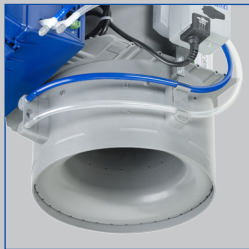
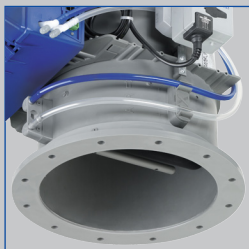




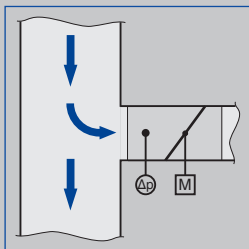
Easy cleaning of sensor tubes



Variant with nozzle and connecting circular spigot



Variant with bluff body and flange



For all upstream conditions



Tested to VDI 6022

VAV terminal units

Type TVLK



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

Type		Page
TVLK	General information	TVLK – 2
	Function	TVLK – 4
	Technical data	TVLK – 5
	Quick sizing	TVLK – 7
	Specification text	TVLK – 9
	Order code	TVLK – 10
	Variants	TVLK – 13
	Attachments	TVLK – 14
	Dimensions and weight	TVLK – 16
	Installation details	TVLK – 18
	Basic information and nomenclature	TVLK – 21

Application

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)

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

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

Description

Variants

- TVLK: VAV terminal unit
- TVLK-FL: VAV terminal unit with flanges on both ends

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

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

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)

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
- per year (recommendation)
- Zero point correction of the static differential pressure transducer should be carried out once

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.

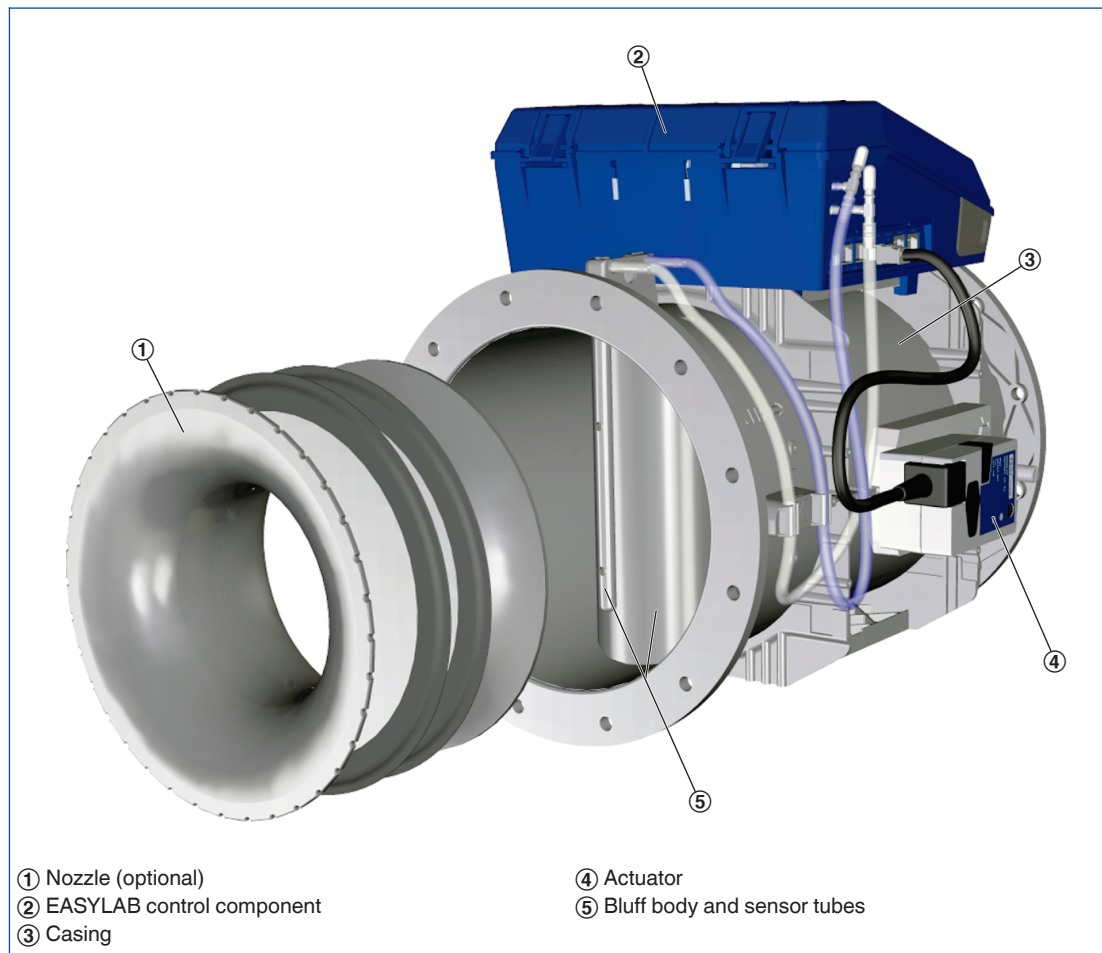
– Fume cupboard control: The volume flow rate

