Function

2

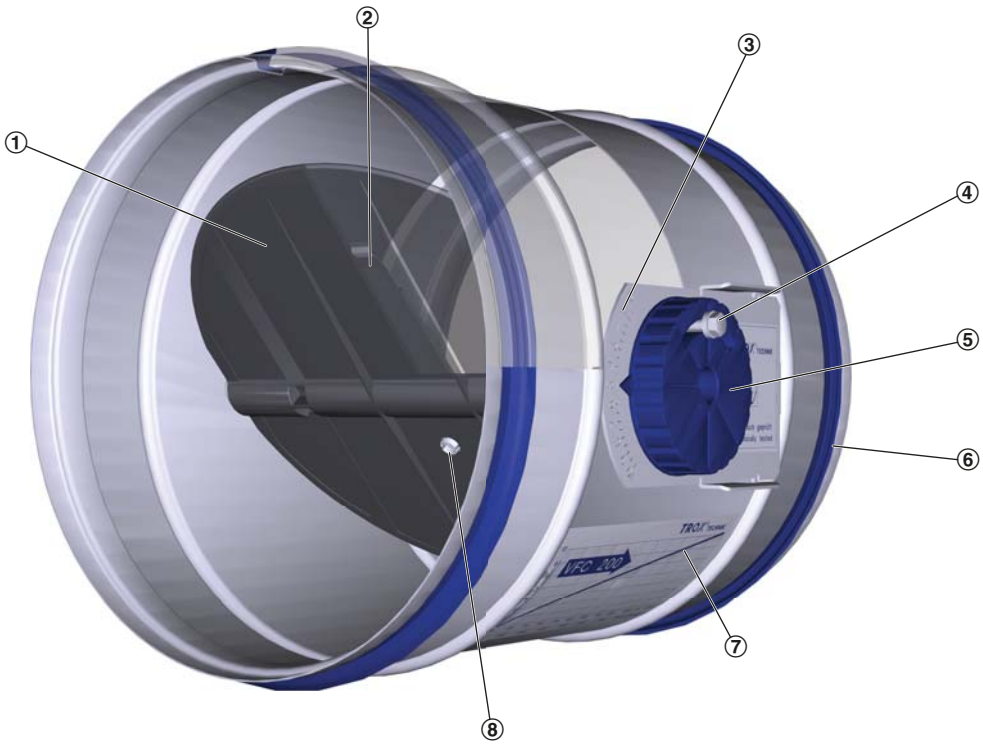
Functional description

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

Order code

VFC

VFC / 100 / E01
1 2 3

1 Type
VFC Volume flow controller

2 Nominal size [mm]
80
100
125
160
200
250

3 Actuator
No entry: manual operation
For example
E01 24 V AC/DC, 3-point, potentiometer
E03 24 V AC/DC, modulating 2 – 10 V DC, potentiometer
M01 24 V AC/DC, 3-point, mechanical stops

Order example

VFC/100/E03

Nominal size	100 mm
Actuator	Variable volume flow, 24 V AC/DC, potentiometer, control signal 0 to 10 V DC

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 50 Pa

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise
			①	②	③	④	①
			L_{PA}	L_{PA1}			L_{PA2}
	l/s	m^3/h	dB(A)				
80	**6**	**22**	25	<15	<15	<15	<15
	10	**36**	28	16	<15	<15	<15
	20	**72**	33	21	<15	<15	<15
	42	**151**	39	27	18	16	17
100	**6**	**22**	29	15	<15	<15	<15
	15	**54**	33	20	<15	<15	15
	30	**108**	37	26	18	17	18
	65	**234**	41	33	26	25	21
125	**10**	**36**	22	<15	<15	<15	<15
	20	**72**	27	16	<15	<15	<15
	45	**162**	34	25	18	16	<15
	100	**360**	41	34	29	27	16
160	**18**	**65**	25	16	<15	<15	<15
	45	**162**	32	24	18	16	18
	85	**306**	36	29	24	22	22
	185	**666**	41	35	30	28	27
200	**25**	**90**	27	16	<15	<15	<15
	60	**216**	31	22	16	<15	18
	120	**432**	35	27	21	19	22
	250	**900**	37	30	25	24	26
250	**37**	**133**	31	21	<15	<15	18
	100	**360**	35	25	18	16	22
	185	**666**	36	28	21	19	25
	370	**1332**	37	29	23	22	29

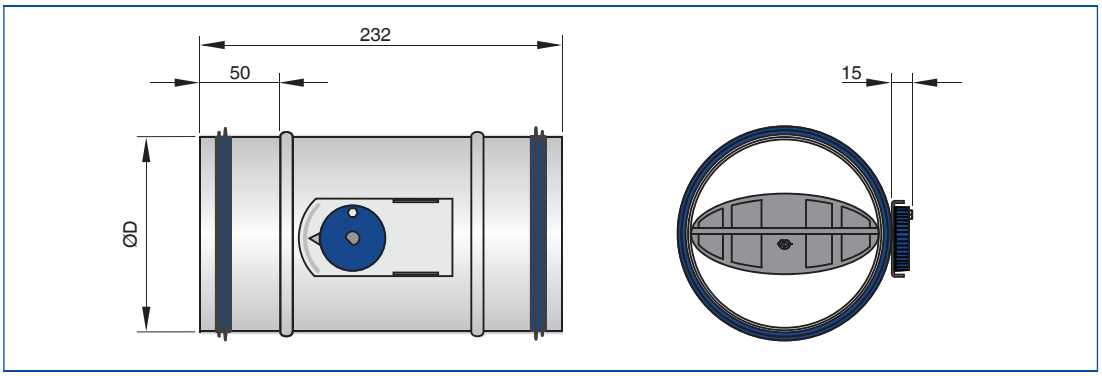
① VFC
② VFC with secondary silencer CS/CF, insulation thickness 50 mm, length 500 mm
③ VFC with secondary silencer CS/CF, insulation thickness 50 mm, length 1000 mm
④ VFC with secondary silencer CS/CF, insulation thickness 50 mm, length 1500 mm

Dimensions



CAV controller variant VFC, with rotary knob

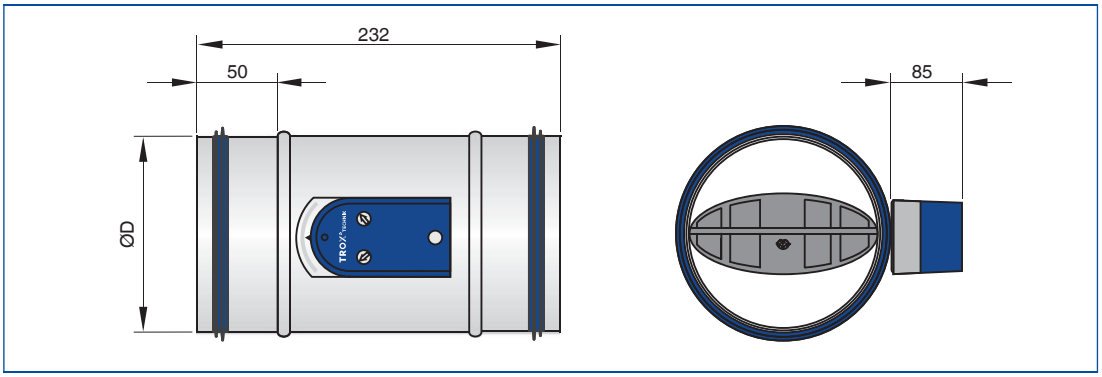
VFC





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

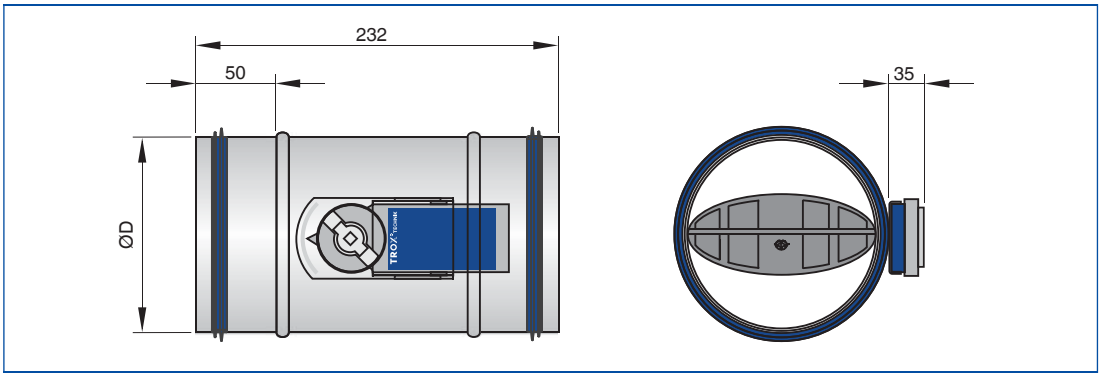
VFC/.../E0*





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

VFC/.../M0*



Dimensions [mm] and weight [kg]

Nominal size	VFC	VFC/.../E0*	VFC/.../M0*	ØD
	m			
	kg			mm
80	0.5	0.8	0.7	79
100	0.6	0.9	0.8	99
125	0.7	1.0	0.9	124

Nominal size	VFC	VFC/.../E0*	VFC/.../M0*	ØD
	m			
	kg			mm
160	0.8	1.1	1.0	159
200	1.0	1.3	1.2	199
250	1.3	1.6	1.5	249

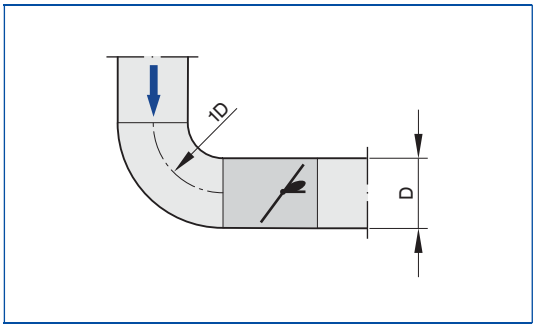
2

Upstream conditions

The volume flow rate accuracy ΔV̇ 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.

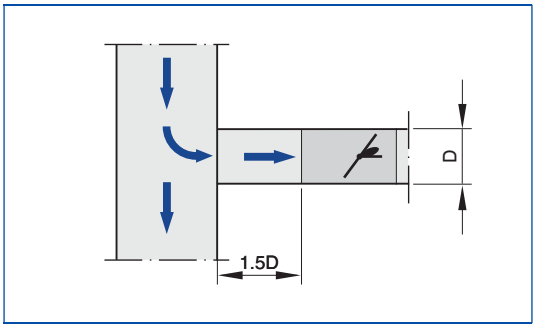
Free air intake only with a straight duct section of 1D upstream.

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

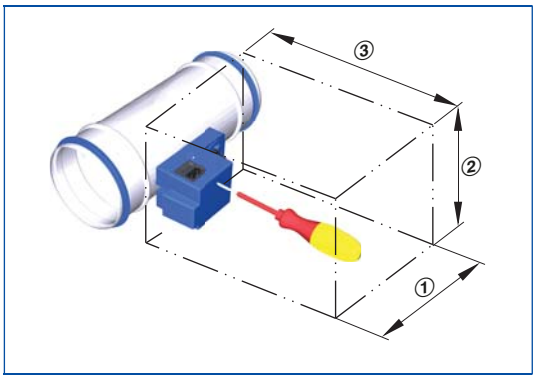


A junction causes strong turbulence. The stated volume flow rate accuracy ΔV̇ can only be achieved with a straight duct section of at least 1.5D upstream. Shorter upstream sections require a perforated plate in the branch and before the CAV controller. If there is no straight upstream section at all,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

Space requirement 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



Space required

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

Standard text

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 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

- Volume flow rate can be set using an external scale; no tools required
- Simple retrofit of an actuator is possible
- Correct operation even under unfavourable upstream or downstream conditions (1.5 D straight section required upstream)
- Any installation orientation
- Aerodynamic function testing of each unit on a special test rig prior to shippin

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, material classification B2
- Leaf spring made of stainless steel
- Polyurethane bellows

Technical data

- Nominal sizes: 80 to 250 mm
- Volume flow rate range: 6 to 370 l/s or 22 to 1332 m^3/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

- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

1 Type
VFC Volume flow controller

2 Nominal size [mm]
☐ **80**
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**

3 Actuator
No entry: manual operation
For example
☐ **E01** 24 V AC/DC, 3-point, potentiometer
☐ **E03** 24 V AC/DC, modulating 2 – 10 V DC, potentiometer
☐ **M01** 24 V AC/DC, 3-point, mechanical stops

CAV controllers
Type VFL



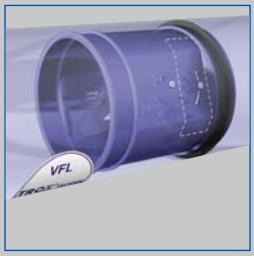
Aerodynamic damper blade



Sticker showing volume flow rates



Set the volume flow rate



Insert



Tested to VDI 6022



Volume flow limiter for insertion into ducting

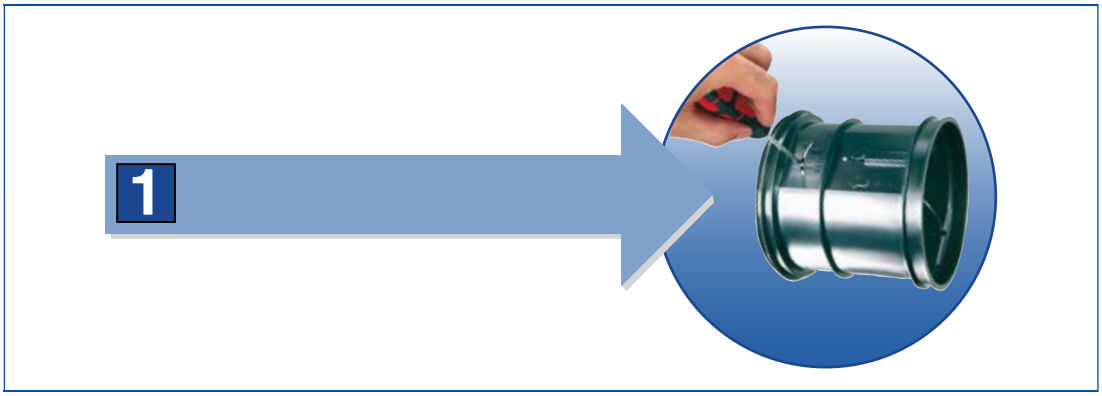
Circular, mechanical self-powered controllers for insertion into ducting, for the quick and easy balancing of constant volume flow rates in ventilation and air conditioning systems

- 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

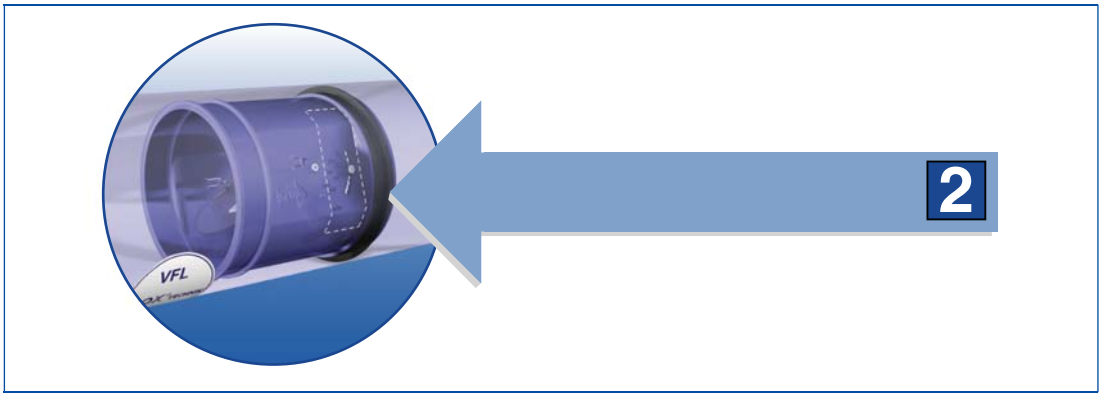
Type		Page
VFL	General information	2.1 – 27
	Order code	2.1 – 30
	Quick sizing	2.1 – 31
	Dimensions and weight	2.1 – 33
	Specification text	2.1 – 34
	Basic information and nomenclature	2.3 – 1

2

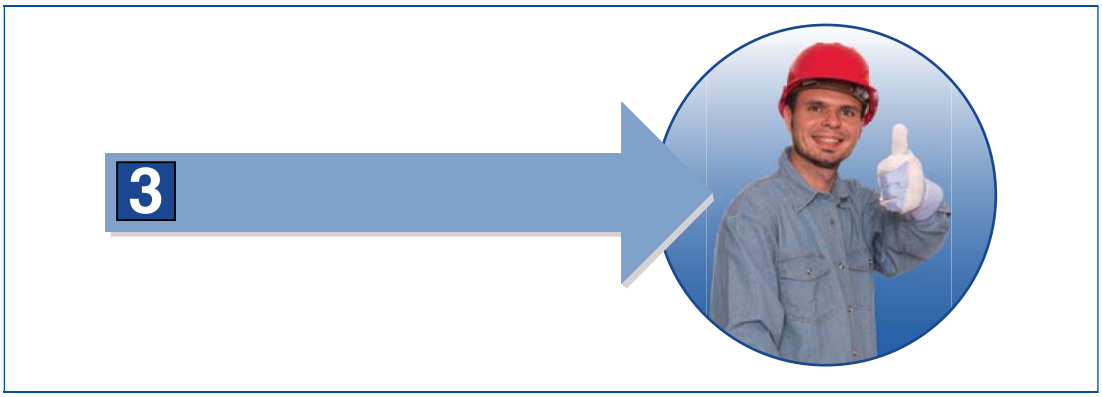
Set



Insert



Done



Description



Volume flow limiter
Type VFL

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

Nominal sizes
- 80, 100, 125, 150, 160, 200, 250

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^3/h and cfm) that can be set each limiter

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

Installation and commissioning
- Any installation orientation
- Set the required volume flow rate using a scale
- Insert the unit into the duct
- Mark the installation location

Standards and guidelines
- Hygiene conforms to VDI 6022

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

2

Technical data

Nominal sizes	80 – 250 mm
Volume flow rate range	4 – 212 l/s or 14 – 764 m^3/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

Function

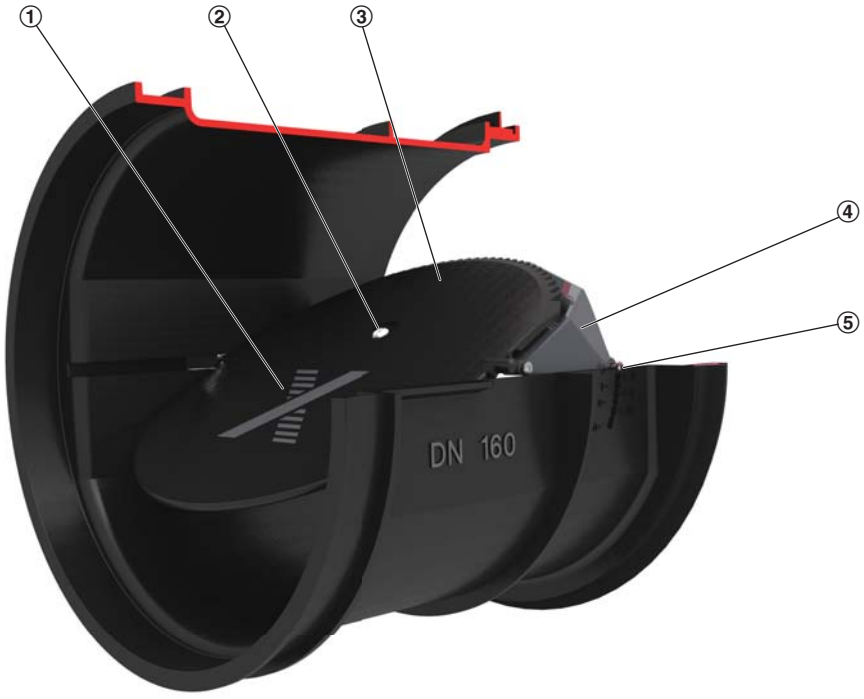
Functional description

The volume flow limiter is a mechanica 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



① Damper blade
② Bellows inlet
③ Bellows
④ Crossbar
⑤ Volume flow rate scale

Order code

VFL

VFL / 100
1 2

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

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 [m³/h]

Nominal size	1	2	3	4	5	6	7	8	9	10	11	$\dot{V}_{Nenn}$	$\dot{V}_{ref}$
	$\dot{V}$												
	m³/h												
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]

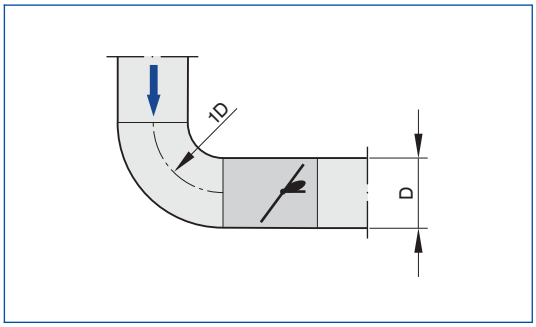
Nominal size	1	2	3	4	5	6	7	8	9	10	11	$\dot{V}_{Nenn}$	$\dot{V}_{ref}$
	$\dot{V}$												
	l/s												
80	4	5	6	8	9	11	14	17	20	23	–	23	9
100	5	7	9	11	13	16	20	22	26	29	34	34	20
125	11	13	16	19	23	27	31	37	42	48	54	54	27
150	14	19	24	29	33	39	44	51	57	64	74	74	44
160	16	23	28	36	43	49	54	60	67	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

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.

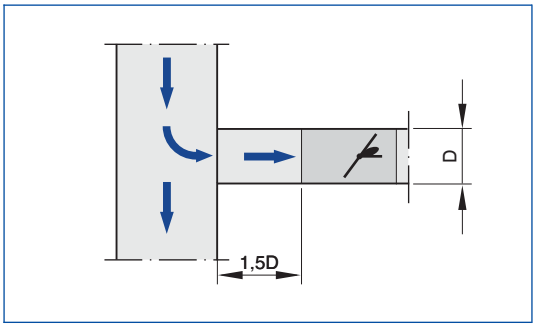
Free air intake only with a straight duct section of 1D upstream.

Bend



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

Junction



A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ 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 volume flow limiter. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Air-regenerated noise

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 volume flow limiter is required.

Quick sizing: Sound pressure level at differential pressure 50 Pa

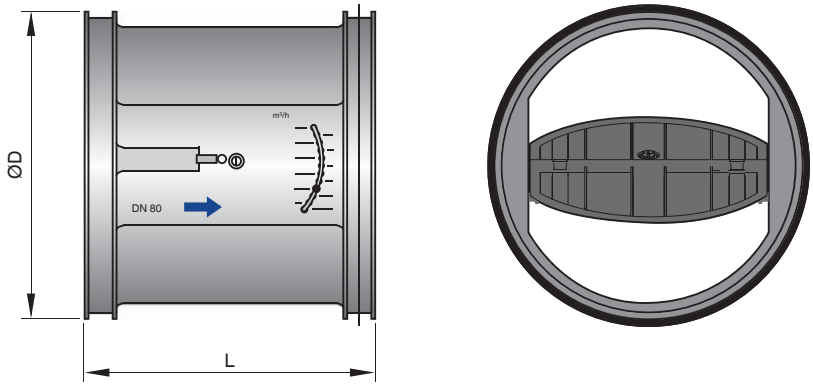
Nominal size	$\dot{V}$		Air-regenerated noise
			L_{PA}
	l/s	m³/h	dB (A)
80	4	14	30
	6	22	30
	14	50	32
	20	73	33
	23	82	34
100	5	18	31
	11	39	33
	16	58	35
	26	92	36
	34	122	37
125	11	39	36
	19	69	37
	27	98	37
	42	150	38
	54	195	39
150	14	50	32
	29	105	32
	44	160	33
	57	205	33
	74	265	34
160	16	58	26
	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

Dimensions



Volume flow limiter
Type VFL

VFL



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	m
	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

Standard text

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^3/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^3/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

- $\dot{V}[m^3/h]$
- $\Delta p_{st}[Pa]$
- L_{PA} air-regenerated noise[dB(A)]

Order options

1 Type

VFL Volume flow limiter

2 Nominal size [mm]

- ☐ **80**
- ☐ **100**
- ☐ **125**
- ☐ **150**
- ☐ **160**
- ☐ **200**
- ☐ **250**

CAV controllers
Type EN



For the precise control of normal and 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 12,096 m^3/h or 3,360 l/s
- Volume flow rate can be set using an external scale, no tools required
- High control accuracy
- No on-site test measurements required for commissioning
- Suitable for airflow velocities of up to 8 m/s
- Casing air leakage to EN 1751, up to class C

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



Actuator for switching between setpoint values



Unit with two controllers

2

Type		Page
EN	General information	2.1 – 36
	Order code	2.1 – 39
	Aerodynamic data	2.1 – 40
	Quick sizing	2.1 – 42
	Dimensions and weight – EN	2.1 – 44
	Dimensions and weight – EN-D	2.1 – 45
	Installation details	2.1 – 46
	Specification text	2.1 – 47
	Basic information and nomenclature	2.3 – 1

Variants

Product examples

Volume flow controller Type EN



CAV controller Type EN-D



Description

For detailed information on actuators see Chapter K5 – 2.2.

Application
- Rectangular CONSTANTFLOW CAV controllers of Type EN 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
- Simplified project handling with orders based on nominal size

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
- Acoustic cladding cannot be retrofitted

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

Nominal sizes
- 19 nominal sizes from 200 × 100 to 600 × 600

Attachments
- Min/Max actuators: Actuators for switching between minimum and maximum volume flow rate setpoint values
- Modulating actuators: Actuators for the stepless adjustment of volume flow rates or to switch between minimum and maximum volume flow rate setpoint values
- Retrofit kits: Actuators and installation accessories
- EN with actuator only up to H = 300 mm

Useful additions
- Secondary silencer Type TX
- Heat exchanger Type WT

Special characteristics
- Volume flow rate can be set using an external scale; no tools required
- High volume flow rate control accuracy
- Any installation orientation
- Correct operation even under unfavourable upstream conditions (1.5 B straight section required upstream)

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
- Scale with pointer to set the volume flow rate setpoint
- Aerodynamic function testing of each unit on a special test rig prior to shipping

Construction features
- Rectangular casing
- 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

Powder-coated construction (P1)
- Casing and damper blade made of galvanised sheet steel, powder-coated

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/EG

Installation and commissioning

- Any installation orientation
- Volume flow rate can be set using an external scale; no tools required
- No repeat measurements or adjustments by an air conditioning engineer are necessary
- EN-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines

- Casing air leakage to EN 1751, class C (B + H ≤400, class B)

Maintenance

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

Attachments

Order code detail	Actuator	Supply voltage	Auxiliary switch
Min/Max actuators			
B50	Actuator with mechanical stops TROX/Belimo	24 V AC/DC	–
B52			2
B60		230 V AC	–
B62			2
Modulating actuators			
B70	Actuator with mechanical stops TROX/Belimo	24 V AC/DC	–
B72			2

Technical data

Nominal sizes	200 × 100 to 600 × 600 mm
Volume flow rate range	40 – 3360 l/s or 144 – 12096 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 – 50 °C

Function

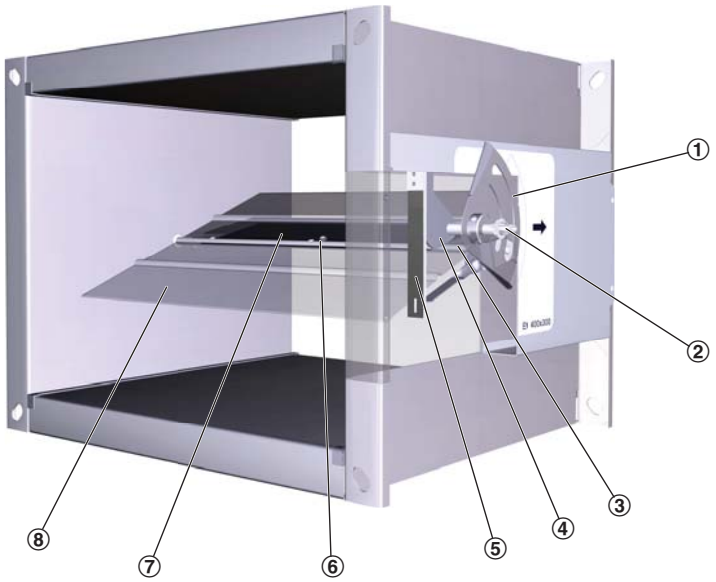
Functional description

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 extends and increases 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.

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 EN



① Volume flow rate scale
② Volume flow rate scale lock
③ Crossbar
④ Cam plate
⑤ Leaf spring
⑥ Bellows inlet
⑦ Bellows
⑧ Damper blade

Order code

EN

EN – D – P1 / 400×200 / B50 / 800 – 3000
1 2 3 4 5 6

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 [mm]
B × H

5 Actuator
No entry: without
For example
B50 24 V AC/DC, 3-point
B52 24 V AC/DC, 3-point, with auxiliary switch
B70 24 V AC/DC, modulating 2 – 10 V DC

6 Volume flow rates [m³/h or l/s]
only actuators 7
$\dot{V}_{min}$ – $_{max}$ for factory setting

Order example

EN-D/200×100

Acoustic cladding	With
Material	Galvanised sheet steel
Nominal size	200 × 100 mm

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 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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m^3/h	Pa		± %
200 × 100	40	144	50	60	13
	80	288	50	80	9
	120	432	50	115	6
	160	576	50	160	5
300 × 100	65	234	50	60	13
	130	468	50	80	9
	195	702	50	120	6
	260	936	50	170	5
300 × 150	105	378	50	60	13
	210	756	50	80	9
	315	1134	50	115	6
	420	1512	50	160	5
300 × 200	130	468	50	60	13
	260	936	50	80	9
	390	1404	50	110	6
	520	1872	50	160	5
400 × 200	210	756	50	60	13
	420	1512	50	80	9
	630	2268	50	115	6
	840	3024	50	160	5
500 × 200	230	828	50	60	13
	460	1656	50	80	9
	690	2484	50	115	6
	920	3312	50	160	5
600 × 200	255	918	50	60	13
	510	1836	50	80	9
	765	2754	50	115	6
	1020	3672	50	160	5
400 × 250	220	792	50	60	13
	440	1584	50	80	9
	660	2376	50	115	6
	880	3168	50	160	5
500 × 250	300	1080	50	60	13
	600	2160	50	80	9
	900	3240	50	115	6
	1200	4320	50	160	5
600 × 250	320	1152	50	60	13
	640	2304	50	80	9
	960	3456	50	115	6
	1280	4608	50	160	5
400 × 300	315	1134	50	60	13
	630	2268	50	80	9
	945	3402	50	115	6
	1260	4536	50	160	5
500 × 300	375	1350	50	60	13
	750	2700	50	80	9
	1125	4050	50	115	6
	1500	5400	50	160	5

① EN
② EN with secondary silencer TX

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 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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m^3/h	Pa		± %
600 × 300	420	1512	50	60	13
	840	3024	50	75	9
	1260	4536	50	110	6
	1680	6048	50	150	5
400 × 400	420	1512	50	60	13
	840	3024	50	85	9
	1260	4536	50	120	6
	1680	6048	50	175	5
500 × 400	460	1656	50	60	13
	920	3312	50	80	9
	1380	4968	50	115	6
	1840	6624	50	160	5
600 × 400	510	1836	50	60	13
	1020	3672	50	80	9
	1530	5508	50	115	6
	2040	7344	50	160	5
500 × 500	600	2160	50	60	13
	1200	4320	50	80	9
	1800	6480	50	115	6
	2400	8640	50	160	5
600 × 500	640	2304	50	55	13
	1280	4608	50	70	9
	1920	6912	50	95	6
	2560	9216	50	130	5
600 × 600	840	3024	50	60	13
	1680	6048	50	75	9
	2520	9072	50	105	6
	3360	12096	50	145	5

① EN
② EN with secondary silencer TX

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
200 × 100	40	144	35	19	21	<15
	80	288	41	28	28	21
	120	432	44	34	33	26
	160	576	46	38	35	30
300 × 100	65	234	38	22	24	16
	130	468	44	30	32	24
	195	702	45	35	36	29
	260	936	47	38	39	32
300 × 150	105	378	41	24	28	19
	210	756	44	31	34	26
	315	1134	46	35	39	32
	420	1512	47	38	41	35
300 × 200	130	468	45	24	31	21
	260	936	46	29	35	26
	390	1404	46	33	38	29
	520	1872	47	35	40	32
400 × 200	210	756	42	23	30	20
	420	1512	43	27	35	26
	630	2268	44	31	38	30
	840	3024	44	33	40	33
500 × 200	230	828	40	21	28	18
	460	1656	40	26	33	24
	690	2484	41	29	36	28
	920	3312	42	31	38	31
600 × 200	255	918	38	20	27	17
	510	1836	39	24	31	23
	765	2754	39	28	35	27
	1020	3672	40	31	37	31
400 × 250	220	792	44	23	32	22
	440	1584	45	28	37	27
	660	2376	45	31	39	30
	880	3168	45	34	41	33
500 × 250	300	1080	41	21	31	21
	600	2160	42	26	36	27
	900	3240	43	30	39	30
	1200	4320	43	33	41	33
600 × 250	320	1152	40	20	30	20
	640	2304	40	25	34	25
	960	3456	41	28	37	29
	1280	4608	42	31	39	32
400 × 300	315	1134	45	25	53	25
	630	2268	46	29	40	30
	945	3402	47	34	43	34
	1260	4536	47	36	45	36
500 × 300	375	1350	43	22	34	23
	750	2700	44	28	38	29
	1125	4050	44	31	41	32
	1500	5400	45	33	43	35

① EN
② EN with secondary silencer TX
③ EN-D

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
600 × 300	420	1512	41	21	33	22
	840	3024	42	26	37	28
	1260	4536	42	30	40	31
	1680	6048	43	32	42	34
400 × 400	420	1512	47	27	39	29
	840	3024	49	32	44	34
	1260	4536	49	36	47	37
	1680	6048	50	38	49	40
500 × 400	460	1656	45	24	37	27
	920	3312	46	29	42	32
	1380	4968	47	33	44	35
	1840	6624	47	35	46	37
600 × 400	510	1836	43	22	36	25
	1020	3672	44	27	40	30
	1530	5508	44	31	43	33
	2040	7344	45	33	45	36
500 × 500	600	2160	47	26	40	30
	1200	4320	48	31	45	35
	1800	6480	49	35	48	39
	2400	8640	49	37	50	41
600 × 500	640	2304	45	24	39	28
	1280	4608	46	29	43	33
	1920	6912	46	32	46	36
	2560	9216	46	35	48	39
600 × 600	840	3024	46	26	41	31
	1680	6048	47	30	46	36
	2520	9072	48	35	49	39
	3360	12096	48	37	51	42

① EN
② EN with secondary silencer TX
③ EN-D

Description

– Volume flow controller for constant air volume flow control

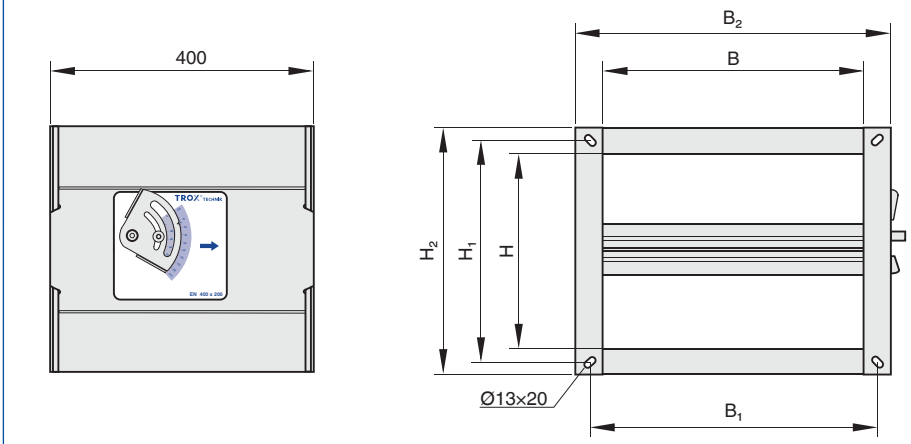


Volume flow controller
Type EN

2

Dimensions

EN



Dimensions [mm] and weight [kg]

Nominal size	Nominal width	Nominal height	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	276	134	176	5
300 × 100	300	100	334	376	134	176	6
300 × 150	300	150	334	376	184	226	7
300 × 200	300	200	334	376	234	276	7
400 × 200	400	200	434	476	234	276	9
400 × 250	400	250	434	476	284	326	10
400 × 300	400	300	434	476	334	376	12
400 × 400	400	400	434	476	434	476	18
500 × 200	500	200	534	576	234	276	11
500 × 250	500	250	534	576	284	326	12
500 × 300	500	300	534	576	334	376	13
500 × 400	500	400	534	576	434	476	18
500 × 500	500	500	534	576	534	576	19
600 × 200	600	200	634	676	234	276	13
600 × 250	600	250	634	676	284	326	14
600 × 300	600	300	634	676	334	376	15
600 × 400	600	400	634	676	434	476	18
600 × 500	600	500	634	676	534	576	19
600 × 600	600	600	634	676	634	676	20

Description

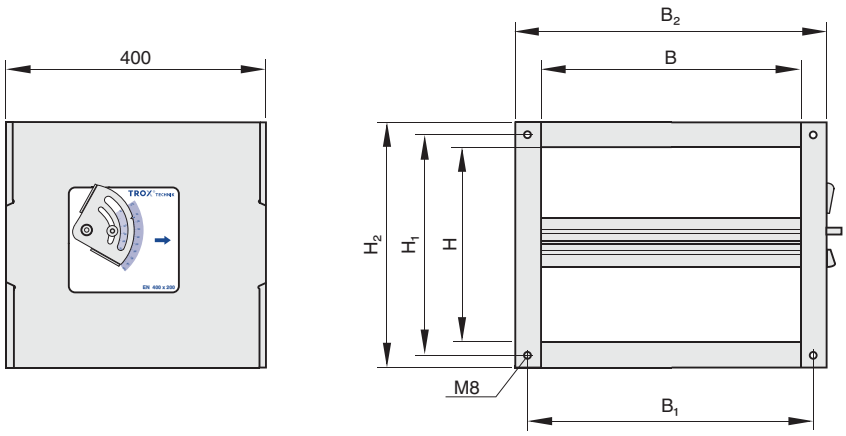


CAV controller Type EN-D

- 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-D



Dimensions [mm] and weight [kg]

Nominal size	Nominal width	Nominal height	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	280	134	180	8
300 × 100	300	100	334	380	134	180	10
300 × 150	300	150	334	380	184	230	11
300 × 200	300	200	334	380	234	280	12
400 × 200	400	200	434	480	234	280	15
400 × 250	400	250	434	480	284	330	17
400 × 300	400	300	434	480	334	380	18
400 × 400	400	400	434	480	434	480	26
500 × 200	500	200	534	580	234	280	17
500 × 250	500	250	534	580	284	330	18
500 × 300	500	300	534	580	334	380	19
500 × 400	500	400	534	580	434	480	26
500 × 500	500	500	534	580	534	580	28
600 × 200	600	200	634	680	234	280	20
600 × 250	600	250	634	680	284	330	22
600 × 300	600	300	634	680	334	380	22
600 × 400	600	400	634	680	434	480	26
600 × 500	600	500	634	680	534	580	29
600 × 600	600	600	634	680	634	680	30

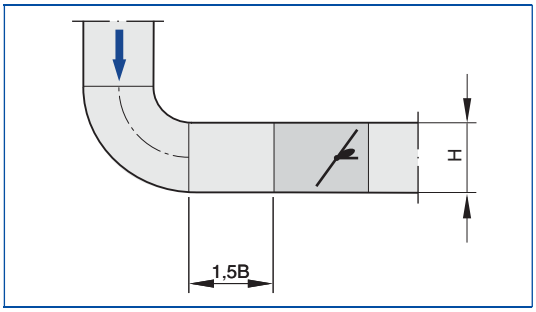
2

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.

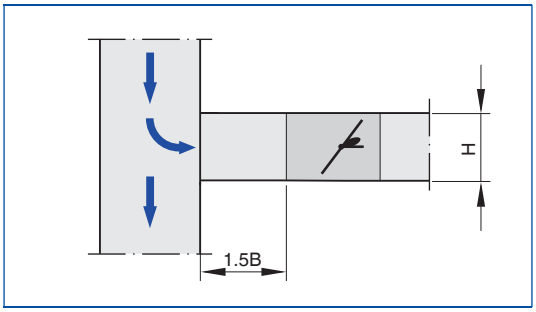
Free air intake only with a straight duct section of 1B upstream.

Bend, vertical



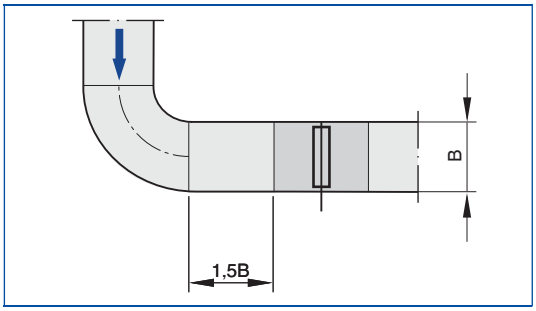
The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 1.5H upstream between any bend and the controller.

Junction, vertical



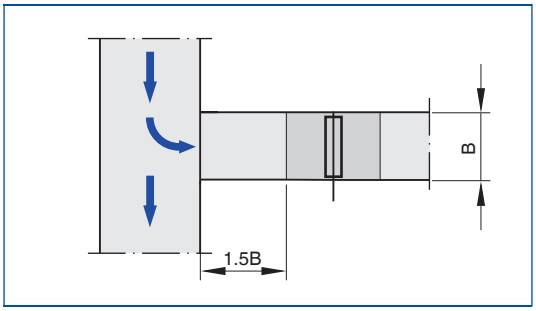
A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 1.5H upstream. Shorter upstream sections require a perforated plate in the branch and before the CAV controller. If there is no straight upstream section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

Bend, horizontal



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

Junction, horizontal

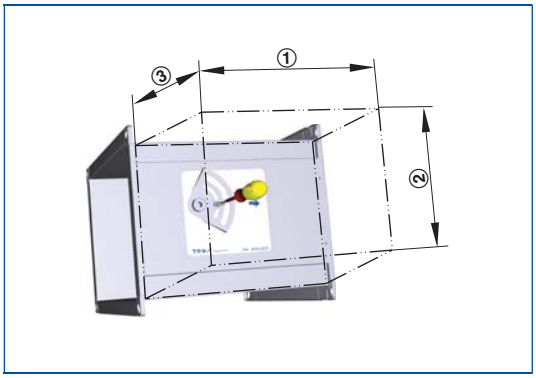


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 1.5B upstream. Shorter upstream sections require a perforated plate in the branch and before the CAV controller. If there is no straight upstream section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

Space requirement 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 for commissioning and maintenance



Space required

Attachments	①	②	③
	mm		
Without actuator	200	H	200
With actuator	200	H	300

H: Unit height

Standard text

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

2

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. Volume flow controllers without actuators are factory set to a reference volume flow rate (customers can set the required volume flow rate on site).
Both ends suitable for the connection of ducts.
Casing air leakage to EN 1751, class C
(B + H ≤400, class B)

Special characteristics
- Volume flow rate can be set using an external scale; no tools required
- High volume flow rate control accuracy
- Any installation orientation
- Correct operation even under unfavourable upstream conditions (1.5 B straight section required upstream)

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

Powder-coated construction (P1)
- Casing and damper blade made of galvanised sheet steel, powder-coated

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/EG

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: 40 to 3360 l/s or 144 to 12096 m^3/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

Sizing data
- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

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 [mm]
B × H

5 Actuator
No entry: without
For example
☐ **B50** 24 V AC/DC, 3-point
☐ **B52** 24 V AC/DC, 3-point, with auxiliary switch
☐ **B70** 24 V AC/DC, modulating 2 – 10 V DC

6 Volume flow rates [m^3/h or l/s]
only actuators 7
$\dot{V}_{min}$ – $_{max}$ for factory setting

CAV controllers
Type RN-Ex





Adjustment scale

ATEX-Zertifizierung

Tested to VDI 6022

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

Circular, 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
- Volume flow rate can be set using an external scale, no tools required
- No on-site test measurements required for commissioning
- Suitable for airflow velocities of up to 12 m/s
- Any installation orientation
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

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

2

Type		Page
RN-Ex	General information	2.1 – 49
	Order code	2.1 – 52
	Aerodynamic data	2.1 – 53
	Quick sizing	2.1 – 54
	Dimensions and weight – RN-Ex	2.1 – 55
	Dimensions and weight – RN-Ex-D	2.1 – 56
	Installation details	2.1 – 57
	Specification text	2.1 – 58
	Basic information and nomenclature	2.3 – 1

Description



CAV controllers
Type RN-Ex

Application
- Circular EXCONTROL CAV controllers of Type RN-Ex for the precise supply air or extract air 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

Classification
According to type examination certificate TUEV 05 ATEX 7159 X
- 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

Variants
- RN-Ex: Volume flow controller
- RN-Ex-D: Volume flow controller with acoustic cladding
- Units with acoustic cladding and/or Type CA secondary silencers for demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Nominal sizes
- 80, 100, 125, 160, 200, 250, 315, 400

Accessories
- Lip seals on both ends (factory fitted)

Useful additions
- Secondary silencer Type CA

Special features
- ATEX mark and certification
- ATEX equipment group II, approved for zones 1, 2, 21 and 22
- Volume flow rate can be set using an external scale; no tools required
- High volume flow rate control accuracy
- Any installation orientation
- Correct operation even under unfavourable upstream or downstream conditions (1.5 D straight section required upstream)

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
- Scale with pointer to set the volume flow rate setpoint
- Connection for equipotential bonding
- Aerodynamic function testing of each unit on a special test rig prior to shipping

Construction features
- Circular casing
- Construction and materials comply with the EU directive for use in potentially explosive atmospheres (ATEX)
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal (RN-P1/80 without groove)

Materials and surfaces

Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Interior parts, nominal sizes 80 – 125: stainless steel 1.4301, nominal sizes 160 – 400: galvanised sheet steel
- Polyurethane bellows
- Plain bearings with PTFE coating
- Leaf spring made of stainless steel

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Interior parts, nominal sizes 80 – 125: stainless steel 1.4301, nominal sizes 160 – 400: galvanised sheet steel, powder-coated

Stainless steel construction (A2)
- Casing made of stainless steel 1.4301
- Interior parts made of stainless 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/EG

Installation and commissioning

- Connections for equipotential bonding: Suitable cables must be connected by others
- Any installation orientation
- Volume flow rate can be set using an external scale; no tools required
- No repeat measurements or adjustments by an air conditioning engineer are necessary
- RN-Ex-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines

- Directive 94/9/EC: Equipment and protective systems intended for use in potentially explosive atmospheres
- Hygiene conforms to VDI 6022
- Casing air leakage to EN 1751, class C

Maintenance

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

2

Technical data

Nominal sizes	80 – 400 mm
Volume flow rate range	11 – 1400 l/s or 40 – 5040 m^3/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 – 50 °C

Function

2

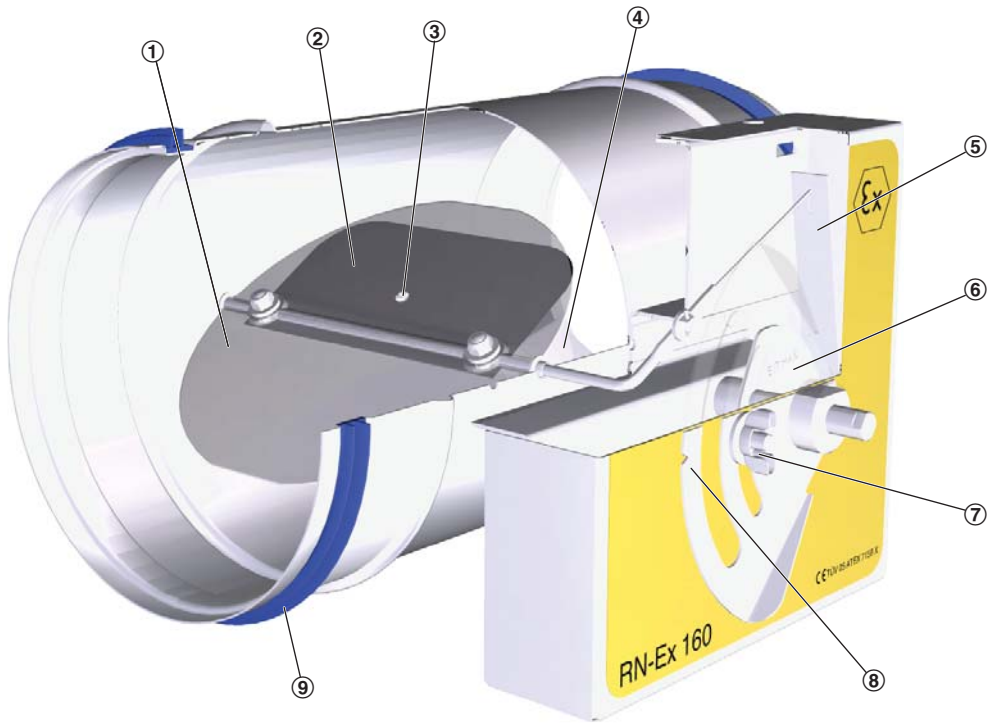
Functional description

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 extends and increases 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.