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



Nominal sizes	250 mm
Volume flow rate range	30 – 515 l/s or 108 – 1854 m³/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

Volume flow rate ranges

The minimum differential pressure of VAV terminal units is an important factor in designing the ductwork and in rating the fan including speed control.

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

The volume flow rates given for VAV terminal units

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

TVLK with EASYLAB, volume flow rate ranges and minimum differential pressures

Nominal size	①	②	③	④			
	V̇		Δp _{st min}				ΔV̇
	l/s	m³/h	Pa	Pa	Pa	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

TVLK with Universal controller, volume flow rate ranges and minimum differential pressures

Nominal size	①	②	③	④			
	V̇		Δp _{st min}				ΔV̇
	l/s	m³/h	Pa	Pa	Pa	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

Quick sizing tables provide a good overview of the room sound pressure levels that can be expected. Approximate intermediate values can be interpolated. Precise intermediate values and spectral data can be calculated with our Easy Product Finder design programme.

The first selection criteria for the nominal size are the actual volume flow rates $\dot{V}_{\min}$ and $\dot{V}_{\max}$. The quick sizing tables are based on generally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger air terminal unit and/or a silencer is required.

TVLK with EASYLAB, Sound pressure level at differential pressure 150 Pa

Nominal size	Ṽ	Ṽ	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

TVLK with VARYCONTROL Universal controller, Sound pressure level at differential pressure 150 Pa

Nominal size	Ṽ	Ṽ	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

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 m³/h
- Volume flow rate control range: approx. 15 – 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 130 Pa
- Maximum differential pressure: 1000 Pa

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

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

Air-regenerated noise

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

Case-radiated noise

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

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)

BB3 Universal controller with static differential pressure transducer

BP3 Universal controller with MP bus interface and static differential pressure transducer

BPG Universal controller with MP bus interface and static differential pressure transducer, fast-running actuator

Order example: 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

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

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 switch contacts provided by others

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-02 OLED display

BE-LCD-01 40-character display

Order example: 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 rate	200 – 900 m³/h

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

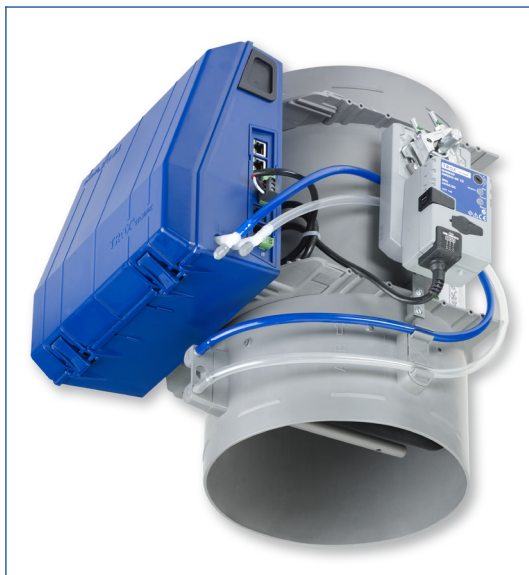
3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$