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 RN-Ex



① Damper blade
② Bellows
③ Bellows inlet
④ Crossbar
⑤ Leaf spring
⑥ Cam plate
⑦ Volume flow rate scale lock
⑧ Volume flow rate scale
⑨ Lip seal

Order code

RN-Ex

RN – Ex – D – P1 / 160 / D2
1 2 3 4 5

1 Type
RN-Ex Volume flow controller for potentially explosive atmospheres

2 Acoustic cladding
No entry: none
D With acoustic cladding

3 Material
No entry: galvanised sheet steel
P1 Powder-coated (RAL 7001), silver grey
A2 Stainless steel

4 Nominal size [mm]
80
100
125
160
200
250
315
400

5 Accessories
No entry: none
D2 Lip seals on both ends

Order example

RN-Ex/160/D2

Nominal size	160
Material	Galvanised sheet steel
Accessories	Lip seals on both ends

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 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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	③	④	$\Delta\dot{V}$
			$\Delta p_{st\ min}$				
	l/s	m³/h	Pa				± %
80	11	40	100	105	105	105	20
	20	72	100	105	105	105	15
	40	144	100	110	115	120	10
	45	162	100	110	120	125	8
100	22	79	50	55	55	55	10
	40	144	50	55	55	60	8
	70	252	50	60	65	70	6
	90	324	50	60	70	80	5
125	35	126	50	55	55	55	10
	60	216	50	55	55	55	8
	115	414	50	60	65	70	6
	140	504	50	60	70	80	5
160	60	216	50	55	55	55	10
	105	378	50	55	55	55	8
	190	684	50	55	60	60	6
	240	864	50	55	65	70	5
200	90	324	50	55	55	55	10
	160	576	50	55	55	55	8
	300	1080	50	55	60	65	6
	360	1296	50	55	60	65	5
250	145	522	50	55	55	55	10
	255	918	50	55	55	55	8
	470	1692	50	55	60	60	6
	580	2088	50	55	60	65	5
315	230	828	50	55	55	55	10
	400	1440	50	55	55	55	8
	750	2700	50	55	60	60	6
	920	3312	50	55	60	65	5
400	350	1260	50	55	55	55	10
	610	2196	50	55	55	55	8
	1130	4068	50	55	55	55	6
	1400	5040	50	55	55	60	5

① RN-Ex
② RN-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ RN-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ RN-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise				Case-radiated noise	
			①	②	③	④	①	⑤
			L_{PA}	L_{PA1}			L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)					
80	11	40	37	24	17	15	22	<15
	20	72	39	27	19	17	24	<15
	40	144	47	34	24	22	31	<15
	45	162	48	35	25	24	32	<15
100	22	79	37	24	17	15	22	<15
	40	144	40	47	22	20	21	<15
	70	252	47	47	27	26	29	<15
	90	324	50	50	30	29	33	<15
125	35	126	37	27	21	18	15	<15
	60	216	43	34	27	25	19	<15
	115	414	50	41	35	33	27	<15
	140	504	52	44	39	37	30	<15
160	60	216	40	32	26	24	29	<15
	105	378	45	37	32	29	33	<15
	190	684	49	41	35	33	39	<15
	240	864	50	41	36	34	41	16
200	90	324	40	31	24	22	28	<15
	160	576	43	35	28	26	32	<15
	300	1080	48	40	33	32	40	17
	360	1296	49	41	35	33	42	20
250	145	522	41	32	24	22	29	15
	255	918	42	34	28	26	33	<15
	470	1692	46	39	33	31	40	19
	580	2088	48	41	35	34	43	22
315	230	828	39	33	26	23	30	<15
	400	1440	42	35	29	27	35	<15
	750	2700	44	38	32	31	40	19
	920	3312	46	41	35	34	43	23
400	350	1260	46	39	33	29	45	<15
	610	2196	48	42	36	32	49	18
	1130	4068	50	44	38	35	54	24
	1400	5040	51	45	40	37	56	27

① RN-Ex
② RN-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ RN-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ RN-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm
⑤ RN-Ex-D

Description

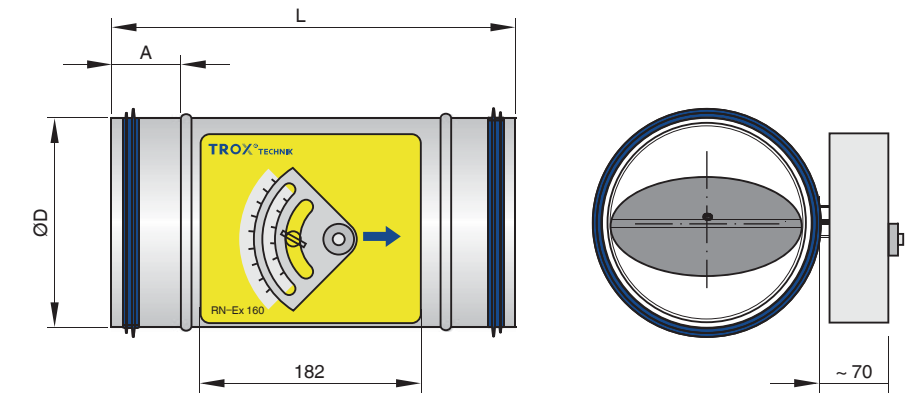
- Volume flow controller for constant air volume flow control
- Spigot to make connections to the ducting



CAV controllers
Type RN-Ex

Dimensions

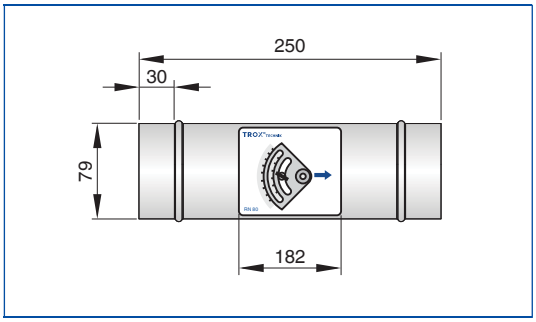
RN-Ex



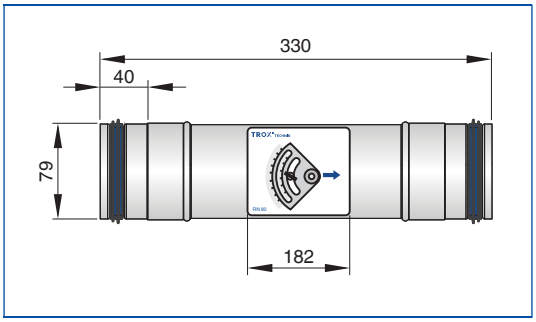
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	A	m
	mm			kg
80	79	310	50	1.4
100	99	310	50	1.8
125	124	310	50	2.0
160	159	310	50	2.5
200	199	310	50	3.0
250	249	400	50	3.5
315	314	400	50	4.8
400	399	400	50	5.7

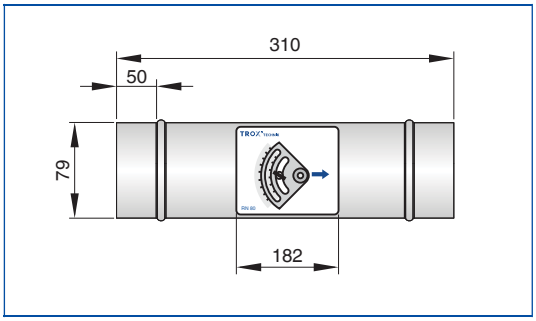
RN-Ex-P1/80



RN-Ex-P1/80/D2



RN-Ex-A2/80



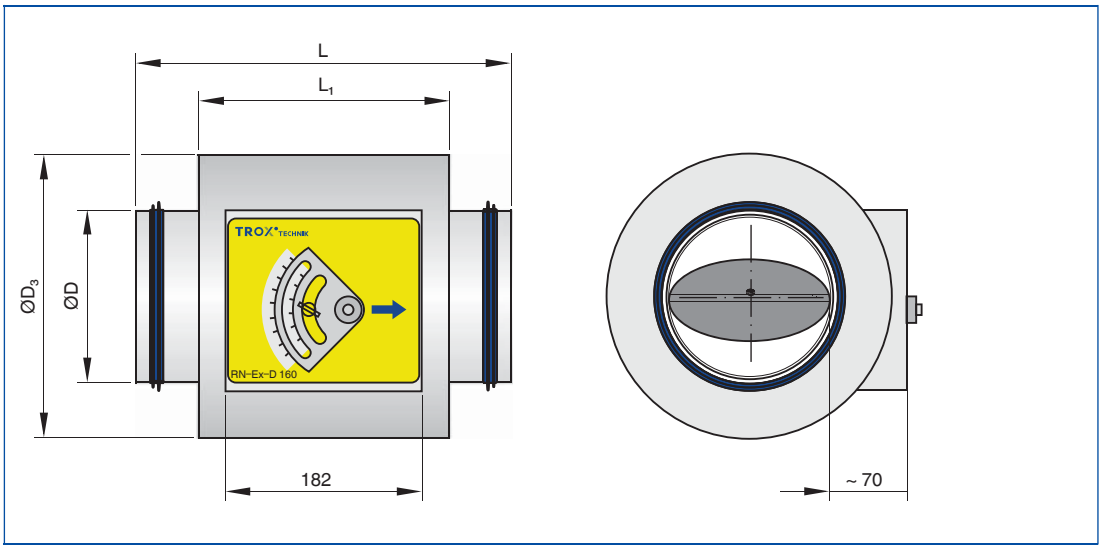
2

Description

- Volume flow controller with acoustic cladding for constant air volume flow control
- Spigot to make connections to the ducting
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular 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

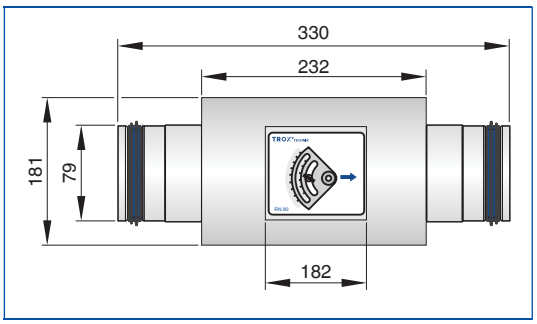
RN-Ex-DRN-Ex-D



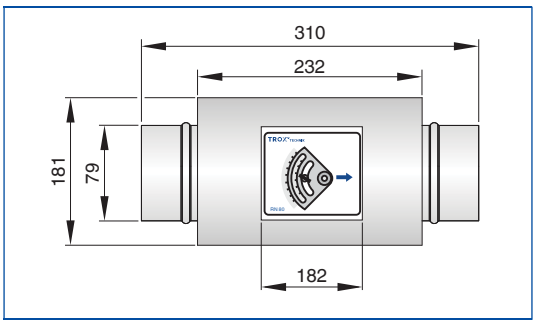
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	$ØD_3$	L_1	m
	mm				kg
80	79	310	181	232	2.2
100	99	310	200	232	3.6
125	124	310	220	232	4.0
160	159	310	262	232	5.0
200	199	310	300	232	6.0
250	249	400	356	312	7.3
315	314	400	418	312	9.8
400	399	400	500	312	11.8

RN-Ex-D-P1/80/D2



RN-Ex-D-A2/80

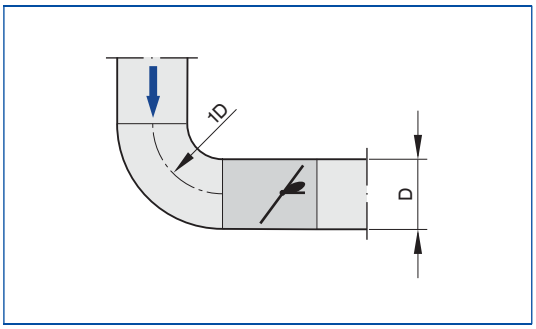


Upstream conditions

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.

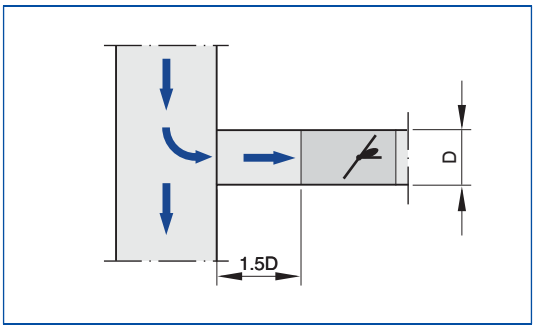
Free air intake only with a straight duct section of 1D upstream.

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

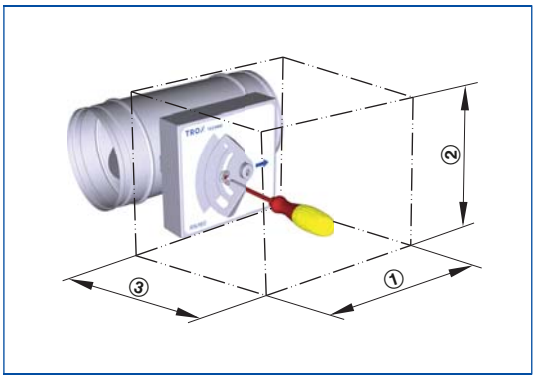


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 1.5D upstream. Shorter upstream sections require a perforated plate in the branch and before the CAV controller. If there is no straight upstream section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

Space requirement 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 for commissioning and maintenance



Space required

Attachments	①	②	③
	mm		
Without actuator	200	200	200

Standard text

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

2

Circular volume flow controllers for constant air volume systems in potentially explosive atmospheres, mechanical self-powered, without external power supply, suitable for supply or extract air, available in 8 nominal sizes. Ready-to-commission unit consists of the casing containing a damper blade with low-friction bearings, bellows, external cam plate with leaf spring, and parts for equipotential bonding and for protection in potentially explosive atmospheres. Volume flow controllers are factory set to a reference volume flow rate (customers can set the required volume flow rate on site). Spigot with groove for lip seal, suitable for connecting ducts according to EN 1506 or EN 13180. Casing air leakage to EN 1751, class C.

Special features
- ATEX mark and certification
- ATEX equipment group II, approved for zones 1, 2, 21 and 22
- Volume flow rate can be set using an external scale; no tools required
- High volume flow rate control accuracy
- Any installation orientation
- Correct operation even under unfavourable upstream or downstream conditions (1.5 D straight section required upstream)

Materials and surfaces
Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Interior parts, nominal sizes 80 – 125: stainless steel 1.4301, nominal sizes 160 – 400: galvanised sheet steel
- Polyurethane bellows
- Plain bearings with PTFE coating
- Leaf spring made of stainless steel

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Interior parts, nominal sizes 80 – 125: stainless steel 1.4301, nominal sizes 160 – 400: galvanised sheet steel, powder-coated

Stainless steel construction (A2)
- Casing made of stainless steel 1.4301
- Interior parts made of stainless 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/EG

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Technical data
- Nominal sizes: 80 to 400 mm
- Volume flow rate range: 11 to 1400 l/s or 40 to 5040 m^3/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

Sizing data
- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

1 Type
RN-Ex Volume flow controller for potentially explosive atmospheres

2 Acoustic cladding
No entry: none
☐ **D** With acoustic cladding

3 Material
No entry: galvanised sheet steel
☐ **P1** Powder-coated (RAL 7001), silver grey
☐ **A2** Stainless steel

4 Nominal size [mm]
☐ **80**
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

5 Accessories
No entry: none
☐ **D2** Lip seals on both ends

CAV controllers
Type EN-Ex



For the precise control of normal and 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 12,096 m^3/h or 3,360 l/s
- Volume flow rate can be set using an external scale, no tools required
- High control accuracy
- No on-site test measurements required for commissioning
- Suitable for airflow velocities up to 8 m/s
- Casing air leakage to EN 1751, up to class C

Optional equipment and accessories

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



Adjustment scale

ATEX-Zertifizierung

Type		Page
EN-Ex	General information	2.1 – 60
	Order code	2.1 – 63
	Aerodynamic data	2.1 – 64
	Quick sizing	2.1 – 66
	Dimensions and weight – EN-Ex	2.1 – 68
	Dimensions and weight – EN-Ex-D	2.1 – 69
	Installation details	2.1 – 70
	Specification text	2.1 – 71
	Basic information and nomenclature	2.3 – 1

Description



CAV controllers
Type EN-Ex

Application
- Rectangular EXCONTROL CAV controllers of Type EN-Ex for the precise supply air or extract air 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

Classification
According to type examination certificate
TUEV 05 ATEX 7159 X
- 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

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
- Acoustic cladding cannot be retrofitted

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

Nominal sizes
- 19 nominal sizes from 200 × 100 to 600 × 600

Useful additions
- Secondary silencer Type TX

Special features
- ATEX mark and certification
- ATEX equipment group II, approved for zones 1, 2, 21 and 22
- Volume flow rate can be set using an external scale; no tools required
- High volume flow rate control accuracy
- Any installation orientation

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
- Scale with pointer to set the volume flow rate setpoint
- Connection for equipotential bonding
- Aerodynamic functional testing of each unit on a special test rig prior to shipping
- Correct operation even under unfavourable upstream conditions (1.5 B straight section required upstream)

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

Powder-coated construction (P1)
- Casing and damper blade made of galvanised sheet steel, powder-coated

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 A2, 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/EG

Installation and commissioning

- Any installation orientation
- Connect the equipotential bonding to the ductwork
- Volume flow rate can be set using an external scale; no tools required
- No repeat measurements or adjustments by an air conditioning engineer are necessary
- EN-Ex-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines

- Directive 94/9/EC: Equipment and protective systems intended for use in potentially explosive atmospheres
- Casing air leakage to EN 1751, class C (B + H ≤400, class B)

Maintenance

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

Technical data

Nominal sizes	200 × 100 to 600 × 600 mm
Volume flow rate range	40 – 3360 l/s or 144 – 12096 m^3/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 – 50 °C

Function

2

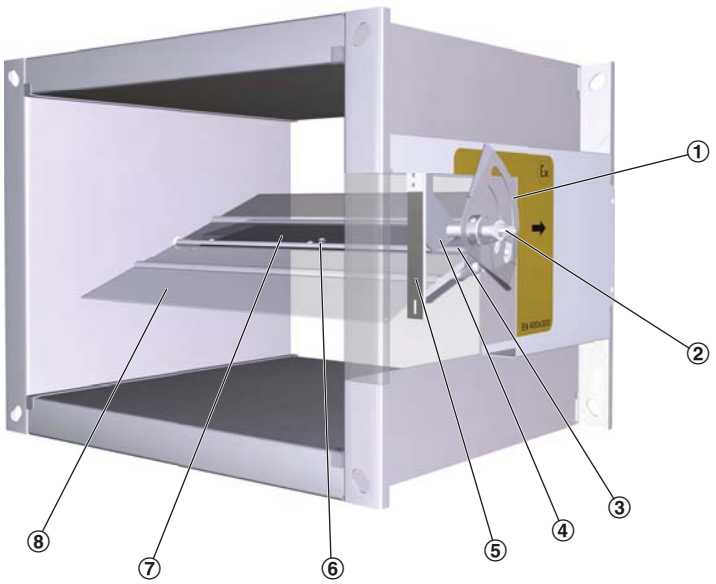
Functional description

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 extends and increases 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.

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 EN-Ex



① Volume flow rate scale
② Volume flow rate scale lock
③ Crossbar
④ Cam plate
⑤ Leaf spring
⑥ Bellows inlet
⑦ Bellows
⑧ Damper blade

Order code

EN-Ex

EN – Ex – D – P1 / 400×200
1 2 3 4

1 Type
EN-Ex Volume flow controller for potentially explosive atmospheres

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 [mm]
B × H

Order example

EN-Ex-D/200×100

Acoustic cladding	With
Material	Galvanised sheet steel
Nominal size	200 × 100 mm

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 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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m^3/h	Pa		± %
200 × 100	40	144	50	60	13
	80	288	50	80	9
	120	432	50	115	6
	160	576	50	160	5
300 × 100	65	234	50	60	13
	130	468	50	80	9
	195	702	50	120	6
	260	936	50	170	5
300 × 150	105	378	50	60	13
	210	756	50	80	9
	315	1134	50	115	6
	420	1512	50	160	5
300 × 200	130	468	50	60	13
	260	936	50	80	9
	390	1404	50	110	6
	520	1872	50	160	5
400 × 200	210	756	50	60	13
	420	1512	50	80	9
	630	2268	50	115	6
	840	3024	50	160	5
500 × 200	230	828	50	60	13
	460	1656	50	80	9
	690	2484	50	115	6
	920	3312	50	160	5
600 × 200	255	918	50	60	13
	510	1836	50	80	9
	765	2754	50	115	6
	1020	3672	50	160	5
400 × 250	220	792	50	60	13
	440	1584	50	80	9
	660	2376	50	115	6
	880	3168	50	160	5
500 × 250	300	1080	50	60	13
	600	2160	50	80	9
	900	3240	50	115	6
	1200	4320	50	160	5
600 × 250	320	1152	50	60	13
	640	2304	50	80	9
	960	3456	50	115	6
	1280	4608	50	160	5
400 × 300	315	1134	50	60	13
	630	2268	50	80	9
	945	3402	50	115	6
	1260	4536	50	160	5
500 × 300	375	1350	50	60	13
	750	2700	50	80	9
	1125	4050	50	115	6
	1500	5400	50	160	5

① EN-Ex
② EN-Ex with secondary silencer TX

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 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.

Volume flow rate ranges and minimum differential pressure values

Nominal size	$\dot{V}$		①	②	$\Delta\dot{V}$
			$\Delta p_{st\ min}$		
	l/s	m³/h	Pa	Pa	± %
600 × 300	420	1512	50	60	13
	840	3024	50	75	9
	1260	4536	50	110	6
	1680	6048	50	150	5
400 × 400	420	1512	50	60	13
	840	3024	50	85	9
	1260	4536	50	120	6
	1680	6048	50	175	5
500 × 400	460	1656	50	60	13
	920	3312	50	80	9
	1380	4968	50	115	6
	1840	6624	50	160	5
600 × 400	510	1836	50	60	13
	1020	3672	50	80	9
	1530	5508	50	115	6
	2040	7344	50	160	5
500 × 500	600	2160	50	60	13
	1200	4320	50	80	9
	1800	6480	50	115	6
	2400	8640	50	160	5
600 × 500	640	2304	50	55	13
	1280	4608	50	70	9
	1920	6912	50	95	6
	2560	9216	50	130	5
600 × 600	840	3024	50	60	13
	1680	6048	50	75	9
	2520	9072	50	105	6
	3360	12096	50	145	5

① EN-Ex
② EN-Ex with secondary silencer TX

2

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
200 × 100	40	144	35	19	21	<15
	80	288	41	28	28	21
	120	432	44	34	33	26
	160	576	46	38	35	30
300 × 100	65	234	38	22	24	16
	130	468	44	30	32	24
	195	702	45	35	36	29
	260	936	47	38	39	32
300 × 150	105	378	41	24	28	19
	210	756	44	31	34	26
	315	1134	46	35	39	32
	420	1512	47	38	41	35
300 × 200	130	468	45	24	31	21
	260	936	46	29	35	26
	390	1404	46	33	38	29
	520	1872	47	35	40	32
400 × 200	210	756	42	23	30	20
	420	1512	43	27	35	26
	630	2268	44	31	38	30
	840	3024	44	33	40	33
500 × 200	230	828	40	21	28	18
	460	1656	40	26	33	24
	690	2484	41	29	36	28
	920	3312	42	31	38	31
600 × 200	255	918	38	20	27	17
	510	1836	39	24	31	23
	765	2754	39	28	35	27
	1020	3672	40	31	37	31
400 × 250	220	792	44	23	32	22
	440	1584	45	28	37	27
	660	2376	45	31	39	30
	880	3168	45	34	41	33
500 × 250	300	1080	41	21	31	21
	600	2160	42	26	36	27
	900	3240	43	30	39	30
	1200	4320	43	33	41	33
600 × 250	320	1152	40	20	30	20
	640	2304	40	25	34	25
	960	3456	41	28	37	29
	1280	4608	42	31	39	32
400 × 300	315	1134	45	25	53	25
	630	2268	46	29	40	30
	945	3402	47	34	43	34
	1260	4536	47	36	45	36
500 × 300	375	1350	43	22	34	23
	750	2700	44	28	38	29
	1125	4050	44	31	41	32
	1500	5400	45	33	43	35

① EN-Ex
② EN-Ex with secondary silencer TX
③ EN-Ex-D

Air-regenerated noise

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 normally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger VAV terminal unit and/or a silencer is required.

Quick sizing: Sound pressure level at differential pressure 150 Pa

Nominal size	$\dot{V}$		Air-regenerated noise		Case-radiated noise	
			①	②	①	③
			L_{PA}	L_{PA1}	L_{PA2}	L_{PA3}
	l/s	m³/h	dB(A)			
600 x 300	420	1512	41	21	33	22
	840	3024	42	26	37	28
	1260	4536	42	30	40	31
	1680	6048	43	32	42	34
400 x 400	420	1512	47	27	39	29
	840	3024	49	32	44	34
	1260	4536	49	36	47	37
	1680	6048	50	38	49	40
500 x 400	460	1656	45	24	37	27
	920	3312	46	29	42	32
	1380	4968	47	33	44	35
	1840	6624	47	35	46	37
600 x 400	510	1836	43	22	36	25
	1020	3672	44	27	40	30
	1530	5508	44	31	43	33
	2040	7344	45	33	45	36
500 x 500	600	2160	47	26	40	30
	1200	4320	48	31	45	35
	1800	6480	49	35	48	39
	2400	8640	49	37	50	41
600 x 500	640	2304	45	24	39	28
	1280	4608	46	29	43	33
	1920	6912	46	32	46	36
	2560	9216	46	35	48	39
600 x 600	840	3024	46	26	41	31
	1680	6048	47	30	46	36
	2520	9072	48	35	49	39
	3360	12096	48	37	51	42

① EN-Ex
② EN-Ex with secondary silencer TX
③ EN-Ex-D

Description

– Volume flow controller for constant air volume flow control

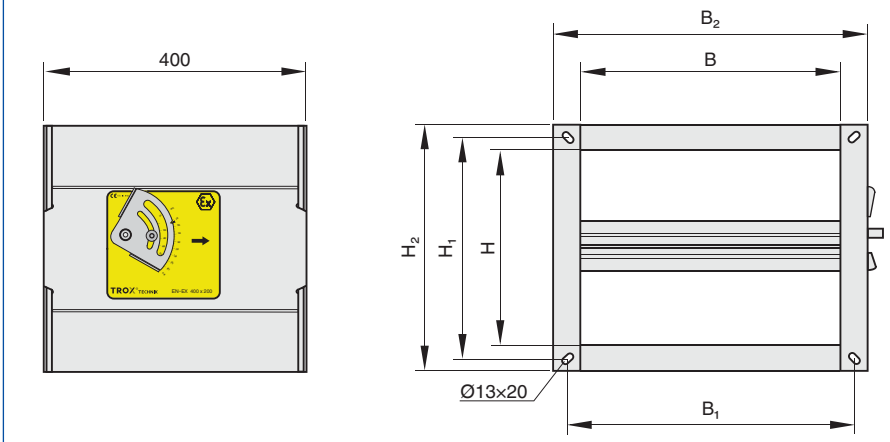


CAV controllers
Type EN-Ex

2

Dimensions

EN-Ex



Dimensions [mm] and weight [kg]

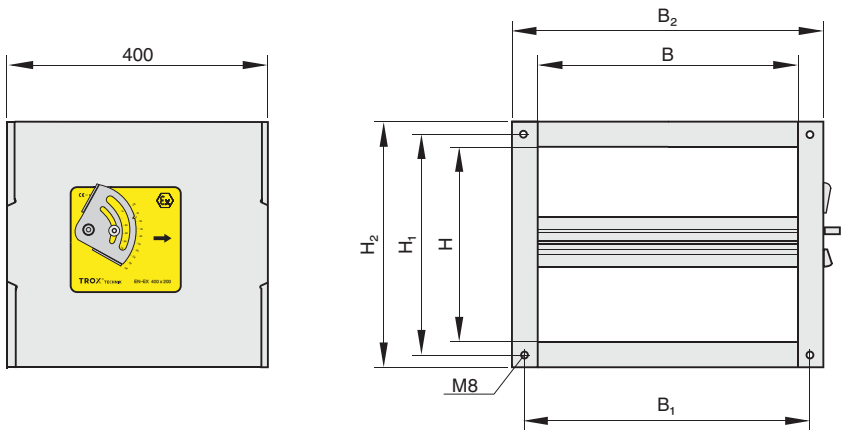
Nominal size	Nominal width	Nominal height	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	276	134	176	5
300 × 100	300	100	334	376	134	176	6
300 × 150	300	150	334	376	184	226	7
300 × 200	300	200	334	376	234	276	7
400 × 200	400	200	434	476	234	276	9
400 × 250	400	250	434	476	284	326	10
400 × 300	400	300	434	476	334	376	12
400 × 400	400	400	434	476	434	476	18
500 × 200	500	200	534	576	234	276	11
500 × 250	500	250	534	576	284	326	12
500 × 300	500	300	534	576	334	376	13
500 × 400	500	400	534	576	434	476	18
500 × 500	500	500	534	576	534	576	19
600 × 200	600	200	634	676	234	276	13
600 × 250	600	250	634	676	284	326	14
600 × 300	600	300	634	676	334	376	15
600 × 400	600	400	634	676	434	476	18
600 × 500	600	500	634	676	534	576	19
600 × 600	600	600	634	676	634	676	20

Description

- 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-D



Dimensions [mm] and weight [kg]

Nominal size	Nominal width	Nominal height	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	280	134	180	8
300 × 100	300	100	334	380	134	180	10
300 × 150	300	150	334	380	184	230	11
300 × 200	300	200	334	380	234	280	12
400 × 200	400	200	434	480	234	280	15
400 × 250	400	250	434	480	284	330	17
400 × 300	400	300	434	480	334	380	18
400 × 400	400	400	434	480	434	480	26
500 × 200	500	200	534	580	234	280	17
500 × 250	500	250	534	580	284	330	18
500 × 300	500	300	534	580	334	380	19
500 × 400	500	400	534	580	434	480	26
500 × 500	500	500	534	580	534	580	28
600 × 200	600	200	634	680	234	280	20
600 × 250	600	250	634	680	284	330	22
600 × 300	600	300	634	680	334	380	22
600 × 400	600	400	634	680	434	480	26
600 × 500	600	500	634	680	534	580	29
600 × 600	600	600	634	680	634	680	30

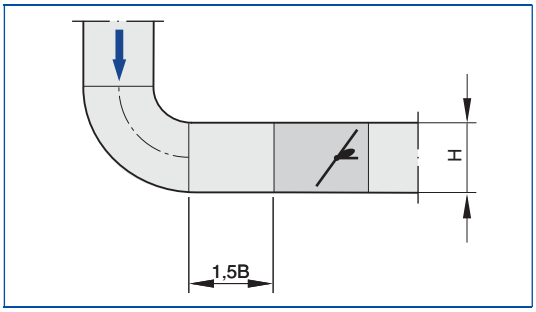
2

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.

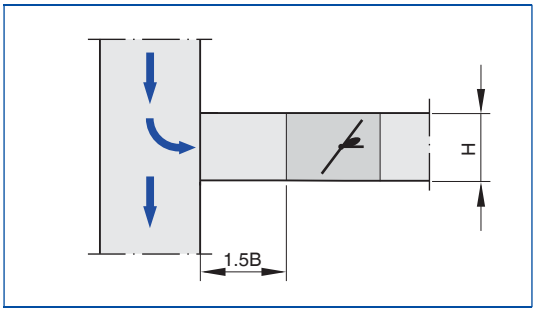
Free air intake only with a straight duct section of 1B upstream.

Bend, vertical



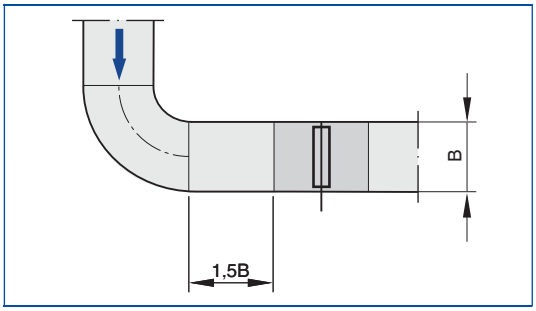
The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 1.5H upstream between any bend and the controller.

Junction, vertical



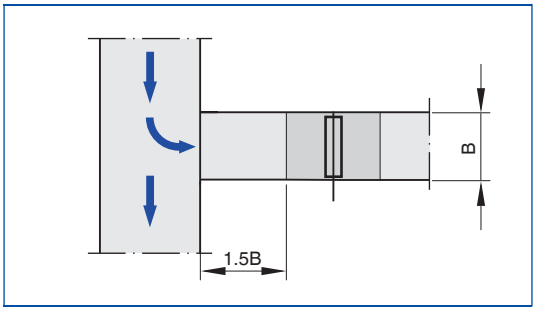
A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 1.5H upstream. Shorter upstream sections require a perforated plate in the branch and before the CAV controller. If there is no straight upstream section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

Bend, horizontal



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

Junction, horizontal

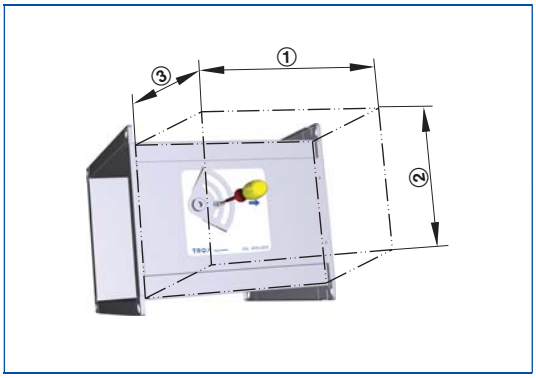


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 1.5B upstream. Shorter upstream sections require a perforated plate in the branch and before the CAV controller. If there is no straight upstream section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

Space requirement 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 for commissioning and maintenance



Space required

Attachments	①	②	③
	mm		
Without actuator	200	H	200

H: Unit height

Standard text

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

2

Rectangular volume flow controllers for constant air volume systems in potentially explosive atmospheres, 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 with leaf spring, and parts for equipotential bonding and for protection in potentially explosive atmospheres. Volume flow controllers are factory set to a reference volume flow rate (customers can set the required volume flow rate on site). Both ends suitable for the connection of ducts. Casing air leakage to EN 1751, class C (B + H ≤400, class B)

Special features
- ATEX mark and certification
- ATEX equipment group II, approved for zones 1, 2, 21 and 22
- Volume flow rate can be set using an external scale; no tools required
- High volume flow rate control accuracy
- Any installation orientation

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

Powder-coated construction (P1)
- Casing and damper blade made of galvanised sheet steel, powder-coated

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 A2, 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/EG

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

Technical data
- Nominal sizes: 200 × 100 to 600 × 600
- Volume flow rate range: 40 to 3360 l/s or 144 to 12096 m^3/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

Sizing data
- $\dot{V}$ _____ [m^3/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

Order options

1 Type
EN-Ex Volume flow controller for potentially explosive atmospheres
☐

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 [mm]
B × H

Actuators for CAV controllers

Type Min/Max actuators



For constant volume flows with $\dot{V}_{min}/\dot{V}_{max}$ switching in air conditioning systems

Actuators for mechanical self-powered CAV controllers Type EN, RN, or VFC, and for flow adjustment dampers Type VFR

- Switching between two volume flow setpoint values, e.g. for daytime and night-time operation
- Supply voltage 24 V AC/DC or 230 V AC
- Control input signal: 1-wire control or 2-wire control (3-point)
- Potentiometer or mechanical stops
- Positive lock connection with CAV controller
- Retrofit possible

Type		Page
Min/Max actuators	General information	2.2 – 2
	Special information – B5*	2.2 – 4
	Special information – B6*	2.2 – 5
	Special information – B*2	2.2 – 6
	Special information – E01	2.2 – 7
	Special information – M01	2.2 – 8
	Special information – E02	2.2 – 9
	Special information – M02	2.2 – 10
	Basic information and nomenclature	2.3 – 1

Description

Application

- Actuators for min/max switching
- Switching between volume flow setpoint values of mechanical self-powered CAV controllers Type RN, EN or VFC
- Change of the damper blade positions of flow adjustment dampers Type VFR

Parts and characteristics

- Potentiometer or mechanical stops for setting the volume flow rate setpoints
- Supply voltage 24 V AC/DC or 230 V AC
- Overload protection
- 1-wire control or 2-wire control (3-point)
- Optional auxiliary switch for capturing the end positions

Any attachments must be defined with the order code of the CAV controller.

Actuators for volume flow controllers Type RN or EN

Order code detail	Actuator			Auxiliary switch	
	Part number	Type	Supply voltage	Part number	Type
B50	M466DT4	LM24A-F	24 V	–	–
B52	M466DT4	LM24A-F	24 V	M536AI3	S2A
B60	M466DT5	LM230A-F	230 V	–	–
B62	M466DT5	LM230A-F	230 V	M536AI3	S2A

Actuators for volume flow controllers Type VFC and for flow adjustment dampers Type VFR

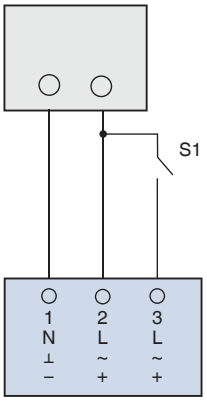
Order code detail	Part number	Type	Setpoint setting	Supply voltage
E01	M466EP6	224-024-02-001	Potentiometer	24 V
M01	M466EP4	CM24-F	Mechanical stops	24 V
E02	M466EP8	224-230-02-002	Potentiometer	230 V
M02	M466EP5	CM230-F	Mechanical stops	230 V

Function

Functional description

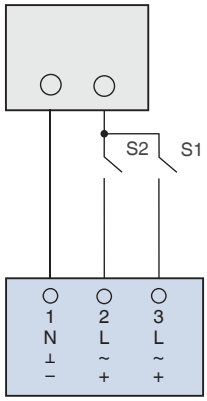
The actuator moves a damper blade or a damper blade mechanism to the minimum or maximum position. Minimum and maximum positions can be set on potentiometers or using mechanical stops. 1-wire control or 2-wire control (3-point) can be used. 1-wire control is actually an open/close control or min/max control.

1-wire control



Switch functions
S1 open: Direction of rotation 1
S1 closed: Direction of rotation 2

2-wire control (3-point)



Switch functions
S1 open
S2 open: Actuator has stopped (any position)
S2 closed: Direction of rotation 1

S1 closed
S2 open: Direction of rotation 2
S2 closed: Direction of rotation 2

Effect of actuator action in case of factory setting

Order code detail	Direction of rotation	
	1	2
B5*	$\dot{V}_{min}$	$\dot{V}_{max}$
B6*	$\dot{V}_{min}$	$\dot{V}_{max}$
E01	$\dot{V}_{min}$	$\dot{V}_{max}$
E02	$\dot{V}_{min}$	$\dot{V}_{max}$
M01	$\dot{V}_{max}$	$\dot{V}_{min}$
M02	$\dot{V}_{max}$	$\dot{V}_{min}$

2

Description

/ **B50**
/ **B52**

Order code detail

Application

– Actuator LM24A-F for the min/max switching of volume flow setpoint values of mechanical self-powered volume flow controllers Type RN or EN (only up to a height of 300 mm)

Variants

– B52: with auxiliary switch for capturing the end positions

Parts and characteristics

– Supply voltage 24 V AC/DC
– 1-wire control or 2-wire control (3-point)
– Mechanical stops for setting the volume flow rate setpoints
– Switch for setting the direction of rotation
– Positive lock connection with damper blade shaft
– Release button to allow for manual operation

Commissioning

– Set the mechanical stops according to the minimum and maximum volume flow rates
– Change the direction of rotation if necessary, using the switch, to switch between $\dot{V}_{min}$ and $\dot{V}_{max}$

Technical data

Actuators LM24A and LM24A-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	2 VA max.
Power rating (DC)	1 W max.
Torque	5 Nm
Running time for 90°	150 s
Control input signal	1-wire control or 2-wire control (3-point)
Connecting cable	3 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	0.5 kg

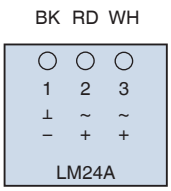


Actuator LM24A-F

Wiring

For control options see General information – function

Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Control voltage for direction of rotation 1
3 ~, +: Control voltage for direction of rotation 2

LM24A and LM24A-F

Description

/ **B60**
/ **B62**

Order code detail

Application

– Actuator LM230A-F for the min/max switching of volume flow setpoint values of mechanical self-powered volume flow controllers Type RN or EN (only up to a height of 300 mm)

Variants

– B62: with auxiliary switch for capturing the end positions

Parts and characteristics

– Supply voltage 230 V AC
– 1-wire control or 2-wire control (3-point)
– Mechanical stops for setting the volume flow rate setpoints
– Switch for setting the direction of rotation
– Positive lock connection with damper blade shaft
– Release button to allow for manual operation

Commissioning

– Set the mechanical stops according to the minimum and maximum volume flow rates
– Change the direction of rotation if necessary, using the switch, to switch between $\dot{V}_{min}$ and $\dot{V}_{max}$

Technical data



Actuator LM230A-F

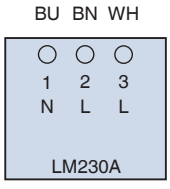
Actuator LM230A

Supply voltage	85 – 265 V AC, 50/60 Hz
Power rating	4 VA max.
Torque	5 Nm
Running time for 90°	150 s
Control input signal	1-wire control or 2-wire control (3-point)
Connecting cable	3 × 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 54
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	0.5 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 N: Neutral
2 L: Control voltage for direction of rotation 1
3 L: Control voltage for direction of rotation 2

Description

/ **B52**
/ **B62**

Order code detail

Application

- Auxiliary switch S2A for capturing damper blade end positions (end positions reached through actuator operation)
- Volt-free contacts for signalling or activating switch functions
- Two integral switches, e.g. for damper blade OPEN and damper blade CLOSED
- Potentiometer for setting any switch point

2



Auxiliary switch S2A

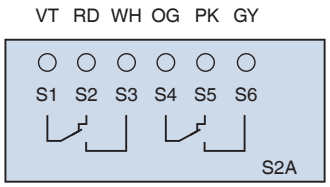
Auxiliary switch S2A

Type of contact	2 changeover contacts[1)]
Max. switching voltage (AC)	250 V AC
Max. switching current (AC)	3 A (resistive load); 0.5 A (inductive load)
Max. switching voltage (DC)	110 V DC
Max. switching current (DC)	0.5 A (resistive load); 0.2 A (inductive load)
Connecting cable	6 × 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 54
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	0.250 kg

[1)] **If both auxiliary switches are used the switching voltages must be the same**

Wiring

Connecting cable core identification



S1: Common contact
S2: Mechanical stop 1 < x
S3: Mechanical stop 1 > x
S4: Common contact
S5: Mechanical stop 2 < x
S6: Mechanical stop 2 > x
x: 0 – 100 % Switching point (adjustable)

Description

/ **E01**

Order code detail

Application

- Actuator 224-024-02-001 for min/max switching
- Min/Max switching between volume flow setpoint values of mechanical self-powered CAV controllers Type VFC
- Min/Max change of the damper blade positions of flow adjustment dampers Type VFR

Parts and characteristics

- Supply voltage 24 V AC/DC
- 1-wire control or 2-wire control (3-point)
- Potentiometer for setting the volume flow rate setpoints
- Positive lock connection with damper blade shaft
- Functional test button: Motor drives first to minimum position, then to maximum position, then returns to the set position
- Indicator light: Actuator has reached setpoint, actuator in motion, actuator blocked

Commissioning

- Use the potentiometer to set the minimum or maximum volume flow rate or the damper blade position

Technical data



Actuator 224-024-02-001

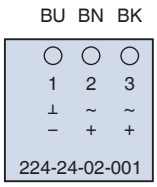
Actuator 224-24-02-001

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	3 VA max.
Power rating (DC)	2 W max.
Torque	1 Nm
Running time for 90°	20 – 60 s
Control input signal	1-wire control or 2-wire control (3-point)
Connecting cable	3 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	0.300 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 ⊥, –:	Ground, neutral
2 ~, +:	Control voltage for direction of rotation 1
3 ~, +:	Control voltage for direction of rotation 2

2

Description

/ **M01**

Order code detail

Application

- Actuator CM24-F for min/max switching
- Min/Max switching between volume flow setpoint values of mechanical self-powered CAV controllers Type VFC
- Min/Max change of the damper blade positions of flow adjustment dampers Type VFR

Parts and characteristics

- Supply voltage 24 V AC/DC
- 1-wire control or 2-wire control (3-point)
- Mechanical stops for setting the volume flow rates
- Positive lock connection with damper blade shaft
- Gear release magnet

Commissioning

- Set the mechanical stops according to the minimum and maximum volume flow rates or the damper blade position

Technical data



Actuator CM24-F

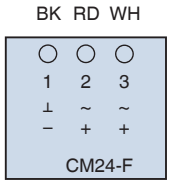
Actuator CM24-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	1 VA max.
Power rating (DC)	0.5 W max.
Torque	2 Nm
Running time for 90°	75 s
Control input signal	1-wire control or 2-wire control (3-point)
Connecting cable	3 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	0.185 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Control voltage for direction of rotation 1
3 ~, +: Control voltage for direction of rotation 2

Description

/ **E02**

Order code detail

Application

- Actuator 224-230-02-002 for min/max switching
- Min/Max switching between volume flow setpoint values of mechanical self-powered CAV controllers Type VFC
- Min/Max change of the damper blade positions of flow adjustment dampers Type VFR

Parts and characteristics

- Supply voltage 230 V AC
- 1-wire control or 2-wire control (3-point)
- Potentiometer for setting the volume flow rate setpoints
- Positive lock connection with damper blade shaft
- Functional test button: Motor drives first to minimum position, then to maximum position, then returns to the set position
- Indicator light: Actuator has reached setpoint, actuator in motion, actuator blocked

Commissioning

- Use the potentiometer to set the minimum or maximum volume flow rate or the damper blade position

Technical data



Actuator 224-230-02-002

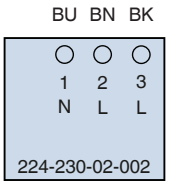
Actuator 224-230-02-002

Supply voltage	230 V AC, 50/60 Hz
Power rating	3 VA
Torque	1 Nm
Running time for 90°	20 – 60 s
Control input signal	1-wire control or 2-wire control (3-point)
Connecting cable	3 × 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 42
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	0.300 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 N:	Neutral
2 L:	Control voltage for direction of rotation 1
3 L:	Control voltage for direction of rotation 2

Description

/ **M02**

Order code detail

Application

- Actuator CM230-F for min/max switching
- Min/Max switching between volume flow setpoint values of mechanical self-powered CAV controllers Type VFC
- Min/Max change of the damper blade positions of flow adjustment dampers Type VFR

Parts and characteristics

- Supply voltage 230 V AC
- 1-wire control or 2-wire control (3-point)
- Mechanical stops for setting the volume flow rate setpoints
- Positive lock connection with damper blade shaft
- Gear release magnet

Commissioning

- Set the mechanical stops according to the minimum and maximum volume flow rates or the damper blade position

Technical data



Actuator CM230-F

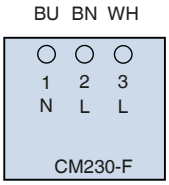
Actuator CM230-F

Supply voltage	100 to 240 V AC –15 % +10 %, 50/60 Hz
Power rating	3 VA
Torque	2 Nm
Running time for 90°	75 s
Control input signal	1-wire control or 2-wire control (3-point)
Connecting cable	3 × 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 54
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	0.185 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 N:	Neutral
2 L:	Control voltage for direction of rotation 1
3 L:	Control voltage for direction of rotation 2

Actuators for CAV controllers

Type Modulating actuators



For variable volume flows in air conditioning systems

Actuators for mechanical self-powered CAV controllers Type EN, RN, or VFC, and for flow adjustment dampers Type VFR

- Setpoint value adjustment
- Supply voltage 24 V AC/DC
- Control input signal: Voltage signal 0 – 10 V DC or 2 – 10 V DC
- Potentiometer or mechanical stops
- Positive lock connection with CAV controller or flow adjustment damper
- Retrofit possible

Type		Page
Modulating actuators	General information	2.2 – 12
	Special information – B7*	2.2 – 14
	Special information – B*2	2.2 – 15
	Special information – E03	2.2 – 16
	Basic information and nomenclature	2.3 – 1

2

Description

Application

- Actuators for variable adjustment
- Variable adjustment of volume flow setpoint values of mechanical self-powered CAV controllers Type EN, RN or VFC
- Setting of various damper blade positions of flow adjustment dampers Type VFR

Parts and characteristics

- Potentiometer or mechanical stops for setting the volume flow rate setpoints
- Supply voltage 24 V AC/DC
- Overload protection
- Setpoint value signal 0 – 10 V DC or 2 – 10 V DC

Any attachments must be defined with the order code of the CAV controller.

Actuators for volume flow controllers Type RN or EN

Order code detail	Actuator			Auxiliary switch	
	Part number	Type	Supply voltage	Part number	Type
B70	M466DT6	LM24A-SR-F	24 V AC/DC		
B72	M466DT6	LM24A-SR-F	24 V AC/DC	M536AI3	S2A

Actuators for volume flow controllers Type VFC and for flow adjustment dampers Type VFR

Order code detail	Part number	Type	Setpoint setting	Supply voltage
E03	M466EP7	224C-024-02-003	Potentiometer	24 V AC/DC

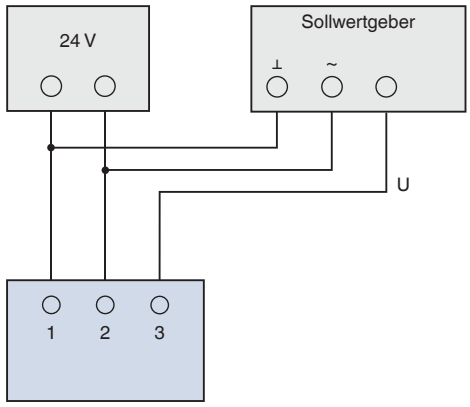
Function

Functional description

The actuator moves the damper blade mechanism to any position between minimum and maximum. Minimum and maximum positions can be set on potentiometers. The control input signal is a voltage signal. The output signal indicates the damper blade position rather than the volume flow rate actual value since the CAV controller does not perform any measurements.

Applies to attachments with order codes B7* and E03

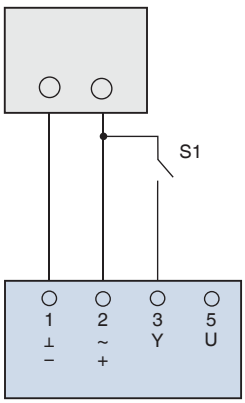
Variable control initiated by a voltage signal



U Voltage signal 0 – 10 V DC or 2 – 10 V DC

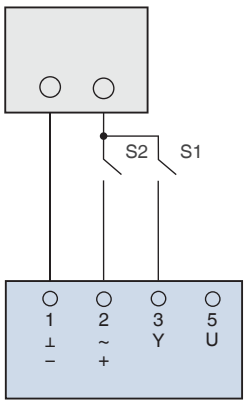
Applies to attachments with order code B7*

1-wire control for modulating actuators



Switch functions
S1 open: Direction of rotation 1
S1 closed: Direction of rotation 2

2-wire control (3-point) for modulating actuators



Switch functions
S1 open
S2 open: Actuator has stopped (any position)
S2 closed: Direction of rotation 1

S1 closed
S2 open: Direction of rotation 2
S2 closed: Direction of rotation 2

Effect of actuator action in case of factory setting

Order code detail	Direction of rotation	
	1	2
B7*	$\dot{V}_{min}$	$\dot{V}_{max}$

2

Description

/ **B70**
/ **B72**

Order code detail

Application

– Actuator LM24A-SR for the variable adjustment of volume flow setpoint values of mechanical self-powered volume flow controllers Type RN or EN (only up to a height of 300 mm)

Variants

– B72: with auxiliary switch for capturing the end positions

Parts and characteristics

– Supply voltage 24 V AC/DC
– Control input signal: Setpoint value signal 2 – 10 V DC, corresponds to the total rotation range (90°), working range is limited by mechanical stops
– Output: Position feedback 2 – 10 V
– Mechanical stops for setting the volume flow rates
– Switch for setting the direction of rotation
– Positive lock connection with damper blade shaft
– Release button to allow for manual operation

Commissioning

– Set the mechanical stops according to the minimum and maximum volume flow rates
– Change the direction of rotation if necessary, using the switch

Technical data



Actuator LM24A-SR-F

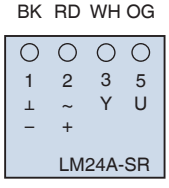
Actuators LM24A-SR and LM24A-SR-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	2 VA
Power rating (DC)	1 W
Torque	5 Nm
Running time for 90°	150 s
Position feedback	2 – 10 V DC, 1 mA
Control signal	2 – 10 V DC, R_a > 100 kΩ
Connecting cable	4 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	0.5 kg

Electrical connection

For control options see General information – function

Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Supply voltage
3 Y: Setpoint value signal
5 U: Position feedback

LM24A-SR and LM24A-SR-F

Description

/ **B52**
/ **B62**

Order code detail

Application

- Auxiliary switch S2A for capturing damper blade end positions (end positions reached through actuator operation)
- Volt-free contacts for signalling or activating switch functions
- Two integral switches, e.g. for damper blade OPEN and damper blade CLOSED
- Potentiometer for setting any switch point



Auxiliary switch S2A

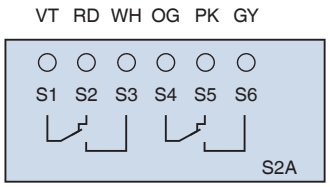
Auxiliary switch S2A

Type of contact	2 changeover contacts[1)]
Max. switching voltage (AC)	250 V AC
Max. switching current (AC)	3 A (resistive load); 0.5 A (inductive load)
Max. switching voltage (DC)	110 V DC
Max. switching current (DC)	0.5 A (resistive load); 0.2 A (inductive load)
Connecting cable	6 × 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 54
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	0.250 kg

[1)] **If both auxiliary switches are used the switching voltages must be the same**

Wiring

Connecting cable core identification



S1: Common contact
S2: Mechanical stop 1 < x
S3: Mechanical stop 1 > x
S4: Common contact
S5: Mechanical stop 2 < x
S6: Mechanical stop 2 > x
x: 0 – 100 % Switching point (adjustable)

Description

/ **E03**

Order code detail

Application

- Actuator 224C-024-02-003 for variable adjustment
- Variable adjustment of volume flow setpoint values of mechanical self-powered CAV controllers Type VFC
- Setting of various damper blade positions of flow adjustment dampers Type VFR

Parts and characteristics

- Supply voltage 24 V AC/DC
- Control input signal: Setpoint value signal 2 – 10 V DC, corresponds to the working range (set on potentiometers)
- Output: Position feedback 0 – 10 V
- Potentiometer for setting the volume flow rate setpoints
- Positive lock connection with damper blade shaft
- Functional test button: Motor drives first to minimum position, then to maximum position, then returns to the set position
- Indicator light: Actuator has reached setpoint, actuator in motion, actuator blocked

Commissioning

- Use the potentiometer to set the minimum or maximum volume flow rate

Technical data



Actuator 224C-024-02

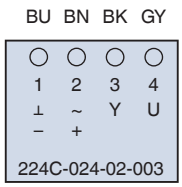
Actuator 224C-024-02-003

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ±20 %
Power rating (AC)	3 VA
Power rating (DC)	2 W
Torque	5 Nm
Running time for 90°	20 – 60 s
Control signal	0 – 10 V DC, R_a > 100 kΩ
Connecting cable	3 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	0.5 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Supply voltage
3 Y: Setpoint value signal
4 U: Position feedback

Actuators for CAV controllers

Type Retrofit kits



Actuator for switching between setpoint values with Type EN



Actuator for switching between setpoint values with Type RN



Actuator with mechanical stops for Type VFC or VFR



Actuator with potentiometers for Type VFC or VFR



For variable volume flows or $\dot{V}_{min}$ / $\dot{V}_{max}$ switching in room air conditioning systems

Actuators and installation accessories for mechanical self-powered CAV controllers Type EN, RN, or VFC, and flow adjustment dampers Type VFR

- Parts kits for easy retrofit
- Potentiometer or mechanical stops
- Supply voltage 24 V AC/DC or 230 V AC
- Control input signal: Signal voltage 0 – 10 V for modulating actuators
- Control input signal: 1-wire control or 2-wire control (3-point) for min/max switching
- Positive lock connection with CAV controller or flow adjustment damper

Optional accessories for Types RN and EN

- Auxiliary switch with adjustable switching points, for example for capturing the end positions

Type		Page
Retrofit kits	General information	2.2 – 20
	Basic information and nomenclature	2.3 – 1

2

Description

Application

Parts kits for the retrofit of mechanica self-powered volume flow controllers or flow adjustment dampers with actuators.
CAV controllers Type EN or RN, as well as for VFC
- Min/Max switching of volume flow setpoint values
- Variable adjustment of volume flow rate setpoints

Flow adjustment dampers Type VFR
- Min/Max change of the damper blade position

Parts and characteristics

- Damper blade can take various positions
- Mechanical stops or potentiometers (only for Types VFC and VFR) to set the volume flow rates
- Supply voltage 24 V AC/DC or 230 V AC
- Switching between setpoint values# or signal voltage range0 – 10 V DC



Actuator for switching between setpoint values (B*05, B6*, B7*) for Type RN or EN



Auxiliary switch (B*2) S2A

Actuators for volume flow controllers Type RN or EN

Part number	Construction	Supply voltage	Type	Identical to attachment
NR-VAV-B50	Min/Max switching, mechanical stops	24 V AC/DC	LM24A-F	B50
NR-VAV-B60	Min/Max switching, mechanical stops	230 V AC	LM230A-F	B60
NR-VAV-B70	Variable adjustment, mechanical stops	24 V AC/DC	LM24A-SR-F	B70
NR-VAV-S2	Auxiliary switch		S2A	Included with B*2
NR-VAV-RNMAT	Installation accessories for RN			
NR-VAV-ENMAT	Installation accessories for EN			

Installation accessories for CAV controllers Type EN or RN are to be ordered separately



Actuator with potentiometers (E0*) for Types VFC and VFR



Actuator with mechanical stops (M0*) for Type VFC or VFR

Actuators for volume flow controllers Type VFC and for flow adjustment dampers Type VFR

Part number	Construction	Supply voltage	Type	Identical to attachment
NR-VAV-E01	Min/Max switching, potentiometer	24 V AC/DC	224-024-02-001	E01
NR-VAV-E02	Min/Max switching, potentiometer	230 V AC	224-230-02-002	E02
NR-VAV-E03	Variable adjustment, potentiometer	24 V AC/DC	224C-024-02-003	E03
NR-VAV-M01	Min/Max switching, mechanical stops	24 V AC/DC	CM24-F	M01
NR-VAV-M02	Min/Max switching, mechanical stops	230 V AC	CM230-F	M02

2

Order code

Retrofit kits for EN, RN, VFC, VFR

NR-VAV-E01
[1]

[1] Retrofit kit

For Types EN and RN

NR-VAV-B50 Retrofit actuator for min/max switching, identical to attachment B50
NR-VAV-B60 Retrofit actuator for min/max switching, identical to attachment B60
NR-VAV-B50 Retrofit actuator for variable adjustment, identical to attachment E03
NR-VAV-B70 Retrofit actuator for variable adjustment, identical to attachment B70
NR-VAV-S2 Retrofit auxiliary switch, identical to attachment B*2
NR-VAV-ENMAT Retrofit installation accessories for EN
NR-VAV-RNMAT Retrofit installation accessories for RN

For Types VFC and VFR

NR-VAV-E01 Retrofit actuator for min/max switching, identical to attachment E01
NR-VAV-E02 Retrofit actuator for min/max switching, identical to attachment E02
NR-VAV-E03 Retrofit actuator for variable adjustment, identical to attachment E03
NR-VAV-M01 Retrofit actuator for min/max switching, identical to attachment M01
NR-VAV-M02 Retrofit actuator for min/max switching, identical to attachment M02

Constant volume flow control – CONSTANTFLOW

Basic information and nomenclature



- Product selection
- Principal dimensions
- Nomenclature
- Construction
- Correction values for system attenuation
- Measurements
- Sizing and sizing example

Product selection

	Type					
	RN	EN	VFL	VFC	RN-Ex	EN-Ex
Type of system						
Supply air	●	●	●	●	●	●
Extract air	●	●	●	●	●	●
Duct connection, fan end						
Circular	●		●	●	●	
Rectangular		●				●
Volume flow rate range						
Up to [m^3/h]	5040	12100	900	1330	5040	12100
Up to [l/s]	1400	3360	250	370	1400	3360
Air quality						
Filtered	●	●	●	●	●	●
Office extract air	●	●	●	●	●	●
Polluted	○	○	○	○	○	○
Contaminated	○	○	○	○	○	○
Control function						
Constant	●	●	●	●	●	●
Variable	○	○		○		
Min/Max	○	○		○		
Acoustic requirements						
High < 40 dB(A)	○	○		○	○	○
Low < 50 dB (A)	●	●	●	●	●	●
Special areas						
Areas with explosive atmospheres					●	●

●	Possible
○	Possible under certain conditions: Robust unit variant and/or specific actuator or a useful additional product
	Not possible

Principal dimensions

ØD [mm]
Outside diameter of the spigot

$ØD_1$ [mm]
Pitch circle diameter of flanges

$ØD_2$ [mm]
Outside diameter of flanges

$ØD_4$ [mm]
Inside diameter of the screw holes of flanges

L [mm]
Length of unit including connecting spigot

L_1 [mm]
Length of casing or acoustic cladding

B [mm]
Duct width

B_1 [mm]
Screw hole pitch of flange (horizontal)

B_2 [mm]
Outside dimension of flange (width)

B_3 [mm]
Width of device

H [mm]
Duct height

H_1 [mm]
Screw hole pitch of flange (vertical)

H_2 [mm]
Outside dimension of flange (height)

H_3 [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

Nomenclature

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

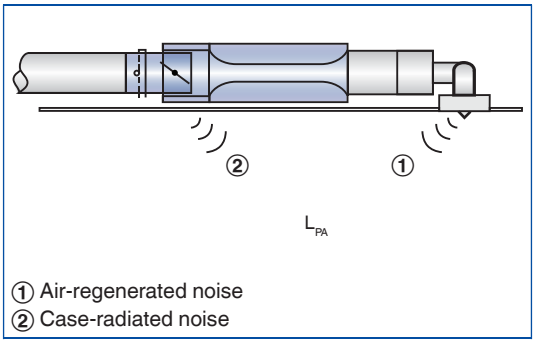
L_{PA1} [dB(A)]
A-weighted sound pressure level of air-regenerated noise of the VAV terminal unit with secondary silencer, system attenuation taken into account

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



① Air-regenerated noise
② Case-radiated 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.
- Upper limit of the setting range and maximum volume flow rate setpoint value for the CAV controller

$\dot{V}$ [m³/h] and [l/s]
Volume flow rate

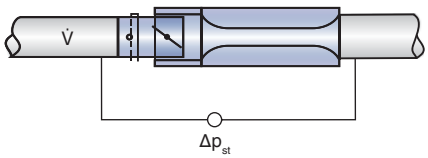
$\Delta\dot{V}$ [± %]
Volume flow rate tolerance from setpoint value

Differential pressure

Δp_{st} [Pa]
Static differential pressure

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

Static differential pressure



Constructions

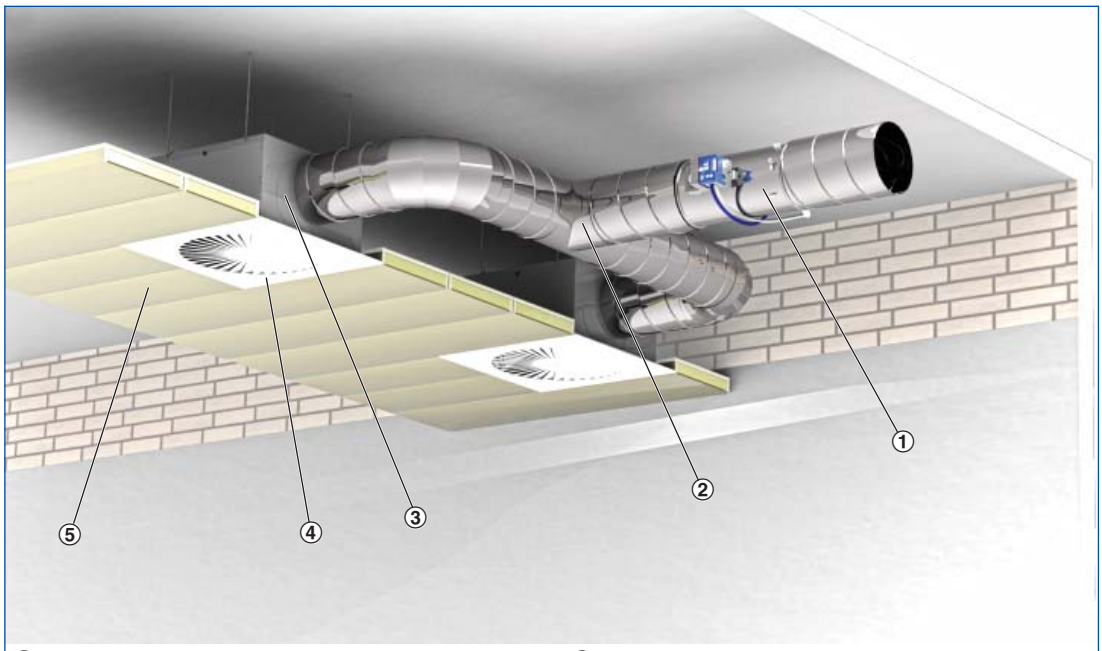
Galvanised sheet steel
- Casing made of galvanised sheet steel
- Parts in contact with the airflow as described for the product type
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel

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

The quick sizing tables show the sound pressure levels that can be expected in a room both for the air-regenerated noise and for the case-radiated noise. The sound pressure level in a room results from the sound power level of the products – for a given volume flow rate and differential pressure – and the attenuation and insulation on site. Generally accepted attenuation and insulation values have been taken into account.
The distribution of air across the ductwork, changes of direction, end reflection, and room attenuation all affect the sound pressure level of the air-regenerated noise. Ceiling insulation and room attenuation influence the sound pressure level of the case-radiated noise.

Reducing the sound pressure level of the air-regenerated noise



① VAV terminal unit
② Distribution in the ducting
③ Change of direction
④ End reflection
⑤ Ceiling insulation

Correction values for acoustic quick sizing

The correction values for the distribution in the ducting are based on the number of diffusers assigned to any one air terminal unit. If there is just one diffuser (assumption: 140 l/s or 500 m^3/h), no correction is necessary.

One change of direction, e.g. at the horizontal connection of the diffuser plenum box, has been taken into consideration for the system attenuation values. Vertical connection of the plenum box does not result in a system attenuation. Additional bends result in lower sound pressure levels.

Octave correction for the distribution in the ducting, used to calculate the air-regenerated noise

$\dot{V}$ in [m^3/h]	500	1000	1500	2000	2500	3000	4000	5000
[l/s]	140	280	420	550	700	840	1100	1400
[dB]	0	3	5	6	7	8	9	10

System attenuation per octave to VDI 2081 for the calculation of the air-regenerated noise

Centre frequency [Hz]	63	125	250	500	1000	2000	4000	8000
	ΔL							
	dB							
Change of direction	0	0	1	2	3	3	3	3
Mündungsreflexion	10	5	2	0	0	0	0	0
Room attenuation	5	5	5	5	5	5	5	5

The calculation is based on the end reflection for nominal size 250

Octave correction for the calculation of case-radiated noise

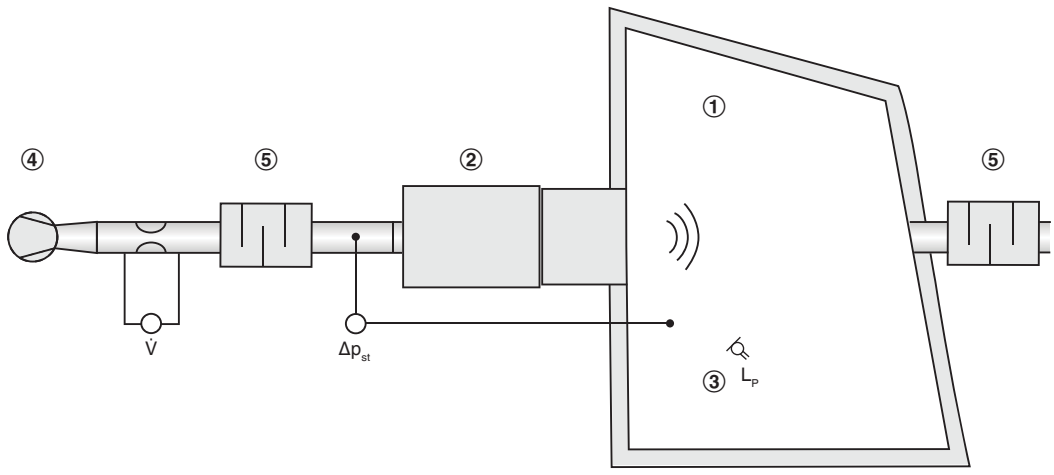
Centre frequency [Hz]	63	125	250	500	1000	2000	4000	8000
	ΔL							
	dB							
Ceiling insulation	4	4	4	4	4	4	4	4
Room attenuation	5	5	5	5	5	5	5	5

2

Measurements

The acoustic data for the air-regenerated noise and case-radiated noise are determined according to EN ISO 5135. All measurements are carried out in a reverberation chamber to EN ISO 3741.

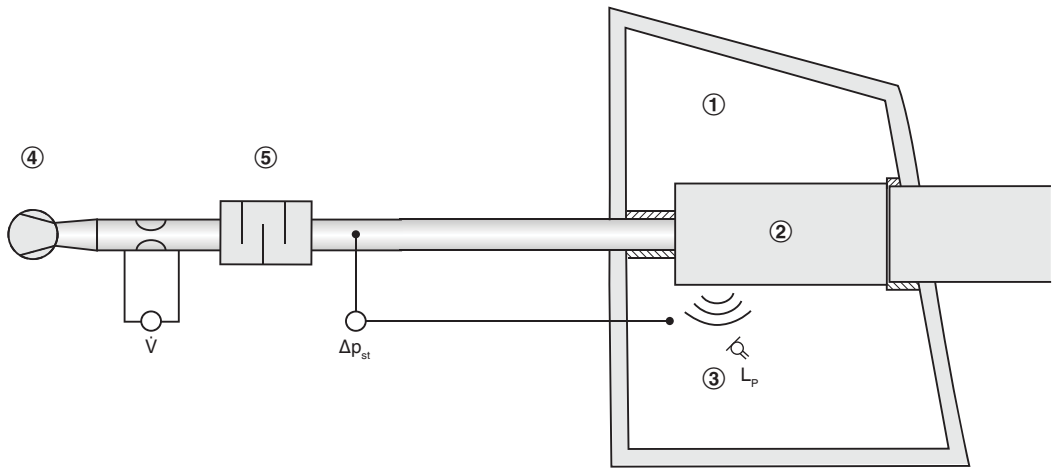
Measuring the air-regenerated noise



① Reverberation chamber
② VAV terminal unit
③ Microphone
④ Fan
⑤ Sound attenuator

The sound pressure levels for air-regenerated noise L_{PA} given by us result from measurements in a reverberation chamber. The sound pressure L_P is measured for the entire frequency range. The evaluation of the measurements, including system attenuation and A-weighting, results in the sound pressure level L_{PA}.

Measuring the case-radiated noise



① Reverberation chamber
② VAV terminal unit
③ Microphone
④ Fan
⑤ Sound attenuator

The sound pressure levels for case-radiated noise L_{PA2} given by us result from measurements in a reverberation chamber. The sound pressure L_P is measured for the entire frequency range. The evaluation of the measurements, including system attenuation and A-weighting, results in the sound pressure level L_{PA2}.

2

Sizing with the help of this catalogue

This catalogue provides convenient quick sizing tables for CAV controllers. The sound pressure levels for air-regenerated noise and for case-radiated noise are provided for all nominal sizes. In addition, generally accepted attenuation and insulation values have been taken into account. Sizing data for other volume flow rates and differential pressures can be determined quickly and precisely using the Easy Product Finder design programme.

Sizing example

Given data

$\dot{V}_{max}$ = 280 l/s (1010 m³/h)
Δp_{st} = 150 Pa
Required sound pressure level in the room 35 dB(A)

Quick sizing

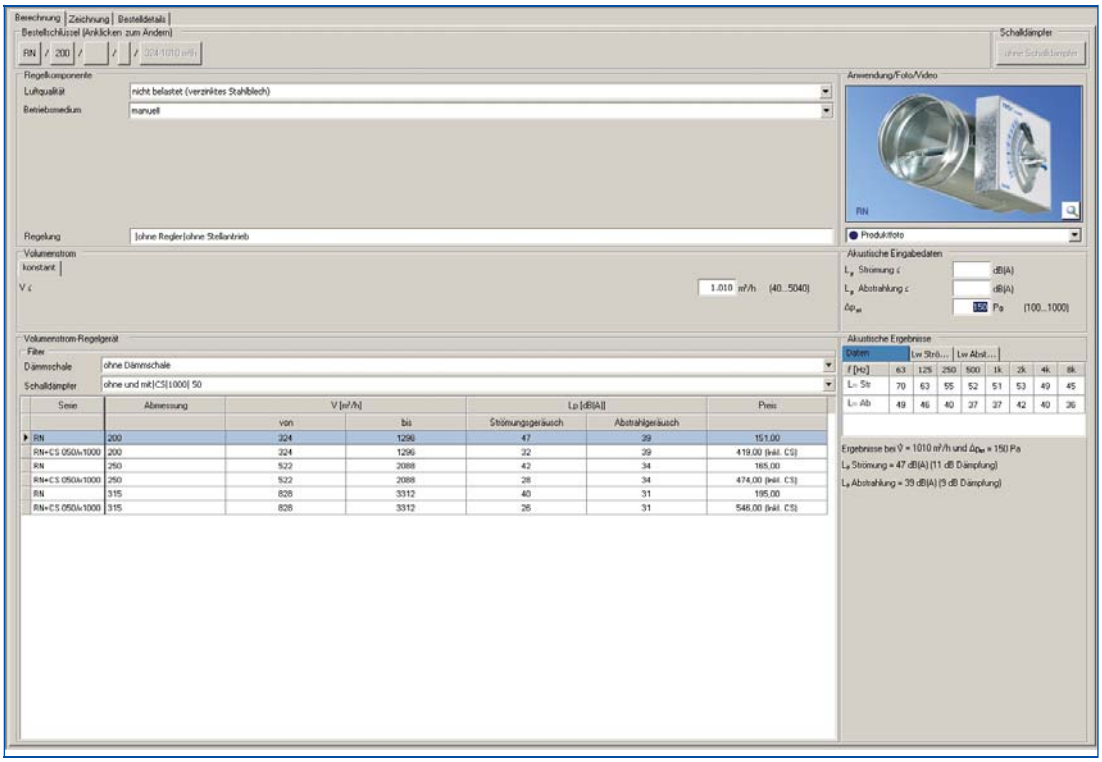
RN/200 with circular silencer CS 050/200×1000
Air-regenerated noise L_{PA} = 26 dB(A)
Case-radiated noise L_{PA} = 31 dB(A)

Easy Product Finder



The Easy Product Finder allows you to size products using your project-specific data.

You will find the Easy Product Finder on our website.





3 Shut-off and flow adjustment

Flow adjustment dampers are circular dampers for the manual balancing of volume flow rates. Shut-off dampers are used for low-leakage shut-off or for the balancing of volume flow rates.

3.1 Shut-off dampers		**Type**	**Page**
Circular	 For low-leakage shut-off	**AK**	**3.1 – 1**
Optimum resistance	 For contaminated air	**AKK**	**3.1 – 12**
For use in potentially explosive atmospheres	 For low-leakage shut-off of volume flows in potentially explosive atmospheres (ATEX)	**AK-Ex**	**3.1 – 22**
3.2 Flow adjustment dampers			
Circular	 For the reliable balancing of volume flow rates	**VFR**	**3.2 – 1**
3.3 Actuators for shut-off dampers			
	 For the opening and closing of shut-off dampers in air conditioning systems	**Open/Close actuators**	**3.3 – 1**
	 For moving the damper blades of shut-off dampers to any position	**Modulating actuators**	**3.3 – 12**
3.4 Basic information and nomenclature			
	Shut-off and flow adjustment		**3.4 – 1**

Shut-off dampers
Type AK



For low-leakage shut-off

Circular shut-off dampers for shutting off volume flows in ventilation ducts of air conditioning systems

- Maintenance-free damper blade mechanism
- Closed blade air leakage to EN 1751, up to class 4
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Electric actuator
- Spring return actuator
- Pneumatic actuator
- Auxiliary switch with adjustable switching points for capturing the end positions



Variant for manual operation

Tested to VDI 6022

Type		Page
AK	General information	3.1 – 2
	Order code	3.1 – 5
	Quick sizing	3.1 – 6
	Dimensions and Weight – AK...	3.1 – 7
	Dimensions and Weight – AK.../.../B**	3.1 – 8
	Dimensions and Weight – AK.../.../TN0	3.1 – 9
	Installation details	3.1 – 10
	Specification text	3.1 – 11
	Basic information and nomenclature	3.4 – 1

Variants

Product examples

Shut-off damper, variant AK



Shut-off dampers Type AK with actuator



Description



Shut-off damper, variant AK, with actuator

For detailed information on actuators see Chapter K5 – 3.3.

Application
- Circular shut-off dampers Type AK for shutting off or restricting the airflow in ventilation ducts of air conditioning systems

Variants
- AK: Shut-off damper
- AK-FL: Shut-off damper with flanges on both ends

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Nominal sizes
- 100, 125, 160, 200, 250, 315, 400

Attachments
- Min/Max actuators: Actuators for switching between minimum and maximum volume flow rate setpoint values
- Auxiliary switch for capturing the end positions

Accessories
- Lip seals on both ends (factory fitted)
- Matching flanges for both ends

Special features
- Damper blade can be actuated manually, electrically or pneumatically
- Low-leakage shut-off
- Safety function provided by optional spring return actuator

Parts and characteristics
- Ready-to-install shut-off damper
- Damper blade with blade mechanism

Construction features
- Circular casing
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Position of the damper blade indicated externally at the shaft extension
- AK-FL: Flanges to EN 12220

Materials and surfaces
Galvanised sheet steel construction
- Casing and damper blade made of galvanised sheet steel
- Blade seal made of TPE plastic
- Plain bearings made of polyurethane

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Shut-off damper and shaft made of stainless steel 1.4301

Stainless steel construction (A2)
- Casing, damper blade and shaft made of stainless steel 1.4301

Installation and commissioning
- Any installation orientation

Standards and guidelines

- Hygiene conforms to VDI 6022
- Closed blade air leakage to EN 1751, class 4 (nominal sizes 100, 125 and 160, class 3)
- Nominal sizes 100, 125, and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class C

Maintenance

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

Attachments: electric

Order code detail	Actuator	Supply voltage	Auxiliary switch
Open/Close actuators			
B30	Actuator with mechanical stops TROX/Belimo	24 V AC/DC	–
B32			2
B40		230 V AC	–
B42			2
BP0	Spring return actuator with mechanical stops TROX/Belimo	24 V AC/DC	–
BP2			2
BR0		230 V AC	–
BR2			2
Modulating actuators			
B20	Modulating actuator 0 – 10 V with mechanical stops TROX/Belimo	24 V AC/DC	–

Attachments: pneumatic

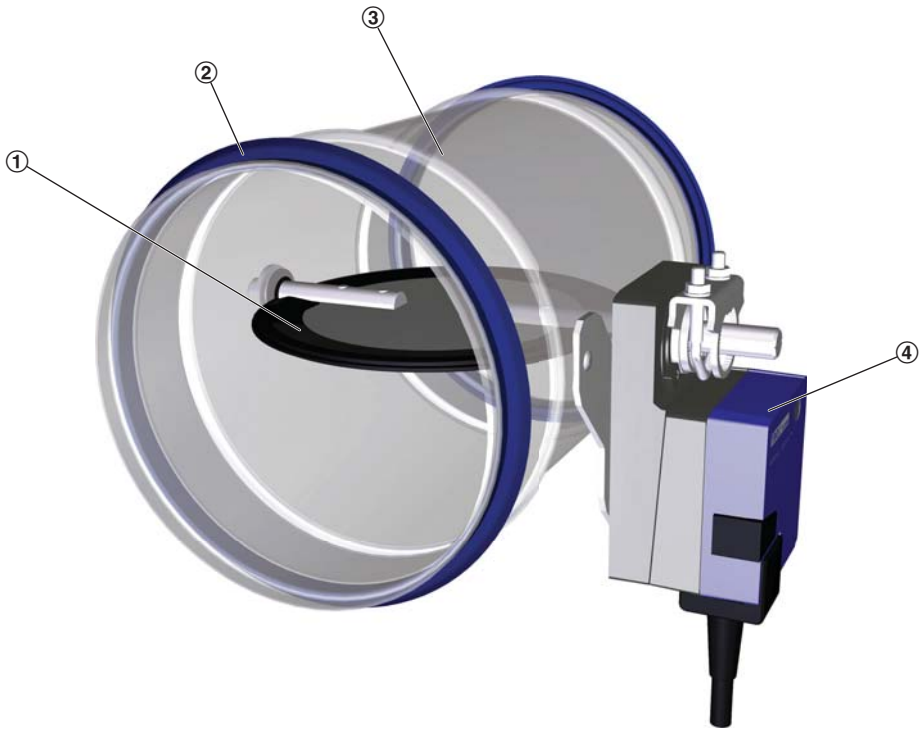
Order code detail	Actuator	Control pressure	Auxiliary switch
Pneumatic actuators			
TN0	Pneumatic actuator TROX	0.2 – 1.0 bar	–

Technical data

Nominal sizes	100 – 400 mm
Acceptable static differential pressure	1500 Pa
Operating temperature	10 – 50 °C

Function

Schematic illustration of the AK



① Damper blade
② Lip seal
③ Casing
④ Actuator

Order code

AK

AK – P1 – FL / 160 / G2 / BP0 / NO
1 2 3 4 5 6 7

1 Type
AK Shut-off damper

2 Material
No entry: galvanised sheet steel
P1 Powder-coated, silver grey (RAL 7001)
A2 Stainless steel

3 Construction
No entry: none
FL Flanges on both ends

4 Nominal size [mm]
100
125
160
200
250
315
400

5 Accessories
No entry: none
D2 Lip seals on both ends
G2 Matching flanges for both ends

6 Actuator
No entry: manual operation
For example
B20 24 V AC/DC, modulating 2 – 10 V DC
B30 24 V AC/DC, 3-point
B32 24 V AC/DC, 3-point, with auxiliary switch
TN0 Pneumatic 0.2 – 1 bar

7 Damper blade position
Only for spring return actuators and pneumatic actuators
NO Pressure off/power off to OPEN
NC Power off/Pressure off to close

3

Order examples

AK/160/D2/B30

Material	Galvanised sheet steel
Nominal size	160 mm
Accessories	Lip seals on both ends
Actuator	Supply voltage 24 V AC/DC

AK-A2-FL/200/G2

Material	Stainless steel
Construction	Flanges on both ends
Nominal size	200 mm
Accessories	Matching flanges for both ends

Air-regenerated noise

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.

Quick sizing: Static differential pressure and sound pressure levels with open damper blade

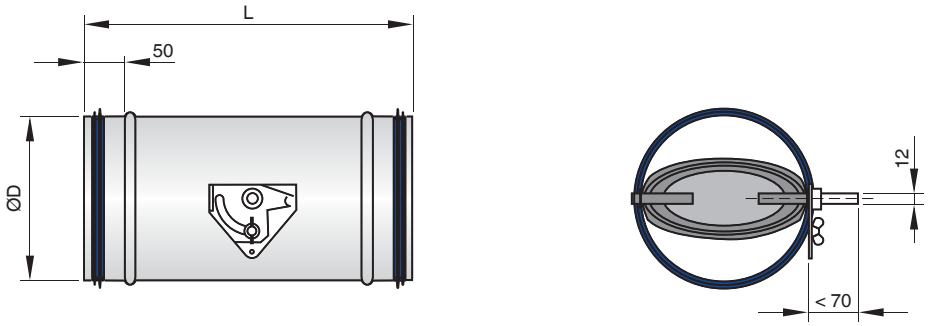
Nominal size	$\dot{V}$		Differential pressure	Air-regenerated noise
			Δp_{st}	L_{PA}
	l/s	m³/h	Pa	dB(A)
100	10	36	5	<15
	40	144	10	27
	65	234	25	38
	95	342	55	49
125	15	54	5	<15
	60	216	10	24
	105	378	25	36
	150	540	50	45
160	25	90	5	<15
	100	360	10	22
	175	630	20	33
	250	900	45	41
200	40	144	5	<15
	160	576	10	21
	280	1008	20	31
	405	1458	40	39
250	60	216	<5	<15
	250	900	5	19
	430	1548	15	29
	615	2214	30	38
315	100	360	<5	<15
	410	1476	5	21
	720	2592	15	34
	1030	3708	25	43
400	170	612	<5	<15
	670	2412	5	34
	1175	4230	10	50
	1680	6048	15	61

Dimensions

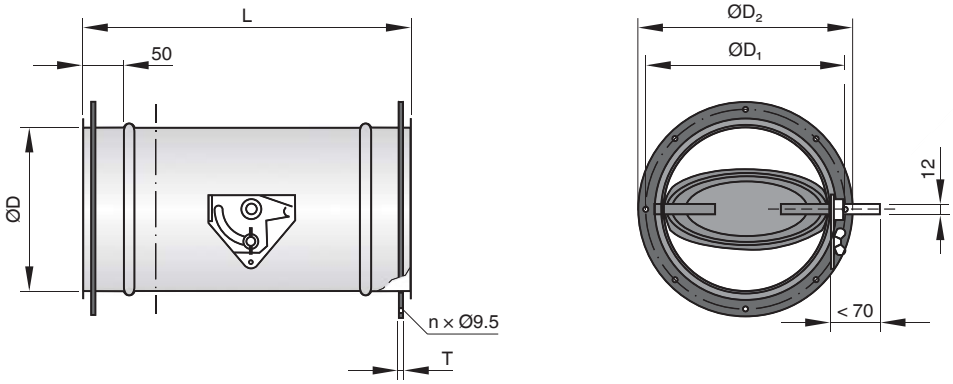


Shut-off damper, variant AK

AK



AK-FL



Dimensions [mm] and weight [kg]

Nominal size	AK		AK-FL		ØD
	L	m	L	m	
	mm	kg	mm	kg	mm
100	250	1.1	230	1.8	99
125	250	1.4	230	2.0	124
160	250	1.8	230	3.0	159
200	250	2.5	230	3.9	199
250	250	3.5	230	5.2	249
315	400	5.1	380	8.2	314
400	400	7.1	380	11.0	399

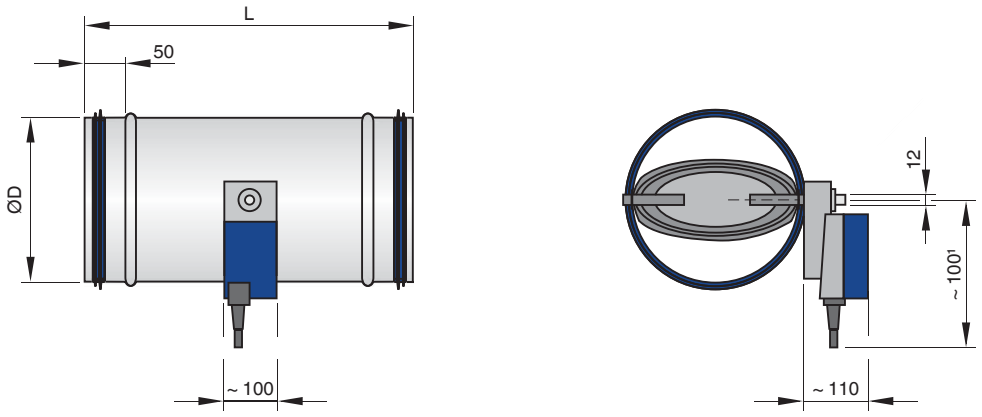
Flange dimensions

Nominal size	AK-FL			
	$ØD_1$	$ØD_2$	n	T
	mm			mm
100	132	152	4	4
125	157	177	4	4
160	192	212	6	4
200	233	253	6	4
250	283	303	6	4
315	352	378	8	4
400	438	464	8	4



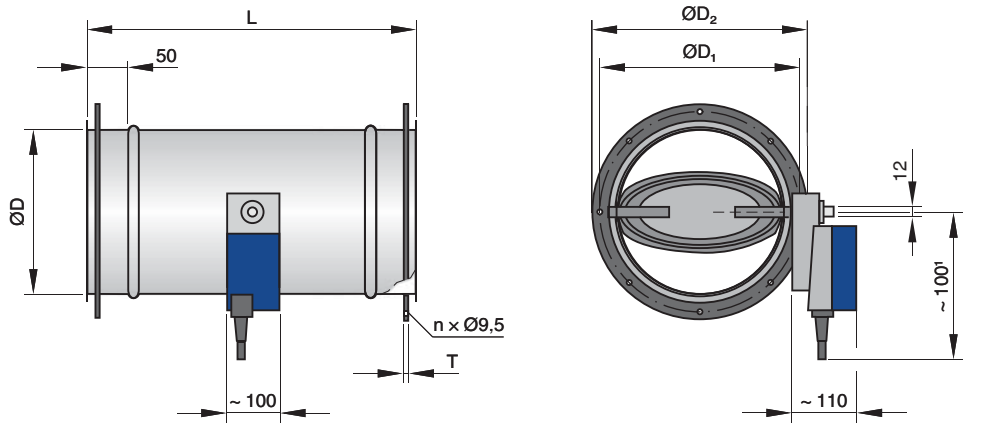
Shut-off dampers
Type AK with actuator

AK/.../B** (electric actuators)



[1] for spring return actuators up to 195

AK-FL/.../B** (electric actuators)



[1] for spring return actuators up to 195

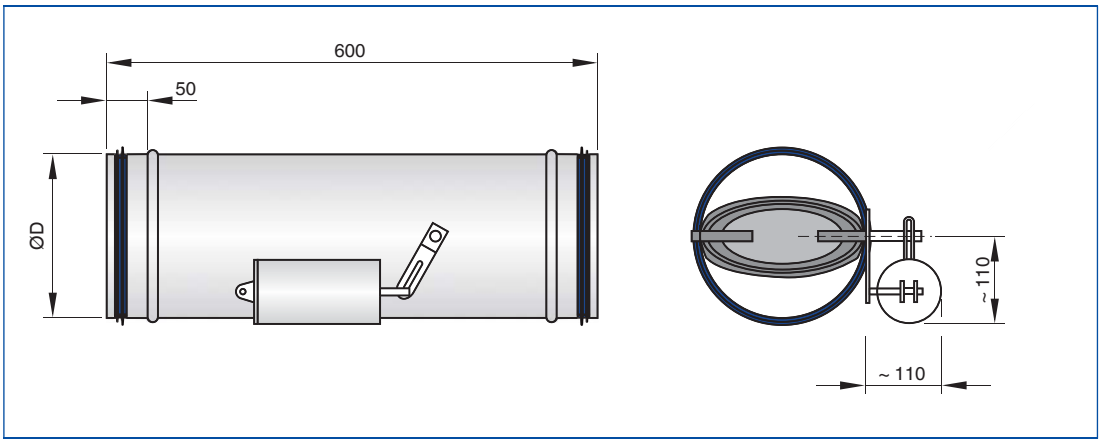
Dimensions [mm] and weight [kg]

Nominal size	AK/.../B**		AK-FL/.../B**		ØD
	L	m	L	m	
	mm	kg	mm	kg	mm
100	250	2.6	230	3.2	99
125	250	2.9	230	3.5	124
160	250	3.3	230	4.4	159
200	250	4.0	230	5.4	199
250	250	5.0	230	6.7	249
315	400	6.6	380	9.7	314
400	400	8.6	380	12.5	399

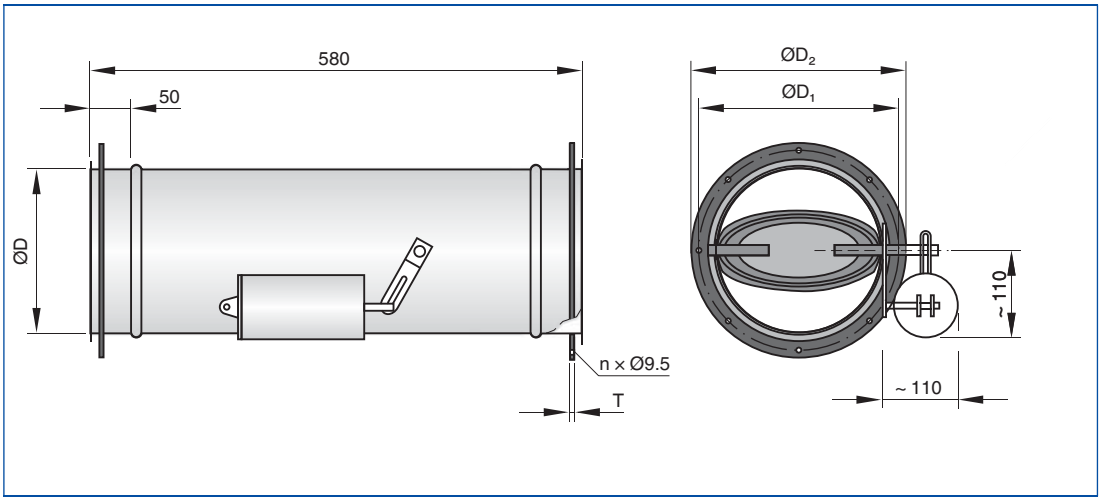
Flange dimensions

Nominal size	AK-FL			
	$ØD_1$	$ØD_2$	n	T
	mm			mm
100	132	152	4	4
125	157	177	4	4
160	192	212	6	4
200	233	253	6	4
250	283	303	6	4
315	352	378	8	4
400	438	464	8	4

AK/.../TN0 (pneumatic drive)



AK-FL/.../TN0 (pneumatic drive)



Dimensions [mm] and weight [kg]

Nominal size	AK/.../TN0		AK-FL/.../TN0		ØD
	L	m	L	m	
	mm	kg	mm	kg	mm
100	600	3.3	580	3.9	99
125	600	3.6	580	4.2	124
160	600	4.2	580	5.3	159
200	600	5.1	580	6.5	199
250	600	6.1	580	7.8	249
315	600	7.2	580	10.3	314
400	600	9.4	580	13.3	399

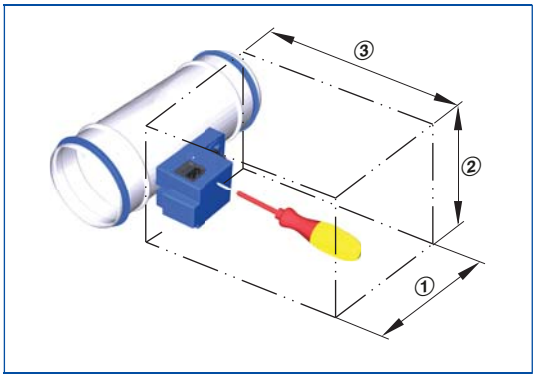
Flange dimensions

Nominal size	AK-FL			
	$ØD_1$	$ØD_2$	n	T
	mm			mm
100	132	152	4	4
125	157	177	4	4
160	192	212	6	4
200	233	253	6	4
250	283	303	6	4
315	352	378	8	4
400	438	464	8	4

Space requirement 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



Space required

Attachments	①	②	③
	mm		
Without actuator	250	200	200
With electric actuator	200	300	300
With pneumatic actuator	400	300	300

Standard text

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

Circular shut-off dampers for shutting off or restricting the airflow in ventilation ducts of air conditioning systems, for supply air or extract air, available in 7 nominal sizes Suitable for duct pressures up to 1500 Pa. Ready-to-install unit consists of the casing with a damper blade. Spigot with groove for lip seal, suitable for connecting ducts according to EN 1506 or EN 13180.
Position of the damper blade indicated externally at the shaft extension.
Closed blade air leakage to EN 1751, class 4 (nominal sizes 100, 125 and 160, class 3).
Casing air leakage to EN 1751, class C.