F: $\dot{V}_1$

Order example: 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 m ³ /h

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



TVLK

- VAV terminal unit for the control of variable air

volume flow rates

- Spigot to make connections to the ducting

TVLK-FL

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

- With flanges to make detachable connections to the ductwork

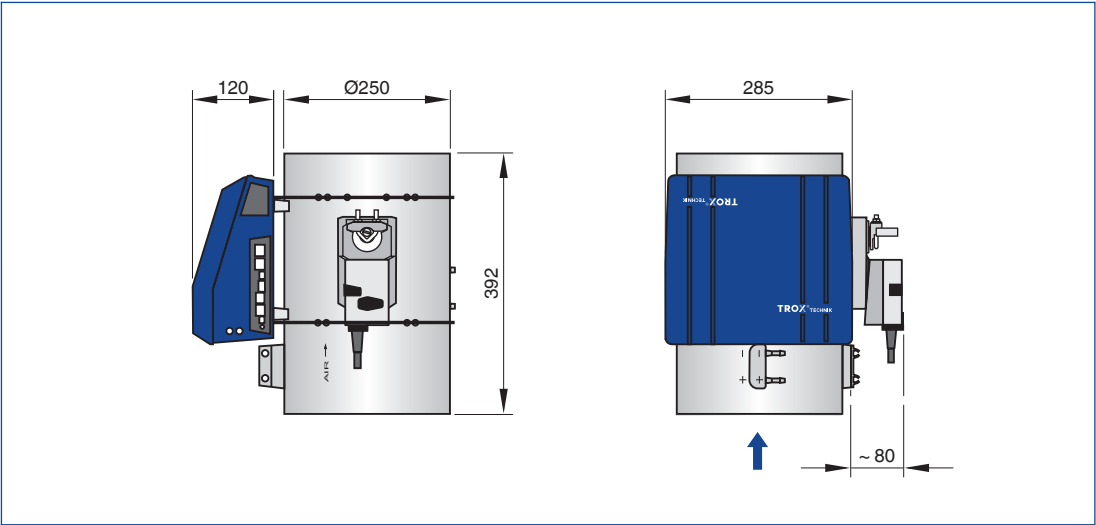
TVLK, VARYCONTROL control components

Order code detail	Controlled variable	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

TVLK, LABCONTROL control components

Order code detail	Controlled variable	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

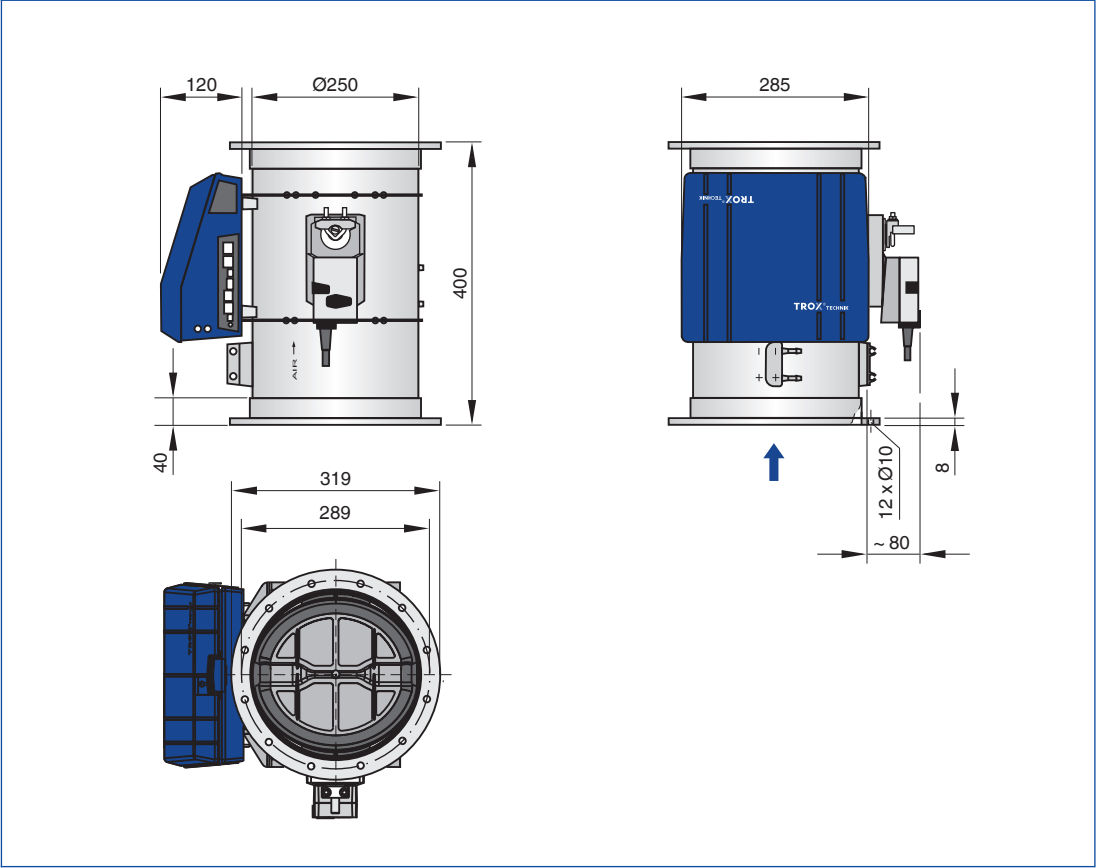
TVLK



TVLK

Nominal size	m
	kg
250	5.1

TVLK-FL



TVLK-FL

Nominal size	m
	kg
250	5.7

Installation and commissioning

- Installation orientation must be as shown on the sticker

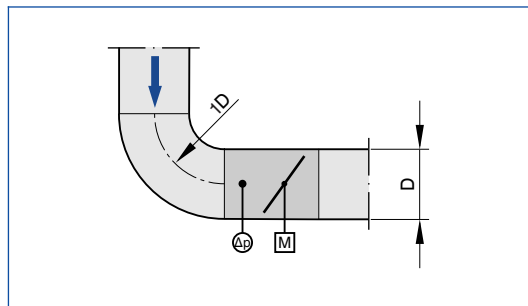
Upstream conditions

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

Space required for commissioning and maintenance

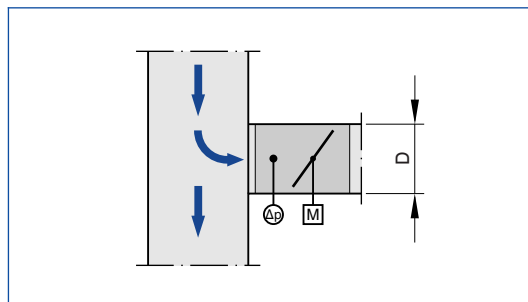
Sufficient space must be kept clear near any attachments to allow for commissioning and maintenance. It may be necessary to provide sufficiently sized inspection access openings.

Bend



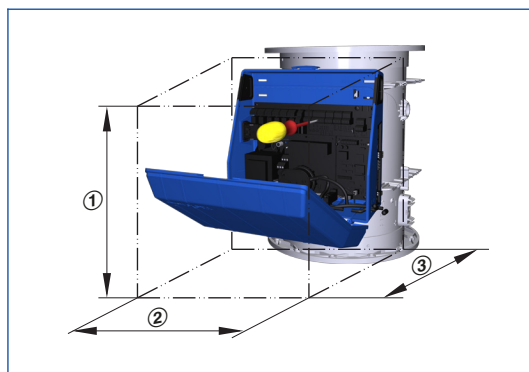
A bend with a centre line curvature radius of at least $1D$ – without an additional straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction



The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed in a branch just off the main duct. Even the installation on the dome of a fume cupboard will have no adverse effect.

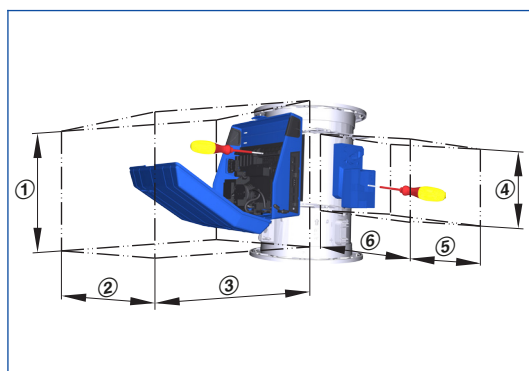
Access to attachments



Space requirement, control component on one side

Attachments	①	②	③
	mm		
VARYCONTROL			
Universal controller	300	320	300

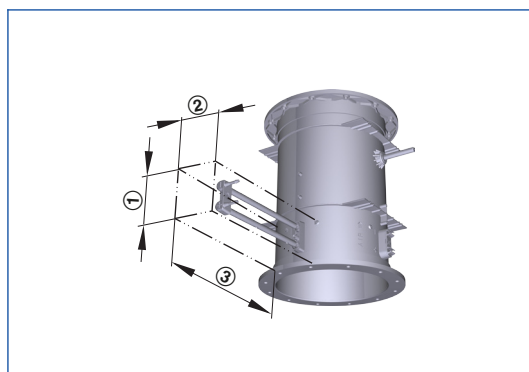
Access to attachments



Space requirement, control components on two sides

Attachments	①	②	③	④	⑤	⑥
	mm					
LABCONTROL						
EASYLAB	350	350	400	300	250	300