Special features
- Damper blade can be actuated manually, electrically or pneumatically
- Low-leakage shut-off
- Safety function provided by optional spring return actuator

Materials and surfaces
Galvanised sheet steel construction
- Casing and damper blade made of galvanised sheet steel
- Blade seal made of TPE plastic
- Plain bearings made of polyurethane

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Shut-off damper and shaft made of stainless steel 1.4301

Stainless steel construction (A2)
- Casing, damper blade and shaft made of stainless steel 1.4301

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Technical data
- Nominal sizes: 100 – 400 mm
- Acceptable static differential pressure: 1500 Pa

Sizing data
- $\dot{V}$[m³/h]
- L_{PA} air-regenerated noise[dB(A)]

3

Order options

1 Type
AK Shut-off damper

2 Material
No entry: galvanised sheet steel
☐ **P1** Powder-coated, silver grey (RAL 7001)
☐ **A2** Stainless steel

3 Construction
No entry: none
☐ **FL** Flanges on both ends

4 Nominal size [mm]
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

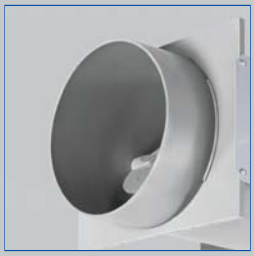
5 Accessories
No entry: none
☐ **D2** Lip seals on both ends
☐ **G2** Matching flanges for both ends

6 Actuator
No entry: manual operation
For example
☐ **B20** 24 V AC/DC, modulating 2 – 10 V DC
☐ **B30** 24 V AC/DC, 3-point
☐ **B32** 24 V AC/DC, 3-point, with auxiliary switch
☐ **TN0** Pneumatic 0.2 – 1 bar

7 Damper blade position
Only for spring return actuators and pneumatic actuators
☐ **NO** Pressure off/power off to OPEN
☐ **NC** Power off/Pressure off to close
☐

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Type AKK





Variant with circular spigot



Variant for manual operation



Tested to VDI 6022

For contaminated air

Plastic circular shut-off dampers for shutting off aggressive media volume flows in air conditioning systems

- Maintenance-free damper blade mechanism
- Closed blade air leakage to EN 1751, class 3
- Casing air leakage to EN 1751, class B

Optional equipment and accessories

- Electric actuator
- Spring return actuator
- Pneumatic actuator
- Auxiliary switch with adjustable switching points for capturing the end positions

Type		Page
AKK	General information	3.1 – 14
	Order code	3.1 – 16
	Quick sizing	3.1 – 17
	Dimensions and Weight – AKK	3.1 – 18
	Dimensions and Weight – AKK-FL	3.1 – 20
	Installation details	3.1 – 21
	Specification text	3.1 – 22
	Basic information and nomenclature	3.4 – 1

Variants

Product examples

Shut-off dampers Type AKK



Shut-off damper, variant AKK, with actuator



Description

For detailed information on actuators see Chapter K5 – 3.3.

Application
- Plastic circular shut-off dampers Type AKK for shutting off or restricting the airflow in ventilation ducts of air conditioning systems
- Suitable for contaminated air

Variants
- AKK: Shut-off damper
- AKK-FL: Shut-off damper with flanges on both ends

Nominal sizes
- 125, 160, 200, 250, 315, 400

Attachments
- Min/Max actuators: Actuators for switching between minimum and maximum volume flow rate setpoint values
- Auxiliary switch for capturing the end positions

Special features
- Damper blade can be actuated manually, electrically or pneumatically
- Low-leakage shut-off
- Safety function provided by optional spring return actuator

Parts and characteristics
- Ready-to-install shut-off damper
- Damper blade with blade mechanism

Construction features
- Circular casing
- Spigot suitable for ducts according to DIN 8077
- Position of the damper blade indicated externally at the shaft extension
- All components coming into contact with the airflow are made of plastic (no interior metal parts)

Materials and surfaces
- Casing and damper blade made of flame-resistant polypropylene (PPs)
- Plain bearings made of polypropylene (PP)
- Damper blade seals in chloroprene rubber (CR)

Installation and commissioning
- Any installation orientation

Standards and guidelines
- Hygiene conforms to VDI 6022
- Closed blade air leakage to EN 1751, class 3
- 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 B

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

Attachments: electric

Order code detail	Actuator	Supply voltage	Auxiliary switch
Open/Close actuators			
B30	Actuator with mechanical stops TROX/Belimo	24 V AC/DC	–
B32			2
B40		230 V AC	–
B42			2
BP0	Spring return actuator with mechanical stops TROX/Belimo	24 V AC/DC	–
BP2			2
BR0		230 V AC	–
BR2			2
Modulating actuators			
B20	Modulating actuator 0 – 10 V with mechanical stops TROX/Belimo	24 V AC/DC	–

Attachments: pneumatic

Order code detail	Actuator	Control pressure	Auxiliary switch
Pneumatic actuators			
TN0	Pneumatic actuator TROX	0.2 – 1.0 bar	–

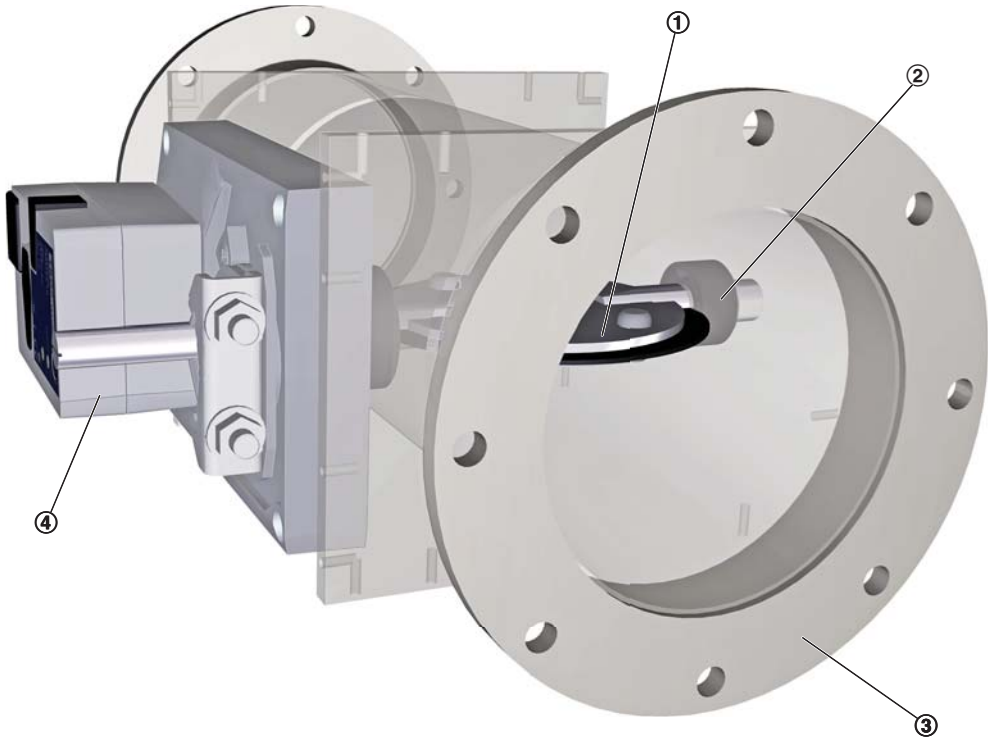
3

Technical data

Nominal sizes	125 – 400 mm
Acceptable static differential pressure	1500 Pa
Operating temperature	10 – 50 °C

Function

Schematic illustration of the AKK (construction variant with flange)



① Damper blade
② Plain bearings
③ Flange
④ Actuator

Order code

AKK

AKK – FL / 160 / GK / BP0 / NO
1 2 3 4 5 6

1 Type
AKK Shut-off damper, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Actuator
No entry: manual operation
For example
B20 24 V AC/DC, modulating 2 – 10 V DC
B30 24 V AC/DC, 3-point
B32 24 V AC/DC, 3-point, with auxiliary switch
TN0 Pneumatic 0.2 – 1 bar

6 Damper blade position
Only for spring return actuators and pneumatic actuators
NO Pressure off/power off to OPEN
NC Power off/Pressure off to close

Order example

AKK/160/B30

Nominal size	160 mm
Actuator	Supply voltage 24 V AC/DC

Air-regenerated noise

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.

Quick sizing: Static differential pressure and sound pressure levels with open damper blade

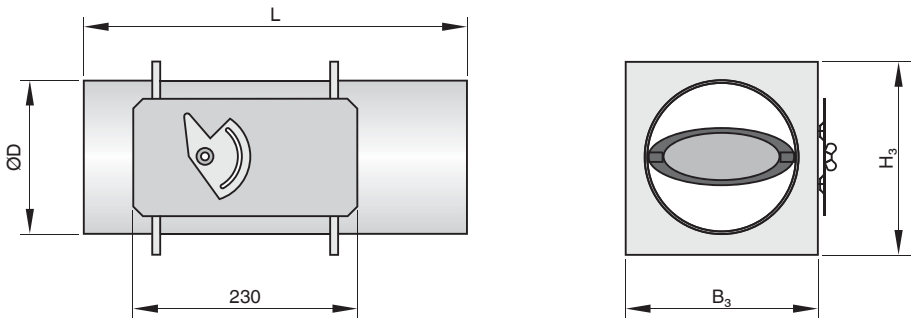
Nominal size	$\dot{V}$		Differential pressure	Air-regenerated noise
			Δp_{st}	L_{PA}
	l/s	m³/h	Pa	dB(A)
125	15	54	5	<15
	60	216	10	24
	105	378	25	36
	150	540	50	45
160	25	90	5	<15
	100	360	10	22
	175	630	20	33
	250	900	45	41
200	40	144	5	<15
	160	576	10	21
	280	1008	20	31
	405	1458	40	39
250	60	216	<5	<15
	250	900	5	19
	430	1548	15	29
	615	2214	30	38
315	100	360	<5	<15
	410	1476	5	21
	720	2592	15	34
	1030	3708	25	43
400	170	612	<5	<15
	670	2412	5	34
	1175	4230	10	50
	1680	6048	15	61

Dimensions

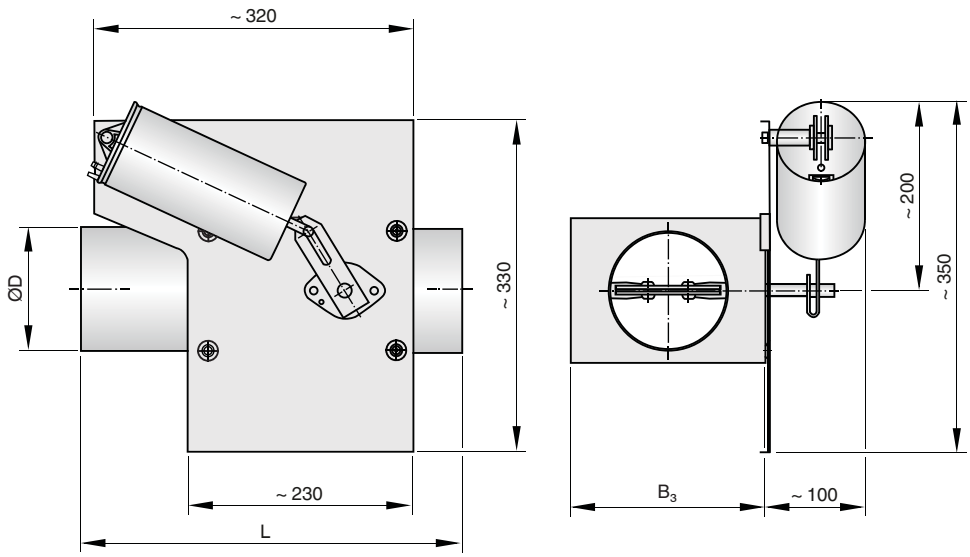


Shut-off dampers
Type AKK

AKK



AKK/.../.../TN0 (pneumatic actuator)



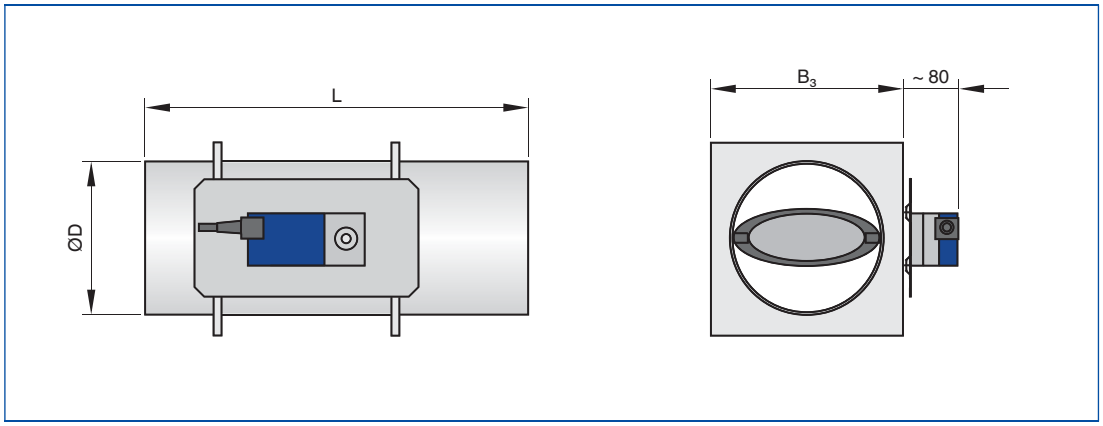
Dimensions [mm] and weight [kg]

Nominal size	AKK	AKK/.../TN0	ØD	L	B_3	H_3
	m					
	kg		mm			
125	1.2	2.9	125	394	195	145
160	1.5	3.2	160	394	230	180
200	1.9	3.6	200	394	270	220
250	3.1	4.8	250	594	320	270
315	5.0	6.7	315	594	385	335
400	7.2	8.9	400	594	470	420



Shut-off damper, variant AKK, with actuator

AKK/.../B** (electric actuators)



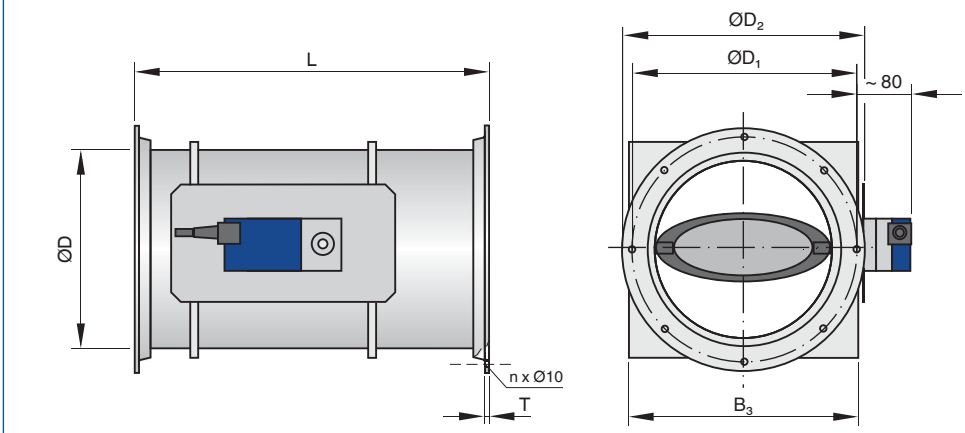
Dimensions [mm] and weight [kg]

Nominal size	AKK/.../B**	ØD	L	B_3	H_3
	m				
	kg	mm			
125	3.1	125	394	195	145
160	3.4	160	394	230	180
200	3.8	200	394	270	220
250	5.0	250	594	320	270
315	6.9	315	594	385	335
400	9.1	400	594	470	420



Shut-off damper, variant AKK

AKK-FL



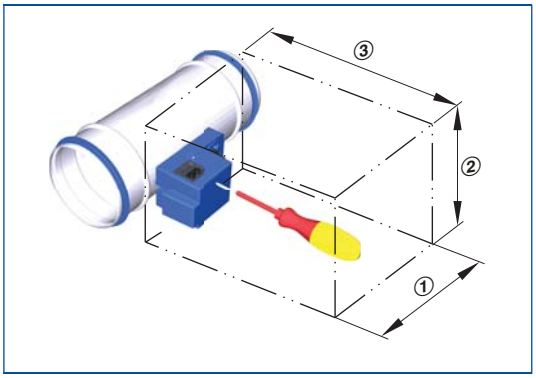
Dimensions [mm] and weight [kg]

Nominal size	AKK-FL	AKK-FL/.../B**	AKK-FL/.../TN0	ØD	L	B_3	H_3	$ØD_1$	$ØD_2$	n	T
	m										
	kg			mm							mm
125	1.5	3.4	3.2	125	400	195	145	165	185	8	8
160	1.9	3.8	3.6	160	400	230	180	200	230	8	8
200	2.4	4.3	4.1	200	400	270	220	240	270	8	8
250	3.7	5.6	5.4	250	600	320	270	290	320	12	8
315	6.0	7.9	7.7	315	600	385	335	350	395	12	10
400	8.5	10.4	10.2	400	600	470	420	445	475	16	10

Space requirement 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



Space required

Attachments	①	②	③
	mm		
Without actuator	250	150	200
With electric actuator	300	200	300
With pneumatic actuator	400	350	300

Standard text

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

Circular shut-off dampers in PPs plastic for air conditioning systems, available in 6 nominal sizes. Suitable for shutting off or restricting extract air flows containing aggressive substances since all components coming into contact with the airflow are made of plastic (no interior metal parts). Suitable for duct pressures up to 1500 Pa. Ready-to-install unit consists of the casing with a damper blade.
Spigot, suitable for ducts according to DIN 8077.
Position of the damper blade indicated externally at the shaft extension.
Closed blade air leakage to EN 1751, class 3.
Casing air leakage to EN 1751, class B.

Special features
- Damper blade can be actuated manually, electrically or pneumatically
- Low-leakage shut-off
- Safety function provided by optional spring return actuator

Materials and surfaces
- Casing and damper blade made of flame-resistant polypropylene (PPs)
- Plain bearings made of polypropylene (PP)
- Damper blade seals in chloroprene rubber (CR)

Technical data
- Nominal sizes: 125 – 400 mm
- Acceptable static differential pressure: 1500 Pa

Sizing data
- $\dot{V}$[m³/h]
- L_{PA} air-regenerated noise[dB(A)]

3

Order options

1 Type
AKK Shut-off damper, plastic

2 Flange
No entry: none
☐ **FL** Flanges on both ends

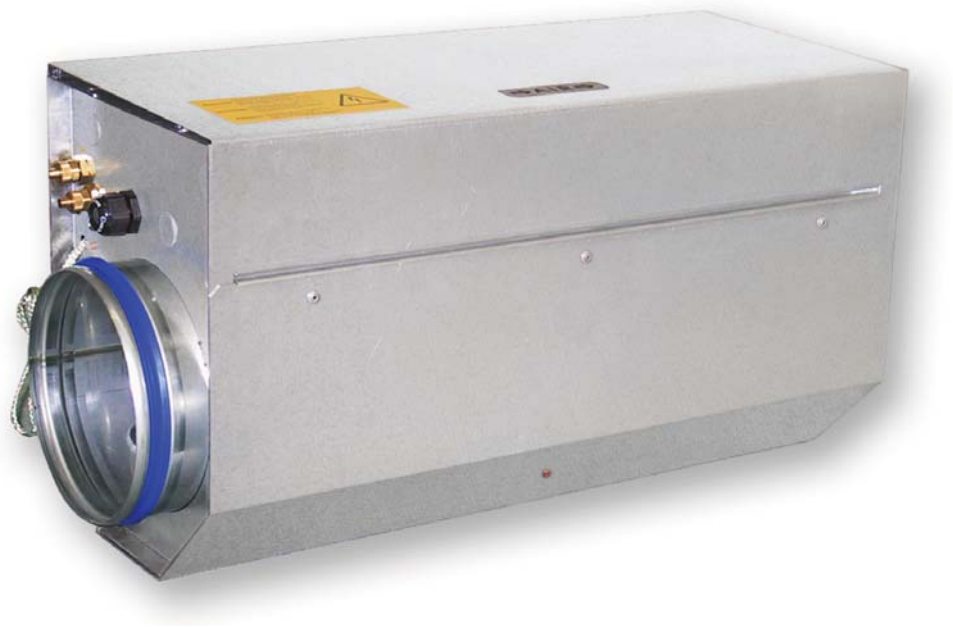
3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **GK** Matching flanges for both ends

5 Actuator
No entry: manual operation
For example
☐ **B20** 24 V AC/DC, modulating 2 – 10 V DC
☐ **B30** 24 V AC/DC, 3-point
☐ **B32** 24 V AC/DC, 3-point, with auxiliary switch
☐ **TN0** Pneumatic 0.2 – 1 bar

6 Damper blade position
Only for spring return actuators and pneumatic actuators
☐ **NO** Pressure off/power off to OPEN
☐ **NC** Power off/Pressure off to close
☐

Shut-off dampers
Type AK-Ex



For low-leakage shut-off of volume flows in potentially explosive atmospheres (ATEX)

Circular shut-off dampers for shutting off ducts,
approved and certified for potentially explosive atmospheres (ATEX)

- ATEX-compliant construction and parts
- Approved for all gases, mists and vapours in zones 1 and 2, with electric actuator additionally for dusts in zones 21 and 22
- Suitable for supply air and extract air
- Electric or pneumatic actuator
- Any installation orientation
- Closed blade air leakage to EN 1751, up to class 4
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Spring return actuator
- Auxiliary switch with adjustable switching points for capturing the end positions



ATEX-compliant parts and units

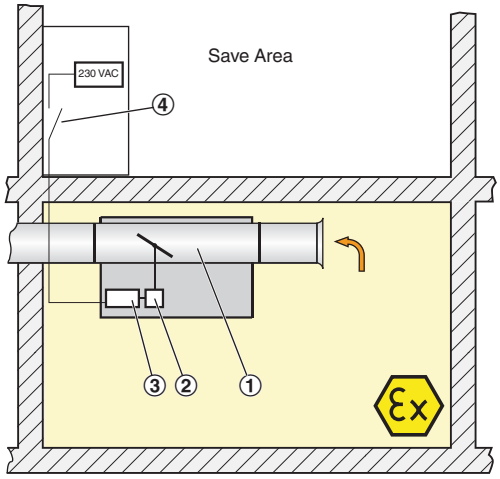


ATEX-Zertifizierung

Type		Page
AK-Ex	General information	3.1 – 24
	Order code	3.1 – 27
	Quick sizing	3.1 – 28
	Dimensions and weight	3.1 – 29
	Installation details	3.1 – 30
	Specification text	3.1 – 31
	Basic information and nomenclature	3.4 – 1

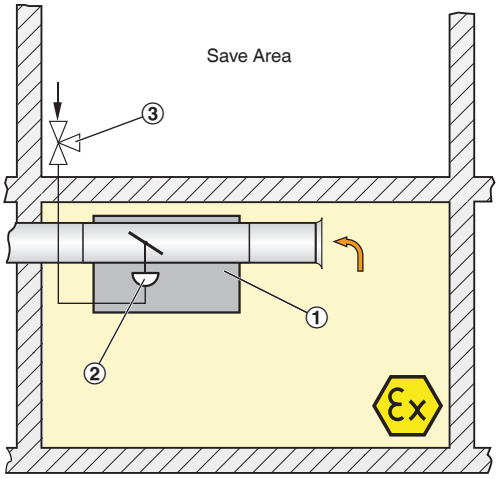
3

Schematic illustration of the AK-Ex with electronic control



① Shut-off damper
② Electric actuator
③ Terminal box
④ Switch (to be provided by others)

Schematic illustration of the AK-Ex with pneumatic control



① Shut-off damper
② Pneumatic actuator
③ Valve or control signal 0 –1 bar
(to be provided by others)

Description



Shut-off damper
Type AK-Ex

Application
- Circular EXCONTROL shut-off dampers Type AK-Ex for shutting off or restricting the airflow in ventilation ducts of air conditioning systems
- For use in potentially explosive atmospheres (ATEX)
- Input signal to control shut-off damper blade is to be provided by others

Classification
Electronic control: Equipment group II
- Zones 1 and 2 (atmosphere: gases): II 2 G c II T5/T6
- Zones 21 and 22 (atmosphere: dusts): II 2 D c II 80 °C

Pneumatic control: Equipment group II
- Zones 1 and 2 (atmosphere: gases): II 2 G c II T5/T6

Construction
- Galvanised sheet steel
- P1: Inner duct powder-coated, silver grey (RAL 7001)
- A2: Inner duct in stainless steel

Nominal sizes
- 125, 160, 200, 250, 315, 400

Attachments
- Electronic actuator:
- Auxiliary switch for capturing the end positions
- Pneumatic actuator

Special features
- ATEX mark and certification
- ATEX equipment group II, approved for use in zones 1 and 2; electric actuator also for zones 21 and 22

Parts and characteristics
- Ready-to-install shut-off damper
- Damper blade with blade mechanism
- Connection for equipotential bonding
- Cable bushings suitable for use in potentially explosive atmospheres
- ATEX-compliant actuator is factory assembled and wired

Construction features
- Circular casing
- Construction and materials comply with the EU directive for use in potentially explosive atmospheres (ATEX)
- Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180

Materials and surfaces
- Casing and damper blade made of galvanised sheet steel
- Blade seal made of TPE plastic
- Plain bearings made of polyurethane
- Electric actuator made of die cast aluminium
- Pneumatic actuator made of plastic
- Inner tube either made of stainless steel (A2) or powder-coated (P1)

Installation and commissioning
- Connections for equipotential bonding: Suitable cables must be connected by others
- Any installation orientation

Standards and guidelines
- Directive 94/9/EC: Equipment and protective systems intended for use in potentially explosive atmospheres
- Closed blade air leakage to EN 1751, class 4 (nominal sizes 100 and 160, class 3)
- Nominal sizes 125 and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class C

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

Technical data

Nominal sizes	125 – 400 mm
Acceptable static differential pressure	1500 Pa
Operating temperature	10 – 50 °C

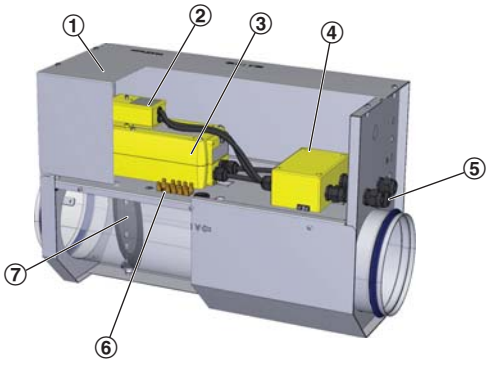
Electronic

Supply voltage	24 – 230 V AC ± 10 %, 50/60 Hz
Power rating	120 VA max.
IEC protection class	I (protective earth)
Protection level	IP 66
EC conformity	ATEX to 94/9/EG, EMC to 2004/108/EG, low voltage to 2006/95/EG

Pneumatic

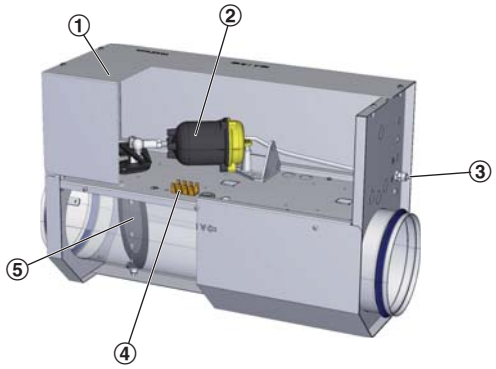
Control pressure	0 – 1.2 bar
Maximum pressure	1.5 bar
Compressed air	Compressed air for instruments, free of oil, water and dust
Protection level	IP 20
Air consumption (100 % stroke)	0.3 l/n (nominal sizes 125 – 250) to 0.5 l/n max. (nominal size 315 – 400)

Schematic illustration of the AK-Ex with electronic control



① Cover
② Auxiliary switch
③ Electric actuator
④ Terminal box
⑤ Cable bushing
⑥ Equipotential bonding
⑦ Damper blade

Schematic illustration of the AK-Ex with pneumatic control



① Cover
② Pneumatic actuator
③ Control signal connection
④ Equipotential bonding
⑤ Damper blade

Order code

AK-Ex

AK-Ex – P1 / 125 / T0F / NO
1 2 3 4 5

1 Type
AK-Ex Shut-off damper for potentially explosive atmospheres

2 Material
No entry: galvanised sheet steel
P1 Inner duct powder-coated, silver grey (RAL 7001)
A2 Inner duct in stainless steel

3 Nominal size [mm]
125
160
200
250
315
400

4 Actuator
Electronic
T0S Actuator
T0F Spring return actuator
T0X Actuator with auxiliary switch
T0Y Spring return actuator with auxiliary switch

Pneumatic
P50 Actuator

5 Damper blade position
Only for spring return actuators and pneumatic actuators
NO Pressure off/power off to OPEN
NC Power off/Pressure off to close

Order examples

AK-Ex/125/T0S

Material	Galvanised sheet steel
Nominal size	125 mm
Actuator	Electric actuator

AK-Ex/200/P50/NO

Material	Galvanised sheet steel
Nominal size	200 mm
Actuator	Pneumatic actuator
Damper blade position	Pressure off to OPEN

Air-regenerated noise

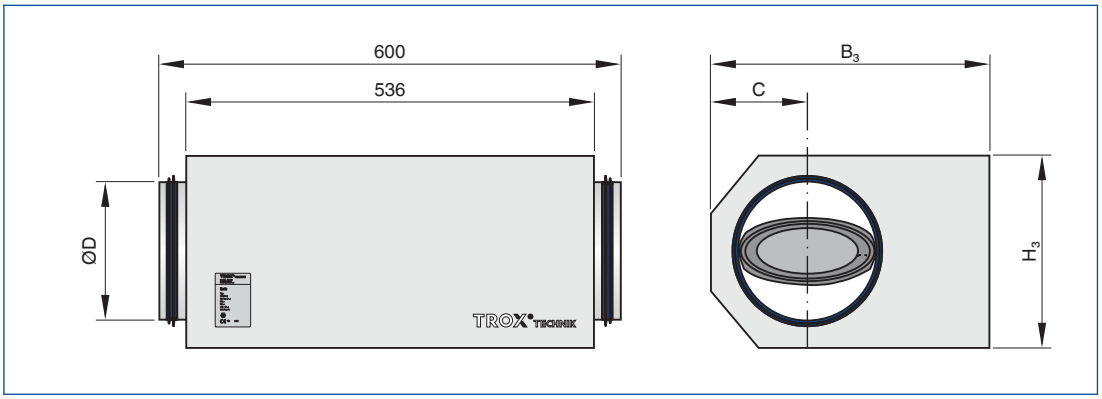
Quick sizing tables provide a good overview of the room sound pressure levels that can be expected. Approximate intermediate values can be interpolated. Precise intermediate values and spectral data can be calculated with our Easy Product Finder design programme.

Quick sizing: Static differential pressure and sound pressure levels with open damper blade

Nominal size	$\dot{V}$		Differential pressure	Air-regenerated noise
			Δp_{st}	L_{PA}
	l/s	m³/h	Pa	dB(A)
125	**49**	**177**	5	20
	74	**265**	12	28
	98	**353**	21	34
	147	**530**	46	45
160	**80**	**290**	4	18
	121	**434**	10	26
	161	**579**	17	32
	241	**869**	39	40
200	**126**	**452**	4	17
	188	**679**	8	24
	251	**905**	14	29
	377	**1357**	32	37
250	**196**	**707**	3	16
	295	**1060**	6	22
	393	**1414**	11	28
	589	**2121**	25	37
315	**312**	**1122**	2	16
	468	**1683**	4	24
	623	**2244**	8	30
	935	**3367**	18	41
400	**503**	**1810**	1	26
	754	**2714**	3	37
	1005	**3619**	5	45
	1508	**5429**	10	58

Dimensions

AK-Ex



Dimensions

Nominal size	ØD	B_3	H_3	C
	mm			
125	124	372	221	129
160	159	372	221	111
200	199	463	311	182
250	249	463	311	157
315	314	627	461	289
400	399	627	461	246

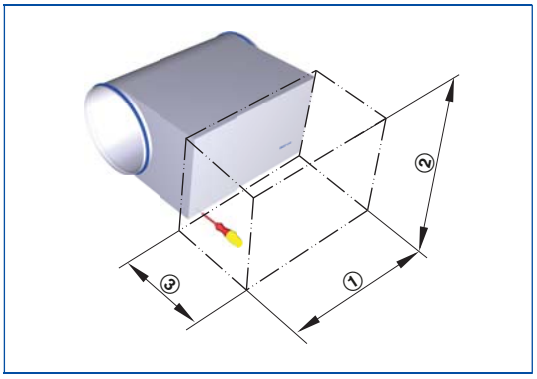
Weight

Nominal size	AK-Ex/.../T0*	AK-Ex/.../P..
	m	
	kg	
125	16.5	15.0
160	16.5	15.0
200	18.0	16.5
250	18.0	16.5
315	22.0	20.5
400	22.0	20.5

Space requirement 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



Space required

Nominal size	①	②	③
	mm		
125	600	220	300
160	600	220	300
200	600	310	300
250	600	310	300
315	600	460	300
400	600	460	300

Standard text

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

Circular shut-off dampers for shutting off or restricting the airflow in potentially explosive atmospheres, for supply air or extract air, available in 6 nominal sizes.
Suitable for duct pressures up to 1500 Pa.
Ready-to-install unit consists of the casing with damper blade, and parts for equipotential bonding and for use in potentially explosive atmospheres.
Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180.
Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).
Casing air leakage to EN 1751, class C.

Special features
- ATEX mark and certification
- ATEX equipment group II, approved for use in zones 1 and 2; electric actuator also for zones 21 and 22

Materials and surfaces
- Casing and damper blade made of galvanised sheet steel
- Blade seal made of TPE plastic
- Plain bearings made of polyurethane
- Electric actuator made of die cast aluminium
- Pneumatic actuator made of plastic
- Inner tube either made of stainless steel (A2) or powder-coated (P1)

Construction
- Galvanised sheet steel
- P1: Inner duct powder-coated, silver grey (RAL 7001)
- A2: Inner duct in stainless steel

Technical data
- Nominal sizes: 125 – 400 mm
- Acceptable static differential pressure: 1500 Pa

Sizing data
- $\dot{V}$[m³/h]
- L_{PA} air-regenerated noise[dB(A)]

Order options

1 Type
AK-Ex Shut-off damper for potentially explosive atmospheres

2 Material
No entry: galvanised sheet steel
☐ **P1** Inner duct powder-coated, silver grey (RAL 7001)
☐ **A2** Inner duct in stainless steel

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Actuator
Electronic
☐ **T0S** Actuator
☐ **T0F** Spring return actuator
☐ **T0X** Actuator with auxiliary switch
☐ **T0Y** Spring return actuator with auxiliary switch

Pneumatic
☐ **P50** Actuator

5 Damper blade position
Only for spring return actuators and pneumatic actuators
☐ **NO** Pressure off/power off to OPEN
☐ **NC** Power off/Pressure off to close

Flow adjustment dampers
Type VFR



Variant with rotary knob



Actuator with potentiometers



Actuator with mechanical stops



Tested to VDI 6022



For the reliable balancing of volume flow rates

Circular flow adjustment dampers for the adjustment of volume flow rates and pressures in supply air and extract air systems

- Each flow adjustment damper carries a diagram with setting values that ensure rapid commissioning on site
- Suitable for duct pressures up to 1000 Pa.
- Volume flow rate can be set using a rotary knob and a scale on the outside of the casing
- Simple retrofit of an actuator
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Actuator with potentiometer
- Actuator with mechanical stops

Type		Page
VFR	General information	3.2 – 2
	Order code	3.2 – 5
	Aerodynamic data	3.2 – 6
	Quick sizing	3.2 – 7
	Dimensions and weight	3.2 – 8
	Installation details	3.2 – 9
	Specification text	3.2 – 10
	Basic information and nomenclature	3.4 – 1

Type VFR – The System



① Flow adjustment damper VFR with rotary knob
② Actuator E0* with potentiometers
③ Actuator M0* with mechanical stops

Diagram with setting values

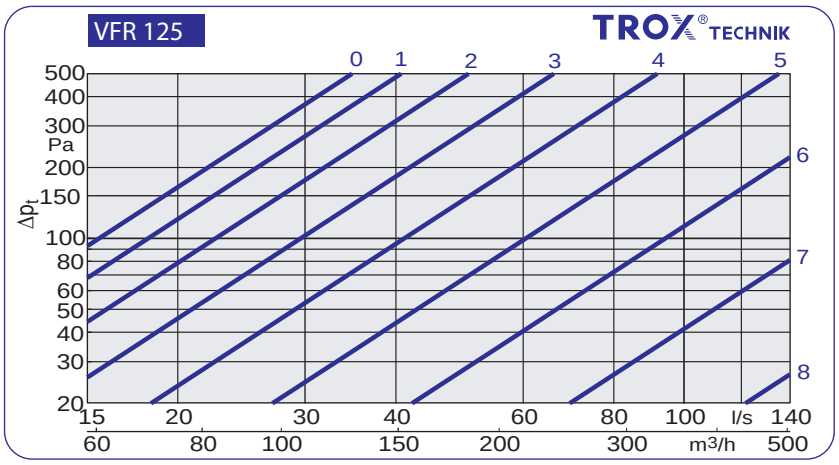


Diagram to determine the setting values on site (example for nominal size 125)

Description



① Flow adjustment damper, variant VFR, with rotary knob

For detailed information on actuators see Chapter K5 – 2.2.

Application
- Circular flow adjustment dampers Type VFR for the simple balancing of volume flow rates and pressures in air conditioning systems
- Stepless adjustment of the volume flow rate using a rotary knob with position indicator
- Simple retrofit of an actuator
- At the minimum setting (closed position 0) a system pressure dependent leakage flow rate occurs

Construction
- Galvanised sheet steel
- A2: Stainless steel

Nominal sizes
- 80, 100, 125, 140, 150, 160, 180 , 200, 224, 250

Attachments
- Min/Max actuators: Actuators for switching between minimum and maximum volume flow rate setpoint values
- Modulating actuators: Actuators for the stepless adjustment of volume flow rates

Special features
- Diagram with setting values on each flow adjustment damper
- Simple retrofit of an actuator is possible

Parts and characteristics
- Ready-to-install flow adjustment damper
- Rotary knob with position indicator
- Stepless adjustment from 0 to 10
- Diagram with setting values
- Lip seal

Construction features
- Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180
- Very good dimensional stability due to double grooves
- Damper blade without seal but with perimeter gap of 3 mm

Materials and surfaces
- Rotary knob, damper blade and bearings made of plastic, flame retardant (V-0) to UL 94

Galvanised sheet steel construction (P1)
- Casing made of galvanised sheet steel

Stainless steel construction (A2)
- Casing made of stainless steel 1.4301

Installation and commissioning
- Any installation orientation
- Volume flow rate setpoint can be set on external scale

Standards and guidelines
- Hygiene conforms to VDI 6022
- Casing air leakage to EN 1751, class C

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

3

Attachments

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

Technical data

Nominal sizes	80 – 250 mm
Volume flow rate range	20 – 485 l/s or 72 – 1746 m^3/h
Minimum differential pressure	20 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

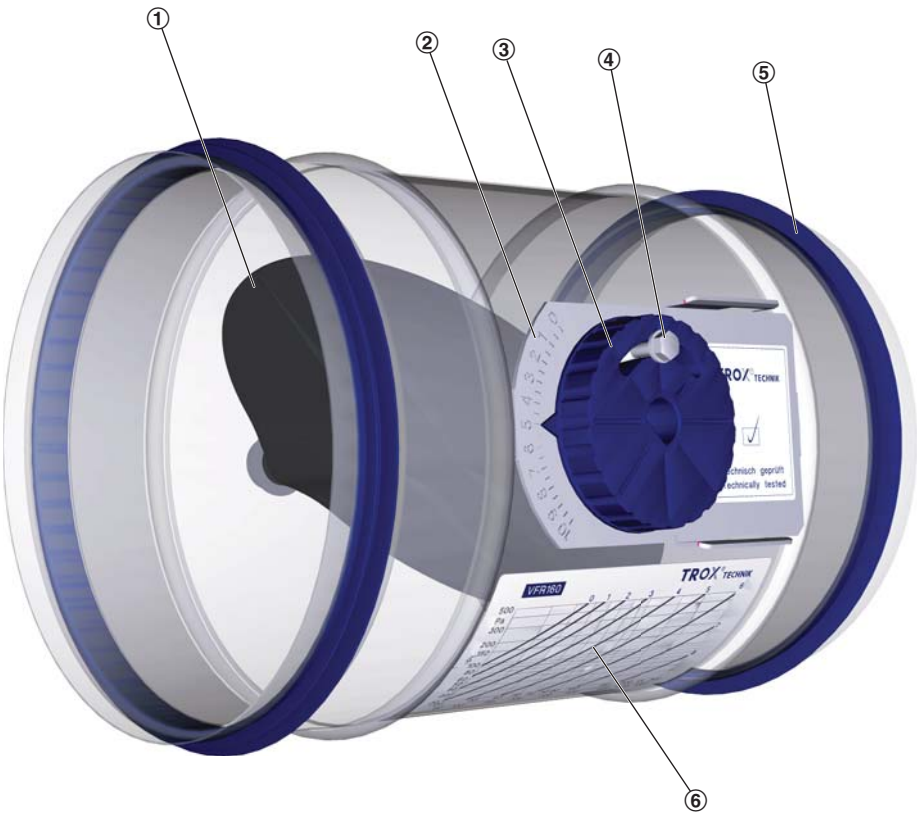
Function

Functional description

For balancing the volume flow rates of duct sections and air terminal devices the differential pressure must be set on the flow adjustment dampers. The value to be set for a certain required volume flow rate at a given differential pressure can be taken from the diagram that each flow adjustment damper carries. This value can then be set using the rotary knob with the position indicator (stepless adjustment between 0 and 10).

3

Schematic illustration of the VFR



① Damper blade
② Scale
③ Rotary knob
④ Rotary knob locking screw
⑤ Lip seal
⑥ Diagram with setting values

Order code

VFR

VFR – A2 / 160 / E01
1 2 3 4

1 Type
VFR Flow adjustment damper

2 Material
No entry: galvanised sheet steel
A2 Stainless steel

3 Nominal size [mm]
80
100
125
140
150
160
180
200
224
250

4 Actuator
No entry: manual operation potentiometer
E01 24 V AC/DC, 3-point
E02 230 V AC, 3-point
E03 24 V AC/DC, modulating 0 – 10 V DC
Mechanical stops
M01 24 V AC/DC, 3-point
M02 230 V AC, 3-point

Order example

VFR/160/M01

Nominal size	160 mm
Actuator	24 V AC/DC, mechanical stops

Closed blade air leakage

Nominal size	Δp_{st} [Pa]					
	100		200		500	
	l/s	m^3/h	l/s	m^3/h	l/s	m^3/h
80	9	32	13	46	20	72
100	13	45	18	64	28	101
125	16	58	23	82	36	130
140	17	61	25	89	39	140
150	18	66	26	93	41	148
160	21	76	30	107	47	169
180	19	69	27	98	43	155
200	21	74	29	105	46	166
224	22	80	32	114	50	180
250	25	89	35	125	55	198

Air-regenerated noise

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.

Quick sizing: Sound pressure level

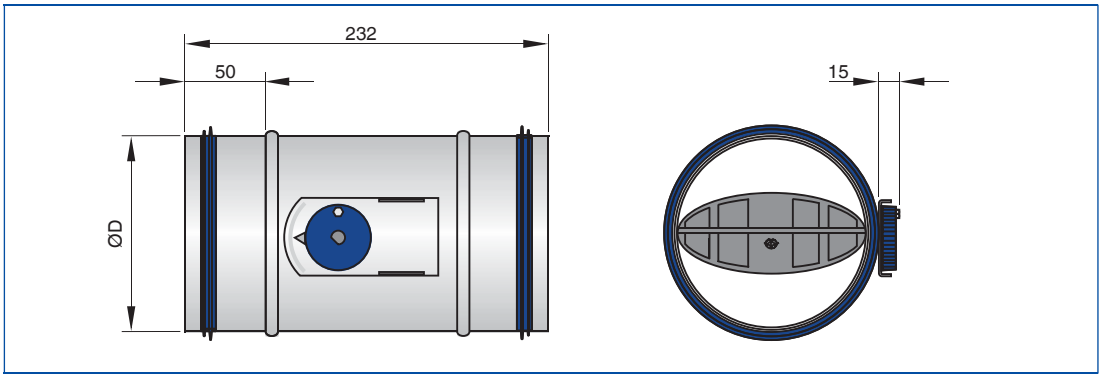
Nominal size	Volume flow rate		Δp_{st} [Pa]						
			10	20	30	50	80	100	200
			L_{PA}						
	l/s	m^3/h	dB(A)						
80	20	72	25	28	30	32	35	36	41
	30	108	30	33	35	37	40	41	45
	40	144	33	36	38	41	43	45	49
	50	180	36	40	42	44	47	48	53
100	30	109	27	29	31	34	36	38	44
	45	163	32	35	37	39	42	43	48
	60	217	36	39	41	44	46	48	52
	75	272	40	43	45	48	50	52	56
125	50	180	28	31	33	36	39	41	47
	70	252	33	36	38	41	44	46	51
	95	342	37	41	43	46	49	50	55
	120	432	41	45	47	50	53	54	59
140	60	215	25	29	31	34	38	40	47
	90	323	31	34	37	40	44	45	51
	120	431	35	39	42	45	48	50	56
	150	538	39	43	45	49	52	54	59
150	70	252	26	30	32	36	39	41	48
	105	378	31	35	37	41	44	46	52
	140	504	35	39	42	45	48	50	56
	170	619	37	42	44	48	51	53	58
160	80	612	27	30	33	36	39	41	48
	120	432	33	37	39	42	45	47	53
	155	558	38	41	44	47	50	51	57
	195	702	41	45	47	50	53	54	59
180	100	358	25	29	32	35	39	41	48
	150	540	31	35	38	41	45	47	53
	200	720	35	39	42	45	48	50	56
	250	900	38	42	45	48	51	53	59
200	125	450	26	30	33	37	41	43	51
	185	665	32	36	39	42	46	48	55
	245	882	36	40	43	47	50	52	59
	310	1116	39	44	46	50	54	56	62
224	155	557	24	28	31	35	39	41	47
	230	828	28	32	35	39	42	44	50
	310	1115	32	36	38	42	45	47	53
	385	1386	34	38	41	44	48	49	55
250	195	702	24	28	32	36	41	43	52
	290	1043	28	33	36	40	45	47	56
	385	1386	31	36	40	44	49	51	59
	485	1746	34	39	43	47	52	54	62

Dimensions



① Flow adjustment damper, variant VFR, with rotary knob

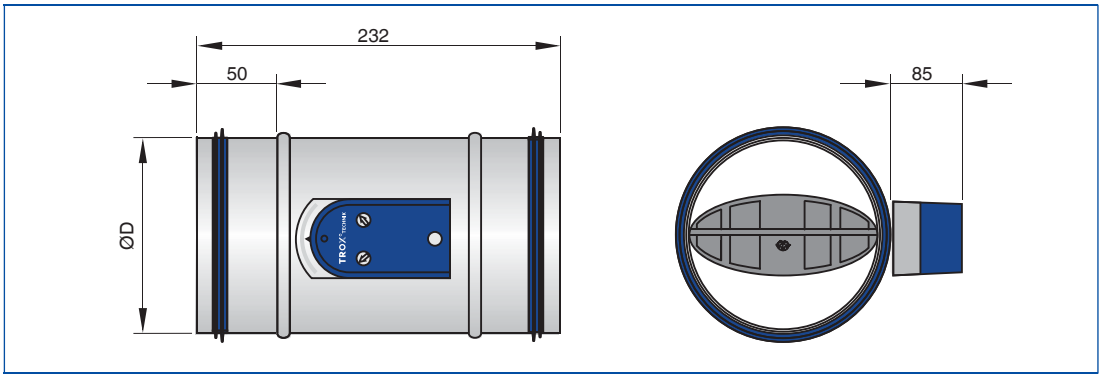
VFR





Flow adjustment damper, variant VFR, with actuator (potentiometer)

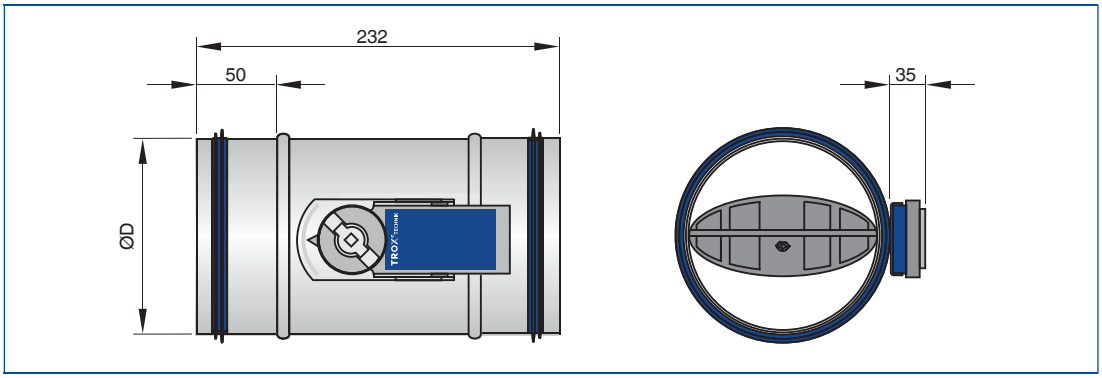
VFR/.../E0*





Flow adjustment damper, variant VFR, with actuator (mechanical stops)

VFR/.../M0*



Dimensions [mm] and weight [kg]

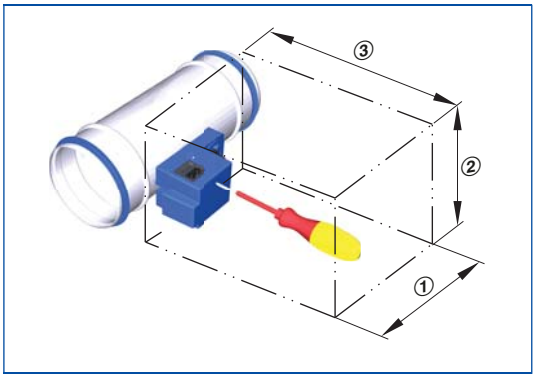
Nominal size	VFR	VFR/.../E0*	VFR/.../M0*	ØD
	m			
	kg			mm
80	0.5	0.8	0.7	79
100	0.6	0.9	0.8	99
125	0.7	1.0	0.9	124
140	0.8	1.1	1.0	139
150	0.8	1.1	1.0	149

Nominal size	VFR	VFR/.../E0*	VFR/.../M0*	ØD
	m			
	kg			mm
160	0.8	1.1	1.0	159
180	0.9	1.2	1.1	179
200	1.0	1.3	1.2	199
224	1.2	1.4	1.4	223
250	1.3	1.6	1.5	249

Space requirement 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



Space required

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

Standard text

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

Circular flow adjustment dampers for the simple balancing of volume flow rates in air conditioning systems, for supply air and extract air, available in 10 nominal sizes.
Suitable for duct pressures up to 1000 Pa.
Ready-to-install unit consists of the casing with damper blade and rotary knob for the stepless adjustment of volume flow rates.
Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180.
Casing air leakage to EN 1751, class C.

Special features
- Diagram with setting values on each flow adjustment damper
- Simple retrofit of an actuator is possible

Materials and surfaces
- Rotary knob, damper blade and bearings made of plastic, flame retardant (V-0) to UL 94

Galvanised sheet steel construction (P1)
- Casing made of galvanised sheet steel

Stainless steel construction (A2)
- Casing made of stainless steel 1.4301

Construction
- Galvanised sheet steel
- A2: Stainless steel

Technical data
- Nominal sizes: 80 to 250 mm
- Volume flow rate range: 9 to 615 l/s or 32 to 2215 m^3/h
- Minimum differential pressure: 20 Pa
- Maximum differential pressure: 1000 Pa

Sizing data
- $\dot{V}[m^3/h]$
- $\Delta p_{st}[Pa]$
- L_{PA} air-regenerated noise[dB(A)]

Order options

1 Type
VFR Flow adjustment damper

2 Material
No entry: galvanised sheet steel
☐ **A2** Stainless steel

3 Nominal size [mm]
☐ **80**
☐ **100**
☐ **125**
☐ **140**
☐ **150**
☐ **160**
☐ **180**
☐ **200**
☐ **224**
☐ **250**

4 Actuator
No entry: manual operation potentiometer
☐ **E01** 24 V AC/DC, 3-point
☐ **E02** 230 V AC, 3-point
☐ **E03** 24 V AC/DC, modulating 0 – 10 V DC
Mechanical stops
☐ **M01** 24 V AC/DC, 3-point
☐ **M02** 230 V AC, 3-point
☐

Actuators for shut-off dampers

Type Open/Close actuators



For the opening and closing of shut-off dampers in air conditioning systems

Actuators for Type AK or AKK shut-off dampers

- Change of the damper blade position for two different operating situations
- Supply voltage 24 V AC/DC or 230 V AC or operating pressure 1 bar
- Control input signal: 1-wire control or 2-wire control (3-point)
- Mechanical stops
- Retrofit possible

Type		Page
Open/Close actuators	General information	3.3 – 2
	Special information – B3*	3.3 – 4
	Special information – B4*	3.3 – 5
	Special information – B*2	3.3 – 6
	Special information – BP0	3.3 – 7
	Special information – BP2	3.3 – 8
	Special information – BR0	3.3 – 9
	Special information – BR2	3.3 – 10
	Special information – TN0	3.3 – 11
	Basic information and nomenclature	3.4 – 1

Description

Application
- Actuators for opening and closing
- Opening and closing of Type AK or AKK shut-off dampers

Parts and characteristics
- Mechanical stops for setting the damper blade positions
- Electric or pneumatic operation
- Overload protection
- Control input signal: 1-wire control, 2-wire control (3-point) or pneumatic control
- Optional spring return actuator for damper blade safety function
- Optional auxiliary switch for capturing the end positions

Any attachments must be defined with the order code of the shut-off damper.

Actuators for Type AK or AKK shut-off dampers

Order code detail	Actuator			Auxiliary switch	
	Part number	Type	Supply voltage	Part number	Type
B30	M466DU5	LM24A	24 V	–	–
B32	M466DU5	LM24A	24 V	M536AI3	S2A
B40	M466DU4	LM230A	230 V	–	–
B42	M466DU4	LM230A	230 V	M536AI3	S2A
BP0	M466ET0	NF24A spring return actuator	24 V	–	–
BP2	M466ET2	NF24A-S2 spring return actuator	24 V		integrated
BR0	M466ET1	NFA spring return actuator	24 – 240 V AC 24 – 125 V DC	–	–
BR2	M466ET3	NFA-S2 spring return actuator	24 – 240 V AC 24 – 125 V DC		integrated
TN0	B555DC2	Pneumatic control	0.2 – 1 bar	–	

Function

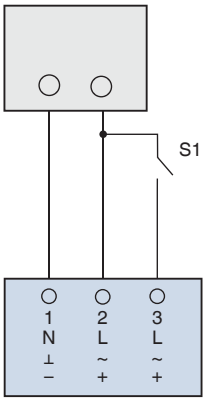
Functional description

The actuator opens or closes the damper blade. Minimum and maximum positions can be set using mechanical stops. 1-wire control or 2-wire control (3-point) can be used. 1-wire control is actually an open/close control. A spring return actuator moves the damper blade to the safe position in case of a power failure.

Define the safe position with the order code: NC (normally closed) or NO (normally open). The spring return actuator is factory set according to the safe position. The normal position of the damper blade is only achieved with 1-wire control (control voltage).

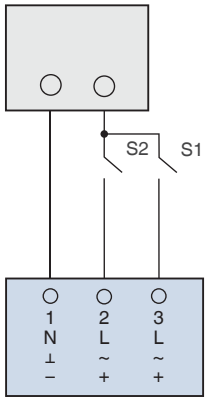
Applies to attachments with order codes B3*, B4*

1-wire control



Switch functions
S1 open: Direction of rotation 1
S1 closed: Direction of rotation 2

2-wire control (3-point)



Switch functions
S1 open
S2 open: Actuator has stopped (any position)
S2 closed: Direction of rotation 1

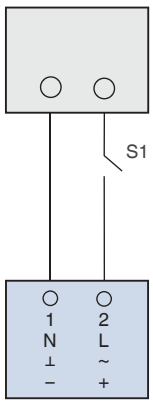
S1 closed
S2 open: Direction of rotation 2
S2 closed: Direction of rotation 2

Effect of actuator action in case of factory setting

Order code detail	Direction of rotation	
	1	2
B30, B32	CLOSED	OPEN
B40, B42	CLOSED	OPEN

Applies to attachments with order codes BP* and BR*

1-wire control (control input signal for spring return actuator)



Switch functions
S1 open: Safe position (spring return)
S1 closed: Normal operation
(spring-winding mechanism)
Damper blade position (OPEN or CLOSED), depending on defined safe position

Description

/ B30
/ B32

Order code detail

Application

- Actuator LM24A
- Opening and closing of Type AK or AKK shut-off dampers

Variants

- B32: with auxiliary switch for capturing the end positions

Parts and characteristics

- Supply voltage 24 V AC/DC
- 1-wire control or 2-wire control (3-point)
- Mechanical stops for setting the volume flow rate setpoints
- Switch for setting the direction of rotation
- Release button to allow for manual operation

Installation and commissioning

- Change the direction of rotation if necessary, using the switch

Technical data



Actuator LM24A

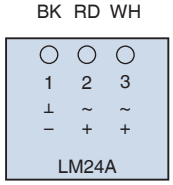
Actuators LM24A and LM24A-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	2 VA max.
Power rating (DC)	1 W max.
Torque	5 Nm
Running time for 90°	150 s
Control input signal	1-wire control or 2-wire control (3-point)
Connecting cable	3 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	0.5 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Control voltage for direction of rotation 1
3 ~, +: Control voltage for direction of rotation 2

LM24A and LM24A-F

Description

/ B40
/ B42

Order code detail

Application

- Actuator LM230A
- Opening and closing of Type AK or AKK shut-off dampers

Variants

- B42: with auxiliary switch for capturing the end positions

Parts and characteristics

- Supply voltage 100 – 240 V AC
- 1-wire control or 2-wire control (3-point)
- Mechanical stops for setting the volume flow rate setpoints
- Switch for setting the direction of rotation
- Release button to allow for manual operation

Installation and commissioning

- Change the direction of rotation if necessary, using the switch

3

Technical data



Actuator LM230A

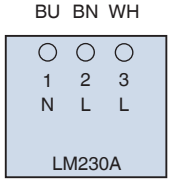
Actuator LM230A

Supply voltage	85 – 265 V AC, 50/60 Hz
Power rating	4 VA max.
Torque	5 Nm
Running time for 90°	150 s
Control input signal	1-wire control or 2-wire control (3-point)
Connecting cable	3 x 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 54
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	0.5 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 N:	Neutral
2 L:	Control voltage for direction of rotation 1
3 L:	Control voltage for direction of rotation 2

Description

/ **B52**
/ **B62**

Order code detail

Application

- Auxiliary switch S2A for capturing damper blade end positions (end positions reached through actuator operation)
- Volt-free contacts for signalling or activating switch functions
- Two integral switches, e.g. for damper blade OPEN and damper blade CLOSED
- Potentiometer for setting any switch point



Auxiliary switch S2A

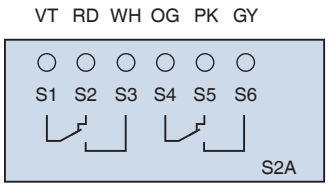
Auxiliary switch S2A

Type of contact	2 changeover contacts[1)]
Max. switching voltage (AC)	250 V AC
Max. switching current (AC)	3 A (resistive load); 0.5 A (inductive load)
Max. switching voltage (DC)	110 V DC
Max. switching current (DC)	0.5 A (resistive load); 0.2 A (inductive load)
Connecting cable	6 × 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 54
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	0.250 kg

[1)] **If both auxiliary switches are used the switching voltages must be the same**

Wiring

Connecting cable core identification



S1: Common contact
S2: Mechanical stop 1 < x
S3: Mechanical stop 1 > x
S4: Common contact
S5: Mechanical stop 2 < x
S6: Mechanical stop 2 > x
x: 0 – 100 % Switching point (adjustable)

Description

/ BP0 / NO

Order code detail

Application

- Pneumatic actuator NF24A for the opening and closing of Type AK or AKK shut-off dampers
- Opening and closing with safety function
- The safety function of the shut-off damper is defined with the order code

Parts and characteristics

- Supply voltage 24 V AC/DC
- Control input signal: Supply voltage on/off
- Mechanical stops for setting the volume flow rate setpoints
- Manual operation using crank handle and position lock

Technical data



Spring return actuator NF24A

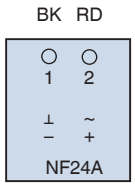
Spring return actuator NF24A

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10 %, +20 %
Power rating (AC)	8.5 VA max.
Power rating (DC)	6 W max.
Torque	10 Nm
Motor running time for 90°	< 75 s
Spring return time	20 s (for < –20 °C up to 60 s)
Control input signal	Supply voltage on/off
Connecting cable	2 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	1.8 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Control voltage for direction of rotation 1

Description

/ BP2 / NO

Order code detail

Application

- Spring return actuator NF24A-S2 with integral auxiliary switches for the opening and closing of Type AK or AKK shut-off dampers
- Opening and closing of shut-off dampers with safety function
- The safety function of the shut-off damper is defined with the order code

Parts and characteristics

- Supply voltage 24 V AC/DC
- Control input signal: Supply voltage on/off
- Mechanical stops for setting the volume flow rate setpoints
- Manual operation using crank handle and position lock
- One fixed and one adjustable auxiliary switch for signalling rotation angles of 10 % and 10 – 90 %.
- Fixed auxiliary switch, switching point 10 %
- Adjustable auxiliary switch, switching point 10 – 90 %

Technical data



Spring return actuator NF24A-S2

Spring return actuator NF24A-S2

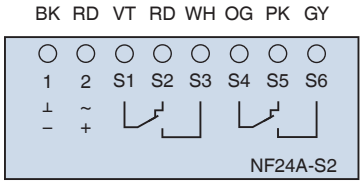
Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10 %, +20 %
Power rating (AC)	8.5 VA max.
Power rating (DC)	6 W max.
Torque	10 Nm
Motor running time for 90°	< 75 s
Spring return time	20 s (for < –20 °C up to 60 s)
Control input signal	Supply voltage on/off
Auxiliary switch: type of contact	2 changeover contacts[1)]
Max. switching voltage (AC)	250 V AC
Max. switching current (AC)	3 A (resistive load); 0.5 A (inductive load)
Max. switching voltage (DC)	110 V DC
Max. switching current (DC)	0.5 A (resistive load); 0.2 A (inductive load)
Connecting cable – actuator	2 × 0.75 mm², 1 m long
Connecting cable – auxiliary switch	6 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	2.0 kg

[1)] **If both auxiliary switches are used the switching voltages must be the same**

Wiring

For control options see General information – function

Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Control voltage for direction of rotation 1
S1: Common contact
S2: Mechanical stop 1 < x
S3: Mechanical stop 1 > x
S4: Common contact
S5: Mechanical stop 2 < y
S6: Mechanical stop 2 > y
x: 10 % Switching point 1
y: 10 ... 90 % Switching point 2 (adjustable)

Description

/ BR0 / NO

Order code detail

Application

- Pneumatic actuator NFA for the opening and closing of Type AK or AKK shut-off dampers
- Opening and closing with safety function
- The safety function of the shut-off damper is defined with the order code

Parts and characteristics

- Supply voltage 24 – 240 V AC/24 – 125 V DC
- Control input signal: Supply voltage on/off
- Mechanical stops for setting the volume flow rate setpoints
- Manual operation using crank handle and position lock

Technical data



Spring return actuator NFA

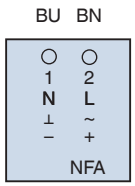
Spring return actuator NFA

Supply voltage (AC)	19.2 – 264 V AC, 50/60 Hz
Supply voltage (DC)	21.6 – 137 V DC
Power rating (AC)	9.5 VA max.
Power rating (DC)	6 W max.
Torque	10 Nm
Motor running time for 90°	< 75 s
Spring return time	20 s (for < –20 °C up to 60 s)
Control input signal	Supply voltage on/off
Connecting cable	2 × 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 54
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	2.0 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 N ⊥, –: Ground, neutral
2 L ~, +: Control voltage for direction of rotation 1

Description

/ BR2 / NO

Order code detail

Application

- Spring return actuator NFA-S2 with integral auxiliary switches for the opening and closing of Type AK or AKK shut-off dampers
- Opening and closing with safety function
- The safety function of the shut-off damper is defined with the order code

Parts and characteristics

- Supply voltage 24 – 240 V AC or 24 – 125 V DC
- Control input signal: Supply voltage on/off
- Mechanical stops for setting the volume flow rates
- Manual operation using crank handle and position lock
- Two auxiliary switches with volt-free contacts for signalling or activating switch functions
- Fixed auxiliary switch, switching point 10 %
- Adjustable auxiliary switch, switching point 10 – 90 %

Technical data



Spring return actuator NFA-S2

Spring return actuator NFA-S2

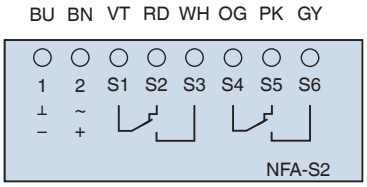
Supply voltage (AC)	19.2 – 264 V AC, 50/60 Hz
Supply voltage (DC)	21.6 – 137 V DC
Power rating (AC)	9.5 VA max.
Power rating (DC)	6 W max.
Torque	10 Nm
Motor running time for 90°	< 75 s
Spring return time	20 s (for < –20 °C up to 60 s)
Control input signal	Supply voltage on/off
Auxiliary switch: type of contact	2 changeover contacts[1)]
Max. switching voltage (AC)	250 V AC
Max. switching current (AC)	3 A (resistive load); 0.5 A (inductive load)
Max. switching voltage (DC)	110 V DC
Max. switching current (DC)	0.5 A (resistive load); 0.2 A (inductive load)
Connecting cable – actuator	2 × 0.75 mm², 1 m long
Connecting cable – auxiliary switch	6 × 0.75 mm², 1 m long
IEC protection class	II (protective insulation)
Protection level	IP 54
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU
Operating temperature	–30 to 50 °C
Weight	2.2 kg

[1)] If both auxiliary switches are used the switching voltages must be the same

Wiring

For control options see General information – function

Connecting cable core identification



1 N, ⊥, –: Ground, neutral
2 L_1,~, +: Control voltage for direction of rotation 1
S1: Common contact
S2: Mechanical stop 1 < x
S3: Mechanical stop 1 > x
S4: Common contact
S5: Mechanical stop 2 < y
S6: Mechanical stop 2 > y
x: 10 % Switching point 1
y: 10 ... 90 % Switching point 2 (adjustable)

Description

/ TN0 / NO

Order code detail

Application

- Pneumatic actuator B555DC2 for the opening and closing of Type AK or AKK shut-off dampers
- Opening and closing with safety function
- The safety function of the shut-off damper is defined with the order code

Parts and characteristics

- Control pressure 0.2 – 1 bar
- Control input signal: pneumatic, control pressure on/off
- Piston rod with 85 mm stroke
- When the control pressure increases, the piston rod extends; it retracts by means of the spring force

3

Technical data



Pneumatic actuator B555DC2

Pneumatic actuator B555DC2

Control pressure	0.2 – 1.0 bar
Maximum pressure	2.0 bar
Compressed air	Compressed air for instruments, free of oil, water and dust
Weight	0.840 kg

Actuators for shut-off dampers

Type Modulating actuators



For moving the damper blades of shut-off dampers to any position

Modulating actuators for Type AK or AKK shut-off dampers

- Various damper blade positions
- Supply voltage 24 V AC/DC
- Control input signal: Voltage signal 2 – 10 V
- Mechanical stops
- Retrofit possible

Type		Page
Modulating actuators	General information	2.2 – 1
	Special information – B20	2.2 – 15
	Basic information and nomenclature	2.3 – 1

Description



Actuator LM24A-SR

Any attachments must be defined with the order code of the shut-off damper.

Application

- Actuators for variable adjustment
- For moving the damper blades of Type AK and AKK shut-off dampers to any position

Parts and characteristics

- Mechanical stops for limiting the damper blade positions
- Supply voltage 24 V AC/DC
- Overload protection
- Setpoint value signal 2 – 10 V DC
- Release button to allow for manual operation

Actuators for the variable adjustment of shut-off dampers

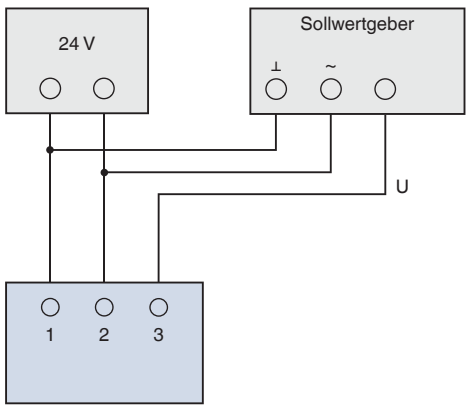
Order code detail	Actuator		Supply voltage
	Part number	Type	
B20	M466DT6 with M536AJ4	LM24A-SR	24 V

Function

Functional description

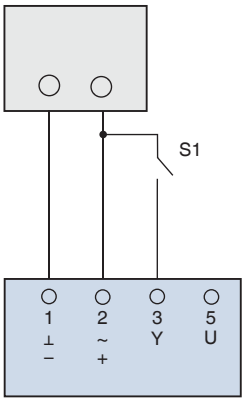
The actuator moves the blade of a shut-off damper to any position between the OPEN and CLOSED positions.
The control input signal is a voltage signal.

Variable control initiated by a voltage signal



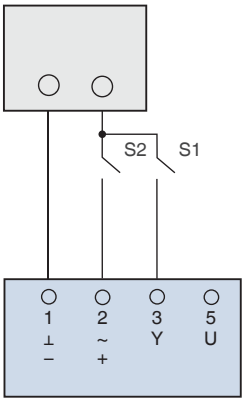
U Voltage signal 0 – 10 V DC or 2 – 10 V DC

1-wire control for modulating actuators



Switch functions
S1 open: Direction of rotation 1
S1 closed: Direction of rotation 2

2-wire control (3-point) for modulating actuators



Switch functions
S1 open
S2 open: Actuator has stopped (any position)
S2 closed: Direction of rotation 1

S1 closed
S2 open: Direction of rotation 2
S2 closed: Direction of rotation 2

Effect of actuator action in case of factory setting

Order code detail	Direction of rotation	
	1	2
B20	OPEN	CLOSED

Description

/ **B20**

Order code detail

Application

- Actuator LM24A-SR
- Stepless adjustment as well as opening and closing of shut-off dampers

Parts and characteristics

- Supply voltage 24 V AC/DC
- Control input signal: Setpoint value signal 2 – 10 V DC, corresponds to the total rotation range (90°), working range is limited by mechanical stops
- Output: Position feedback 2 – 10 V
- Mechanical stops
- Direction of action can be reversed
- Release button to allow for manual operation

Technical data



Actuator LM24A-SR

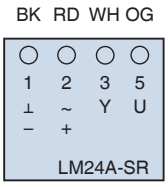
Actuators LM24A-SR and LM24A-SR-F

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 20 %
Power rating (AC)	2 VA
Power rating (DC)	1 W
Torque	5 Nm
Running time for 90°	150 s
Position feedback	2 – 10 V DC, 1 mA
Control signal	2 – 10 V DC, R_a > 100 kΩ
Connecting cable	4 × 0.75 mm², 1 m long
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2004/108/EC
Operating temperature	–30 to 50 °C
Weight	0.5 kg

Wiring

For control options see General information – function

Connecting cable core identification



1 ⊥, –: Ground, neutral
2 ~, +: Supply voltage
3 Y: Setpoint value signal
5 U: Position feedback

LM24A-SR and LM24A-SR-F

Shut-off and restriction

Basic information and nomenclature



- Product selection
- Principal dimensions
- Nomenclature
- Construction
- Correction values for system attenuation
- Measurements
- Sizing and sizing example

Product selection

	Type			
	AK	AK-Ex	AKK	VFR
Type of system				
Supply air	●	●	●	●
Extract air	●	●	●	●
Duct connection				
Circular	●	●	●	●
Rectangular				
Volume flow rate range				
Up to [m^3/h]	5435	5435	5435	1745
Up to [l/s]	1510	1510	1510	485
Air quality				
Filtered	●	●	●	●
Office extract air	●	●	●	●
Polluted	○	○	●	
Contaminated	○	○	●	
Shut-off				
Manually	●		●	
Electric/pneumatic actuator	○	●	○	
Safe position	○	○	○	
Restriction				
Manually				●
Electric actuator				○
Special areas				
Areas with explosive atmospheres		●		

●	Possible
○	Possible under certain conditions: Robust unit variant and/or specific actuator
	Not possible

Principal dimensions

ØD [mm]
Shut-off and flow adjustment dampers made of stainless steel: Outside diameter of the connecting spigot
Shut-off dampers made of plastic: Inside diameter of the connecting spigot

$ØD_1$ [mm]
Pitch circle diameter of flanges

$ØD_2$ [mm]
Outside diameter of flanges

$ØD_4$ [mm]
Inside diameter of the screw holes of flanges

L [mm]
Length of unit including connecting spigot

L_1 [mm]
Length of casing or acoustic cladding

n [ ]
Number of flange screw holes

T [mm]
Flange thickness

m [kg]
Unit weight including the minimum required attachments

Nomenclature

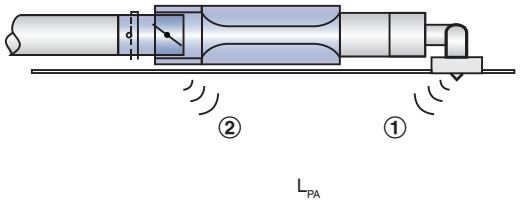
L_{PA} [dB(A)]
A-weighted sound pressure level of air-regenerated noise of the shut-off or flow adjustment damper, system attenuation taken into account

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

Δp_{st} [%]
Static differential pressure

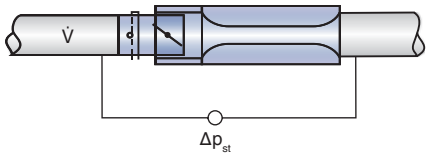
All sound pressure levels are based on 20 µPa.

Definition of noise



① Air-regenerated noise
② Case-radiated noise

Static differential pressure



Constructions

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

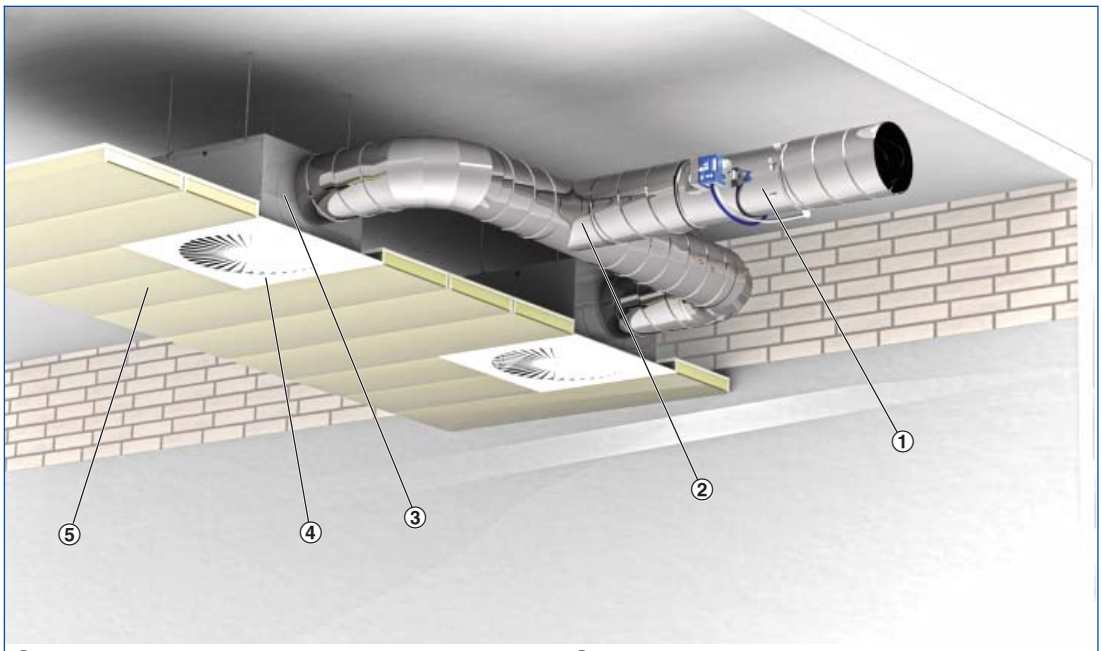
Powder-coated surface (P1)
- Casing made of galvanised sheet steel, powder-coated RAL 7001, silver grey
- Parts in contact with the airflow are powder-coated or made of plastic
- Due to production, some parts that come into contact with the airflow may be stainless steel or aluminium, powder-coated
- 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

3

The quick sizing tables show the sound pressure levels that can be expected in a room both for the air-regenerated noise and for the case-radiated noise. The sound pressure level in a room results from the sound power level of the products – for a given volume flow rate and differential pressure – and the attenuation and insulation on site. Generally accepted attenuation and insulation values have been taken into account.
The distribution of air across the ductwork, changes of direction, end reflection, and room attenuation all affect the sound pressure level of the air-regenerated noise. Ceiling insulation and room attenuation influence the sound pressure level of the case-radiated noise.

Reducing the sound pressure level of the air-regenerated noise



① VAV terminal unit
② Distribution in the ducting
③ Change of direction
④ End reflection
⑤ Ceiling insulation

Correction values for acoustic quick sizing

The correction values for the distribution in the ducting are based on the number of diffusers assigned to any one shut-off damper or flow adjustment damper.
If there is just one diffuser (assumption: 140 l/s or 500 m^3/h), no correction is necessary.

One change of direction, e.g. at the horizontal connection of the diffuser plenum box, has been taken into consideration for the system attenuation values. Vertical connection of the plenum box does not result in a system attenuation. Additional bends result in lower sound pressure levels.

Octave correction for the distribution in the ducting, used to calculate the air-regenerated noise

$\dot{V}$ in [m^3/h]	500	1000	1500	2000	2500	3000	4000	5000
[l/s]	140	280	420	550	700	840	1100	1400
[dB]	0	3	5	6	7	8	9	10

System attenuation per octave to VDI 2081 for the calculation of the air-regenerated noise

Centre frequency [Hz]	63	125	250	500	1000	2000	4000	8000
	ΔL							
	dB							
Change of direction	0	0	1	2	3	3	3	3
Mündungsreflexion	10	5	2	0	0	0	0	0
Room attenuation	5	5	5	5	5	5	5	5

The calculation is based on the end reflection for nominal size 250

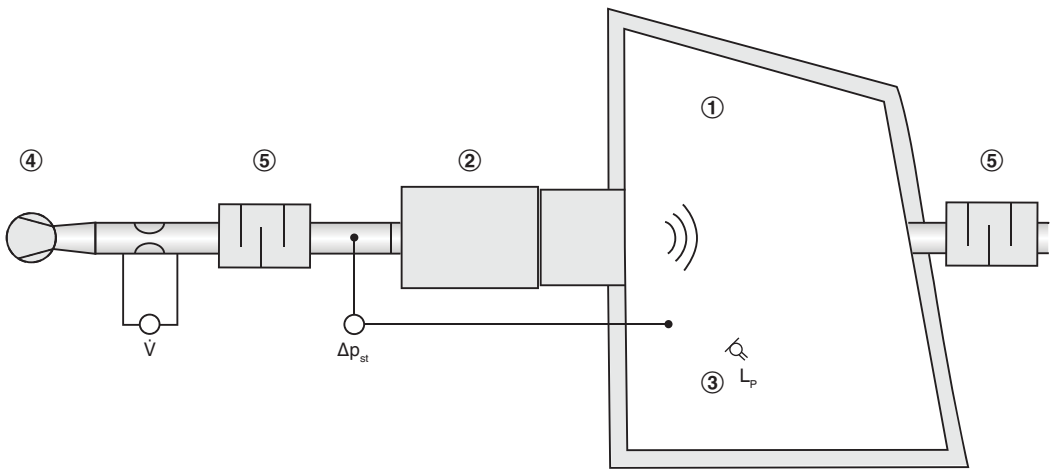
Octave correction for the calculation of case-radiated noise

Centre frequency [Hz]	63	125	250	500	1000	2000	4000	8000
	ΔL							
	dB							
Ceiling insulation	4	4	4	4	4	4	4	4
Room attenuation	5	5	5	5	5	5	5	5

Measurements

The acoustic data for the air-regenerated noise and case-radiated noise are determined according to EN ISO 5135. All measurements are carried out in a reverberation chamber to EN ISO 3741.

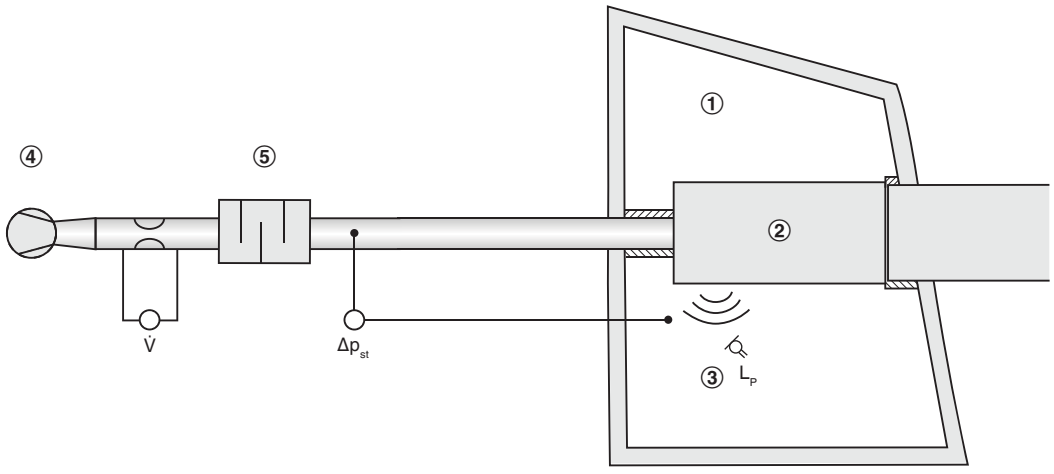
Measuring the air-regenerated noise



① Reverberation chamber
② VAV terminal unit
③ Microphone
④ Fan
⑤ Sound attenuator

The sound pressure levels for air-regenerated noise L_{PA} given by us result from measurements in a reverberation chamber. The sound pressure L_P is measured for the entire frequency range. The evaluation of the measurements, including system attenuation and A-weighting, results in the sound pressure level L_{PA}.

Measuring the case-radiated noise



① Reverberation chamber
② VAV terminal unit
③ Microphone
④ Fan
⑤ Sound attenuator

The sound pressure levels for case-radiated noise L_{PA2} given by us result from measurements in a reverberation chamber. The sound pressure L_P is measured for the entire frequency range. The evaluation of the measurements, including system attenuation and A-weighting, results in the sound pressure level L_{PA2}.

Sizing with the help of this catalogue

This catalogue provides convenient quick sizing tables for shut-off and flow adjustment dampers. The sound pressure levels for air-regenerated noise are provided for all nominal sizes. The quick sizing tables are based on normally accepted attenuation levels. Sizing data for other volume flow rates and differential pressures can be determined quickly and precisely using the Easy Product Finder design programme.

Sizing example

Given data

$\dot{V}_{max}$ = 280 l/s (1010 m³/h)
Δp_{st} = 150 Pa
Required sound pressure level in the room 30 dB(A)

Quick sizing

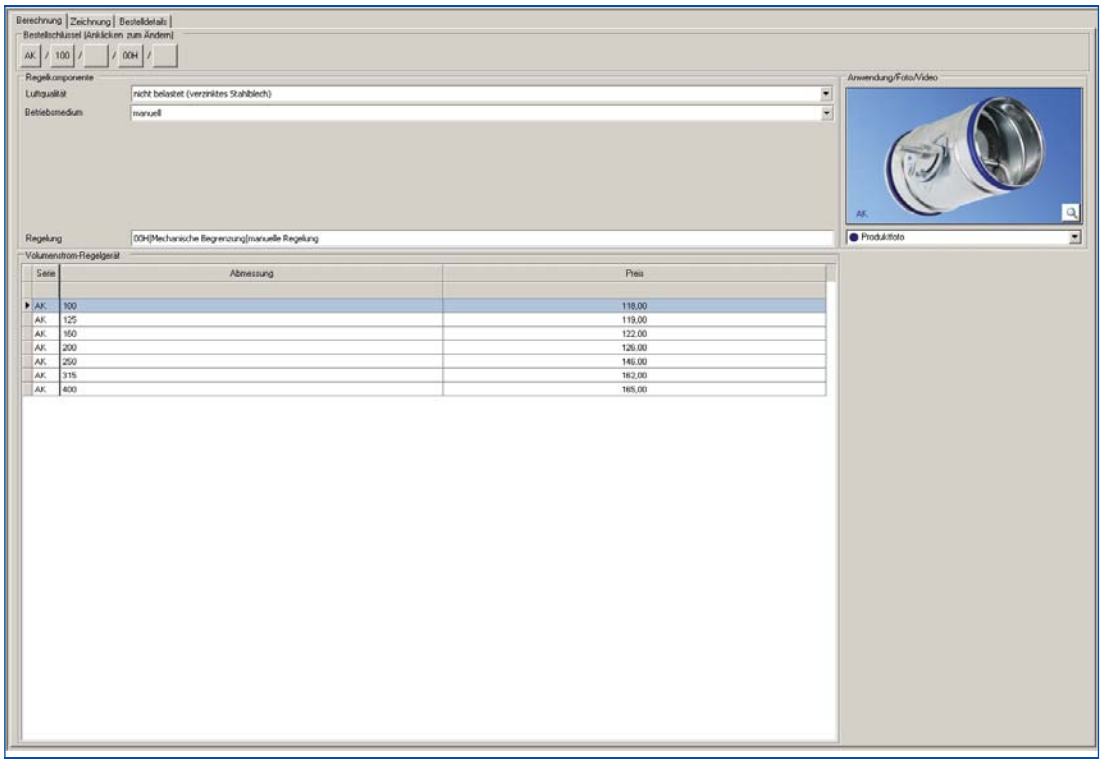
AK/100/00H
Air-regenerated noise L_{PA} = 23 dB(A)

Easy Product Finder



The Easy Product Finder allows you to size products using your project-specific data.

You will find the Easy Product Finder on our website.





4 Volume flow rate measurement

Volume flow rate measuring units are used for the recording of volume flow rates.

4.1 Volume flow rate measuring units		Type	Page
Circular			
	For the measurement of volume flow rates in ducts	**VMR**	**4.1 – 1**
Rectangular			
	For the measurement of volume flow rates in ducts	**VME**	**4.1 – 15**
Acoustically optimised			
	For the measurement of volume flow rates in ducts with contaminated air	**VMRK**	**4.1 – 27**
	For the measurement of volume flow rates in ducts with contaminated air from laboratories	**VMLK**	**4.1 – 40**
4.2 Differential pressure transducers for volume flow rate measuring units			
	For the dynamic measurement of effective and differential pressures	**Dynamic differential pressure transducers**	**4.2 – 1**
	For the static effective and differential pressure measurement	**Static differential pressure transducers**	**4.2 – 5**
4.3 Basic information and nomenclature			
	Volume flow rate measurement		**4.3 – 1**

Volume flow rate measuring units
Type VMR



Variant with circular spigot



Static differential pressure transducer



Dynamic differential pressure transducer



Tested to VDI 6022



4

For the measurement of volume flow rates in ducts

Circular volume flow rate measuring units
for the recording or monitoring of volume flow rates

- Manual volume flow rate measuring
- Permanent volume flow rate measuring
- Recording of measured values for other controllers or for the LABCONTROL air management system
- Pressure transducer for the automatic recording of measured values, factory assembled and complete with wiring and tubing
- Casing air leakage to EN 15727, class C

Optional equipment and accessories

- With flanges on both ends
- Lip seal
- Dynamic or static differential pressure transducers

Type		Page
VMR	General information	4.1 – 2
	Order code	4.1 – 4
	Aerodynamic data	4.1 – 7
	Dimensions and weight – VMR	4.1 – 8
	Dimensions and weight – VMR-FL	4.1 – 9
	Installation details	4.1 – 10
	Specification text	4.1 – 11
	Basic information and nomenclature	4.3 – 1

Variants

Product examples

Volume flow rate measuring unit, variant VMR



Volume flow rate measuring unit, variant VMR, with differential pressure transducer



4

Description

For detailed information on pressure transducers see chapter K5 – 4.2.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- Circular volume flow rate measuring units Type VMR for the manual recording or automatic measuring of volume flow rates
- Simplified commissioning, approval and maintenance
- Suitable for permanent installation because of low differential pressure
- Optional static differential pressure transducer for systems with polluted air

Variants
- VMR: Volume flow rate measuring unit
- VMR-FL: Volume flow rate measuring unit with flanges on both ends

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Nominal sizes
- 100, 125, 160, 200, 250, 315, 400

Attachments
- Dynamic differential pressure transducer
- Static differential pressure transducer
- LABCONTROL: Components for air management systems

Accessories
- Lip seals on both ends (factory fitted)
- Matching flanges for both ends

Special characteristics
- Measurement accuracy ± 5 %
- Low differential pressure of only about 10 – 26 % of the measured effective pressure

Parts and characteristics
- Ready-to-commission unit which consists of the mechanical parts and an optional pressure transducer
- Averaging differential pressure sensor for volume flow rate measurement
- Optional factory-assembled pressure transducers complete with wiring and tubing
- High measurement accuracy (even with upstream bend R = 1D).

Construction features
- Circular casing
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Connecting nipple for tubes with 6 mm inside diameter
- VMR-FL: Circular flanges to EN 12220

Materials and surfaces
Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Aluminium sensor tubes

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Sensor tubes made of aluminium, powder-coated

Stainless steel construction (A2)
- Casing, damper blade and shaft made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

Installation and commissioning
- Any installation orientation (except units with static differential pressure transducer)
- Note the upstream conditions
- Static differential pressure transducer: Check zero point and correct, if necessary

Standards and guidelines
- Hygiene conforms to VDI 6022
- Casing air leakage to EN 15727, class C

Maintenance
- Maintenance-free as construction and materials are not subject to wear
- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

Attachments: VARYCONTROL differential pressure transducer for Type VMR

Order code detail	Differential pressure transducer	Measurement principle
Universal		
B10	Universal controller with integral differential pressure transducer TROX/Belimo	Dynamic
BB0	Universal controller with separate differential pressure transducer TROX/Belimo	Static

Attachments: LABCONTROL differential pressure transducer for Type VMR

Order code detail	Differential pressure transducer	Measurement principle
EASYLAB		
ELAB	EASYLAB TCU3 (recording of measured values for EASYLAB system)	Static
TCU-LON-II		
TM0	Electronic controller TCU-LON-II with LonWorks interface	Static

4

Technical data

Nominal sizes	100 – 400 mm
Volume flow rate range	10 – 1680 l/s or 36 – 6048 m^3/h
Measurement accuracy	± 5 % of the measured value
Effective pressure range	approx. 5 – 250 Pa
Measuring unit differential pressure (pressure loss)	10 – 26 % of the measured effective pressure
Operating temperature	10 – 50 °C

Order code

VARYCONTROL

VMR

VMR – P1 – FL / 160 / G2 / B10 / E0
1 2 3 4 5 6 7

1 Type
VMR Circular volume flow rate measuring unit

2 Material
No entry: galvanised sheet steel
P1 Powder-coated (RAL 7001), silver grey
A2 Stainless steel

3 Flange
No entry: none
FL Flanges on both ends

4 Nominal size [mm]
100
125
160
200
250
315
400

5 Accessories
No entry: none
D2 Lip seals on both ends
G2 Matching flanges for both ends

6 Attachments (differential pressure transducer)
No entry: none
B10 Dynamic differential pressure transducer
BB0 Static differential pressure transducer

7 Signal voltage range
For the actual value signal
Only for attachment B10
E0 0 – 10 V
E2 2 – 10 V

4

Order example

VARYCONTROL

VMR/160/D2/B10/E0

Nominal size	160 mm
Accessories	Lip seals on both ends
Differential pressure transducer	Dynamic
Actual value signal	0 – 10 V

Order code
LABCONTROL
EASYLAB

VMR with EASYLAB for the recording of measured values

VMR – P1 – FL / 160 / G2 / ELAB / EC – E0 / ULZ
1 2 3 4 5 6 7 8 9

1 Type
VMR Circular volume flow rate measuring unit

2 Material
No entry: galvanised sheet steel
P1 Powder-coated, silver grey (RAL 7001)
A2 Stainless steel

3 Flange
No entry: none
FL Flanges on both ends

4 Nominal size [mm]
100
125
160
200
250
315
400

5 Accessories
No entry: none
D2 Lip seals on both ends
G2 Matching flanges for both ends

6 Attachments (control component)
ELAB EASYLAB TCU3

7 Equipment function
SC Supply air recording
EC Extract air recording

8 Voltage range for the actual value signal
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC

9 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Order code
LABCONTROL
EASYLAB

VMR with EASYLAB for fume cupboard control with external signalling (frequency converter)

VMR – P1 – FL / 160 / G2 / ELAB / FH – VS / ULZS / ...

1 2 3 4 5 6 7 8 9

1 Type
VMR Circular volume flow rate measuring unit

2 Material
No entry: galvanised sheet steel
P1 Powder-coated, silver grey (RAL 7001)
A2 Stainless steel

3 Flange
No entry: none
FL Flanges on both ends

4 Nominal size [mm]
100
125
160
200
250
315
400

5 Accessories
No entry: none
D2 Lip seals on both ends
G2 Matching flanges for both ends

6 Attachments (control component)
ELAB EASYLAB controller TCU3

7 Equipment function
With face velocity transducer
FH-VS Face velocity control
With sash distance sensor
FH-DS Linear control strategy
FH-DV Safety-optimised control strategy
With switching steps
for on-site switch contacts
FH-2P 2 switching steps
FH-3P 3 switching steps
Without signalling
FH-F Volume flow rate constant value

8 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
S EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

9 Operating values [m³/h or l/s]
Depending on the equipment function
VS: $\dot{V}_{min} - \dot{V}_{max}$
DS: $\dot{V}_{min} - \dot{V}_{max}$
DV: $\dot{V}_{min} - \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
BE-SEG-** 2-character display
BE-LCD-01 40-character display

Volume flow rate ranges

Nominal size	$\dot{V}_{Nenn}$		$\dot{V}_{min}$		C-Wert		Δp_{st}	$\Delta\dot{V}$
	l/s	m³/h	l/s	m³/h	l/s	m³/h	%	± %
100	**95**	**342**	10	36	6.1	22	26	5
125	**150**	**540**	15	54	9.7	35	24	5
160	**250**	**900**	25	90	15.9	57	22	5
200	**405**	**1458**	40	144	25.5	92	19	5
250	**615**	**2214**	60	216	39.0	140	17	5
315	**1030**	**3708**	105	378	65.0	234	15	5
400	**1680**	**6048**	170	612	106.0	382	10	5

K value for air density 1.2 kg/m³, Δp_{st} in relation to the measured effective pressure

Volume flow rate calculation

Calculation conditions

- The volume flow rate is calculated based on the measured effective pressure
- The effective pressure is measured using an electronic manometer or an inclined tube manometer
- Air density ρ = 1.2 kg/m³

Volume flow rate calculation for air density 1.2 kg/m³

$$\dot{V} = C \times \sqrt{\Delta p_w}$$

Volume flow rate calculation for other air densities

$$\dot{V} = C \times \sqrt{\Delta p_w} \times \sqrt{\frac{1.2}{\rho}}$$

Calculation example

Given data

- VMR/160
- Δp_w = 100 Pa (manometer reading of effective pressure)
- Volume flow rate $\dot{V}$ [m³/h]

Unit data

- K value from table: K = 57 m³/h (15.9 l/s)

Calculation procedure

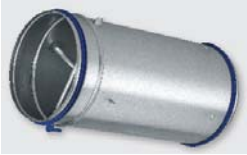
$$\dot{V} = 15.9 \times \sqrt{100}$$

$$\dot{V} = 159 \text{ l/s}$$

4

Description

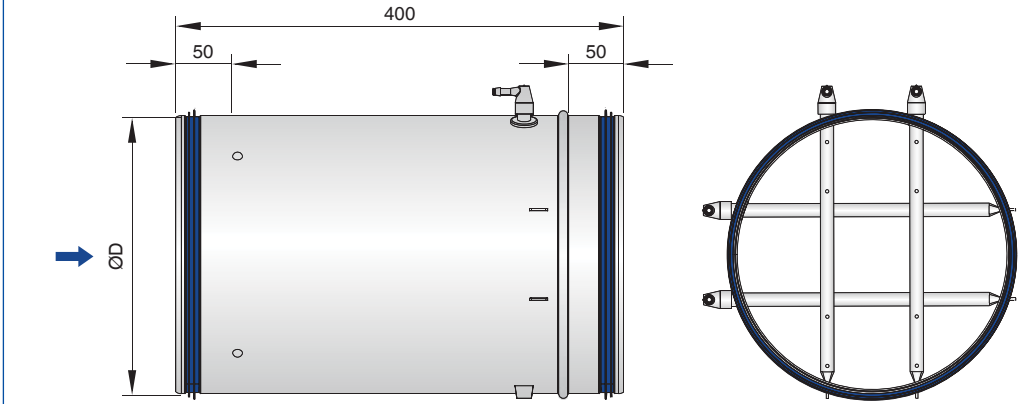
- Volume flow rate measuring unit
- Spigot to make connections to the ducting



Volume flow rate measuring unit, variant VMR

Dimensions

VMR



Weight without attachments

Dimensions [mm] and weight [kg]

Nominal size	VMR	
	ØD	m
	mm	kg
100	99	0.8
125	124	1.0
160	159	1.4
200	199	1.7
250	249	2.1
315	314	2.7
400	399	3.4

Description

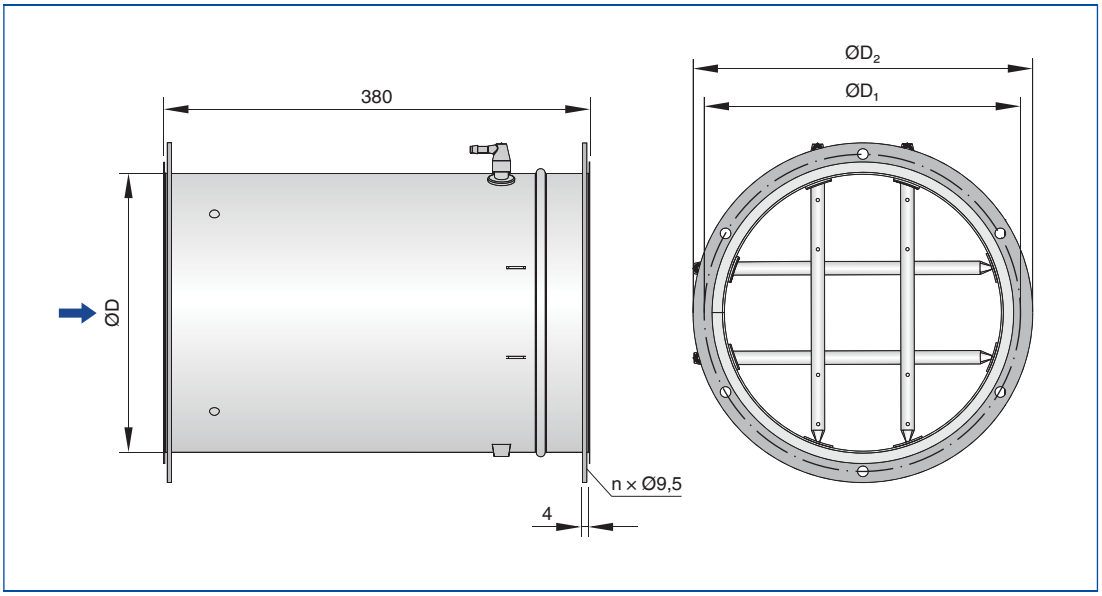
- Volume flow rate measuring unit
- With flanges on both ends to make detachable connections to the ducting



Volume flow rate measuring unit, variant VMR/.../BB0

Dimensions

VMR-FL



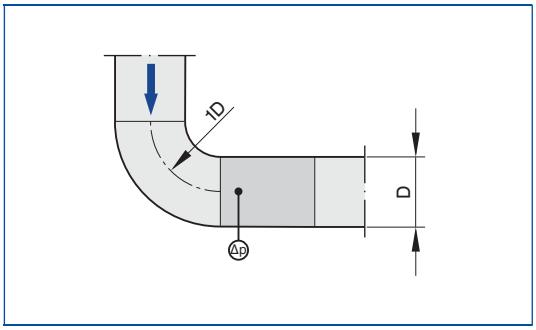
Dimensions [mm] and weight [kg]

Nominal size	ØD	$ØD_1$	$ØD_2$	n	T	m
	mm				mm	kg
100	99	132	152	4	4	1.2
125	124	157	177	4	4	1.5
160	159	192	212	6	4	2.1
200	199	233	253	6	4	2.7
250	249	283	303	6	4	3.3
315	314	352	378	8	4	4.5
400	399	438	464	8	4	5.7

Upstream conditions

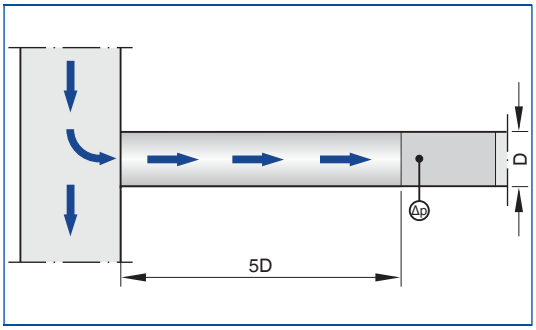
The volume flow rate accuracy ΔV̇ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require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

Bend



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

Junction

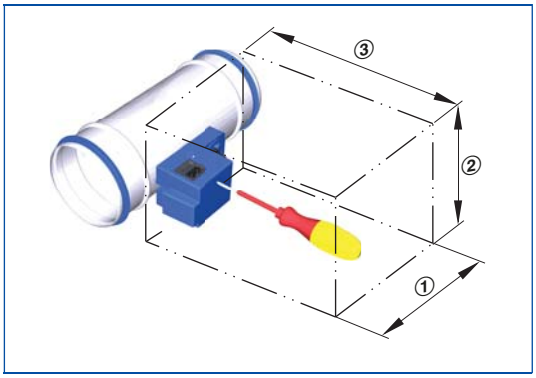


A junction causes strong turbulence. The stated volume flow rate accuracy ΔV̇ can only be achieved with a straight duct section of at least 5D upstream. Shorter upstream sections require a perforated plate in the branch and before the measuring unit. If there is no straight upstream section at all, the actual value signal may not be stable, even with a perforated plate.

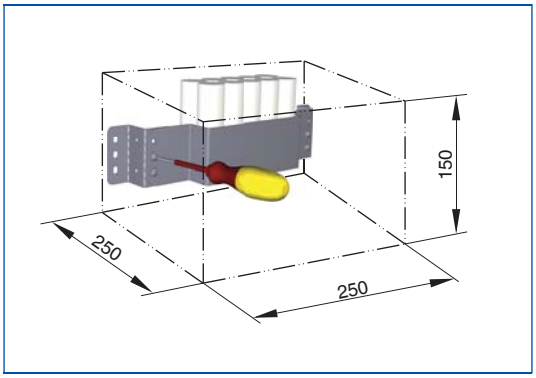
Space requirement for commissioning and maintenance

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



Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Space required

Attachments	①	②	③
	mm		
Without attachments	200	200	200
VARYCONTROL			
Universal controller	250	200	250
LABCONTROL			
EASYLAB	350	350	400

Standard text

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 rate measuring unit
for the measurement of volume flow rates in air conditioning systems, available in 7 nominal sizes.
For the manual volume flow rate measuring or for the permanent monitoring of the actual value signal.
Ready-to-commission unit which consists of the casing with an averaging differential pressure sensor.
Differential pressure sensor with 3 mm measuring holes, thus resistant to dust and pollution.
Both ends spigot with groove for lip seal, suitable for connecting ducts to EN 1506 or EN 13180.
Casing air leakage to EN 1751, class C.

Special characteristics
- Measurement accuracy ± 5 %
- Low differential pressure of only about 10 – 26 % of the measured effective pressure

Materials and surfaces
Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Aluminium sensor tubes

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated
- Sensor tubes made of aluminium, powder-coated

Stainless steel construction (A2)
- Casing, damper blade and shaft made of stainless steel 1.4301
- Sensor tubes made of aluminium, powder-coated

Construction
- Galvanised sheet steel
- P1: Powder-coated, silver grey (RAL 7001)
- A2: Stainless steel

Technical data
- Nominal sizes: 100 to 400 mm
- Volume flow rate range: 10 to 1680 l/s or 36 to 6048 m^3/h
- Effective pressure range: approx. 5 – 250 Pa
- Measuring unit differential pressure (pressure loss): 10 – 26 % of the measured effective pressure
- Operating temperature: 10 to 50 °C

Attachments
Volume flow rate measurement with static differential pressure transducer emitting an actual value signal for integration into the central BMS.
- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC or 2 – 10 V DC
- TCU-LON-II: Integration with LonWorks
- EASYLAB: Integration using either 0 – 10 V DC signals or expansion modules (LonWorks, BACnet MS/TP, Modbus RTU)

Sizing data
- $\dot{V}[m^3/h]$

4

Order options

VARYCONTROL

1 Type
VMR Circular volume flow rate measuring unit

2 Material
No entry: galvanised sheet steel
☐ **P1** Powder-coated (RAL 7001), silver grey
☐ **A2** Stainless steel

3 Flange
No entry: none
☐ **FL** Flanges on both ends

4 Nominal size [mm]
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

5 Accessories
No entry: none
☐ **D2** Lip seals on both ends
☐ **G2** Matching flanges for both ends

6 Attachments (differential pressure transducer)
No entry: none
☐ **B10** Dynamic differential pressure transducer
☐ **BB0** Static differential pressure transducer

7 Signal voltage range
For the actual value signal
Only for attachment B10
☐ **E0** 0 – 10 V
☐ **E2** 2 – 10 V

Order options
LABCONTROL
EASYLAB

1 Type
VMR Circular volume flow rate measuring unit

2 Material
No entry: galvanised sheet steel
☐ **P1** Powder-coated, silver grey (RAL 7001)
☐ **A2** Stainless steel

3 Flange
No entry: none
☐ **FL** Flanges on both ends

4 Nominal size [mm]
☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

5 Accessories
No entry: none
☐ **D2** Lip seals on both ends
☐ **G2** Matching flanges for both ends

6 Attachments (control component)
ELAB EASYLAB TCU3

7 Equipment function
☐ **SC** Supply air recording
☐ **EC** Extract air recording

8 Voltage range for the actual value signal
☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC

9 Module expansions
Option 1: Power supply
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Order options

LABCONTROL

EASYLAB

1 Type

VMR Circular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel
☐ **P1** Powder-coated, silver grey (RAL 7001)
☐ **A2** Stainless steel

3 Flange

No entry: none
☐ **FL** Flanges on both ends

4 Nominal size [mm]

☐ **100**
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

5 Accessories

No entry: none
☐ **D2** Lip seals on both ends
☐ **G2** Matching flanges for both ends

6 Attachments (control component)

ELAB EASYLAB controller TCU3

7 Equipment function

With face velocity transducer
☐ **FH-VS** Face velocity control
With sash distance sensor
☐ **FH-DS** Linear control strategy
☐ **FH-DV** Safety-optimised control strategy
With switching steps
for on-site switch contacts
☐ **FH-2P** 2 switching steps
☐ **FH-3P** 3 switching steps
Without signalling
☐ **FH-F** Volume flow rate constant value

8 Expansion modules

Option 1: Supply voltage
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
☐ **S** EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

9 Operating values [m³/h or l/s]

Depending on the equipment function
VS: $\dot{V}_{min} - \dot{V}_{max}$
DS: $\dot{V}_{min} - \dot{V}_{max}$
DV: $\dot{V}_{min} - \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions

Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
☐ **BE-SEG-**** 2-character display
☐ **BE-LCD-01** 40-character display

4

Volume flow rate measuring units

Type VME



For the measurement of volume flow rates in ducts

Rectangular volume flow rate measuring units for the recording or monitoring of volume flow rates

- Manual volume flow rate measuring
- Permanent volume flow rate measuring
- Recording of measured values for other controllers or for the LABCONTROL air management system
- Suitable for airflow velocities of up to 10 m/s
- Pressure transducer for the automatic recording of measured values, factory assembled and complete with wiring and tubing
- Casing air leakage to EN 15727, up to class C



Static differential pressure transducer



Dynamic differential pressure transducer

Type		Page
VME	General information	4.1 – 16
	Order code	4.1 – 18
	Aerodynamic data	4.1 – 20
	Dimensions and weight	4.1 – 22
	Installation details	4.1 – 24
	Specification text	4.1 – 25
	Basic information and nomenclature	4.3 – 1

Variants

Product examples

Volume flow rate measuring unit, variant VME



Volume flow rate measuring unit, variant VME, with differential pressure transducer



4

Description

For detailed information on pressure transducers see chapter K5 – 4.2.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- Rectangular volume flow rate measuring units Type VME for the manual recording or automatic measuring of volume flow rates
- Simplified commissioning, approval and maintenance
- Suitable for permanent installation because of low differential pressure

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

Nominal sizes
- 39 nominal sizes from 200 × 100 to 1000 × 1000

Attachments
- Dynamic differential pressure transducer
- Static differential pressure transducer
- LABCONTROL: Components for air management systems

Special features
- Measurement accuracy ± 5 % even with unfavourable upstream conditions
- Effective pressure range: approx. 8 – 200 Pa
- Low differential pressure of only about 17 – 32 % of the measured effective pressure

Parts and characteristics
- Ready-to-commission unit which consists of the mechanical parts and an optional pressure transducer
- Averaging differential pressure sensor for volume flow rate measurement
- Optional factory-assembled pressure transducers complete with wiring and tubing
- High measurement accuracy

Construction features
- Rectangular casing
- Flanges on both sides, suitable for duct connection
- Connecting nipple for tubes with 6 mm inside diameter

Materials and surfaces
Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Aluminium sensor tubes

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated

Installation and commissioning
- Any installation orientation (except units with static differential pressure transducer)
- Note the upstream and downstream conditions
- Static differential pressure transducer: Check zero point and correct, if necessary

Standards and guidelines
– Casing air leakage to EN 15727, class C (B + H) ≤ 400, class B)

Maintenance
– Maintenance-free as construction and materials are not subject to wear
– Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

Attachments: VARYCONTROL differential pressure transducer for Type VME

Order code detail	Differential pressure transducer	Measurement principle
Universal		
B10	Universal controller with integral differential pressure transducer TROX/Belimo	Dynamic
BB0	Universal controller with separate differential pressure transducer TROX/Belimo	Static

Attachments: LABCONTROL differential pressure transducer for Type VME

Order code detail	Differential pressure transducer	Measurement principle
EASYLAB		
ELAB	EASYLAB TCU3 (recording of measured values for EASYLAB system)	Static
TCU-LON-II		
TM0	Electronic controller TCU-LON-II with LonWorks interface	Static

Technical data

Nominal sizes	200 x 100 – 1000 x 1000
Volume flow rate range	45 – 10100 l/s or 162 – 36360 m^3/h
Measurement accuracy	± 5 % of the measured value
Effective pressure range	Approx. 8 – 200 Pa
Measuring unit differential pressure (pressure loss)	17 – 32 % of the measured effective pressure
Operating temperature	10 – 50 °C

Order code

VARYCONTROL

VME

VME – P1 / 600×400 / B10 / E0

1 2 3 4 5

1 Type

VME Rectangular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel

P1 Powder-coated (RAL 7001), silver grey

3 Nominal size [mm]

B × H

4 Attachments (differential pressure transducer)

No entry: none

B10 Dynamic differential pressure transducer

BB0 Static differential pressure transducer

5 Signal voltage range

For the actual value signal

Only for attachment B10

E0 0 – 10 V

E2 2 – 10 V

Order example

VME/600×400/B10/E0

Nominal size	600 × 400 mm
Differential pressure transducer	Dynamic
Actual value signal	0 – 10 V

4

Order code
LABCONTROL
EASYLAB

VME with EASYLAB for the recording of measured values

VME – P1 / 600×400 / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 8

1 Type
VME Rectangular volume flow rate measuring unit

2 Material
No entry: galvanised sheet steel
P1 Powder-coated (RAL 7001), silver grey

3 Nominal size [mm]
B × H

4 Attachments
ELAB EASYLAB controller TCU3

5 Equipment function
SC Supply air recording
EC Extract air recording

6 Voltage range for the actual value signal
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC

7 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Volume flow rate ranges

Nominal size	$\dot{V}_{Nenn}$		$\dot{V}_{min}$		C-Wert		Δp_{st}	$\Delta\dot{V}$
	l/s	m³/h	l/s	m³/h	l/s	m³/h	%	± %
200 × 100	215	774	45	162	14.8	53	19	5
300 × 100	320	1152	65	234	21.2	76	18	5
400 × 100	425	1530	85	306	28.8	104	18	5
500 × 100	535	1926	105	378	35.0	126	17	5
600 × 100	650	2340	130	468	44.0	158	18	5
200 × 200	415	1494	85	306	30.0	108	21	5
300 × 200	620	2232	125	450	45.0	162	21	5
400 × 200	825	2970	165	594	60.0	216	21	5
500 × 200	1035	3726	205	738	75.0	270	21	5
600 × 200	1250	4500	250	900	90.0	324	21	5
700 × 200	1450	5220	290	1044	107.0	385	22	5
800 × 200	1650	5940	330	1188	120.0	432	21	5
300 × 300	920	3312	185	666	75.0	270	23	5
400 × 300	1230	4428	245	882	100.0	360	23	5
500 × 300	1535	5526	305	1098	137.0	493	28	5
600 × 300	1850	6660	370	1332	147.0	529	22	5
700 × 300	2150	7740	430	1548	174.0	626	23	5
800 × 300	2450	8820	490	1764	207.0	745	25	5
900 × 300	2770	9972	555	1998	228.0	821	24	5
1000 × 300	3100	11160	620	2232	254.0	914	24	5
400 × 400	1630	5868	325	1170	146.0	526	28	5
500 × 400	2040	7344	410	1476	183.0	659	28	5
600 × 400	2450	8820	490	1764	212.0	763	26	5
700 × 400	2850	10260	570	2052	239.0	860	25	5
800 × 400	3250	11700	650	2340	281.0	1012	26	5
900 × 400	3670	13212	735	2646	320.0	1152	27	5
1000 × 400	4100	14760	820	2952	359.0	1292	27	5
500 × 500	2540	9144	510	1836	207.0	745	27	5
600 × 500	3050	10980	610	2196	234.0	842	24	5
700 × 500	3550	12780	710	2556	284.0	1022	26	5
800 × 500	4050	14580	810	2916	318.0	1145	25	5
900 × 500	4570	16452	915	3294	361.0	1300	25	5
1000 × 500	5100	18360	1020	3672	409.0	1472	26	5
600 × 600	3650	13140	730	2628	297.0	1069	26	5
800 × 600	4850	17460	970	3492	396.0	1426	27	5
1000 × 600	6100	21960	1220	4392	508.0	1829	28	5
800 × 800	6500	23400	1300	4680	543.0	1955	28	5
1000 × 800	8100	29160	1620	5832	681.0	2452	28	5
1000 × 1000	10100	36360	2020	7272	904.0	3254	32	5

K value for air density 1.2 kg/m³, Δp_{st} in relation to the measured effective pressure

Volume flow rate calculation

Calculation conditions

- The volume flow rate is calculated based on the measured effective pressure
- The effective pressure is measured using an electronic manometer or an inclined tube manometer
- Air density $\rho = 1.2\ kg/m^3$

Volume flow rate calculation for air density 1.2 kg/m³

$$\dot{V} = C \times \sqrt{\Delta p_w}$$

Volume flow rate calculation for other air densities

$$\dot{V} = C \times \sqrt{\Delta p_w} \times \sqrt{\frac{1.2}{\rho}}$$

Calculation example

Given data

- VME/400 × 200
- $\Delta p_w = 100$ Pa (manometer reading of effective pressure)
- Volume flow rate $\dot{V}$ [m³/h]

Unit data

- K value from table: K = 216 m³/h (60 l/s)

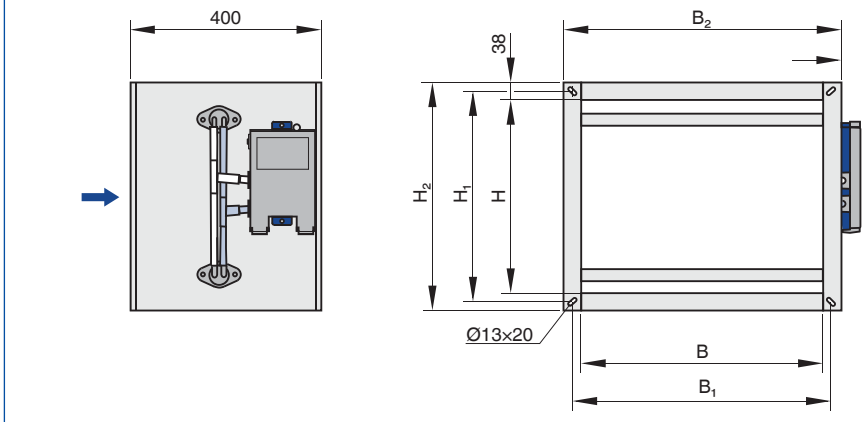
Calculation procedure

$$\dot{V} = 60.0 \times \sqrt{100}$$

$$\dot{V} = 600\ l/s$$

Dimensions

VME

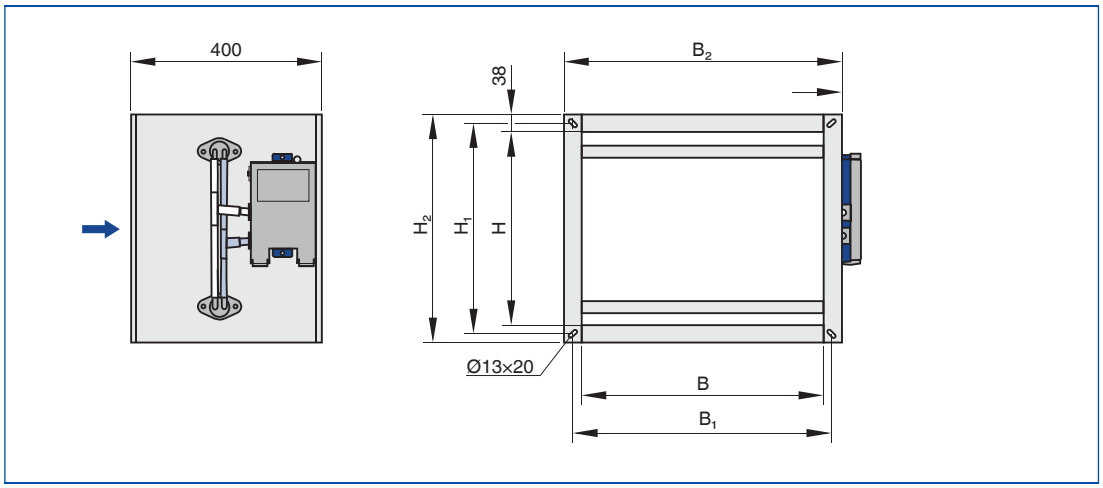


Dimensions [mm] and weight [kg]

Nominal size	Nominal width	Nominal height	B_1	B_2	H_1	H_2	m
	mm						kg
200 × 100	200	100	234	276	134	176	5.0
300 × 100	300	100	334	376	134	176	6.0
400 × 100	400	100	434	476	134	176	7.0
500 × 100	500	100	534	576	134	176	8.0
600 × 100	600	100	634	676	134	176	10.0
200 × 200	200	200	234	276	234	276	6.0
300 × 200	300	200	334	376	234	276	7.0
400 × 200	400	200	434	476	234	276	8.5
500 × 200	500	200	534	576	234	276	10.0
600 × 200	600	200	634	676	234	276	11.0
700 × 200	700	200	734	776	234	276	12.5
800 × 200	800	200	834	876	234	276	13.5
300 × 300	300	300	334	376	334	376	8.0
400 × 300	400	300	434	476	334	376	9.5
500 × 300	500	300	534	576	334	376	11.0
600 × 300	600	300	634	676	334	376	12.0
700 × 300	700	300	734	776	334	376	13.5
800 × 300	800	300	834	876	334	376	14.5
900 × 300	900	300	934	976	334	376	16.0
1000 × 300	1000	300	1034	1076	334	376	17.0

Dimensions

VME



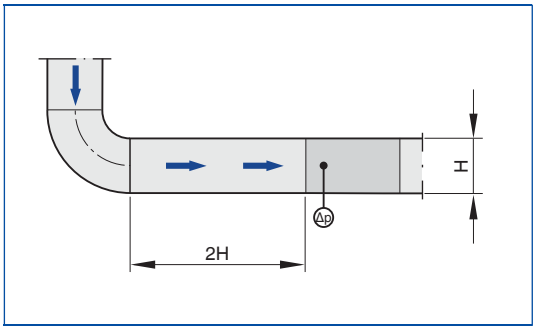
Dimensions [mm] and weight [kg]

Nominal size	Nominal width	Nominal height	B_1	B_2	H_1	H_2	m
	mm						kg
400 × 400	400	400	434	476	434	476	10.5
500 × 400	500	400	534	576	434	476	11.5
600 × 400	600	400	634	676	434	476	13.0
700 × 400	700	400	734	776	434	476	14.5
800 × 400	800	400	834	876	434	476	15.5
900 × 400	900	400	934	976	434	476	17.0
1000 × 400	1000	400	1034	1076	434	476	18.0
500 × 500	500	500	534	576	534	576	14.0
600 × 500	600	500	634	676	534	576	16.0
700 × 500	700	500	734	776	534	576	17.5
800 × 500	800	500	834	876	534	576	19.5
900 × 500	900	500	934	976	534	576	23.0
1000 × 500	1000	500	1034	1076	534	576	20.5
600 × 600	600	600	634	676	634	676	17.0
800 × 600	800	600	834	876	634	676	20.0
1000 × 600	1000	600	1034	1076	634	676	23.0
800 × 800	800	800	834	876	834	876	22.0
1000 × 800	1000	800	1034	1076	834	876	25.0
1000 × 1000	1000	1000	1034	1076	1034	1076	27.0

Upstream conditions

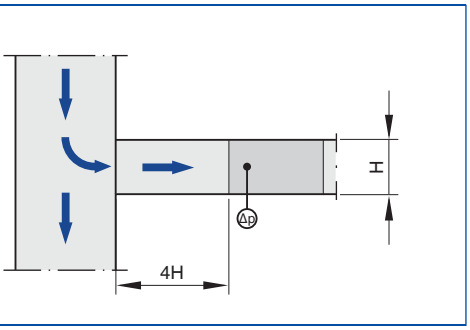
The volume flow rate accuracy ΔV̇ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require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

Bend, vertical



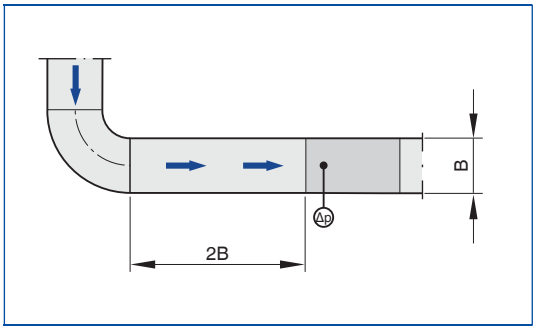
A bend – with a straight duct section of at least 2H upstream of the volume flow rate measuring unit – has only a negligible effect on the volume flow rate accuracy.

Junction, vertical



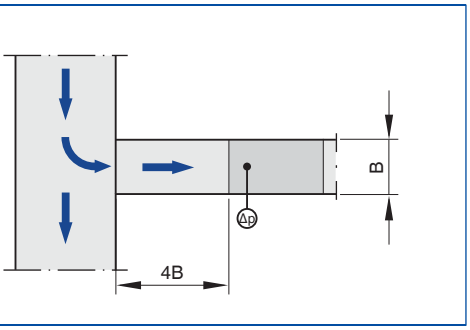
A junction causes strong turbulence.
The stated volume flow rate accuracy ΔV̇ can only be achieved with a straight duct section of at least 4H upstream. Shorter upstream sections require a perforated plate in the branch and before the measuring unit. If there is no straight upstream section at all, the actual value signal may not be stable, even with a perforated plate.

Bend, horizontal



A bend – with a straight duct section of at least 2B upstream of the volume flow rate measuring unit – has only a negligible effect on the volume flow rate accuracy.

Junction, horizontal

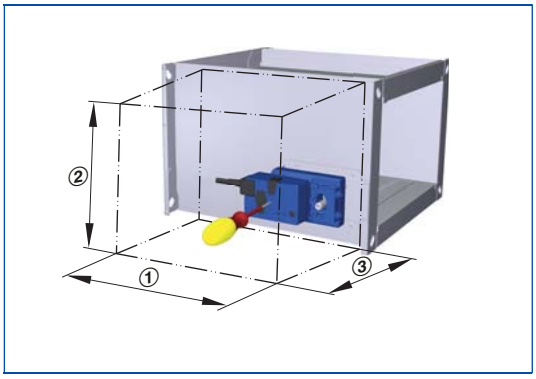


A junction causes strong turbulence.
The stated volume flow rate accuracy ΔV̇ can only be achieved with a straight duct section of at least 4B upstream. Shorter upstream sections require a perforated plate in the branch and before the measuring unit. If there is no straight upstream section at all, the actual value signal may not be stable, even with a perforated plate.

Space requirement 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



Space required

Attachments	①	②	③
	mm		
Without attachments	200	H	200
VARYCONTROL			
Universal controller	300	H	300
LABCONTROL			
EASYLAB	500	H	400

H: Unit height

Standard text

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

Rectangular volume flow rate measuring unit for the measurement of volume flow rates in air conditioning systems, available in 39 nominal sizes. For the manual volume flow rate measuring or for the permanent monitoring of the actual value signal. Ready-to-commission unit which consists of the casing with an averaging differential pressure sensor. Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution).
Both ends suitable for the connection of air duct profiles.
Casing air leakage to EN 15727, class B.

Special features
- Measurement accuracy ± 5 % even with unfavourable upstream conditions
- Effective pressure range: approx. 8 – 200 Pa
- Low differential pressure of only about 17 – 32 % of the measured effective pressure

Materials and surfaces
Galvanised sheet steel construction
- Casing made of galvanised sheet steel
- Aluminium sensor tubes

Powder-coated construction (P1)
- Casing made of galvanised sheet steel, powder-coated

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

Technical data
- Nominal sizes: 200 × 100 to 1000 × 1000
- Volume flow rate range: 45 to 10100 l/s or 162 to 36360 m^3/h
- Effective pressure range: approx. 8 – 200 Pa
- Measuring unit differential pressure (pressure loss): 17 – 32 % of the measured effective pressure
- Operating temperature: 10 to 50 °C

Attachments
Volume flow rate measurement with static differential pressure transducer emitting an actual value signal for integration into the central BMS.
- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC or 2 – 10 V DC
- TCU-LON-II: Integration with LonWorks
- EASYLAB: Integration using either 0 – 10 V DC signals or expansion modules (LonWorks, BACnet MS/TP, Modbus RTU)

Sizing data
- $\dot{V}[m^3/h]$

Order options
VARYCONTROL

1 Type
VME Rectangular volume flow rate measuring unit

2 Material
No entry: galvanised sheet steel
☐ **P1** Powder-coated (RAL 7001), silver grey

3 Nominal size [mm]
B × H

4 Attachments (differential pressure transducer)
No entry: none
☐ **B10** Dynamic differential pressure transducer
☐ **BB0** Static differential pressure transducer

5 Signal voltage range
For the actual value signal
Only for attachment B10
☐ **E0** 0 – 10 V
☐ **E2** 2 – 10 V

Order options

LABCONTROL

EASYLAB

1 Type

VME Rectangular volume flow rate measuring unit

2 Material

No entry: galvanised sheet steel

☐ **P1** Powder-coated (RAL 7001), silver grey

3 Nominal size [mm]

B × H

4 Attachments

ELAB EASYLAB controller TCU3

5 Equipment function

☐ **SC** Supply air recording

☐ **EC** Extract air recording

6 Voltage range for the actual value signal

☐ **E0** Voltage signal 0 – 10 V DC

☐ **E2** Voltage signal 2 – 10 V DC

7 Module expansions

Option 1: Power supply

No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC

☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

☐ **L** EM-LON for LonWorks FTT-10A

☐ **B** EM-BAC-MOD-01 for BACnet MS/TP

☐ **M** EM-BAC-MOD-01 for Modbus RTU

☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver

☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction

No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Volume flow rate measuring units

Type VMRK





Variant with circular spigot



Static differential pressure transducer



Tested to VDI 6022

For the measurement of volume flow rates in ducts with contaminated air

Plastic circular volume flow rate measuring units for the recording or monitoring of volume flow rates

- Manual volume flow rate measuring
- Permanent volume flow rate measuring
- Recording of measured values for other controllers or for the LABCONTROL air management system
- Pressure transducer for the automatic recording of measured values, factory assembled and complete with wiring and tubing
- Casing made of flame-resistant polypropylene (PPs)
- Casing air leakage to EN 15727, class C

Optional equipment and accessories

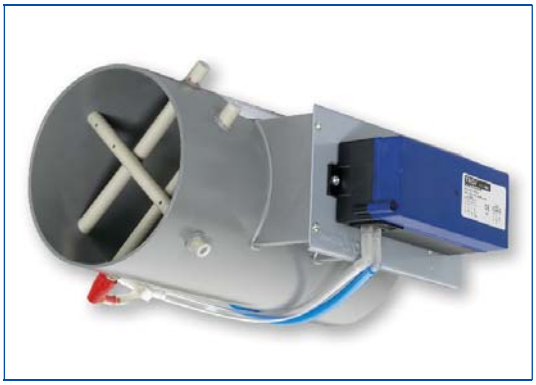
- With flanges on both ends

Type		Page
VMRK	General information	4.1 – 28
	Order code	4.1 – 30
	Aerodynamic data	4.1 – 33
	Dimensions and weight – VMRK	4.1 – 34
	Dimensions and weight – VMRK-FL	4.1 – 35
	Installation details	4.1 – 36
	Specification text	4.1 – 37
	Basic information and nomenclature	4.3 – 1

Variants

Product examples

Volume flow rate measuring unit, variant VMRK



Volume flow rate measuring unit, variant VMRK-FL



4

Description

For detailed information on pressure transducers see chapter K5 – 4.2.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- Plastic circular volume flow rate measuring units Type VMRK for the manual or automatic measuring of volume flow rates
- Suitable for contaminated air
- Simplified commissioning, approval and maintenance
- Suitable for permanent installation because of low differential pressure

Variants
- VMRK: Volume flow rate measuring unit
- VMRK-FL: Volume flow rate measuring unit with flanges on both ends

Nominal sizes
- 125, 160, 200, 250, 315, 400

Attachments
- Static differential pressure transducer
- LABCONTROL components for air management systems

Accessories
- Matching flanges for both ends

Special features
- Measurement accuracy ± 5 % even with unfavourable upstream conditions
- Effective pressure range: approx. 5 – 250 Pa
- Low differential pressure of only about 15 – 24 % of the measured effective pressure

Parts and characteristics
- Ready-to-commission unit which consists of the mechanical parts and an optional pressure transducer
- Averaging differential pressure sensor for volume flow rate measurement; can be removed for cleaning
- Optional factory-assembled pressure transducers complete with wiring and tubing
- High measurement accuracy (even with upstream bend R = 1D)

Construction features
- Circular casing
- Spigot suitable for ducts according to DIN 8077
- Connecting nipple for tubes with 6 mm inside diameter

Materials and surfaces
- Casing made of flame-resistant polypropylene (PPs)
- Differential pressure sensor made of polypropylene (PP)

Installation and commissioning
- Installation orientation is relevant
- Static differential pressure transducer: Check zero point and correct, if necessary

Standards and guidelines
- Hygiene conforms to VDI 6022
- Casing air leakage to EN 15727, class C

Maintenance
- Maintenance-free as construction and materials are not subject to wear
- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

Attachments: VARYCONTROL differential pressure transducer for Type VMRK

Order code detail	Differential pressure transducer	Measurement principle
Universal		
BB0	Universal controller with separate differential pressure transducer TROX/Belimo	Static

Attachments: LABCONTROL differential pressure transducer for Type VMRK

Order code detail	Differential pressure transducer	Measurement principle
EASYLAB		
ELAB	EASYLAB TCU3 (recording of measured values for EASYLAB system)	Static
TCU-LON-II		
TM0	Electronic controller TCU-LON-II with LonWorks interface	Static

Technical data

Nominal sizes	125 – 400 mm
Volume flow rate range	25 – 1680 l/s or 90 – 6048 m^3/h
Measurement accuracy	± 5 % of the measured value
Effective pressure range	approx. 5 – 250 Pa
Measuring unit differential pressure (pressure loss)	15 – 24 % of the measured effective pressure
Operating temperature	10 – 50 °C

Order code
VARYCONTROL

VMRK

VMRK – FL / 160 / GK / BB0
1 2 3 4 5

1 Type
VMRK Volume flow rate measuring unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (differential pressure transducer)
No entry: none
BB0 Static differential pressure transducer

Order example
VARYCONTROL

VMRK/160/BB0

Nominal size	160 mm
Differential pressure transducer	Static

4

Order code
LABCONTROL
EASYLAB

VMRK with EASYLAB for the recording of measured values

VMRK – FL / 160 / GK / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 8 9

1 Type
VMRK Volume flow rate measuring unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments
ELAB EASYLAB TCU3

6 Equipment function
EC Extract air recording

7 Voltage range for the actual value signal
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Order code
LABCONTROL
EASYLAB

VMRK with EASYLAB for fume cupboard control with external signalling (frequency converter)

VMLK – FL / 160 / GK / ELAB / FH – VS / ULZS / 200 – 800
1 2 3 4 5 6 7 8

1 Type
VMRK Volume flow rate measuring unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
125
160
200
250
315
400

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (control component)
ELAB EASYLAB controller TCU3

6 Equipment function
With face velocity transducer
FH-VS Face velocity control
With sash distance sensor
FH-DS Linear control strategy
FH-DV Safety-optimised control strategy
With switching steps
for on-site switch contacts
FH-2P 2 switching steps
FH-3P 3 switching steps
Without signalling
FH-F Volume flow rate constant value

7 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
S EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

8 Operating values [m³/h or l/s]
Depending on the equipment function
VS: $\dot{V}_{min} - \dot{V}_{max}$
DS: $\dot{V}_{min} - \dot{V}_{max}$
DV: $\dot{V}_{min} - \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
BE-SEG-** 2-character display
BE-LCD-01 40-character display

Volume flow rate ranges

Nominal size	$\dot{V}_{Nenn}$		$\dot{V}_{min}$		C-Wert		Δp_{st}	$\Delta\dot{V}$
	l/s	m^3/h	l/s	m^3/h	l/s	m^3/h	%	± %
125	**150**	**540**	25	90	8.6	31	24	5
160	**250**	**900**	40	144	15.1	54	22	5
200	**405**	**1458**	65	234	24.3	87	19	5
250	**615**	**2214**	95	342	38.0	137	17	5
315	**1030**	**3708**	155	558	62.0	223	15	5
400	**1680**	**6048**	255	918	102.7	370	15	5

K value for air density 1.2 kg/m^3, Δp_{st} in relation to the measured effective pressure

Volume flow rate calculation

Calculation conditions

- The volume flow rate is calculated based on the measured effective pressure.
- The effective pressure is measured using an electronic manometer or an inclined tube manometer
- Air density ρ = 1.2 kg/m^3

Volume flow rate calculation for air density 1.2 kg/m^3

$$\dot{V} = C \times \sqrt{\Delta p_w}$$

Volume flow rate calculation for other air densities

$$\dot{V} = C \times \sqrt{\Delta p_w} \times \sqrt{\frac{1.2}{\rho}}$$

Calculation example

Given data

- VMRK/160
- Δp_w = 100 Pa (manometer reading of effective pressure)
- Volume flow rate $\dot{V}$ [m^3/h]

Unit data

- K value from table: K = 54 m^3/h (15.1 l/s)

Calculation procedure

$$\dot{V} = 15.9 \times \sqrt{100}$$

$$\dot{V} = 159 \text{ l/s}$$

4

Description

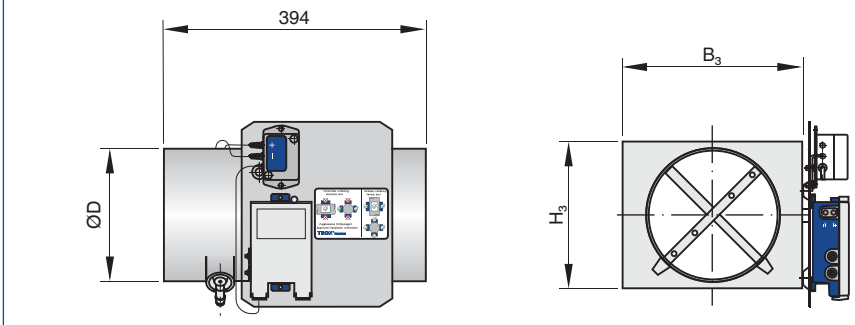
- Volume flow rate measuring unit
- Spigot to make connections to the ducting



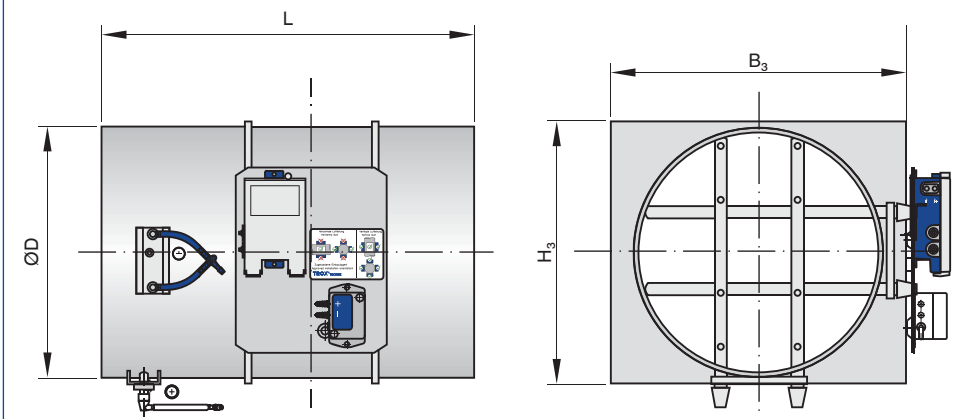
Volume flow rate measuring unit, variant VMRK

Dimensions

VMRK Nenngröße 125 – 200



VMRK nominal sizes 250 – 400



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	m
	mm				kg
125	125	394	195	145	2.0
160	160	394	230	180	2.2
200	200	394	270	220	2.5
250	250	594	320	270	3.5
315	315	594	385	335	5.1
400	400	594	470	420	6.9

Description

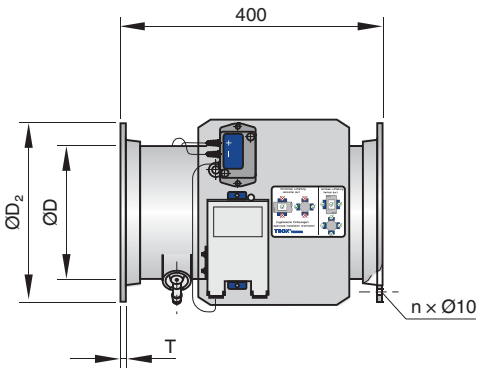
- Volume flow rate measuring unit
- With flanges on both ends to make detachable connections to the ducting



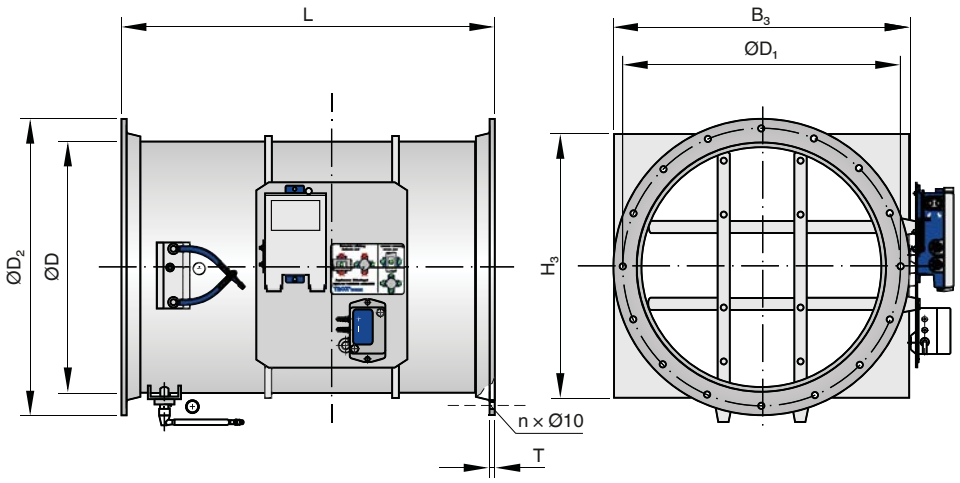
Volume flow rate measuring unit, variant VMRK-FL

Dimensions

VMRK-FL nominal size 125 – 200



VMRK-FL nominal size 250 – 400



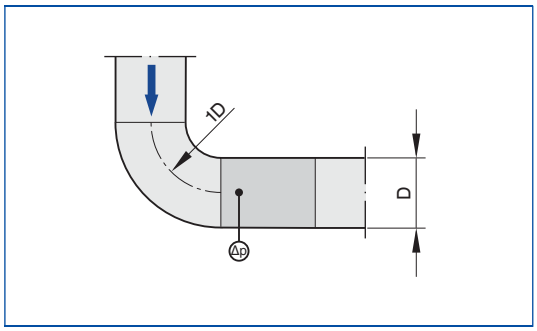
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	$ØD_1$	$ØD_2$	n	T	m
	mm							mm	kg
125	125	400	195	145	165	185	8	8	2.2
160	160	400	230	180	200	230	8	8	2.6
200	200	400	270	220	240	270	8	8	3.0
250	250	600	320	270	290	320	12	8	4.4
315	315	600	385	335	350	395	12	10	6.1
400	400	600	470	420	445	475	16	10	8.2

Upstream conditions

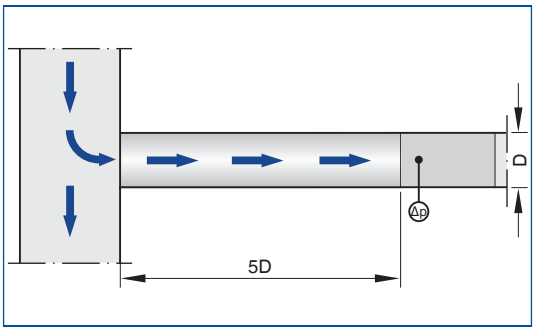
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

Bend



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

Junction

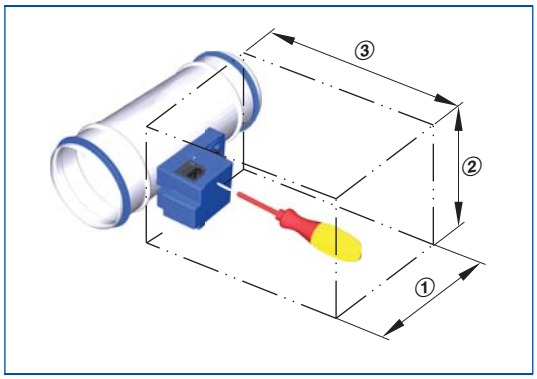


A junction causes strong turbulence. The stated volume flow rate accuracy $\Delta\dot{V}$ can only be achieved with a straight duct section of at least 5D upstream. Shorter upstream sections require a perforated plate in the branch and before the measuring unit. If there is no straight upstream section at all, the actual value signal may not be stable, even with a perforated plate.

Space requirement 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.

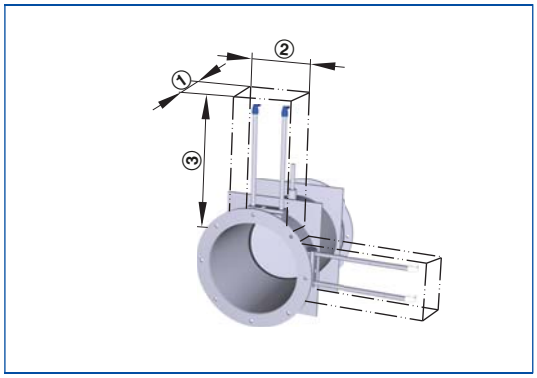
Access to attachments



Space required

Attachments	①	②	③
	mm		
Without attachments	200	200	200
VARYCONTROL			
Universal controller	300	320	300
LABCONTROL			
EASYLAB	350	350	400

Access to sensor tubes for cleaning

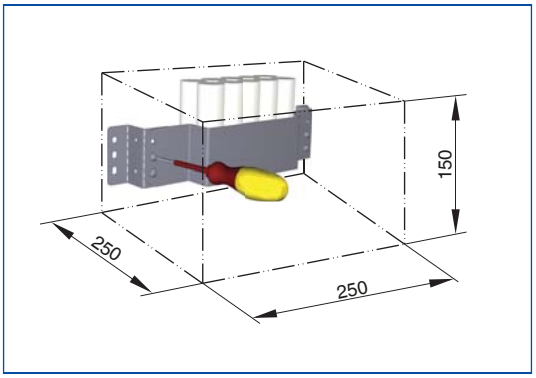


Space required

Nominal size	①	②	③
	mm		
125 – 200	100	100	D
250 – 400	100	160	D

D: Casing diameter

Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Standard text

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

Plastic (PPs) circular volume flow rate measuring unit for the measurement of volume flow rates in air conditioning systems, available in 6 nominal sizes. For the manual volume flow rate measuring or for the permanent monitoring of the actual value signal. Ready-to-commission unit which consists of the casing with an averaging differential pressure sensor. Spigot, suitable for ducts according to DIN 8077. Casing air leakage to EN 15727, class C.

Special features
- Measurement accuracy ± 5 % even with unfavourable upstream conditions
- Effective pressure range: approx. 5 – 250 Pa
- Low differential pressure of only about 15 – 24 % of the measured effective pressure

Materials and surfaces
- Casing made of flame-resistant polypropylene (PPs)
- Differential pressure sensor made of polypropylene (PP)

Technical data
- Nominal sizes: 125 – 400 mm
- Volume flow rate range: 25 to 1680 l/s or 90 to 6048 m^3/h
- Effective pressure range: approx. 5 – 250 Pa
- Measuring unit differential pressure (pressure loss): 15 – 24 % of the measured effective pressure
- Operating temperature: 10 to 50 °C

Attachments
Volume flow rate measurement with static differential pressure transducer emitting an actual value signal for integration into the central BMS.
- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC or 2 – 10 V DC
- TCU-LON-II: Integration with LonWorks
- EASYLAB: Integration using either 0 – 10 V DC signals or expansion modules (LonWorks, BACnet MS/TP, Modbus RTU)

Sizing data
- $\dot{V}[m^3/h]$

Order options

VARYCONTROL

1 Type
VMRK Volume flow rate measuring unit, plastic

2 Flange
No entry: none
☐ **FL** Flanges on both ends

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **GK** Matching flanges for both ends

5 Attachments (differential pressure transducer)
No entry: none
BB0 Static differential pressure transducer

4

Order options

LABCONTROL

EASYLAB

1 Type
VMRK Volume flow rate measuring unit, plastic

2 Flange
No entry: none
☐ **FL** Flanges on both ends

3 Nominal size [mm]
☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories
No entry: none
☐ **GK** Matching flanges for both ends

5 Attachments
ELAB EASYLAB TCU3

6 Equipment function
☐ **EC** Extract air recording

7 Voltage range for the actual value signal
☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

4

Order options

LABCONTROL

EASYLAB

1 Type

VMRK Volume flow rate measuring unit, plastic

2 Flange

No entry: none

☐ **FL** Flanges on both ends

3 Nominal size [mm]

☐ **125**
☐ **160**
☐ **200**
☐ **250**
☐ **315**
☐ **400**

4 Accessories

No entry: none

☐ **GK** Matching flanges for both ends

5 Attachments (control component)

ELAB EASYLAB controller TCU3

6 Equipment function

With face velocity transducer

☐ **FH-VS** Face velocity control

With sash distance sensor

☐ **FH-DS** Linear control strategy
☐ **FH-DV** Safety-optimised control strategy

With switching steps for on-site switch contacts

☐ **FH-2P** 2 switching steps
☐ **FH-3P** 3 switching steps

Without signalling

☐ **FH-F** Volume flow rate constant value

7 Expansion modules

Option 1: Supply voltage
No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none

☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none

☐ **S** EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

8 Operating values [m^3/h or l/s]

Depending on the equipment function
VS: $\dot{V}_{min} - \dot{V}_{max}$
DS: $\dot{V}_{min} - \dot{V}_{max}$
DV: $\dot{V}_{min} - \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions

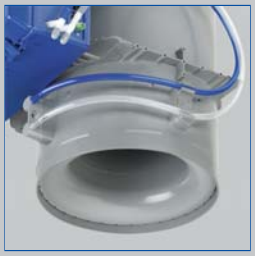
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175

☐ **BE-SEG-**** 2-character display
☐ **BE-LCD-01** 40-character display

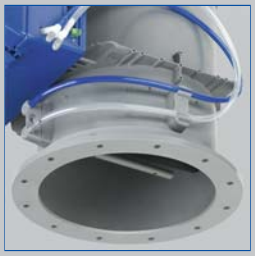
4



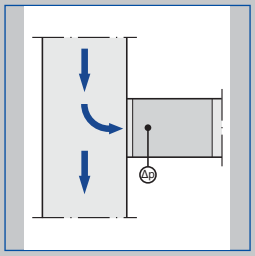
Easy cleaning of sensor tubes



Variant with nozzle
and connecting circular spigot



Variant with bluff body
and flange



For all upstream conditions



Tested to VDI 6022

Volume flow rate measuring units

Type VMLK



For the measurement of volume flow rates in ducts with contaminated air from laboratories

Plastic circular volume flow rate measuring units for the recording or monitoring of volume flow rates

- Permanent volume flow rate measuring
- Recording of measured values and use for slave controllers
- For combination with LABCONTROL control components
- Volume flow rate control for fume cupboards by signalling to frequency converters
- Measurement accuracy ± 5 % even with unfavourable upstream conditions
- Casing made of flame-resistant polypropylene (PPs)
- Casing air leakage to EN 15727, class C

Optional equipment and accessories

- With flanges on both ends

Type		Page
VMLK	General information	4.1 – 41
	Order code	4.1 – 44
	Aerodynamic data	4.1 – 46
	Dimensions and weight – VMLK	4.1 – 47
	Dimensions and weight – VMLK-FL	4.1 – 48
	Installation details	4.1 – 49
	Specification text	4.1 – 50
	Basic information and nomenclature	4.3 – 1

Variants

Product examples

Volume flow rate measuring unit, variant VMLK, with bluff body and circular spigot



Volume flow rate measuring unit, variant VMLK, with bluff body and flange



Volume flow rate measuring unit, variant VMLK, with nozzle and circular spigot



Volume flow rate measuring unit, variant VMLK, with nozzle and flange



Description

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application
- Circular LABCONTROL volume flow rate measuring units Type VMLK for the automatic measurement of volume flow rates from fume cupboards and fume hoods
- Suitable for contaminated air
- Volume flow rate control for fume cupboards by signalling to frequency converters
- Simplified commissioning, approval and maintenance
- Suitable for permanent installation because of low differential pressure

Variants
- VMLK: Volume flow rate measuring unit
- VMLK-FL: Volume flow rate measuring unit with flanges on both ends

Nominal sizes
- Bluff body: 250 – 100, 250 – 160
- Nozzle: 250 – D08, 250 – D10, 250 – D16
- Bluff body available in two sizes and nozzle available in three sizes for different volume flow rate ranges

Attachments
- LABCONTROL: Control components for air management systems

Accessories
- Matching flanges for both ends

Special features
- High measurement accuracy with any upstream conditions
- Effective pressure range: approx. 5 – 250 Pa

Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement; can be removed for cleaning
- Factory-assembled control component complete with tubing

Construction features
- Circular casing
- Spigot suitable for ducts according to DIN 8077
- Short casing: 392 mm without flange, 400 mm with flange

Materials and surfaces
- Casing made of flame-resistant polypropylene (PP), flame retardant (V-0) to UL 94
- Differential pressure sensor (with bluff body, or nozzle) and plain bearing made of polypropylene (PP)

Installation and commissioning
- Installation orientation is relevant
- For any upstream and downstream conditions
- Static differential pressure transducer: Check zero point and correct, if necessary

Standards and guidelines
- Hygiene conforms to VDI 6022
- Casing air leakage to EN 15727, class C

Maintenance
- Maintenance-free as construction and materials are not subject to wear
- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

4

Attachments: VARYCONTROL differential pressure transducer for Type VMRK

Order code detail	Differential pressure transducer	Measurement principle
Universal		
BB0	Universal controller with separate differential pressure transducer TROX/Belimo	Static

Attachments: LABCONTROL differential pressure transducer for Type VMLK

Order code detail	Differential pressure transducer	Measurement principle
EASYLAB		
ELAB	EASYLAB TCU3 (recording of measured values for EASYLAB system)	Static
TCU-LON-II		
TM0	Electronic controller TCU-LON-II with LonWorks interface	Static

Technical data

Nominal sizes	250 mm
Volume flow rate range	30 – 515 l/s or 108 – 1854 m^3/h
Measurement accuracy	± 5 % of the measured value
Effective pressure range	approx. 5 – 250 Pa
Measuring unit differential pressure (pressure loss)	19 – 65 % of the measured effective pressure
Operating temperature	10 – 50 °C

Function

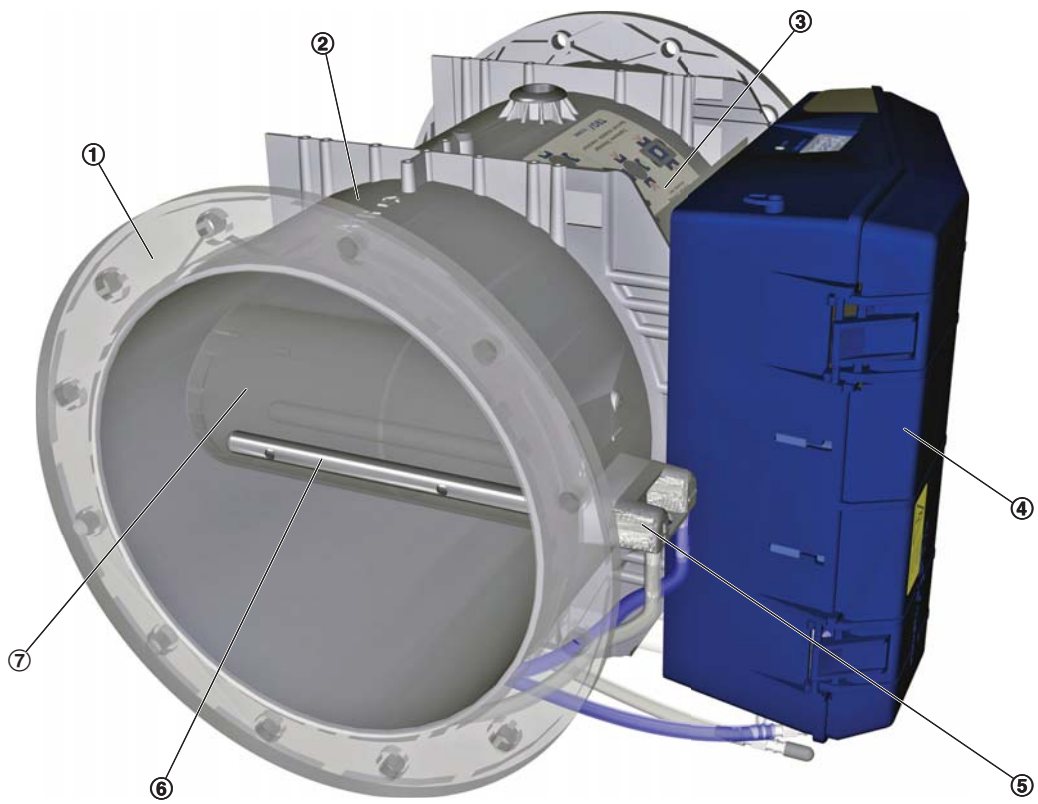
Functional description

The measuring unit is fitted either with a bluff body and a differential pressure sensor or with a nozzle. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, and a controller.

- Fume cupboard control: The volume flow rate setpoint depends on the control strategy for the fume cupboard control and is based on the face velocity, the sash position, or a constant value.
- Volume flow control: The volume flow rate setpoint comes from an external unit or device.

The controller compares the actual value with the setpoint value and alters the control signal of the frequency converter or of the actuator if there is a difference between the two values.

Schematic illustration of the VMLK



① Flange
② Casing
③ Sticker showing the correct installation orientation
④ Control equipment
⑤ Sensor head
⑥ Effective pressure sensor
⑦ Bluff body

Order code
LABCONTROL
EASYLAB

VMLK with EASYLAB for fume cupboard control with external signalling (frequency converter)

VMLK – FL / 250 – 100 / GK / ELAB / FH – VS / ULZS / 200 – 900

1 2 3 4 5 6 7 8

1 Type
VMLK Volume flow rate measuring unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
250-100 Bluff body 100
250-160 Bluff body 160
250 – D08 Nozzle D08
250 – D10 Nozzle D10
250 – D16 Nozzle D16

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments (control component)
ELAB EASYLAB controller TCU3

6 Equipment function
With face velocity transducer
FH-VS Face velocity control
With sash distance sensor
FH-DS Linear control strategy
FH-DV Safety-optimised control strategy
With switching steps
for on-site switch contacts
FH-2P 2 switching steps
FH-3P 3 switching steps
Without signalling
FH-F Volume flow rate constant value

7 Expansion modules
Option 1: Supply voltage
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting
No entry: none
S EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

8 Operating values [m³/h or l/s]
Depending on the equipment function
VS: $\dot{V}_{min} – \dot{V}_{max}$
DS: $\dot{V}_{min} – \dot{V}_{max}$
DV: $\dot{V}_{min} – \dot{V}_{max}$
2P: $\dot{V}_1 / \dot{V}_2$
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$
F: $\dot{V}_1$

Useful additions
Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175
BE-SEG-** 2-character display
BE-LCD-01 40-character display

Order code
LABCONTROL
EASYLAB

VMLK with EASYLAB for the recording of measured values

VMLK – FL / 250 – 100 / GK / ELAB / EC – E0 / ULZ / ...
1 2 3 4 5 6 7 8 9

1 Type
VMLK Volume flow rate measuring unit, plastic

2 Flange
No entry: none
FL Flanges on both ends

3 Nominal size [mm]
250 – 100 Bluff body 100
250 – 160 Bluff body 160
250 – D08 Nozzle D08
250 – D10 Nozzle D10
250 – D16 Nozzle D16

4 Accessories
No entry: none
GK Matching flanges for both ends

5 Attachments
ELAB EASYLAB TCU3

6 Equipment function
EC Extract air recording

7 Voltage range for the actual value signal
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
L EM-LON for LonWorks FTT-10A
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and webserver
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry: none
Z EM-AUTOZERO Solenoid valve for automatic zero point correction

Order example
LABCONTROL
EASYLAB

VMLK-FL/250–100/GK/ELAB/FH-F/250 m³/h

Flange	Both ends
Nominal size	250 with bluff body 100
Attachment	EASYLAB controller
Equipment function	Fume cupboard control with volume flow rate constant value for signalling to the frequency converter
Volume flow rate	250 m³/h

Volume flow rate ranges

Nominal size	$\dot{V}_{Nenn}$		$\dot{V}_{min}$		C-Wert		Δp_{st}	$\Delta\dot{V}$
	l/s	m^3/h	l/s	m^3/h	l/s	m^3/h	%	± %
250 – 100	**360**	**1296**	55	198	25.0	90	43	5
250 – 160	**195**	**702**	30	108	13.3	48	65	5
250 – D08	**515**	**1854**	95	342	34.0	122	19	5
250 – D10	**360**	**1296**	55	198	24.3	87	23	5
250 – D16	**195**	**702**	30	108	13.8	50	37	5

K value for air density 1.2 kg/m^3, Δp_{st} in relation to the measured effective pressure

Description



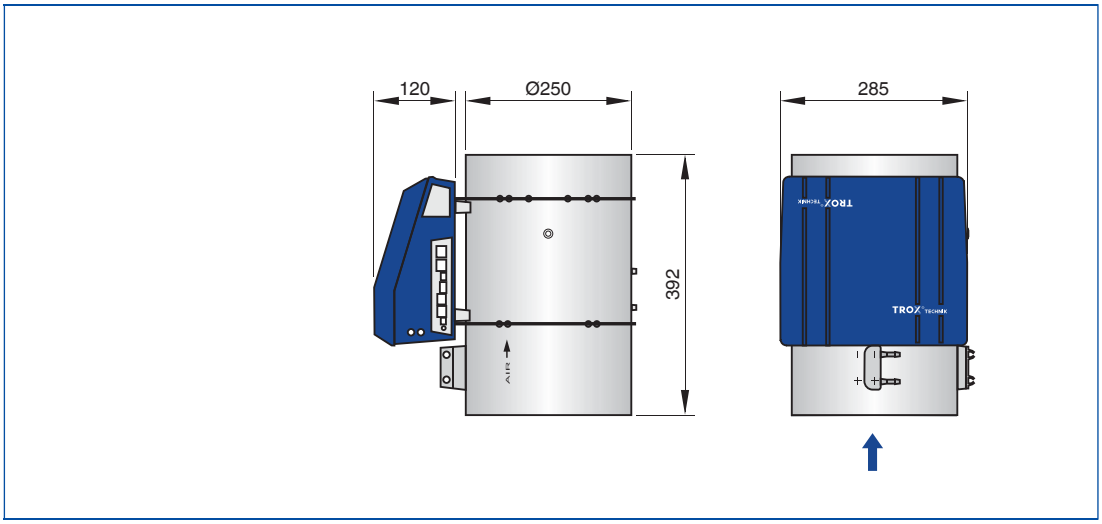
Volume flow rate measuring unit, variant VMLK, with bluff body and circular spigot

Application

- Plastic circular volume flow rate measuring units for volume flow rate measurement
- Spigot to make connections to the ducting

Dimensions

VMLK



Weight

Nominal size	250 – 100, 250 – 160	250 – D08, 250 – D10, 250 – D16
	m	
	kg	
250	2.1	2.6

Description



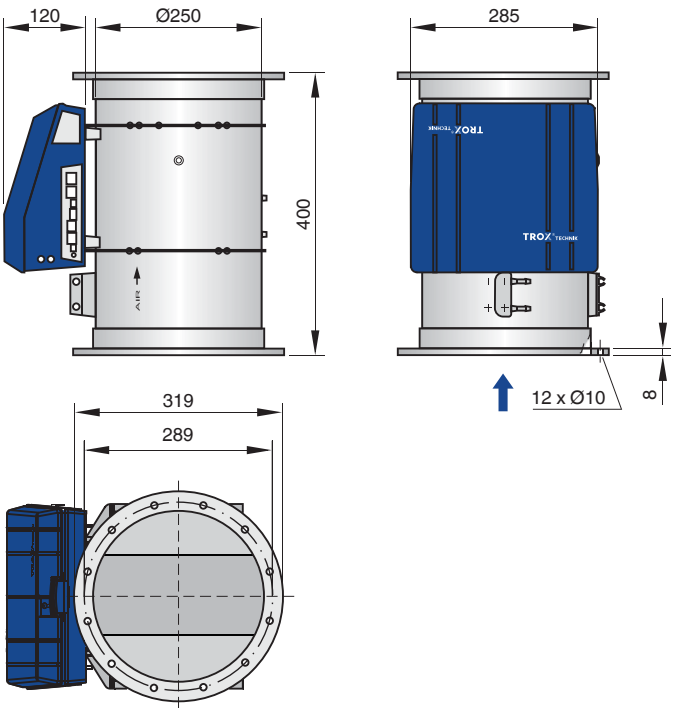
Volume flow rate measuring unit, variant VMLK, with bluff body and flange

Application

- Plastic circular volume flow rate measuring units for volume flow rate measurement
- With flanges on both ends to make detachable connections to the ducting

Dimensions

VMLK-FLVMLK-FL



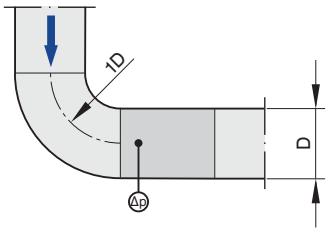
Weight

Nominal size	250 – 100, 250 – 160	250 – D10, 250 – D16, 250 – D08
	m	
	kg	
250	2.6	3.1

Upstream conditions

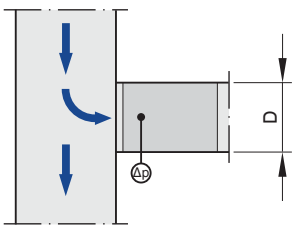
The volume flow rate accuracy ΔV̇ applies to all upstream conditions.

Bend



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

Junction

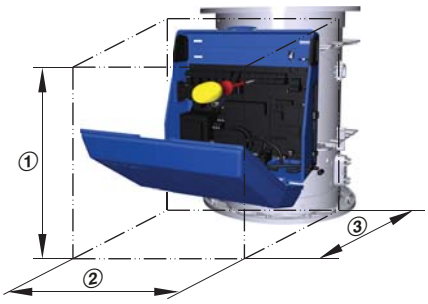


The stated volume flow rate accuracy ΔV̇ will be achieved even when the VAV terminal unit is installed in a branch just off the main duct.

Space requirement 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.

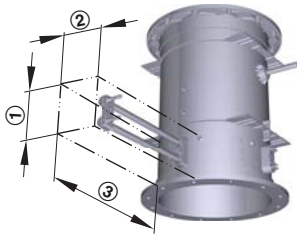
Access to attachments



Space required

Attachments	①	②	③
	mm		
Without attachments	200	200	200
VARYCONTROL			
Universal controller	300	320	300
LABCONTROL			
EASYLAB	350	350	400

Access to sensor tubes for cleaning

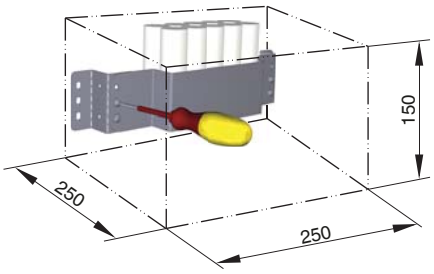


Space required

Nominal size	①	②	③
	mm		
250-1 Bluff body**	100	160	D
250-D Nozzle**	100	160	100

D: Casing diameter

Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Standard text

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 rate measuring unit made of flame-resistant plastic for the measurement of volume flow rates in variable air volume systems and fume cupboards. Suitable for the permanent monitoring of the volume flow rate (actual value signal) of extract air containing aggressive media since all components coming into contact with the airflow are made of plastic (no interior metal parts). Measurement accuracy ± 5 % even with unfavourable upstream and downstream conditions. Suitable also for volume flow rate control by signalling to frequency converters. Ready-to-commission unit which consists of the casing with either averaging effective pressure sensor and bluff body or with nozzle, and an electronic controller.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Spigot, suitable for ducts according to DIN 8077.
Casing air leakage to EN 15727, class C.

Special features
- High measurement accuracy with any upstream conditions
- Effective pressure range: approx. 5 – 250 Pa

Materials and surfaces
- Casing made of flame-resistant polypropylene (PP), flame retardant (V-0) to UL 94
- Differential pressure sensor (with bluff body, or nozzle) and plain bearing made of polypropylene (PP)

Technical data
- Nominal sizes: 250 mm
- Volume flow rate range: 30 to 515 l/s or 108 to 1854 m^3/h
- Measurement accuracy ± 5 % even with unfavourable upstream and downstream conditions.
- Effective pressure range: approx. 5 – 250 Pa
- Measuring unit differential pressure (pressure loss): 19 – 65 % of the measured effective pressure
- Operating temperature: 10 to 50 °C

Attachments
Volume flow rate control with electronic EASYLAB controller for fume cupboards.
- Supply voltage 24 V AC
- Static differential pressure measurement
- Easy commissioning due to plug and play communication system
- Controller is a modular system and can be expanded
- Volume flow rate monitoring

Sizing data
- $\dot{V}[m^3/h]$

Order options

LABCONTROL

EASYLAB

1 Type

VMLK Volume flow rate measuring unit, plastic

2 Flange

No entry: none

☐ **FL** Flanges on both ends

3 Nominal size [mm]

☐ **250-100** Bluff body 100

☐ **250-160** Bluff body 160

☐ **250 – D08** Nozzle D08

☐ **250 – D10** Nozzle D10

☐ **250 – D16** Nozzle D16

4 Accessories

No entry: none

☐ **GK** Matching flanges for both ends

5 Attachments (control component)

ELAB EASYLAB controller TCU3

6 Equipment function

With face velocity transducer

☐ **FH-VS** Face velocity control

With sash distance sensor

☐ **FH-DS** Linear control strategy

☐ **FH-DV** Safety-optimised control strategy

With switching steps for on-site switch contacts

☐ **FH-2P** 2 switching steps

☐ **FH-3P** 3 switching steps

Without signalling

☐ **FH-F** Volume flow rate constant value

7 Expansion modules

Option 1: Supply voltage

No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC

☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

☐ **L** EM-LON for LonWorks FTT-10A

☐ **B** EM-BAC-MOD-01 for BACnet MS/TP

☐ **M** EM-BAC-MOD-01 for Modbus RTU

☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver

☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction

No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

Option 4: Lighting

No entry: none

☐ **S** EM-LIGHT Wired socket for the connection of lighting and for switching the lighting on/off using the control panel (only with EM-TRF or EM-TRF-USV)

8 Operating values [m^3/h or l/s]

Depending on the equipment function

VS: $\dot{V}_{min} – \dot{V}_{max}$

DS: $\dot{V}_{min} – \dot{V}_{max}$

DV: $\dot{V}_{min} – \dot{V}_{max}$

2P: $\dot{V}_1 / \dot{V}_2$

3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$

F: $\dot{V}_1$

Useful additions

Control panel for fume cupboard controller, for displaying the functions of the control system according to EN 14175

☐ **BE-SEG-**** 2-character display

☐ **BE-LCD-01** 40-character display

4

Order options

LABCONTROL

EASYLAB

1 Type
VMLK Volume flow rate measuring unit, plastic

2 Flange
No entry: none
☐ **FL** Flanges on both ends

3 Nominal size [mm]
☐ **250 – 100** Bluff body 100
☐ **250 – 160** Bluff body 160
☐ **250 – D08** Nozzle D08
☐ **250 – D10** Nozzle D10
☐ **250 – D16** Nozzle D16

4 Accessories
No entry: none
☐ **GK** Matching flanges for both ends

5 Attachments
ELAB EASYLAB TCU3

6 Equipment function
☐ **EC** Extract air recording

7 Voltage range for the actual value signal
☐ **E0** Voltage signal 0 – 10 V DC
☐ **E2** Voltage signal 2 – 10 V DC

8 Module expansions
Option 1: Power supply
No entry: 24 V AC
☐ **T** EM-TRF for 230 V AC
☐ **U** EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Communication interface
No entry: none
☐ **L** EM-LON for LonWorks FTT-10A
☐ **B** EM-BAC-MOD-01 for BACnet MS/TP
☐ **M** EM-BAC-MOD-01 for Modbus RTU
☐ **I** EM-IP for BACnet/IP, Modbus/IP and webserver
☐ **R** EM-IP with real time clock

Option 3:
Automatic zero point correction
No entry: none
☐ **Z** EM-AUTOZERO Solenoid valve for automatic zero point correction

4

Differential pressure transducers for volume flow rate measuring units

Type Dynamic differential pressure transducers



For the dynamic measurement of effective and differential pressures

Differential pressure transducers based on the dynamic measurement principle for volume flow rate measuring units Type VMR or VME

- Linear volume flow rate actual value 0 – 10 V DC or 2 – 10 V DC
- Recording of measured values for the display of volume flow rates or for the control of slave controllers
- Any installation orientation
- Parameters are factory set

Type		Page
Dynamic differential pressure transducers	General information	4.2 – 2
	Special information – B10	4.2 – 3
	Basic information and nomenclature	4.3 – 1

Description



Universal controller VRD3

Any attachments must be defined with the order code of the volume flow rate measuring unit.

Application

- Electronic volume flow controller Universal with dynamic differential pressure transducer for use with volume flow rate measuring units
- Parameters are factory set
- On-site adjusting is not required

Standard filtration in comfort air conditioning systems allows for use of the transmitter in the supply air without additional dust protection. Since a partial volume flow is passed through the differential pressure transducer in order to measure the volume flow rate, please note:

- With heavy dust levels in the room, suitable extract air filters must be provided.
- If the air is polluted with fluff or sticky particles, or if it contains aggressive media, dynamic pressure transducers cannot be used

For this application the Universal controller is only used for measuring the differential pressure and for transforming the measured value into a linear voltage signal. Connections for setpoint value signal and actuator are not relevant, and neither are the corresponding technical data.

- Volume flow rate actual value is available as linear voltage signal

Dynamic differential pressure transducers for volume flow rate measuring units

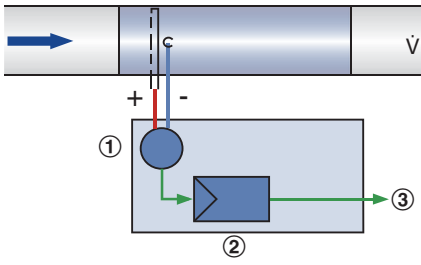
Order code detail	Attachment	Controller	Volume flow rate measuring unit
	Part number	Type	
B10	M546GA4	VRD3	VMR, VME

Function

Functional description

The volume flow rate is determined by measuring the effective pressure. For this reason the measuring unit is fitted with an effective pressure sensor. The integral differential pressure transducer transforms the effective pressure into a voltage signal. The volume flow rate actual value is hence available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal volume flow rate ($\dot{V}_{nom}$). Voltage ranges are factory stored in the controller. Changes on the customer's site can easily be carried out using an adjustment device or a notebook with service tool.

Principle of operation – dynamic differential pressure transducer



① Differential pressure transducer
② Volume flow controller
③ Actual value signal

Description

/ B10

Order code detail

Application

- Electronic volume flow controller VRD3 with dynamic differential pressure transducer for use with volume flow rate measuring units
- Differential pressure transducer and controller electronics are fitted together in one casing

Useful additions

- AT-VAV-B: Adjustment device

Signal voltage range

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC

Technical data



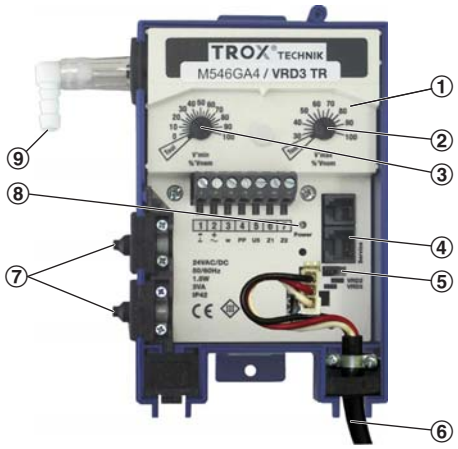
Universal controller VRD3

Volume flow controller VRD3

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC –10/+20 %
Power rating (AC)	without actuator max. 3.5 VA
Power rating (DC)	without actuator max. 2 W
Setpoint value signal input	0 – 10 V DC, R_a > 100 kΩ
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 40
EC conformity	EMC according to 2004/108/EC
Weight	0.440 kg

Function

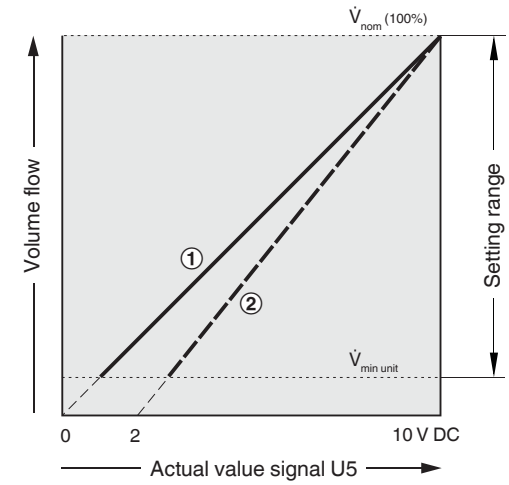
VRD3



① Controller VRD3
② $\dot{V}_{max}$ potentiometer
③ $\dot{V}_{min}$ potentiometer
④ Service socket
⑤ Jumper for input w
⑥ Actuator cable
⑦ Cable bushings for supply voltage, setpoint value signal and actual value signal
⑧ Indicator light
⑨ Connections for differential pressure sensor

Characteristics

Characteristic of the actual value signal



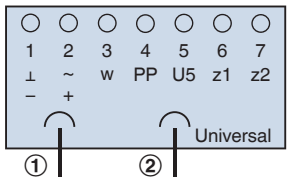
① 0 – 10 V DC
② 2 – 10 V DC

0 – 10 V DC	2 – 10 V DC
$\dot{V}_{actual} = \frac{U5}{10}\ \dot{V}_{nom}$	$\dot{V}_{actual} = \frac{U5 - 2}{8}\ \dot{V}_{nom}$

4

Wiring

Terminal connections



① Plug connection for actuator
② Plug connection for adjustment device

1 ⊥, –:	Ground, neutral
2 ~, +:	Supply voltage
3 w:	Setpoint value signal
4 PP:	Connection for adjustment device
5 U5:	Actual value signal
6 z1:	Override control 1 (OPEN)
7 z2:	Override control 2 (CLOSE, $\dot{V}_{min}$, $\dot{V}_{max}$)

Universal: VRD3

Differential pressure transducers for volume flow rate measuring units

Type Static differential pressure transducers



For the static effective and differential pressure measurement

Differential pressure transducers based on the static measurement principle for volume flow rate measuring units Type VMR, VMRK or VME

- Linear volume flow rate actual value 2 – 10 V DC
- Recording of measured values for the display of volume flow rates or for the control of slave controllers
- Parameters are factory set



Universal controller VRP

Type		Page
Static differential pressure transducers	General information	4.2 – 6
	Special information – BB0	4.2 – 7
	Basic information and nomenclature	4.3 – 1

Description



Universal controller VRP

Any attachments must be defined with the order code of the volume flow rate measuring unit.

Application

- Electronic volume flow controller Universal with static differential pressure transducer for use with volume flow rate measuring units
- For applications with polluted extract air, e.g. with fluff, sticky particles or aggressive substances
- Parameters are factory set
- On-site adjusting is not required
- For this application the Universal controller is only used for measuring the differential pressure and for transforming the measured value into a linear voltage signal. Connections for setpoint value signal and actuator are not relevant, and neither are the corresponding technical data.
- Volume flow rate actual value is available as linear voltage signal

Installation and commissioning

- Installation orientation is relevant
- Zero point correction required

Maintenance

- Zero point correction once per year is recommended

Static differential pressure transducers for volume flow rate measuring units

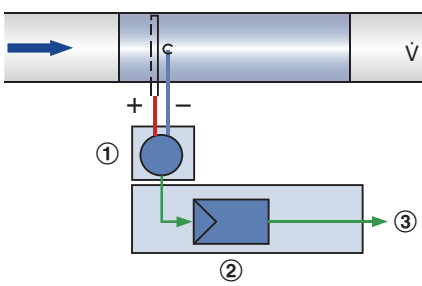
Order code detail	Controller		Static differential pressure transducer		Volume flow rate measuring unit
	Part number	Type	Part number	Type	
BB0	M546EG2	VRP	M546EJ1	VFP-300	VMR, VME, VMRK

Function

Functional description

The volume flow rate is determined by measuring the effective pressure. For this reason the measuring unit is fitted with an effective pressure sensor. The static differential pressure transducer (diaphragm pressure transducer) transforms the effective pressure into a voltage signal. The volume flow rate actual value is hence available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal volume flow rate ($\dot{V}_{nom}$).

Principle of operation – static differential pressure transducer



① Differential pressure transducer
② Volume flow controller
③ Actual value signal

Description

/ BB0

Order code detail

Application

- Electronic volume flow controller VRP with static differential pressure transducer for use with volume flow rate measuring units
- Separate casings for differential pressure transducer and controller electronics

Signal voltage range

- 2 – 10 V DC

Installation and commissioning

- Installation orientation is relevant
- Zero point correction required

Maintenance

- Zero point correction once per year is recommended

Technical data



Universal controller VRP

Volume flow controller VRP

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Power rating (AC)	without actuator max. 2.6 VA
Setpoint value signal input	2 – 10 V DC, R_a >100 kΩ
Actual value signal output	2 – 10 V DC linear, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC



Static differential pressure transducer VFP-300

Static differential pressure transducer VFP-300

Supply voltage	from the controller
Measuring range	0 – 300 Pa
Linearity	± 3 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2004/108/EC

Function

VRP



① Controller VRP
② $\dot{V}_{min}$ potentiometer
③ $\dot{V}_{max}$ potentiometer
④ Cable for differential pressure transducer
⑤ Actuator cable

VFP-300

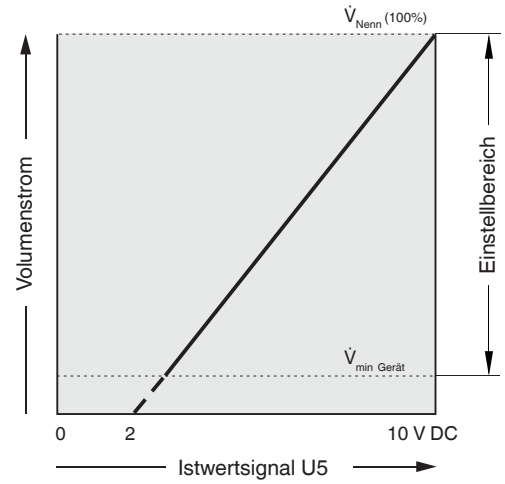


① Connecting cable to Universal controller
② Tube connection for effective pressure sensor

4

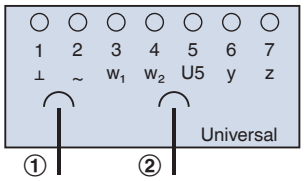
Characteristics

Characteristic of the actual value signal



Wiring

Terminal connections



① Plug connection for differential pressure transducer VFP
② Plug connection for actuator

1 ⊥:	Ground, neutral
2 ~:	Supply voltage
3 w_1:	Setpoint value signal
4 w_2:	Setpoint value signal (0 – 20 V phase cut)
5 U5:	Actual value signal
6 y:	Actuator signal
7 z:	Override control

Universal: VRP

2 – 10 V DC
$\dot{V}_{Ist} = \frac{U5 - 2}{8} \dot{V}_{Nenn}$

Volume flow rate measurement

Basic information and nomenclature



- Product selection
- Principal dimensions
- Nomenclature
- Construction
- Sizing and sizing example

Product selection

	Type			
	VMR	VME	VMRK	VMLK
Type of system				
Supply air	●	●	●	●
Extract air	●	●	●	●
Duct connection				
Circular	●		●	●
Rectangular		●		
Volume flow rate range				
Up to [m^3/h]	6048	36360	6048	1854
Up to [l/s]	1680	10100	1680	515
Air quality				
Filtered	●	●	●	●
Office extract air	●	●	●	●
Polluted	○	○	●	●
Contaminated	○	○	●	●
Volume flow rate measurement				
Manually	●	●	●	
Automatically	○	○	○	●
Special areas				
Labs, clean rooms, operating theatres (EASYLAB, TCU-LON II)	●	●	●	●

●	Possible
○	Possible under certain conditions: Robust unit variant and/or specific differential pressure transducer
	Not possible

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

$ØD_1$ [mm]
Pitch circle diameter of flanges

$ØD_2$ [mm]
Outside diameter of flanges

$ØD_4$ [mm]
Inside diameter of the screw holes of flanges

L [mm]
Length of unit including connecting spigot

L_1 [mm]
Length of casing or acoustic cladding

B [mm]
Duct width

B_1 [mm]
Screw hole pitch of flange (horizontal)

B_2 [mm]
Outside dimension of flange (width)

B_3 [mm]
Width of device

H [mm]
Duct height

H_1 [mm]
Screw hole pitch of flange (vertical)

H_2 [mm]
Outside dimension of flange (height)

H_3 [mm]
Unit height

n [ ]
Number of flange screw holes

T [mm]
Flange thickness

m [kg]
Weight including attachments for the automatic differential pressure measurement

Nomenclature

$\dot{V}_{nom}$ [m^3/h] and [l/s]
Nominal volume flow rate (100 %)

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

$\Delta\dot{V}$ [± %]
Volume flow rate accuracy

K value [m^3/h] and [l/s]
Unit-related constant for air density 1.2 kg/m^3

Δp_w [Pa]
Effective pressure

Δp_{st} [%]
Static differential pressure in relation to the measured effective pressure

Constructions

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

Sizing with the help of this catalogue

This catalogue provides convenient quick sizing tables for volume flow rate measuring unit, based on aerodynamic data. Volume flow rate ranges are provided for all nominal sizes.

Sizing example

Given data

$\dot{V}_{max}$ = 280 l/s (1010 m³/h)

Quick sizing

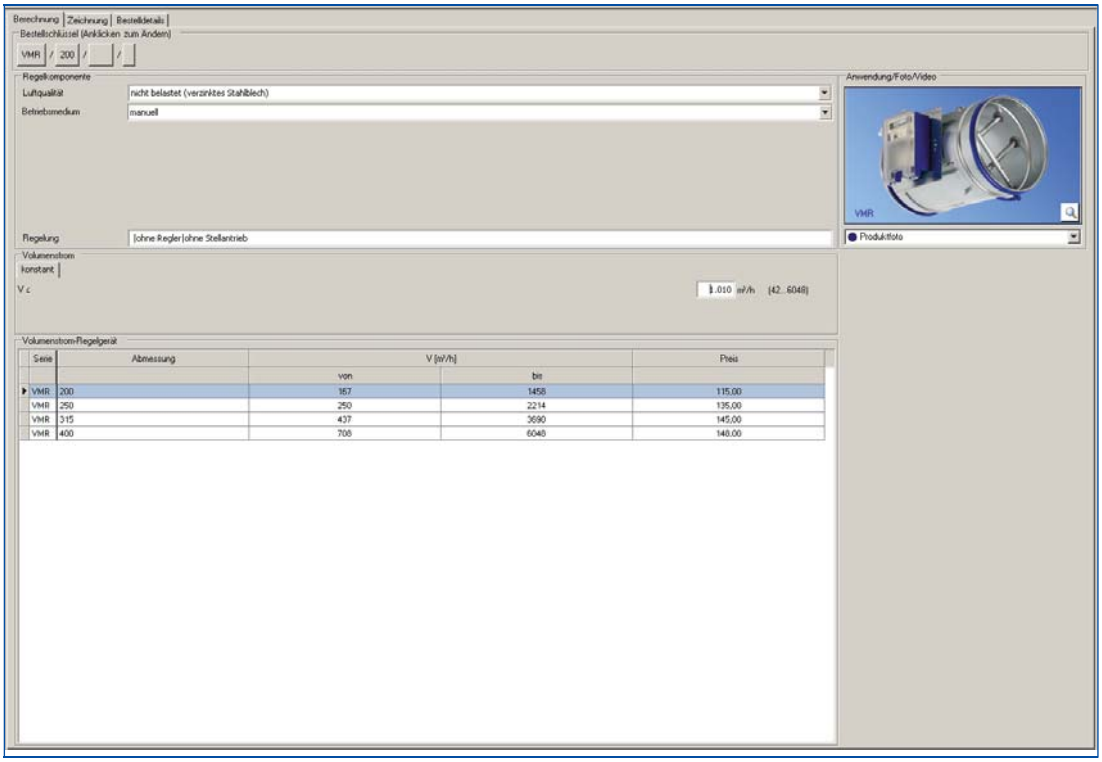
VMR/200
C = 25.5 l/s (92 m³/h)
Δp_{st} = 19 %
Δp_w = 121 Pa
Δp_{st} = 23 Pa (121 Pa × 0,19)

Easy Product Finder



The Easy Product Finder allows you to size products using your project-specific data.

You will find the Easy Product Finder on our website.





5 Heat transfer

Heat exchangers are used to heat the volume flow in ducts.
They are installed in ducts in order to meet individual comfort requirements.

5.1 Heat exchanger		Type	Page
Circular			
	For the reheating of airflows in circular ducting	**WL**	**5.1 – 1**
	For the electric reheating of airflows in circular ducting	**EL**	**5.1 – 7**
Rectangular			
	For the reheating of airflows in rectangular ducting	**WT**	**5.1 – 15**

5.2 Basic information and nomenclature			
	Heat transfer		**5.2 – 1**

5

Heat exchanger
Type WL



For the reheating of airflows in circular ducting

Circular hot water heat exchanger for the reheating of airflows,
suitable for VAV terminal units Type TVR
and mechanical self-powered CAV controllers Type RN or VFC

- For hot water up to 100 °C
- Copper tubes arranged in two rows, with aluminium fins
- Installation in horizontal or vertical ducts independent of airflow direction
- Suitable for circular ducts to EN 1506 or EN 13180
- With lip seal and inspection access
- Maximum water-side operating pressure is 8 bar
- Casing air leakage to EN 15727, class C



Heat exchanger
with copper tubes
and aluminium fins

Type		Page
WL	General information	5.1 – 2
	Order code	5.1 – 3
	Quick sizing	5.1 – 4
	Dimensions and weight	5.1 – 5
	Specification text	5.1 – 6
	Basic information and nomenclature	5.2 – 1

Description



Heat exchanger Type WL

Application
- Hot water heat exchanger Type WT for reheating the airflow in circular ducting
- For VAV terminal units Type TVR and for CAV controllers Type RN or VFC
- For hot water up to 100 °C

Nominal sizes
- 100, 125, 160, 200, 250, 315, 400

Parts and characteristics
- Ready-to-install heat exchanger
- Copper tubes arranged in two rows
- Lip seal
- Inspection access
- Tested for leakage

Construction features
- Rectangular casing
- Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180
- Maximum water-side operating pressure is 10 bar
- Horizontal water connection
- Plain copper tube ends for water connection

Materials and surfaces
- Casing made of galvanised sheet steel
- Copper tubes
- Aluminium fins

Installation and commissioning
- Installation in horizontal or vertical ducts independent of airflow direction
- Capacity control and supply connections to be provided by others
- Venting and draining by others

Standards and guidelines
- Casing air leakage to EN 15727, class C

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

5

Technical data

Nominal sizes	100 – 400 mm
Volume flow rate range	10 – 750 l/s or 36 – 2700 m^3/h
Thermal output	0.25 – 18 kW
Maximum hot water temperature	100 °C
Maximum water-side operating pressure	10 bar
Water-side differential pressure	0.3 – 12 kPa
Static differential pressure	5 – 80 Pa

Order code

WL

WL / 160
1 2

1 Type

WL Hot water heat exchanger for VAV terminal units TVR and CAV controllers RN and VFC

2 Nominal size [mm]

100
125
160
200
250
315
400

Order example

WL/160

Nominal size	160 mm

WL for TVR, RN and VFC

Nominal size	$\dot{V}$		Δp_{st}	PWW 50/40, t_e = 16 °C				PWW 70/55, t_e = 16 °C			
				$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v	$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v
	l/s	m³/h	Pa	kW	°C	kg/h	kPa	kW	°C	kg/h	kPa
100	10	36	5	0.25	36.1	21	0.3	0.40	48.5	23	0.5
100	20	72	10	0.38	31.3	33	0.4	0.62	41.2	36	0.6
100	30	108	15	0.47	28.8	41	0.5	0.79	37.5	46	0.7
100	40	144	25	0.55	27.2	48	0.6	0.95	35.2	55	0.8
100	45	162	30	0.58	26.5	51	0.7	1.02	34.4	59	1.0
125	18	65	5	0.36	32.0	31	0.3	0.58	42.2	34	0.5
125	35	126	20	0.51	27.9	44	0.5	0.87	36.2	51	0.8
125	50	180	40	0.62	26.0	53	1.0	1.09	33.8	64	1.0
125	65	234	60	0.70	24.8	61	1.2	1.30	32.3	76	1.3
125	75	270	80	0.76	24.2	66	1.5	1.44	31.6	84	1.5
160	28	101	5	0.69	36.1	60	1.0	1.17	49.9	68	1.0
160	50	180	10	1.05	33.1	91	2.0	1.83	45.8	107	3.0
160	70	252	15	1.35	31.7	117	4.0	2.32	43.0	135	4.0
160	95	342	25	1.70	30.6	147	5.0	2.85	40.4	166	6.0
160	115	414	35	1.94	29.7	168	7.0	3.23	38.8	188	7.0
200	45	162	5	0.97	33.6	84	2.0	1.69	46.5	98	2.0
200	80	288	20	1.49	31.2	129	4.0	2.54	41.8	148	5.0
200	115	414	35	1.94	29.7	168	7.0	3.23	38.8	188	7.0
200	150	540	55	2.29	28.4	199	9.0	3.37	36.8	223	10.0
200	180	648	80	2.57	27.6	223	11.0	4.30	35.4	251	12.0
250	70	252	5	1.53	33.8	133	1.0	2.67	47.0	155	1.0
250	125	450	15	2.35	31.3	203	2.0	4.14	43.0	242	3.0
250	180	648	25	3.10	30.0	269	3.0	5.29	39.9	308	4.0
250	235	846	40	3.76	29.0	326	5.0	6.29	37.8	367	5.0
250	290	1044	60	4.29	28.1	372	6.0	7.20	36.2	420	7.0
315	115	414	5	2.50	33.7	217	1.0	4.41	47.2	257	1.0
315	200	720	15	3.82	31.5	331	2.0	6.66	43.1	388	3.0
315	285	1026	25	5.02	30.4	436	4.0	8.45	40.1	493	4.0
315	375	1350	40	6.05	29.1	525	5.0	10.11	37.9	589	6.0
315	460	1656	60	6.89	28.2	597	7.0	11.52	36.4	672	7.0
400	185	666	5	4.02	33.7	348	2.0	7.08	47.2	413	2.0
400	325	1170	15	6.24	31.6	542	3.0	10.55	42.4	615	4.0
400	465	1674	30	8.06	30.1	699	5.0	13.40	39.5	781	6.0
400	605	2178	50	9.54	28.8	827	7.0	15.89	37.4	927	8.0
400	750	2700	75	10.92	27.9	947	9.0	18.22	35.8	1062	10.0

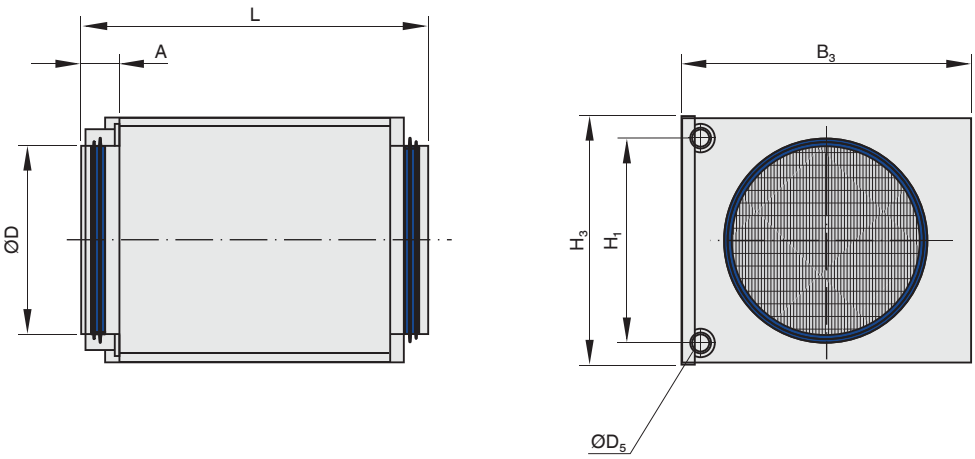
$\dot{Q}$: Thermal capacity
PWW: Fully pumped heating system, flow temperature/return temperature
t_e: Inlet airflow temperature
t_a: Outlet airflow temperature
$\dot{m}_w$: Water flow rate
Δp_v: Water-side differential pressure
Δp_{st}: Static differential pressure

Dimensions



Heat exchanger Type WL

WL



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B_3	H_3	H_1	A	$ØD_5$	m
	mm							kg
100	99	356	238	188	137	40	10	3.7
125	124	356	238	188	137	40	10	3.5
160	159	356	313	263	212	40	10	5.4
200	199	356	313	263	212	40	10	5.3
250	249	356	398	338	250	40	22	7.7
315	314	356	473	413	325	40	22	9.9
400	399	356	557	512	400	65	22	13.1

Standard text

Circular hot water heat exchangers for reheating the airflow in air conditioning systems. Dimensions fit VAV terminal units TVR as well as CAV controllers RN and VFC. Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180. Casing air leakage to EN 15727, class C.

Materials and surfaces

- Casing made of galvanised sheet steel
- Copper tubes
- Aluminium fins

Technical data

- Volume flow rate range: 10 to 750 l/s or 36 to 2700 m^3/h
- Thermal capacity: 0.25 – 18 kW
- Maximum water temperature: 100 °C
- Maximum water-side operating pressure: 10 bar
- Water-side differential pressure: 0.3 – 12 kPa
- Static differential pressure: 5 – 80 Pa

Sizing data

- $\dot{V}[m^3/h]$
- $t_e[°C]$
- PWW[°C]
- $\dot{Q}[kW]$

Order options

1 Type

WL Hot water heat exchanger for VAV terminal units TVR and CAV controllers RN and VFC

2 Nominal size [mm]

- ☐ **100**
- ☐ **125**
- ☐ **160**
- ☐ **200**
- ☐ **250**
- ☐ **315**
- ☐ **400**

5

Heat exchanger
Type EL



For the electric reheating of airflows in circular ducting

Circular electric air heater for the heating of airflows, suitable for VAV terminal units Type TVR and mechanical self-powered CAV controllers Type RN or VFC

- Outlet airflow temperature max. 50 °C
- Smooth surface stainless steel heating element 1.4301
- Integral overheating protection with temperature monitor (auto reset) and thermal cut-out (manual reset)
- Installation in horizontal or vertical ducts independent of airflow direction
- Suitable for circular ducts to EN 1506 or EN 13180
- With lip seal
- Protection level IP 43
- Casing air leakage to EN 15727, up to class D



Heat exchanger with smooth surface stainless steel heating elements

Type		Page
EL	General information	5.1 – 8
	Order code	5.1 – 9
	Quick sizing	5.1 – 10
	Dimensions and weight	5.1 – 11
	Installation details	5.1 – 12
	Specification text	5.1 – 13
	Basic information and nomenclature	5.2 – 1

Description



Heat exchanger Type WL

Application
- Electric air heater Type EL for reheating the airflow in circular ducting
- For VAV terminal units Type TVR and for CAV controllers Type RN or VFC

Nominal sizes
- 100, 125, 160, 200, 250, 315, 400

Parts and characteristics
- Ready-to-install air heater
- Encased smooth surface stainless steel heating elements
- Overheating protection with temperature monitor (auto reset) and thermal cut-out (manual reset)
- Connection terminals inside
- Casing is ready for cable penetration; wire clamping bracket and cable gland (M20 or M25) to be provided by others

Construction features
- Circular casing with rectangular switch cabinet
- Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180

Materials and surfaces
- Casing and switch cabinet made of galvanised sheet steel
- Heating element made of stainless steel 1.4301

Installation and commissioning
- Installation in horizontal or vertical ducts
- Capacity control and supply connections to be provided by others
- A straight duct section of at least 2D upstream or downstream is required between a bend, a branch, etc., and a component, fan, or flow adjustment damper.
- Airflow direction is indicated by an arrow
- Switch cabinet can be located on top or at the side

Standards and guidelines
- Casing air leakage to EN 15727, class D

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

Technical data

Nominal sizes	100 – 400 mm
Volume flow rate range	12 – 750 l/s or 43 – 2700 m^3/h
Thermal output	0.4 – 9 kW
Minimum airflow velocity	1.5 m/s
Maximum outlet airflow temperature	50 °C
Max. operating temperature	40 °C
Static differential pressure	5 – 75 Pa
Supply voltage for nominal sizes 100 – 200	230 V AC, 1-phase
Supply voltage for nominal size 250	400 V AC, 2-phase
Supply voltage for nominal sizes 315, 400	400 V AC, 3-phase
Protection level	IP 43
EC conformity	EMC to 2004/108/EU, low voltage to 2006/95/EU

Order code

EL

EL / 160
1 2

1 Type

EL Electric air heater for VAV terminal units
Type TVR and for CAV controllers
Type RN or VFC

2 Nominal size [mm]

100
125
160
200
250
315
400

Order example

EL/160

Nominal size	160 mm

EL for TVR, RN and VFC

Nominal size	$\dot{V}$		Δp_{st}	t_e = 16 °C	
				$\dot{Q}$	t_a
	l/s	m³/h	Pa	kW	°C
100	12	43	5	0.40	41.8
	20	72	10	0.40	31.4
	30	108	15	0.40	26.3
	40	144	25	0.40	23.7
	45	162	30	0.40	22.9
125	20	72	5	0.88	50.0
	35	126	20	0.90	35.8
	50	180	40	0.90	29.9
	65	234	60	0.90	26.7
	75	270	80	0.90	25.3
160	30	108	5	1.20	46.9
	50	180	10	1.20	34.5
	70	252	15	1.20	29.2
	95	342	25	1.20	25.7
	115	414	35	1.20	24.1
200	50	180	5	2.10	48.4
	80	288	20	2.10	36.3
	115	414	35	2.10	30.1
	150	540	55	2.10	26.8
	180	648	80	2.10	25.0
250	75	275	5	3.00	46.9
	125	450	15	3.00	34.5
	180	648	25	3.00	28.9
	235	846	40	3.00	25.9
	290	1044	60	3.00	24.0
315	115	414	5	5.07	50.0
	200	720	15	6.00	39.1
	285	1026	25	6.00	32.2
	375	1350	40	6.00	28.3
	460	1656	60	6.00	26.1
400	190	684	5	8.37	50.0
	325	1170	15	9.00	37.4
	465	1674	30	9.00	30.9
	605	2178	50	9.00	27.5
	750	2700	75	9.00	25.3

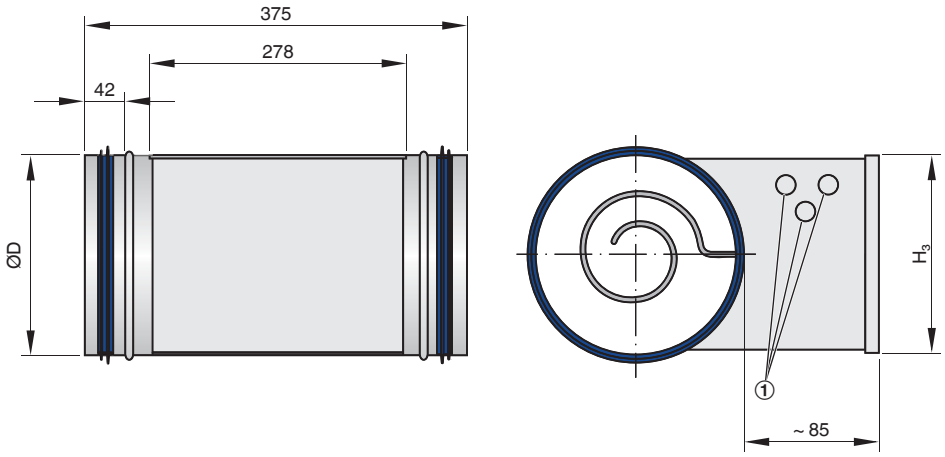
$\dot{Q}$: Thermal capacity
t_e: Inlet airflow temperature
t_a: Outlet airflow temperature

Dimensions



Heat exchanger Type EL

EL



① Prepared for cable bushings (M20 and M25)

Dimensions [mm] and weight [kg]

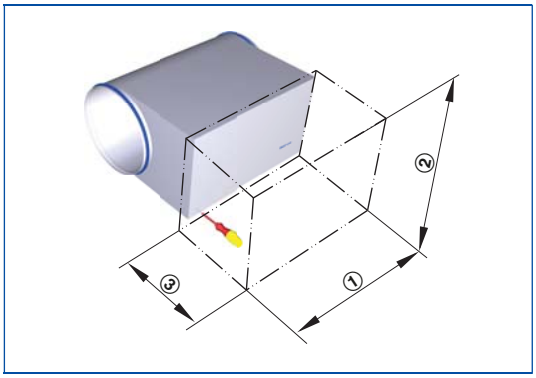
Nominal size	ØD	H_3	m
	mm		kg
100	99	116	2.0
125	124	141	2.5
160	159	176	2.9
200	199	216	3.7
250	249	266	4.5
315	314	331	6.7
400	399	416	8.1

5

Space requirement 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



Space required

Nominal size	①	②	③
	mm		
100	375	115	300
125	375	140	300
160	375	175	300
200	375	215	300
250	375	265	300
315	375	330	300
400	375	415	300

5

Standard text

Circular electric air heater for reheating the airflow in air conditioning systems
Dimensions fit VAV terminal units TVR as well as CAV controllers RN and VFC.
Integral overheating protection with temperature monitor (auto reset) and thermal cut-out (manual reset).
Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180.
Casing air leakage to EN 15727, class C.

Materials and surfaces

- Casing and switch cabinet made of galvanised sheet steel
- Heating element made of stainless steel 1.4301

Technical data

- Volume flow rate range: 12 to 750 l/s or 43 to 2700 m^3/h
- Thermal output: 0.4 – 9 kW
- Maximum outlet airflow temperature: 50 °C
- Static differential pressure: 5 – 75 Pa
- Supply voltage: 1 × 230 V AC – 3 × 400 V AC
- Protection level: IP 43

Sizing data

- $\dot{V}[m^3/h]$
- $t_e[°C]$
- PWW[°C]
- $\dot{Q}[kW]$

Order options

1 Type

EL Electric air heater for VAV terminal units Type TVR and for CAV controllers Type RN or VFC

2 Nominal size [mm]

- ☐ **100**
- ☐ **125**
- ☐ **160**
- ☐ **200**
- ☐ **250**
- ☐ **315**
- ☐ **400**

5

Heat exchanger
Type WT



For the reheating of airflows in rectangular ducting

Rectangular hot water heat exchanger for the reheating of airflows, suitable for VAV terminal units Type TVR, TZ-Silenzio, TVJ or TVT, and mechanical self-powered CAV controllers Type EN

- For hot water up to 100 °C
- Horizontal water connection
- Copper tubes arranged in two rows, with aluminium fins
- Maximum water-side operating pressure is 16 bar
- Casing air leakage to EN 15727, up to class D



Heat exchanger
with copper tubes
and aluminium fins

Type		Page
WT	General information	5.1 – 16
	Order code	5.1 – 17
	Quick sizing	5.1 – 18
	Dimensions and weight	5.1 – 22
	Specification text	5.1 – 24
	Basic information and nomenclature	5.2 – 1

Description



Heat exchangers Type WT

Application
- Hot water heat exchanger Type WT for reheating the airflow in rectangular ducting
- For VAV terminal units TZ-Silenzio, TVZ, TVJ, and TVT, and for CAV controllers EN
- For hot water up to 100 °C

Nominal sizes
- 125, 160, 200, 250, 315, 400 for TZ-Silenzio and TVZ
- 43 nominal sizes from 200 x 100 to 1000 x 1000 for TVJ, TVT and EN

Parts and characteristics
- Ready-to-install heat exchanger
- Copper tubes arranged in two rows

Construction features
- Rectangular casing
- Flanges on both ends for connection to ductwork
- Maximum water-side operating pressure is 16 bar
- Horizontal water connection
- Water connection with external thread

Materials and surfaces
- Casing made of galvanised sheet steel
- Copper tubes
- Aluminium fins

Installation and commissioning
- Installation in horizontal or vertical ducts independent of airflow direction
- Water connection must be horizontal
- Capacity control and supply connections to be provided by others
- Venting and draining by others

Standards and guidelines
- Casing air leakage to EN 15727, class D (H ≤ 400 mm, class C)

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

5

Technical data

Nominal sizes for TZ-Silenzio and TVZ	125 – 400 mm
Nominal sizes for TVJ, TVT and EN	200 × 100 to 1000 × 1000 mm
Volume flow rate range	15 – 6000 l/s or 55 – 21600 m^3/h
Thermal output	0.4 – 117 kW
Maximum hot water temperature	100 °C
Maximum water-side operating pressure	16 bar
Water-side differential pressure	0.1 – 25 kPa
Static differential pressure	25 – 170 Pa

Order code

WT for TZ-Silenzio and TVZ

WT / 160
1 2

1 Type
WT Hot water heat exchanger for VAV terminal units TZ-Silenzio and TVZ

2 Nominal size
125
160
200
250
315
400

Order code

WT for TVJ, TVT and EN

WT / 400×200
1 2

1 Type
WT Hot water heat exchanger for CAV controllers EN and for VAV terminal units TVJ and TVT

2 Nominal size [mm]
B × H

Order examples

WT/200

Nominal size	200 mm

WT/400x200

Nominal size B × H	400 × 200 mm

5

WT for TZ-Silenzio and TVZ

Nominal size	$\dot{V}$		Δp_{st}	PWW 50/40, t_e = 16 °C				PWW 70/55, t_e = 16 °C			
	$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v	$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v			
	l/s	m³/h	Pa	kW	°C	kg/h	kPa	kW	°C	kg/h	kPa
125	15	54	5	0.40	37.8	34	0.2	0.64	51.4	37	0.2
125	35	126	10	0.77	34.3	66	0.7	1.24	45.5	71	0.8
125	60	216	25	1.12	31.5	96	1.5	1.80	40.9	103	1.6
125	95	342	55	1.49	29.1	128	2.5	2.41	37.0	138	2.7
125	150	540	120	1.95	26.8	168	4.1	3.14	33.4	180	4.5
160	25	90	5	0.65	37.6	56	0.1	1.05	51.0	60	0.1
160	65	234	15	1.36	33.4	117	0.5	2.20	44.0	126	0.6
160	100	360	25	1.82	31.1	157	0.9	2.93	40.3	168	1.0
160	170	612	70	2.53	28.3	217	1.7	4.07	35.9	233	1.9
160	250	900	140	3.16	26.5	271	2.6	5.08	32.9	291	2.8
200	40	144	5	1.07	38.3	92	0.1	1.74	52.1	100	0.1
200	110	396	10	2.41	34.2	207	0.4	3.89	45.3	223	0.4
200	180	648	25	3.39	31.6	291	0.8	5.46	41.2	313	0.8
200	280	1008	50	4.48	29.3	385	1.3	7.22	37.4	414	1.4
200	405	1458	100	5.58	27.4	480	1.9	8.98	34.4	515	2.1
250	60	216	5	1.58	37.9	136	0.2	2.56	51.4	147	0.2
250	170	612	15	3.55	33.3	305	0.9	5.72	43.9	328	1.0
250	280	1008	30	4.96	30.7	426	1.8	7.98	39.7	458	1.9
250	470	1692	75	6.80	28.0	585	3.2	10.95	35.3	628	3.5
250	615	2214	125	7.94	26.7	683	4.3	12.77	33.2	732	4.6
315	105	378	5	2.75	37.7	236	0.5	4.44	51.1	255	0.5
315	265	954	10	5.64	33.7	485	1.8	9.10	44.5	522	1.9
315	420	1512	25	7.72	31.3	664	3.1	12.44	40.6	713	3.4
315	720	2592	65	10.79	28.4	928	5.8	17.37	36.0	996	6.3
315	1025	3690	125	13.23	26.7	1138	8.5	21.29	33.2	1221	9.2
400	170	612	5	4.43	37.6	381	0.7	7.17	51.0	411	0.7
400	445	1602	15	9.30	33.3	800	2.5	15.00	44.0	860	2.8
400	710	2556	30	12.73	30.9	1094	4.5	20.51	40.0	1176	4.9
400	1250	4500	80	18.00	28.0	1548	8.6	28.97	35.2	1661	9.4
400	1680	6048	135	21.32	26.5	1833	11.8	34.30	32.9	1966	12.8

$\dot{Q}$: Thermal capacity
PWW: Fully pumped heating system, flow temperature/return temperature
t_e: Inlet airflow temperature
t_a: Outlet airflow temperature
$\dot{m}_w$: Water flow rate
Δp_v: Water-side differential pressure
Δp_{st}: Static differential pressure

WT for TVJ, TVT and EN

Nominal size	V̇		Δp_{st}	PWW 50/40, t_e = 16 °C				PWW 70/55, t_e = 16 °C			
				$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v	$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v
	l/s	m³/h	Pa	kW	°C	kg/h	kPa	kW	°C	kg/h	kPa
200 × 100	40	144	25	0.75	31.5	64	0.5	1.21	41.0	69	0.5
200 × 100	80	288	80	1.15	27.9	99	1.1	1.85	35.2	106	1.2
200 × 100	120	432	170	1.45	26.0	124	1.7	2.33	32.1	133	1.9
300 × 100	60	216	25	1.12	31.5	97	1.3	1.81	41.0	104	1.4
300 × 100	120	432	80	1.72	27.9	148	2.9	2.78	35.2	159	3.2
300 × 100	180	648	170	2.17	26.0	187	4.5	3.49	32.1	200	4.9
400 × 100	80	288	25	1.50	31.5	129	2.7	2.41	41.0	138	2.9
400 × 100	160	576	80	2.30	27.9	198	5.9	3.70	35.2	212	6.4
400 × 100	240	864	170	2.89	26.0	249	9.1	4.65	32.1	267	9.8
500 × 100	100	360	25	1.87	31.5	161	4.7	3.02	41.0	173	5.1
500 × 100	200	720	80	2.87	27.9	247	10.3	4.62	35.2	265	11.1
500 × 100	300	1080	170	3.62	26.0	311	15.8	5.82	32.1	333	17.0
600 × 100	120	432	25	2.25	31.5	193	1.5	3.62	41.0	207	1.6
600 × 100	240	864	80	3.45	27.9	296	3.3	5.55	35.2	318	3.6
600 × 100	360	1296	170	4.34	26.0	373	5.0	6.98	32.1	400	5.5
300 × 150	90	324	25	1.68	31.5	145	4.0	2.71	41.0	156	4.3
300 × 150	180	648	80	2.59	27.9	222	8.7	4.16	35.2	239	9.5
300 × 150	270	972	170	3.25	26.0	280	13.4	5.24	32.1	300	14.5
200 × 200	80	288	25	1.50	31.5	129	3.2	2.41	41.0	138	3.5
200 × 200	160	576	80	2.30	27.9	198	7.2	3.70	35.2	212	7.8
200 × 200	240	864	170	2.89	26.0	249	11.1	4.65	32.1	267	12.1
300 × 200	120	432	25	2.25	31.5	193	1.6	3.62	41.0	207	1.8
300 × 200	240	864	80	3.45	27.9	296	3.6	5.55	35.2	318	4.0
300 × 200	360	1296	170	4.34	26.0	373	5.6	6.98	32.1	400	6.1
400 × 200	160	576	25	2.99	31.5	257	3.2	4.82	41.0	277	3.5
400 × 200	320	1152	80	4.60	27.9	395	7.2	7.40	35.2	424	7.8
400 × 200	480	1728	170	5.79	26.0	498	11.0	9.31	32.1	534	12.1
500 × 200	200	720	25	3.74	31.5	322	5.5	6.03	41.0	346	6.0
500 × 200	400	1440	80	5.75	27.9	494	12.3	9.25	35.2	530	13.4
500 × 200	600	2160	170	7.23	26.0	622	18.8	11.63	32.1	667	20.5
600 × 200	240	864	25	4.49	31.5	386	1.5	7.24	41.0	415	1.6
600 × 200	480	1728	80	6.90	27.9	593	3.3	11.10	35.2	636	3.6
600 × 200	720	2592	170	8.68	26.0	746	5.0	13.96	32.1	800	5.5
700 × 200	280	1008	25	8.44	41.0	484	2.3	8.44	41.0	484	2.3
700 × 200	560	2016	80	12.95	35.2	742	5.2	12.95	35.2	742	5.2
700 × 200	840	3024	170	16.29	32.1	934	7.9	16.29	32.1	934	7.9
800 × 200	320	1152	25	9.65	41.0	553	3.2	9.65	41.0	553	3.2
800 × 200	640	2304	80	14.80	35.2	848	7.1	14.80	35.2	848	7.1
800 × 200	960	3456	170	18.61	32.1	1067	10.9	18.61	32.1	1067	10.9
400 × 250	200	720	25	3.74	31.5	322	5.7	6.03	41.0	346	6.3
400 × 250	400	1440	80	5.75	27.9	494	12.8	9.25	35.2	530	13.9
400 × 250	600	2160	170	7.23	26.0	622	19.6	11.63	32.1	667	21.4
500 × 250	250	900	25	4.68	31.5	402	3.6	7.54	41.0	432	3.9
500 × 250	500	1800	80	7.18	27.9	618	8.0	11.56	35.2	663	8.7
500 × 250	750	2700	170	9.04	26.0	777	12.2	14.54	32.1	834	13.3

$\dot{Q}$: Thermal capacity
PWW: Fully pumped heating system, flow temperature/return temperature
t_e: Inlet airflow temperature
t_a: Outlet airflow temperature
$\dot{m}_w$: Water flow rate
Δp_v: Water-side differential pressure
Δp_{st}: Static differential pressure

5

WT for TVJ, TVT and EN

Nominal size	$\dot{V}$		Δp_{st}	PWW 50/40, t_e = 16 °C				PWW 70/55, t_e = 16 °C			
	$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v	$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v			
	l/s	m³/h	Pa	kW	°C	kg/h	kPa	kW	°C	kg/h	kPa
600 × 250	300	1080	25	5.61	31.5	483	5.6	9.04	41.0	519	6.1
600 × 250	600	2160	80	8.62	27.9	741	12.4	13.87	35.2	795	13.4
600 × 250	900	3240	170	10.85	26.0	933	19.0	17.45	32.1	1000	20.6
300 × 300	180	648	25	3.37	31.5	290	4.6	5.43	41.0	311	5.1
300 × 300	360	1296	80	5.17	27.9	445	10.3	8.32	35.2	477	11.3
300 × 300	540	1944	170	6.51	26.0	560	15.9	10.47	32.1	600	17.4
400 × 300	240	864	25	4.49	31.5	386	3.2	7.24	41.0	415	3.5
400 × 300	480	1728	80	6.90	27.9	593	7.2	11.10	35.2	636	7.8
400 × 300	720	2592	170	8.68	26.0	746	11.0	13.96	32.1	800	12.1
500 × 300	300	1080	25	5.61	31.5	483	2.6	9.04	41.0	519	2.9
500 × 300	600	2160	80	8.62	27.9	741	5.9	13.87	35.2	795	6.4
500 × 300	900	3240	170	10.85	26.0	933	9.0	17.45	32.1	1000	9.8
600 × 300	360	1296	25	6.73	31.5	579	4.1	10.85	41.0	622	4.5
600 × 300	720	2592	80	10.34	27.9	889	9.1	16.65	35.2	954	9.9
600 × 300	1080	3888	170	13.02	26.0	1119	14.0	20.94	32.1	1201	15.2
700 × 300	420	1512	25	7.86	31.5	676	6.0	12.66	41.0	726	6.5
700 × 300	840	3024	80	12.07	27.9	1038	13.3	19.42	35.2	1114	14.4
700 × 300	1260	4536	170	15.19	26.0	1306	20.3	24.43	32.1	1401	22.1
800 × 300	480	1728	25	8.98	31.5	772	3.0	14.47	41.0	830	3.2
800 × 300	960	3456	80	13.79	27.9	1186	6.6	22.20	35.2	1273	7.1
800 × 300	1440	5184	170	17.36	26.0	1493	10.0	27.92	32.1	1601	10.9
900 × 300	540	1944	25	10.10	31.5	869	3.9	16.28	41.0	933	4.3
900 × 300	1080	3888	80	15.51	27.9	1334	8.7	24.97	35.2	1432	9.5
900 × 300	1620	5832	170	19.52	26.0	1679	13.4	31.41	32.1	1801	14.5
1000 × 300	600	2160	25	11.22	31.5	965	5.1	18.09	41.0	1037	5.5
1000 × 300	1200	4320	80	17.24	27.9	1482	11.3	27.75	35.2	1591	12.2
1000 × 300	1800	6480	170	21.69	26.0	1866	17.3	34.90	32.1	2001	18.7
400 × 400	320	1152	25	5.99	31.5	515	3.2	9.65	41.0	553	3.5
400 × 400	640	2304	80	9.19	27.9	791	7.2	14.80	35.2	848	7.8
400 × 400	960	3456	170	11.57	26.0	995	11.0	18.61	32.1	1067	12.1
500 × 400	400	1440	25	7.48	31.5	643	5.5	12.06	41.0	691	6.0
500 × 400	800	2880	80	11.49	27.9	988	12.3	18.50	35.2	1061	13.4
500 × 400	1200	4320	170	14.46	26.0	1244	18.8	23.27	32.1	1334	20.5
600 × 400	480	1728	25	9.98	31.5	772	2.9	14.47	41.0	830	3.2
600 × 400	960	3456	80	13.79	27.9	1186	6.5	22.20	35.2	1273	7.1
600 × 400	1440	5184	170	17.36	26.0	1493	9.9	27.92	32.1	1601	10.8
700 × 400	560	2016	25	10.47	31.5	901	6.8	16.88	41.0	968	7.3
700 × 400	1120	4032	80	16.09	27.9	1384	15.0	25.90	35.2	1485	16.2
700 × 400	1680	6048	170	20.25	26.0	1741	22.9	32.57	32.1	1868	24.9
800 × 400	640	2304	25	11.97	31.5	1029	5.9	19.29	41.0	1106	6.4
800 × 400	1280	4608	80	18.39	27.9	1581	13.0	29.60	35.2	1697	14.1
800 × 400	1920	6912	170	23.14	26.0	1990	19.9	37.23	32.1	2134	21.6
900 × 400	720	2592	25	13.47	31.5	1158	3.9	21.71	41.0	1244	4.3
900 × 400	1440	5184	80	20.69	27.9	1779	8.7	33.30	35.2	1909	9.5
900 × 400	2160	7776	170	26.03	26.0	2239	13.4	41.88	32.1	2401	14.5

$\dot{Q}$: Thermal capacity
PWW: Fully pumped heating system, flow temperature/return temperature
t_e: Inlet airflow temperature
t_a: Outlet airflow temperature
$\dot{m}_w$: Water flow rate
Δp_v: Water-side differential pressure
Δp_{st}: Static differential pressure

WT for TVJ, TVT and EN

Nominal size	V̇		Δp_{st}	PWW 50/40, t_e = 16 °C				PWW 70/55, t_e = 16 °C			
				$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v	$\dot{Q}$	t_a	$\dot{m}_w$	Δp_v
	l/s	m³/h	Pa	kW	°C	kg/h	kPa	kW	°C	kg/h	kPa
1000 × 400	800	2880	25	14.96	31.5	1287	5.1	24.12	41.0	1383	5.5
1000 × 400	1600	5760	80	22.98	27.9	1977	11.3	36.99	35.2	2121	12.2
1000 × 400	2400	8640	170	28.93	26.0	2488	17.3	46.53	32.1	2668	18.7
500 × 500	500	1800	25	9.35	31.5	804	5.5	15.07	41.0	864	6.0
500 × 500	1000	3600	80	14.36	27.9	1235	12.3	23.12	35.2	1326	13.4
500 × 500	1500	5400	170	18.08	26.0	1555	18.8	29.08	32.1	1667	20.5
600 × 500	600	2160	25	11.22	31.5	965	5.6	18.09	41.0	1037	6.1
600 × 500	1200	4320	80	17.24	27.9	1482	12.4	27.75	35.2	1591	13.4
600 × 500	1800	6480	170	21.69	26.0	1866	19.0	34.90	32.1	2001	20.6
700 × 500	700	2520	25	13.09	31.5	1126	3.8	21.10	41.0	1210	4.1
700 × 500	1400	5040	80	20.11	27.9	1729	8.3	32.37	35.2	1856	9.1
700 × 500	2100	7560	170	25.31	26.0	2177	12.8	40.72	32.1	2334	13.9
800 × 500	800	2880	25	14.96	31.5	1287	5.2	24.12	41.0	1383	5.7
800 × 500	1600	5760	80	22.98	27.9	1977	11.5	36.99	35.2	2121	12.5
800 × 500	2400	8640	170	28.93	26.0	2488	17.7	46.53	32.1	2668	19.2
900 × 500	900	3240	25	16.83	31.5	1448	7.0	27.13	41.0	1556	7.6
900 × 500	1800	6480	80	52.86	27.9	2224	15.4	41.62	35.2	2386	16.7
900 × 500	2700	9720	170	32.54	26.0	2799	23.6	52.35	32.1	3001	25.5
1000 × 500	1000	3600	25	18.70	31.5	1609	5.1	30.15	41.0	1728	5.5
1000 × 500	2000	7200	80	28.73	27.9	2471	11.3	46.24	35.2	2651	12.2
1000 × 500	3000	10800	170	36.16	26.0	3109	17.3	58.17	32.1	3335	18.7
600 × 600	720	2592	25	13.47	31.5	1158	4.1	21.71	41.0	1244	4.5
600 × 600	1440	5184	80	20.69	27.9	1779	9.1	33.30	35.2	1909	9.9
600 × 600	2160	7776	170	26.03	26.0	2239	14.0	41.88	32.1	2401	15.2
800 × 600	960	3456	25	17.96	31.5	1544	5.9	28.94	41.0	1659	6.4
800 × 600	1920	6912	80	27.58	27.9	2372	13.0	44.39	35.2	2545	14.1
800 × 600	2880	10368	170	34.71	26.0	2985	19.9	55.84	32.1	3202	21.6
1000 × 600	1200	4320	25	22.45	31.5	1930	5.1	36.18	41.0	2074	5.5
1000 × 600	2400	8640	80	34.47	27.9	2965	11.3	55.49	35.2	3182	12.2
1000 × 600	3600	12960	170	43.39	26.0	3731	17.3	69.80	32.1	4002	18.7
800 × 800	1280	4608	25	23.94	31.5	2059	5.9	38.59	41.0	2212	6.4
800 × 800	2560	9216	80	36.77	27.9	3162	13.0	59.19	35.2	3394	14.1
800 × 800	3840	13824	170	46.28	26.0	3980	19.9	74.45	32.1	4269	21.6
1000 × 800	1600	5760	25	29.93	31.5	2574	5.1	48.23	41.0	2765	5.5
1000 × 800	3200	11520	80	45.97	27.9	3953	11.3	73.99	35.2	4242	12.2
1000 × 800	4800	17280	170	57.85	26.0	4975	17.3	93.07	32.1	5336	18.7
1000 × 1000	2000	7200	25	37.41	31.5	3217	5.1	60.29	41.0	3457	5.5
1000 × 1000	4000	14400	80	57.46	27.9	4941	11.3	92.49	35.2	5303	12.2
1000 × 1000	6000	21600	170	72.31	26.0	6219	17.3	116.33	32.1	6670	18.7

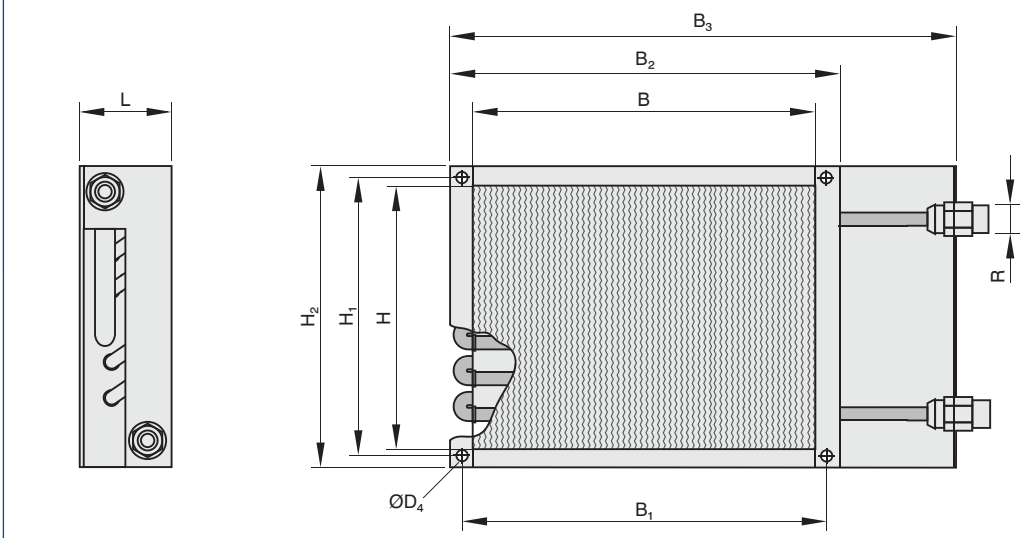
$\dot{Q}$: Thermal capacity
PWW: Fully pumped heating system, flow temperature/return temperature
t_e: Inlet airflow temperature
t_a: Outlet airflow temperature
$\dot{m}_w$: Water flow rate
Δp_v: Water-side differential pressure
Δp_{st}: Static differential pressure

Dimensions



Heat exchangers Type WT

WT



Dimensions and weight – WT for TZ-Silenzio and TVZ

Nominal size	L	B	H	B_1	B_2	B_3	H_1	H_2	$ØD_4$	R	m
	mm									"	kg
125	70	198	152	232	258	336	186	212	10	½	2.4
160	70	308	152	342	368	446	186	212	10	½	3.3
200	70	458	210	492	518	596	244	263	10	½	4.8
250	70	598	201	632	658	736	235	263	10	½	6.0
315	70	798	252	832	868	936	286	314	10	½	8.7
400	70	898	354	932	958	1036	388	416	10	½	12.7

Dimensions and weight – WT for TVJ, TVT and EN

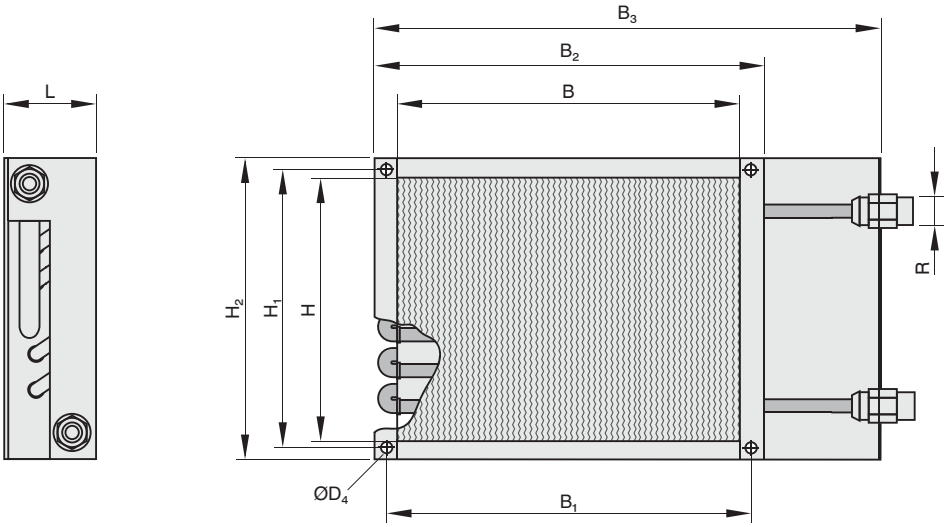
Nominal size	L	B	H	B_1	B_2	B_3	H_1	H_2	$ØD_4$	R	m
	mm									"	kg
200 × 100	80	200	100	234	276	338	134	176	13	½	1.3
300 × 100	80	300	100	334	376	438	134	176	13	½	1.7
400 × 100	80	400	100	434	476	538	134	176	13	½	2.1
500 × 100	80	500	100	534	576	638	134	176	13	½	2.5
600 × 100	80	600	100	634	676	738	134	176	13	½	2.9
300 × 150	80	300	150	334	376	438	184	210	13	½	2.1
200 × 200	80	200	200	234	276	338	234	276	13	½	1.9
300 × 200	80	300	200	334	376	438	234	276	13	½	2.5
400 × 200	80	400	200	434	476	538	234	276	13	½	3.0
500 × 200	80	500	200	534	576	638	234	276	13	½	4.0
600 × 200	80	600	200	634	676	738	234	276	13	½	5.0
700 × 200	80	700	200	734	776	838	234	276	13	½	6.0
800 × 200	80	800	200	834	876	938	234	276	13	½	7.0
400 × 250	80	400	250	434	476	538	284	310	13	½	3.9
500 × 250	80	500	250	534	576	638	284	310	13	½	4.9
600 × 250	80	600	250	634	676	738	284	310	13	½	5.8

Dimensions



Heat exchangers Type WT

WT



Dimensions and weight – WT for TVJ, TVT and EN

Nominal size	L	B	H	B_1	B_2	B_3	H_1	H_2	$ØD_4$	R	m
	mm									"	kg
300 × 300	80	300	300	334	376	438	334	376	13	½	3.2
400 × 300	80	400	300	434	476	538	334	376	13	½	4.5
500 × 300	80	500	300	534	576	638	334	376	13	½	5.8
600 × 300	80	600	300	634	676	738	334	376	13	½	6.5
700 × 300	80	700	300	734	776	838	334	376	13	½	7.2
800 × 300	80	800	300	834	876	938	334	376	13	½	7.9
900 × 300	80	900	300	934	976	1038	334	376	13	½	8.5
1000 × 300	80	1000	300	1034	1076	1138	334	376	13	½	9.2
400 × 400	80	400	400	434	476	538	434	476	13	½	6.5
500 × 400	80	500	400	534	576	638	434	476	13	½	8.7
	80	500	400	534	576	638	434	476	13	½	7.3
600 × 400	80	600	400	634	676	738	434	476	13	½	8.1
	80	600	400	634	676	738	434	476	13	½	9.6
700 × 400	80	700	400	734	776	838	434	476	13	½	10.5
	80	700	400	734	776	838	434	476	13	½	8.9
800 × 400	80	800	400	834	876	938	434	476	13	½	9.7
	80	800	400	834	876	938	434	476	13	½	11.4
900 × 400	80	900	400	934	976	1038	434	476	13	½	10.5
	80	900	400	934	976	1038	434	476	13	½	12.3
1000 × 400	80	1000	400	1034	1076	1138	434	476	13	½	11.2
		1000	400	1034	1076	1138	434	476	13	1	13.2
600 × 600	80	600	600	634	676	738	634	676	13	½	11.1
800 × 600	80	800	600	834	876	938	634	676	13	½	13.9
1000 × 600		1000	600	1034	1076	1138	634	676	13	1	15.9
800 × 800	100	800	800	834	876	938	834	876	13	1	17.7
1000 × 800	100	1000	800	1034	1076	1138	834	876	13	1 ¼	20.2
1000 × 1000	100	1000	1000	1034	1076	1138	1034	1076	13	1 ¼	27.9

Standard text

Rectangular hot water heat exchangers for reheating the airflow in air conditioning systems. Dimensions fit VAV terminal units TZ-Silenzio, TVZ, TVJ, and TVT, as well as CAV controllers EN. Flanges on both sides, suitable for duct connection. Casing air leakage to EN 15727, class D (H ≤ 400 mm, class C)

Materials and surfaces

- Casing made of galvanised sheet steel
- Copper tubes
- Aluminium fins

Technical data

- Volume flow rate range: 15 to 6000 l/s or 55 to 21600 m^3/h
- Thermal capacity: 0.4 – 115 kW
- Maximum water temperature: 100 °C
- Maximum water-side operating pressure: 16 bar
- Water-side differential pressure: 0.1 – 25 kPa
- Static differential pressure: 25 – 170 Pa

Sizing data

- $\dot{V}[m^3/h]$
- $t_e[°C]$
- PWW[°C]
- $\dot{Q}[kW]$

Order options

1 Type

WT Hot water heat exchanger for VAV terminal units TZ-Silenzio and TVZ

2 Nominal size

- ☐ **125**
- ☐ **160**
- ☐ **200**
- ☐ **250**
- ☐ **315**
- ☐ **400**

Order options

1 Type

WT Hot water heat exchanger for CAV controllers EN and for VAV terminal units TVJ and TVT

2 Nominal size [mm]

B × H

5

Heat transfer
Basic information and nomenclature



- Product selection
- Principal dimensions
- Nomenclature

Product selection

	Type		
	WT	WL	EL
Function			
Heating	●	●	●
Cooling			
Energy transfer medium			
Hot water	●	●	
Electric current			●
Duct connection			
Circular		●	●
Rectangular	●		
Can be used with VAV terminal unit Type			
TVR		●	●
TVZ	●		
TZ-Silenzio	●		
TVJ	●		
TVT	●		
RN		●	●
EN	●		
VFC		●	●
●	Possible		
	Not possible		

Principal dimensions

ØD [mm]
Outside diameter of the spigot

L [mm]
Length of unit including connecting spigot

L_1 [mm]
Length of casing or acoustic cladding

B [mm]
Duct width

B_1 [mm]
Screw hole pitch of flange (horizontal)

B_2 [mm]
Outside dimension of flange (width)

B_3 [mm]
Width of device

H [mm]
Duct height

H_1 [mm]
Screw hole pitch of flange (vertical)

H_2 [mm]
Outside dimension of flange (height)

H_3 [mm]
Unit height

R ['']
Diameter of connecting threaded pipes

m [kg]
Unit weight including the minimum required attachments (e.g. Compact controller)

Nomenclature

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

Δp_{st} [Pa]
Static differential pressure

Δp_v [kPa]
Water-side differential pressure

$\dot{Q}$ [kW]
Thermal capacity

$\dot{m}_w$ [kg/h]
Water flow rate

PWW [°C]
Pumped warm water heating system, flow temperature/return temperature

t_e [°C]
Inlet airflow temperature

t_a [°C]
Outlet airflow temperature

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TROX Contact information



TROX® TECHNIK
The art of handling air

TROX GmbH
Heinrich-Trox-Platz
47504 Neukirchen-Vluyn

Phone +49 (0)2845 202-0
Fax +49 (0)2845 202-265
E-mail trox@trox.de

TROX Germany

North branch
Hannover office
Bothfelder Straße 23
30916 Isernhagen, Germany
Phone +49 (0) 511 61003435
Fax +49 (0) 511 619820
E-mail nln@trox.de

South branch
Munich office
Liebigstraße 2
85301 Schweitenkirchen, Germany
Phone +49 (0) 8444 9250
Fax +49 (0) 8444 92510
E-mail nls@trox.de

Central branch
Frankfurt office
Kaiserleistraße 43
63067 Offenbach, Germany
Phone +49 (0) 69 985560
Fax +49 (0) 69 98556111
E-mail nlm@trox.de

Southwest branch
Stuttgart office
Hohentwielstraße 28
70199 Stuttgart, Germany
Phone +49 (0) 711 648620
Fax +49 (0) 711 6486220
E-mail nlsw@trox.de

West branch
Neukirchen-Vluyn office
Heinrich-Trox-Platz
47504 Neukirchen-Vluyn, Germany
Phone +49 (0) 2845 202611
Fax +49 (0) 2845 202612
E-mail nlw@trox.de

East branch
Berlin office
Rotherstraße 18
10245 Berlin, Germany
Phone +49 (0) 30 2618051
Fax +49 (0) 30 2629078
E-mail nlobb@trox.de

Dresden office
Zur Wetterwarte 50, Haus 337/G
01109 Dresden, Germany
Phone +49 (0) 351 889091112
Fax +49 (0) 351 8890910
E-mail nlobd@trox.de

TROX International

Subsidiaries

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Control Units

2015

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TROX GmbH

Heinrich-Trox-Platz
D-47504 Neukirchen-Vluyn

Phone +49(0)2845202-0
Fax +49(0)2845202-265
www.troxtechnik.com
www.trox.de

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