Access to sensor tubes for cleaning

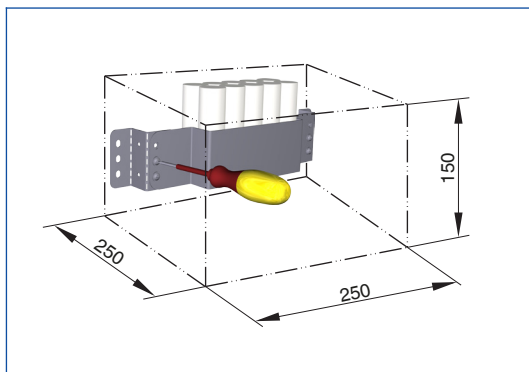


Space required for cleaning the sensor tubes

Nominal size	①	②	③
	mm		
250-1** Bluff body	100	160	D
250-D** Nozzle	100	160	100

D: Casing diameter

Access to battery pack



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

Principal dimensions

$\varnothing D$ [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

$\varnothing D_1$ [mm]

Pitch circle diameter of flanges

$\varnothing D_2$ [mm]

Outside diameter of flanges

$\varnothing D_4$ [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)

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)]

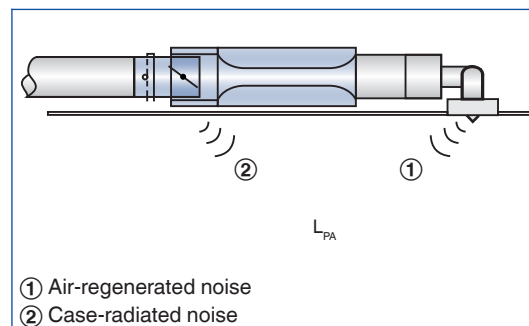
A-weighted sound pressure level of case-regenerated noise of the VAV terminal unit, system attenuation taken into account

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 μ Pa.

Definition of noise



Volume flow rates

$\dot{V}_{nom}$ [m³/h] and [l/s]

Nominal volume flow rate (100 %)

- The value depends on product type and nominal size
- Values are published on the internet and in technical leaflets, and stored in the Easy

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

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

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

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

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

setpoint signal maximum (10 V) (see characteristic)

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

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

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

Volume flow rate

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

Volume flow rate tolerance from setpoint value

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

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

Differential pressure

Δp_{st} [Pa]

Static differential pressure

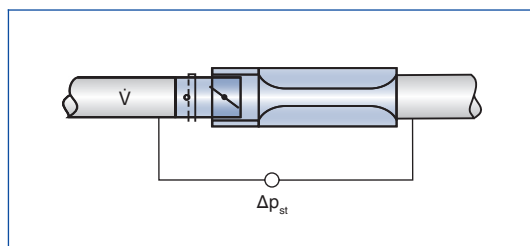
$\Delta p_{\text{st min}}$ [Pa]

Static differential pressure, minimum

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

- If the pressure on the VAV terminal unit is too low, the setpoint volume flow rate may not be achieved, not even when the damper blade is open
- Important factor in designing the ductwork and in rating the fan including speed control
- Sufficient duct pressure must be ensured for all operating conditions and for all terminal units, and the measurement point or points for speed control must have been selected accordingly to achieve this

Static differential pressure



Construction

Galvanised sheet steel

- Casing made of galvanised sheet steel
- Parts in contact with the airflow as described for the product type
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel

Powder-coated surface (P1)

- Casing made of galvanised sheet steel, powder-coated RAL 7001, silver grey
- Parts in contact with the airflow are powder-coated or made of plastic
- Due to production, some parts that come into contact with the airflow may be stainless steel or aluminium, powder-coated
- External parts, e.g. mounting brackets or

covers, are usually made of galvanised sheet steel

Stainless steel (A2)

- Casing made of stainless steel 1.4201

- Parts in contact with the airflow are powder-coated or made of stainless steel
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet