



TROX UNIVERSAL controller,
TROX LABCONTROL controller



Universal controller
(VARYCONTROL)



Variant with flange



Easy cleaning of sensor tubes



Conforms to VDI 6022

VAV terminal units

TVRK



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 effective pressuresensor 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 C

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

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General information

Application

Circular VAV terminal units for use in ventilation and air conditioning systems
VAV terminal units made from plastic, suitable for contaminated air
For controlling, restricting or shutting off airflows, preferably extract air flows
Closed-loop volume flow control using an external power supply
For variable or constant volume flow systems
Shut-off by means of switching (by others)
Can also be used for duct or room pressure control with suitable control components

Special features

Slide-out integral effective pressure sensor with 3 mm measuring holes (resistant to contamination)
Factory set-up or programming and aerodynamic function testing
Parameters can also later be set on the control component; an additional adjustment device may be necessary

Nominal sizes

125, 160, 200, 250, 315, 400

Variants

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

Parts and characteristics

Ready-to-commission unit which consists of mechanical parts and control components.
Averaging effective pressure sensor for volume flow rate measurement; can be removed for cleaning
Damper blade
Factory mounted control components complete with wiring and tubing
Aerodynamic functional testing on a special test rig before shipping of each unit
Set-up data is given on a label affixed to the unit
High control accuracy (even with upstream bend $R = 1D$)

Attachments

Universal controller: controller, effective 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

Construction features

- Circular casing
- Spigot suitable for ducts according to DIN 8077
- Both spigots with the same diameter
- Position of the damper blade indicated externally at shaft extension

Material and surfaces

- Casing and damper blade made of flame-resistant polypropylene (PPs)
- Effective pressure sensor and plain bearings made of polypropylene (PP)
- Damper blade seal made of chloroprene rubber (CR)
- Stainless steel shaft, material no. 14104

Standards and guidelines

Fulfils the hygiene requirements of

- EN 16798, Part 3
- VDI 6022, Sheet 1
- DIN 1946, Part 4
- For other applicable standards and guidelines refer to the hygiene certificate

Casing leakage

- EN 1751, Class C

Closed blade air leakage

- EN 1751, Class 3
- Meets the general requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage

Maintenance

- Maintenance-free as construction and materials are not subject to wear
- Zero point correction of the static effective pressure transducer should be carried out once per year (recommendation)

Function

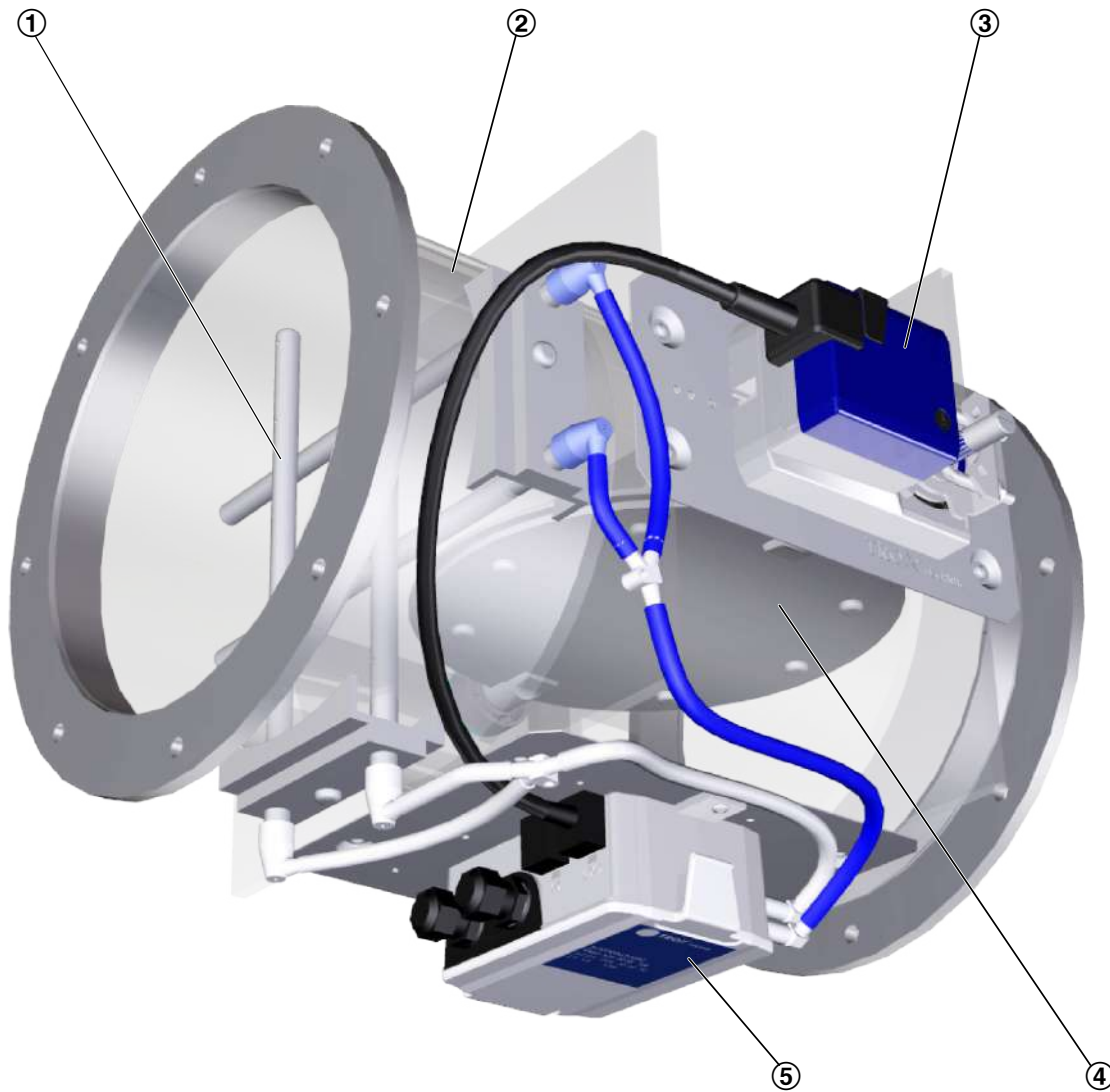
The VAV terminal unit is fitted with an effective pressure sensor for measuring the volume flow rate.

The control components (attachments) include an effective pressure transducer that transforms the effective pressure into an electric signal, a controller and an actuator as 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 Effective pressure sensor
- ② Casing
- ③ Actuator
- ④ Damper blade
- ⑤ Control components, e.g. a Universal controller

Technical data

Quick sizing

Quick sizing tables provide a good overview of the minimum differential pressures, the volume flow rate accuracy and the room sound pressure levels that can be expected. Intermediate values may be achieved by interpolation. The sound power levels for calculating the sound pressure levels were measured in the TROX laboratory according to DIN EN ISO 5135 - see "Basic information and nomenclature". Precise results and spectral data for all control components can be calculated with our Easy Product Finder design program. The first selection criteria for the nominal size are the actual volume flow rates q_{vmin} and q_{vmax} .

Volume flow rate ranges and minimum differential pressure values

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 static differential pressure ($\Delta p_{stat,min}$) must be ensured for all operating conditions and for all controllers. 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.

Volume flow rate ranges and minimum differential pressure values

Control component for static pressure measurements

Attachment: XD0, XD4, BP3, BPG, BPB, BB3, BBB, BUSN, BUSNF, BUSS, TUN, TUNF, TUS, TUSD, ELAB

NS	qv [l/s]	qv [m³/h]	Δp_{stmin} [Pa]				Δqv [±%]
			①	②	③	④	
125	20	70	2	2	2	2	10
125	59	213	10	12	13	15	7
125	99	356	28	32	36	40	6
125	138	499	54	62	70	77	6
160	34	122	2	2	2	2	10
160	104	373	12	13	14	15	7
160	174	625	32	35	38	42	6
160	243	876	62	68	75	81	5
200	55	196	2	2	2	2	10
200	167	601	11	12	12	13	7
200	279	1005	29	31	34	36	6
200	391	1410	56	61	66	71	5
250	85	306	1	1	2	2	10
250	261	939	9	10	10	11	7
250	437	1572	24	26	28	30	6
250	612	2205	47	51	55	59	5
315	139	500	1	1	1	1	10
315	426	1533	6	6	7	8	7
315	713	2565	16	17	19	21	6
315	999	3598	30	33	37	40	5
400	231	830	1	1	1	1	10
400	707	2546	4	5	5	5	7
400	1184	4262	11	12	13	14	6
400	1660	5978	21	24	26	28	5

① Basic unit

② Basic unit with circular silencer CAK, insulation thickness 50 mm, length 500 mm

③ Basic unit with circular silencer CAK, insulation thickness 50 mm, length 1000 mm

④ Basic unit with circular silencer CAK, insulation thickness 50 mm, length 1500 mm

Quick sizing table for sound pressure levels

The quick sizing tables are based on generally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger air terminal unit and/or a silencer or acoustic cladding is required. For more information on the acoustic data, see basic information and nomenclature.

Quick sizing table for air-regenerated noise L_{PA}

Controller including silencer
(total flow rate range of type)

NS	qv [l/s]	qv [m³/h]	150 Pa				500 Pa			
			①	②	③	④	①	②	③	④
125	20	70	35	20	< 15	< 15	41	24	18	< 15
125	59	213	46	32	27	22	52	37	31	26
125	99	356	51	38	33	29	57	43	37	32
125	138	499	54	42	37	33	60	47	41	37
160	34	122	36	23	18	15	42	27	22	17
160	104	373	47	35	30	27	53	40	34	29
160	174	625	51	39	35	31	57	44	39	34
160	243	876	53	41	37	34	58	47	41	37
200	55	196	41	28	23	19	51	40	35	30
200	167	601	44	32	27	23	55	43	38	34
200	279	1005	44	32	27	24	55	43	38	34
200	391	1410	44	32	29	28	55	43	38	34
250	85	306	41	29	23	18	52	40	34	29
250	261	939	44	33	28	24	55	44	39	34
250	437	1572	44	35	30	26	55	45	40	36
250	612	2205	44	36	32	29	55	45	41	37
315	139	500	43	33	28	24	49	38	33	29
315	426	1533	47	39	34	31	53	44	40	36
315	713	2565	50	42	37	34	56	47	43	40
315	999	3598	51	43	39	36	57	49	45	42
400	231	830	40	32	28	25	46	39	35	31
400	707	2546	45	38	35	32	52	45	41	38
400	1184	4262	48	41	38	35	54	48	44	41
400	1660	5978	49	43	40	37	56	49	46	43

Air-regenerated noise L_{PA} [dB] at static differential pressure Δ_{pst} 150 or 500 Pa

- ① Basic unit
- ② Basic unit with circular silencer CAK, insulation thickness 50 mm, length 500 mm
- ③ Basic unit with circular silencer CAK, insulation thickness 50 mm, length 1000 mm
- ④ Basic unit with circular silencer CAK, insulation thickness 50 mm, length 1500 mm

n.a.: The specified static differential pressure Δ_{pst} is lower than the minimum differential pressure $\Delta_{pst min}$.

Quick sizing table for case-radiated noise L_{PA}

NS	qv [l/s]	qv [m³/h]	150 Pa	500 Pa
125	20	70	18	30
125	59	213	26	38
125	99	356	29	41
125	138	499	32	44
160	34	122	19	30
160	104	373	29	40
160	174	625	34	44
160	243	876	37	47
200	55	196	30	41
200	167	601	33	45



NS	qv [l/s]	qv [m³/h]	150 Pa	500 Pa
200	279	1005	35	46
200	391	1410	36	47
250	85	306	28	40
250	261	939	33	45
250	437	1572	36	48
250	612	2205	37	49
315	139	500	31	40
315	426	1533	39	48
315	713	2565	43	51
315	999	3598	45	54
400	231	830	28	36
400	707	2546	38	46
400	1184	4262	42	51
400	1660	5978	45	54

Case-radiated noise L_{PA} [dB] at static differential pressure Δ_{pst} 150 or 500 Pa

n.a.: The specified static differential pressure Δ_{pst} is lower than the minimum differential pressure $\Delta_{pst min}$.

Note:

Information on case-radiated noise for combinations of basic unit and secondary silencer can be found in the Easy Product Finder design program.

Specification text

This specification text describes just one variant of the product that is suitable for many applications. Texts for other variants can be generated with our Easy Product Finder design program.

Specification text

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 effective pressure sensor for volume flow rate measurement, and a damper blade. Factory mounted control components complete with wiring and tubing.

Effective pressure sensor with 3 mm measuring holes, hence resistant to contamination.

Position of the damper blade indicated externally at shaft extension. The damper blade is factory set to open position, which allows a ventilation airflow even without control; this does not apply to variants with defined safe position NC (normally closed).

Closed blade air leakage to EN 1751, class 3.

Casing air leakage to EN 1751, class C.

Meets the hygiene requirements of EN 16798, Part 3, of VDI 6022, Sheet 1, and of DIN 1946, Part 4.

Special features

Slide-out integral effective pressure sensor with 3 mm measuring holes (resistant to contamination)

Factory set-up or programming and aerodynamic function testing

Parameters can also later be set on the control component; an additional adjustment device 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)

Connection type

- Spigot, suitable for ducts according to DIN 8077

Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 20 – 1666 l/s or 70 – 5978 m³/h
- Volume flow rate control range: approx. 12 – 100 % of the nominal volume flow rate
- Minimum differential pressure: up to 62 Pa
- Maximum differential pressure: 1000 Pa

Specification text attachment

Variable volume flow control with electronic Universal controller for applying a reference value and capturing an actual value to be integrated with 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: CLOSE, OPEN, $q_{v,min}$ and $q_{v,max}$

Sizing data

- q_v _____ [m³/h]
- Δ_{pst} _____ [Pa]

Air-regenerated noise

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

Case-radiated noise

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

Order code

Order code for volume flow control (with VARYCONTROL attachment)

TVRK – FL / 160 / GK / XD4 / V 2 / 200 – 900 [m³/h] / NO
 | | | | | | | | |
 1 2 3 4 5 7 8 9 10

1 Type

TVRK VAV terminal unit, plastic

2 Air duct connection

No entry: spigot

FL Flanges on both ends

3 Nominal size [mm]

125, 160, 200, 250, 315, 400

4 Accessories

No entry: none

GK Matching flanges both ends

5 Attachments (control component)

For example

XD4 Universal controller (VARYCONTROL) with static effective pressure transducer

7 Operating mode

F Constant value mode, one setpoint value (no external switch contact)

V Variable operation (adjustable setpoint value range)

8 Signal voltage range

For the actual and setpoint value signals

0 0 – 10 V DC

2 2 – 10 V DC

9 Operating values for factory setting

Volume flow rate [m³/h or l/s]

$q_{v\ const}$ (with operating mode F)

$q_{v\ min} - q_{v\ max}$ (with operating mode V)

10 Damper blade position

Only with spring return actuators

NO power off to open (Normally Open)

NC power off to close (Normally closed)

Order example: TVRK/160/XD4/V2/200–900 m³/h/NO

Duct connection

Spigot

Nominal size

160 mm

Attachments (control components)

VARYCONTROL Universal controller with static effective pressure transducer and safe position function with spring return actuator

Operating mode

Variable operation

Signal voltage range

2 – 10 V DC

Operating values

$q_{v\ min} = 200\ m³/h$

$q_{v\ max} = 900\ m³/h$

Damper blade position

NO power off to OPEN

Order code for volume flow control (with TROX UNIVERSAL attachment)

TVRK – FL / 160 / GK / TUNF / RE / M / 0 / UMZ / ... / NC
 | | | | | | | | | | |
 1 2 3 4 5 6 7 8 9 10 11

1 Type

TVRK VAV terminal unit, plastic

2 Air duct connection

No entry: spigot

FL Flanges on both ends

3 Nominal size [mm]

125, 160, 200, 250, 315, 400

4 Accessories

No entry: none

GK Matching flanges both ends

5 Attachments (control component)

TROX UNIVERSAL controller variants:

TUN Actuator (150 s)

TUNF Spring return actuator (150 s)

TUS Fast-running actuator (3 s)

TUSD Fast-running actuator (3 s), with digital communication interface (TROX HPD)

6 Equipment function

Room control

RE Extract air controller (Room Extract)

7 Operating mode

F Single controller or room master, constant setpoint value

M Single controller or room master, variable setpoint value

S Slave controller (only with room solutions)

8 Signal voltage range

0 0 – 10 V DC

2 2 – 10 V DC

9 Expansion modules

Option 1: Power supply

No entry: 24 V AC/DC

T with EM-TRF for 230 V AC mains supply

U with EM-TRF-USV (including battery pack) for uninterruptible 230 V AC power supply (UPS)

Option 2: Digital communication interface

No entry: none

B with EM-BAC-MOD for BACnet MS/TP

M with EM-BAC-MOD for Modbus RTU

I with EM-IP for BACnet IP, Modbus IP and web server

R with EM-IP (including real time clock, RTC) for BACnet IP, Modbus IP and web server

Option 3: Automatic zero point correction

No entry: none

Order example: TVRK-FL/125/TUN/RE/S/0/UZ/

Flange	both ends
Nominal size	125 mm
Accessories	Without
Attachments (control components)	TROX UNIVERSAL controller, actuator run time 150 s
Equipment function	Extract air control
Volume flow rate setting	Slave
Signal voltage range	0 – 10 V DC
Expansion modules	With expansion module EM-TRF-USV, transformer for 230 V AC and uninterruptible power supply (UPS) With expansion module EM-AUTOZERO, solenoid valve for automatic zero point correction
Operating values	No entry required (slave)

Z with EM-AUTOZERO, solenoid valve for automatic zero point correction

10 Operating values for factory setting

Volume flow rate [m³/h or l/s]

For operating mode F

$q_{v \text{ const}}$: constant volume flow rate^{1,2}

Other parameters are only relevant for the room master as part of a room solution³; for single controllers enter 0

$q_{v \text{ const_Supply}}$: constant supply air (room value)

$q_{v \text{ const_Extract}}$: constant extract air (room value)

$q_{v \text{ Diff}}$: supply air/extract air difference (room value)

For operating mode M

$q_{v \text{ min}}$: minimum volume flow rate^{1,2}

$q_{v \text{ max}}$: maximum volume flow rate^{1,2}

Other parameters are only relevant for the room master as part of a room solution³; for single controllers enter 0

$q_{v \text{ const_Supply}}$: constant supply air (room value)

$q_{v \text{ const_Extract}}$: constant extract air (room value)

$q_{v \text{ Diff}}$: supply air/extract air difference (room value)

For operating mode S

No parameters are required for the slave controller; all entries have to be made on the room master

For volume flow rate operating values please note:

¹ Single controller: $q_{v \text{ min}}$, $q_{v \text{ max}}$ or $q_{v \text{ const}}$ apply to the controller

² Room solutions: $q_{v \text{ min}}$, $q_{v \text{ max}}$, $q_{v \text{ const}}$ apply to the room

³ For more information on room solutions with several directly connected TROX UNIVERSAL controllers (Plug&Play) and for order examples, please refer to the product data sheet

11 Damper blade position

Only with spring return actuators

NO Power off to open (Normally Open)

NC Power off to close (Normally Closed)

Useful additions

Optional room control panel

CP-TOUCH with Touch display

Order code for differential pressure control (with VARYCONTROL attachment)

TVRK – FL / 160 / GK / XF4 / PDE / F 2 / 500 [Pa] / NO
 | | | | | | | | | |
 1 2 3 4 5 6 7 8 9 10

1 Type

TVRK VAV terminal unit, plastic

2 Air duct connection

No entry: spigot

FL Flanges on both ends

3 Nominal size [mm]

125, 160, 200, 250, 315, 400

4 Accessories

No entry: none

GK Matching flanges both ends

5 Attachments (control component)

For example

XF0 Compact controller for duct pressure

XF4 Universal controller for duct pressure (VARYCONTROL)

6 Equipment function/Installation location

PDS Duct pressure controller – supply air (Pressure Duct Supply)

PDE Duct pressure controller – extract air (Pressure Duct Extract)

PRS Room pressure controller – supply air (Pressure Room Supply)

Order example: TVRK/315/XF0/PDE/F0/550 Pa

Duct connection

Spigot

Nominal size

315 mm

Attachments (control components)

Compact controller, static, duct pressure control

Equipment function/installation location

Duct pressure control, extract air

Operating mode

Constant value control

Signal voltage range

0 – 10 V DC

Operating value

$\Delta p_{\text{const}} = 550 \text{ Pa}$

PRE Room pressure controller – extract air (Pressure Room Extract)

7 Operating mode

F Constant value mode, one setpoint value (no external switch contact)

V Variable operation (adjustable setpoint value range)

8 Signal voltage range

For the actual and setpoint value signals

0 0 – 10 V DC

2 2 – 10 V DC

9 Operating values for factory setting

Differential pressure [Pa]

For duct pressure control, enter the differential pressure [Pa] as an absolute value

Δp_{const} (with operating mode F)

$\Delta p_{\text{min}} - \Delta p_{\text{max}}$ (with operating mode V)

10 Damper blade position

Only with spring return actuators

NO power off to open (Normally Open)

NC power off to close (Normally Closed)

Order code for differential pressure control (with TROX UNIVERSAL controller as attachment)

TVRK – FL / 160 / GK / TUNF / PRE / MFP / 0 / UMZ / ... / NC
 | | | | | | | | | | |
 1 2 3 4 5 6 7 8 9 10 11

1 Type

TVRK VAV terminal unit, plastic

2 Air duct connection

No entry: spigot

FL both sides

3 Nominal size [mm]

125, 160, 200, 250, 315, 400

4 Accessories

No entry: none

GK Matching flanges both ends

5 Attachments (control component)

TROX UNIVERSAL controller variants:

TUN Actuator (150 s)

TUNF Spring return actuator (150 s)

TUS Fast-running actuator (3 s)

TUSD Fast-running actuator (3 s), with digital communication interface (TROX HPD)

6 Equipment function

Pressure control

PRE Room pressure controller – extract air (Pressure Room Extract)

PDE Duct pressure controller – extract air (Pressure Duct Extract)

7 Operating mode

MFP Single controller or room master, constant pressure setpoint

MVP Single controller or room master, variable pressure setpoint with room solutions only:

SFP Slave, constant pressure setpoint

SVP Slave, variable pressure setpoint

8 Signal voltage range

0 0 – 10 V DC

2 2 – 10 V DC

9 Expansion modules

Option 1: Power supply

No entry: 24 V AC/DC

T with EM-TRF for 230 V AC mains supply

U with EM-TRF-USV (including battery pack) for uninterruptible 230 V AC power supply (UPS)

Option 2: Digital communication interface

No entry: none

B with EM-BAC-MOD for BACnet MS/TP

M with EM-BAC-MOD for Modbus RTU

I with EM-IP for BACnet IP, Modbus IP and web server

R with EM-IP (including real time clock, RTC) for BACnet IP, Modbus IP and web server

Option 3: Volume flow rate measurement

No entry: none

V with EM-V for volume flow rate measurement at the differential pressure controller

Option 4: Automatic zero point correction

No entry: none

Z with EM-AUTOZERO solenoid valve for automatic zero point correction (only in combination with EM-V)

10 Operating values for factory setting

Volume flow rate [m³/h or l/s], pressure [Pa]

For operating mode MFP and SFP

Δp_{const} : constant differential pressure

For operating mode MVP and SVP

Δp_{min} : minimum differential pressure

Δp_{max} : maximum differential pressure

Other parameters for operating modes MFP and MVP

Only relevant for the room master as part of a room solution¹; for single controller enter 0

$q_{v \text{ min}}$: minimum volume flow rate (room value)

$q_{v \text{ max}}$: maximum volume flow rate (room value)

$q_{v \text{ const_Supply}}$: constant supply air (room value)

$q_{v \text{ const_Extract}}$: constant extract air (room value)

$q_{v \text{ Diff}}$: supply air/extract air difference (room value)

Please note

¹ For more information on room solutions with several directly connected TROX UNIVERSAL controllers (Plug&Play) and for order examples, please refer to the product data sheet

11 Damper blade position

Only with spring return actuators

NO Power off to open (Normally Open)

NC Power off to close (Normally Closed)

Useful additions

Differential pressure transducers required for room or duct pressure control have to be ordered separately or provided by others, e.g.

PT-699 Differential pressure transducer for room pressure control

PT-699-DUCT Differential pressure transducers for duct pressure control, including duct pressure measurement kit

Optional room control panel

CP-TOUCH with Touch display

Order example: TVRK/125/TUN/PDE/SVP/0/TVZ/100/350 Pa

Duct connection

Spigot

Nominal size

125 mm

Attachments (control components)

TROX UNIVERSAL controller, actuator run time 150 s

Equipment function

Duct pressure control, extract air

Effective pressure setting

Slave, variable differential pressure control

Signal voltage characteristics

0 – 10 V DC

Expansion modules

With expansion module EM-TRF, transformer for 230 V AC supply



With expansion module EM-V,
for volume flow rate measurement with differential pressure
control

With expansion module EM-AUTOZERO,
solenoid valve for automatic zero point correction

Operating values

$\Delta_{pmin} = 100 \text{ Pa}$

$\Delta_{pmax} = 350 \text{ Pa}$

Order code for room control (with EASYLAB attachment)

TVRK – FL / 160 / GK / ELAB / S / RE / UMZ / LAB / ...
 | | | | | | | | | |
 1 2 3 4 5 6 8 9 10 11

1 Type

TVRK VAV terminal unit, plastic

2 Air duct connection

No entry: spigot

FL Flanges on both ends

3 Nominal size [mm]

125, 160, 200, 250, 315, 400

4 Accessories

No entry: none

GK Matching flanges both ends

5 Attachments (control component)

ELAB EASYLAB controller TCU3

6 Actuators

S Fast-running actuator (3 s)

SD Fast-running actuator (3 s), with digital communication interface (TROX HPD)

8 Equipment function

Room control

RE Extract air controller (Room Extract)

PC Room pressure controller (Pressure Control)

9 Expansion modules

Option 1: Power supply

No entry: 24 V AC/DC supply

T with EM-TRF for 230 V AC mains supply

U with EM-TRF-USV (including battery pack) for uninterruptible 230 V AC power supply (UPS)

Option 2: Digital communication interface

No entry: none

B with EM-BAC-MOD for BACnet MS/TP

M with EM-BAC-MOD for Modbus RTU

I with EM-IP for BACnet IP, Modbus IP and web server

R with EM-IP (including real time clock, RTC) for BACnet IP, Modbus IP and web server

Option 3: Automatic zero-point adjustment

Order example: TVRK-FL/160/GK/ELAB/S/RE/LAB

Duct connection

Nominal size

Accessories

Attachments (control components)

Actuator

Equipment function

Additional function

Operating values

No entry: none

Z with EM-AUTOZERO, solenoid valve for automatic zero point correction

10 Additional functions

Without room management function

LAB extract air led system (Laboratory)

CLR supply air led system (Clean Room)

Room management function is active

LAB-RMF extract air led system (Laboratory) - with room management function (RMF)

CLR-RMF supply air led system (Clean Room) with room management function (RMF)

11 Operating values for factory setting

Volume flow rate [m³/h or l/s], pressure [Pa]

Only required when room management function is active; total room extract air/supply air

q_{v1}: standard mode

q_{v2}: reduced operation

q_{v3}: increased operation

q_{v4}: constant supply air

q_{v5}: constant extract air

q_{v6}: Supply air/extract air difference

Δp_{set}: setpoint pressure (only with differential pressure control)

Useful additions

room control panel

CP-TOUCH-4.3 Touch control panel with 4.3"

Differential pressure transducers required for room pressure control have to be ordered separately or provided by the client, e.g.

PT-699 Measuring range ±50 Pa or ±100 Pa

PT-GB604 Measuring range ±100 Pa

Flanges on both ends

160 mm

Matching flanges for both ends

EASYLAB controller TCU3

Fast-running (3 s)

Extract air control

Room management function has been deactivated

Extract air led system

not required

Order code for single operation (with EASYLAB attachment)

TVRK – FL / 160 / GK / ELAB / S / EC – E0 / UMZ / ...
 | | | | | | | | | |
 1 2 3 4 5 6 7 8 9 10

1 Type

TVRK VAV terminal unit, plastic

2 Air duct connection

No entry: spigot

FL Flanges on both ends

3 Nominal size [mm]

125, 160, 200, 250, 315, 400

4 Accessories

No entry: none

GK Matching flanges both ends

5 Attachments (control component)

ELAB EASYLAB controller TCU3

6 Actuators

S Fast-running actuator (3 s)

SD Fast-running actuator (3 s), with digital communication interface (TROX HPD)

7 Equipment function

Single operation

EC Single controller – extract air (Extract Controller)

8 External volume flow rate setting

E0 Variable, signal voltage range 0 – 10 V DC

E2 Variable, signal voltage range 2 – 10 V DC

2P 2 switching steps (for one switch contact, by others)

3P 3 switching steps (for two switch contacts, by others)

F Constant value mode, one setpoint value (no external switch contact)

9 Expansion modules

Order example: TVRK/200/ELAB/S/EC/E2/600/900

Duct connection

Nominal size

Attachments (control components)

Actuator

Equipment function

External volume flow rate setting

Operating values

Option 1: Power supply

No entry: 24 V AC/DC

T with EM-TRF for 230 V AC mains supply

U with EM-TRF-USV (including battery pack) for uninterruptible 230 V AC power supply (UPS)

Option 2: Digital communication interface

No entry: none

B with EM-BAC-MOD for BACnet MS/TP

M with EM-BAC-MOD for Modbus RTU

I with EM-IP for BACnet IP, Modbus IP and web server

R with EM-IP (including real time clock, RTC) for BACnet IP, Modbus IP and web server

Option 3: Automatic zero point correction

No entry: none

Z with EM-AUTOZERO solenoid valve for automatic zero point correction

10 Operating values for factory setting

Volume flow rate [m³/h or l/s]

Depends on external volume flow rate setting

E0: $q_{v\min} - q_{v\max}$

E2: $q_{v\min} - q_{v\max}$

2P: q_{v_1}/q_{v_2}

3P: $q_{v_1}/q_{v_2}/q_{v_3}$

F: q_{v_1}

Spigot

200 mm

EASYLAB controller TCU3

Fast-running actuator (3 s)

Extract air controller

Voltage signal 2 – 10 V DC

$q_{v\min} = 600 \text{ m}^3/\text{h}$

$q_{v\max} = 900 \text{ m}^3/\text{h}$

Order code for fume cupboard control (with EASYLAB attachment)

TVRK – FL / 160 / GK / ELAB / S / FH – VS / UMZS / 200 – 900 [m³/h]
 | | | | | | | | |
 1 2 3 4 5 6 7 8 9

1 Type

TVRK VAV terminal unit, plastic

2 Air duct connection

No entry: spigot

FL Flanges on both ends

3 Nominal size [mm]

125, 160, 200, 250, 315, 400

4 Accessories

No entry: none

GK Matching flanges both ends

5 Attachments (control component)

ELAB EASYLAB controller TCU3

6 Actuators

S Fast-running actuator (3 s)

SD Fast-running actuator (3 s), with digital communication interface (TROX HPD)

7 Equipment function

Fume cupboard control

With face velocity transducer

FH-VS Fume cupboard control – control strategy based on face velocity (for face velocity transducer)

With face velocity transducer and sash distance sensor

FH-VD Fume cupboard control – optimised control strategy based on face velocity (for face velocity transducer + sash distance sensor)

With sash distance sensor

FH-DS Fume cupboard control – linear control strategy (with sash distance sensor)

FH-DV Fume cupboard control – safety optimised control strategy (with sash distance sensor)

With switch contacts (provided by the client) for switching steps

FH-2P Fume cupboard control – 2 switching steps (for one switch contact, provided by the client)

FH-3P Fume cupboard control – 3 switching steps (for two switch contacts, provided by the client)

Without signalling

FH-F Fume cupboard control - constant value mode, one setpoint value (no external switch contact)

8 Expansion modules

Option 1: Supply voltage

No entry: 24 V AC/DC supply

T with EM-TRF for 230 V AC mains supply

U with EM-TRF-USV (including battery pack) for uninterruptible 230 V AC power supply (UPS)

Option 2: Digital communication interface

No entry: none

B with EM-BAC-MOD for BACnet MS/TP

M with EM-BAC-MOD for Modbus RTU

I with EM-IP for BACnet IP, Modbus IP and web server

R with EM-IP (including real time clock, RTC) for BACnet IP, Modbus IP and web server

Option 3: Automatic zero-point adjustment

No entry: none

Z with EM-AUTOZERO, solenoid valve for automatic zero point correction

Option 4: Lighting

No entry: none

S with EM-LIGHT, connection socket for lighting, switchable on control panel (can only be used in conjunction with EM-TRF or EM-TRF UPS)

9 Operating values for factory setting

Volume flow rate [m³/h or l/s]

depending on the equipment function

FH-VS: $q_{v\ min} - q_{v\ max}$

FH-VD: $q_{v\ min} - q_{v\ max}$

FH-DS: $q_{v\ min} - q_{v\ max}$

FH-DV: $q_{v\ min} - q_{v\ max}$

FH-2P: $q_{v\ 1}/q_{v\ 2}$

FH-3P: $q_{v\ 1}/q_{v\ 2}/q_{v\ 3}$

FH-F: $q_{v\ 1}$

Useful additions

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

BE-SEG-02 OLED-Display

CP-TOUCH-4.3 Touch control panel with 4.3"

Order example: TVRK/200/ELAB/S/FH-2P/TZ/600/1200

Duct connection	Spigot
Nominal size	200 mm
Attachments (control components)	EASYLAB controller TCU3 with fast-running actuator
Actuator	Fast-running actuator (3 s)
Equipment function	Two switching steps With expansion module EM-TRF, transformer for 230 V AC supply
Expansion module	With expansion module EM-AUTOZERO, solenoid valve for automatic zero point correction
Operating values	$q_{v\ min} = 600\ m³/h$ $q_{v\ max} = 1200\ m³/h$

Variants

VAV terminal unit, variant TVRK



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

VAV terminal unit, variant TVRK-FL



- VAV terminal unit for variable volume flow control
- With flanges to make detachable connections to the ductwork

Material

Order code detail	Part	Material
-	Casing	Plastic, polypropylene (PPs), flame resistant
	Effective pressure sensor	



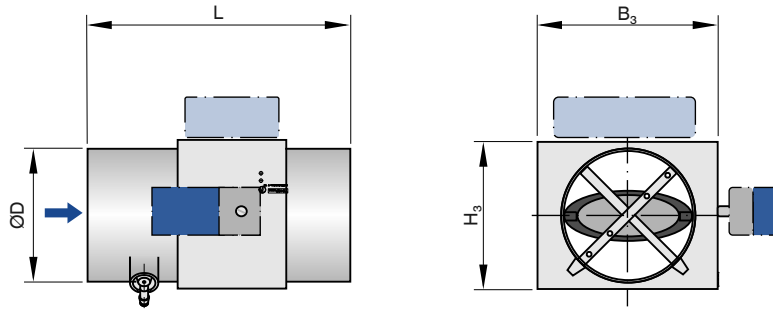
Order code detail	Part	Material
	Damper blade	
	Damper blade seal	Chloroprene rubber (CR)
	Shaft	Stainless steel, material no. 1.4104
	Plain bearings	Plastic, polypropylene (PPs), flame resistant

Order code detail	Part	Material
FL	Flange	Plastic, polypropylene (PPs), flame resistant

Order code detail	Part	Material
GK	Matching flange	Plastic, polypropylene (PPs), flame resistant
	Seal	Rubber, EPDM

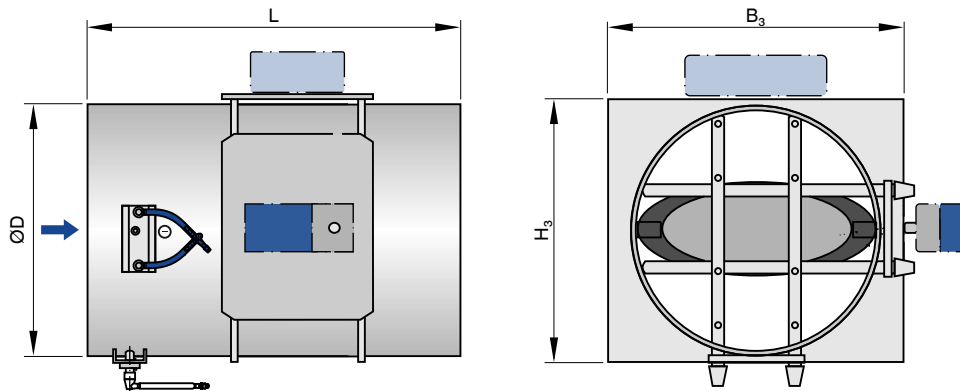
Dimensions and weight

Terminal unit (TVRK, nominal sizes 125 – 200)...



Notes: Length L depends on the nominal size. Only one of the suitable control components is shown. For exact dimensions see the section 'Space required for commissioning and maintenance'.

Terminal unit (TVRK, nominal sizes 250 – 400)...

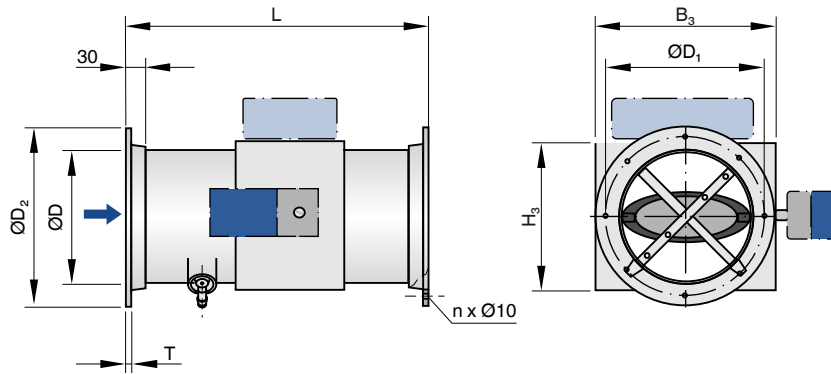


Notes: Length L depends on the nominal size. Only one of the suitable control components is shown. For exact dimensions see the section 'Space required for commissioning and maintenance'.

Dimensions and weights of TVRK

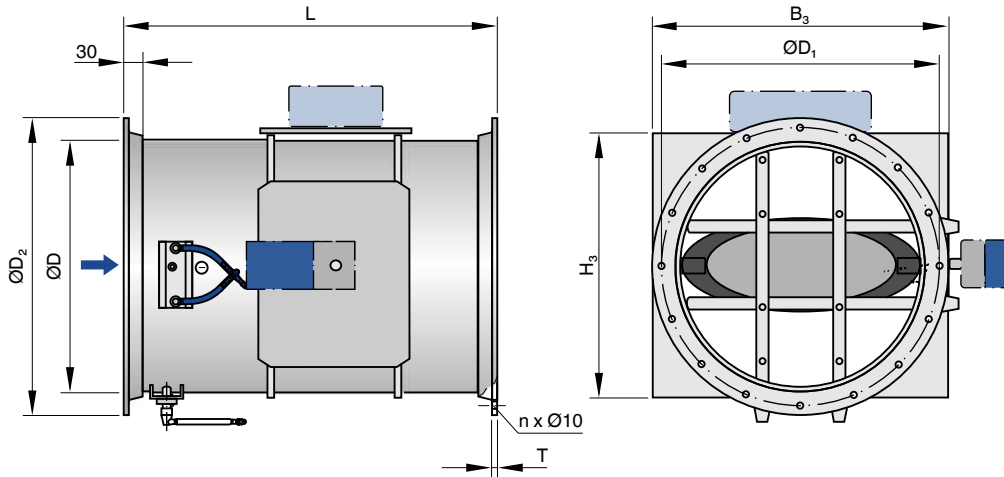
NG	L	ØD	B ₃	H ₃	kg
125	394	125	195	145	4,5
160	394	160	230	180	4,8
200	394	200	270	220	5,2
250	394	250	320	270	6,4
315	594	315	385	335	8,5
400	594	400	470	420	10,7

Terminal unit with flange (TVRK-FL, nominal sizes 125 – 200)...



Notes:

Length L depends on the nominal size. Only one of the suitable control components is shown. For exact dimensions see the section 'Space required for commissioning and maintenance'.

Terminal unit with flange (TVRK-FL, nominal sizes 250 – 400)...


Note:
 Length L depends on the nominal size. Only one of the suitable control components is shown. For exact dimensions see the section 'Space required for commissioning and maintenance'.

Dimensions and weight of TVRK-FL

NG	L	ØD	ØD ₁	ØD ₂	B ₃	H ₃	T	n	kg
125	400	125	165	185	195	145	8	8	4,7
160	400	160	200	230	230	180	8	8	5,2
200	400	200	240	270	270	270	8	8	5,7
250	400	250	290	320	320	270	8	12	7
315	600	315	350	395	385	335	10	12	9,4
400	600	400	445	475	470	420	10	16	11,9

Space required for commissioning and maintenance

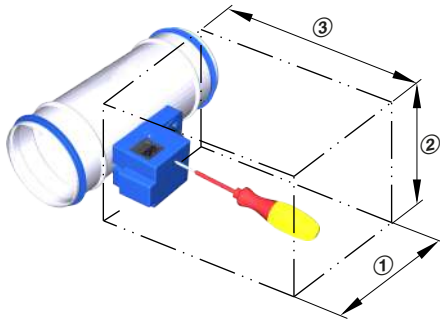
Sufficient space should be kept clear near any attachments to allow for commissioning and maintenance. It may be necessary to provide sufficiently sized inspection access openings.

Product illustrations do not show any installation situation details.

If an attachment requires a certain installation orientation, this is specified on a sticker on the product.

Access to attachments

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Schematic illustration of required installation space

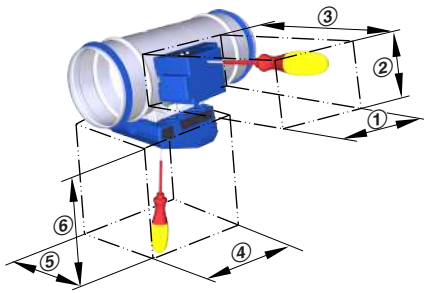
XD0, XD4

Space requirement, control component on one side

Attachment	①	②	③
VARYCONTROL			
Universal controller: BP3, BPB, BPG, BB3, BBB, BR3, BRB, BRG, BS3, BSB, BSG, BG3, BGB, BH3, BHB, XB0, XF0, XD4, XF4	300	320	300

Access to attachments on two sides

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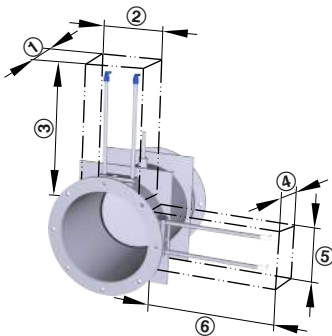
Schematic illustration of required installation space

TUS, BUDN

Space requirement, control components on two sides

Attachment	①	②	③	④	⑤	⑥
LABCONTROL						
EASYLAB: ELAB	300	250	300	350	350	400
TROX UNIVERSAL						
TUN, TUNF, TUS, TUSD	300	250	300	350	350	400
VARYCONTROL						
BUSN, BUSNF, BUSS, BUPN, BUPNF, BURN, BURNF	300	320	300	250	250	250

Access to sensor tubes for cleaning

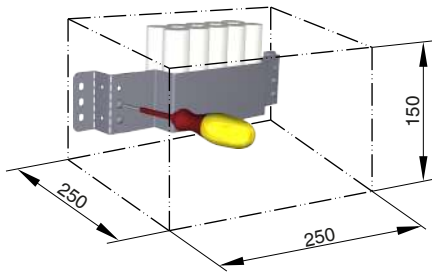


Space required for cleaning the sensor tubes

Nominal size	①	②	③	④	⑤	⑥
125 – 200	100	100	D			
250 – 400	100	160	D	100	160	D

D: Casing diameter

Accessibility to the battery pack



Schematic illustration of required installation space

Note: Additional space for fixing and accessing the battery pack (optional accessory for TROX UNIVERSAL or LABCONTROL EASYLAB control component).

Product details

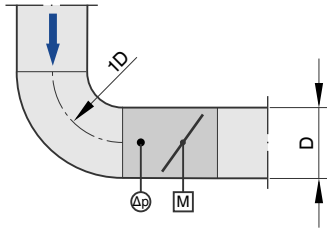
Installation and commissioning

- Installation orientation must be as shown on the sticker

Upstream conditions

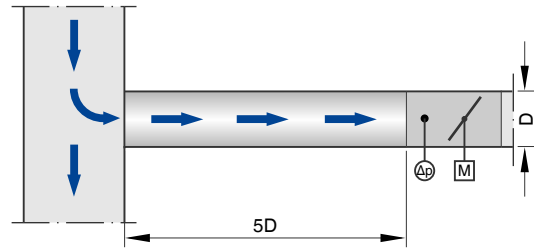
The volume flow rate accuracy Δq_v applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require 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 Δq_v can only be achieved with a straight duct section of at least $5D$ upstream.

VARYCONTROL control components

Attachment	Controlled variable	Interface	Pressure transducer	Actuator	Manufacturer
Compact controller, static					
SB0N	$q_v, \Delta p$	0 – 10 V or 2 – 10 V or BACnet MS/TP or Sauter SLC	integral, 300 Pa	slow-running, integrated	④
SB0S	$q_v, \Delta p$	0 – 10 V or 2 – 10 V or BACnet MS/TP or Sauter SLC	integral, 300 Pa	fast-running, integrated	④
XD0	q_v	0 – 10 V or 2 – 10 V	integrated	Slow running integrated	3
XF0	Δp	0 – 10 V or 2 – 10 V	integral, control range adjustable 25 - 550 Pa or 0.1 – 2.2 inWg	Slow running integrated	3
VARYCONTROL Universal controller, static					
XD4	q_v	0 – 10 V or 2 – 10 V	integrated	Spring return actuator separate	3
XF4	Δp	0 – 10 V or 2 – 10 V	integral, control range adjustable 25 - 550 Pa or 0.1 – 2.2 inWg	Spring return actuator separate	3
BUSN	q_v	0 - 10 V or 2 - 10 V or MP-Bus or Modbus RTU or BACnet MS/TP	integrated	Slow running separate	2
BUSS	q_v	0 - 10 V or 2 - 10 V or MP-Bus or Modbus RTU or BACnet MS/TP	integrated	fast-running separate	2
BUSNF	q_v	0 - 10 V or 2 - 10 V or MP-Bus or Modbus RTU or BACnet MS/TP	integrated	Spring return actuator separate	2
BUPN	Δp	0 - 10 V or 2 - 10 V or MP-Bus or Modbus RTU or BACnet MS/TP	integrated Control range adjustable 25 - 450 Pa or 0.1 – 1.8 inWg	Slow running separate	2
BUPNF	Δp	0 - 10 V or 2 - 10 V or MP-Bus or Modbus RTU or BACnet MS/TP	integrated Control range adjustable 25 - 450 Pa or 0.1 – 1.8 inWg	Spring return actuator separate	2
BURN	Δp	0 - 10 V or 2 - 10 V or MP-Bus or Modbus RTU or BACnet MS/TP	integrated Control range adjustable -50 – -10 Pa or 10 – 50 Pa/ -0.2 – -0.04 inWg or 0.2 – 0.04 inWg	Slow running separate	2
BURNF	Δp	0 - 10 V or 2 - 10 V or MP-Bus or Modbus RTU or BACnet MS/TP	integrated Control range adjustable -50 – -10 Pa or 10 – 50 Pa/ -0.2 – -0.04 inWg or 0.2 – 0.04 inWg	Spring return actuator separate	2

q_v Volume flow rate

Δp Differential pressure

① TROX, ② TROX/Belimo, ③ TROX/Gruner

* Control component has been discontinued

TROX UNIVERSAL control components

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
TROX UNIVERSAL controller – static					
TUN	$q_v, \Delta p$	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	$q_v = \text{integriert}, \Delta p = \text{separat}$	Slow running separate	①
TUNF	$q_v, \Delta p$	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	$q_v = \text{integriert}, \Delta p = \text{separat}$	Spring return actuator separate	①
TUS	$q_v, \Delta p$	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	$q_v = \text{integriert}, \Delta p = \text{separat}$	fast-running separate	①
TUSD	$q_v, \Delta p$	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	$q_v = \text{integriert}, \Delta p = \text{separat}$	fast-running with digital communication interface (TROX HPD), separate	①

q_v Volume flow rate

Δp Differential pressure

① TROX

LABCONTROL EASYLAB control components

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
EASYLAB Regler – statisch					
ELAB	$q_v, \Delta p^*$	TROX plug and play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	$q_v = \text{integriert}, \Delta p = \text{separat}$	fast-running, separate or fast-running with digital communication interface (TROX HPD), separate	①

① TROX

*** The controlled variable depends on the type of VAV terminal unit**

- TVR, TVRK: Fume cupboard, room supply air, room extract air, room pressure, single controller
- TVLK: Fume cupboard, single controller
- TVJ, TVT: Room supply air, room extract air, room pressure, single controller
- TVZ, TZ-Silenzio: Room supply air, room pressure, single controller
- TVA, TA-Silenzio: Room extract air, room pressure, single controller

Nomenclature

Dimensions of rectangular units

B [mm]; [in]
Duct width

B₁ [mm]; [in]
Screw hole pitch of flange (horizontal)

B₂ [mm]; [in]
Overall dimension of flange (width)

H [mm]; [in]
Duct height

H₁ [mm]; [in]
Screw hole pitch of flange (vertical)

H₂ [mm]; [in]
Overall dimension of flange (height)

Dimensions of circular units

ØD [mm]; [in]
Basic units made of sheet steel: Outer diameter of the spigot;
basic units made of plastic: Inside diameter of the spigot

ØD₁ [mm]; [in]
Pitch circle diameter of flanges

ØD₂ [mm]; [in]
Outer diameter of flanges

L [mm]; [in]
Length of unit including connecting spigot

L₁ [mm]; [in]
Length of casing or acoustic cladding

n [
Number of flange screw holes

T [mm]; [in]
Flange thickness

General information

m [kg]; [lb]
Unit weight including the minimum required attachments (control component)

NS [mm]
Nominal size

f_m [Hz]
Octave band centre frequency

L_{PA} [dB(A)]
A-weighted sound pressure level of air-regenerated noise of the CAV controller, system attenuation taken into account

L_{PA1} [dB(A)]

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

L_{PA2} [dB(A)]
A-weighted sound pressure level of case-regenerated noise of the CAV controller, system attenuation taken into account

L_{PA3} [dB(A)]
A-weighted sound pressure level of case-regenerated noise of the CAV controller with acoustic cladding, system attenuation taken into account

Note on acoustic data: All sound pressure levels are based on a reference value of 20 µPa.

q_{vNom} [m³/h]; [l/s]; [CFM]
Nominal flow rate (100 %): The value depends on product type, nominal size and control component (attachment). Values are published on the internet and in technical leaflets and defined in the Easy Product Finder design programme. Reference value for calculating percentages (e.g. q_{vmax}). Upper limit of the setting range and maximum volume flow rate setpoint value for the VAV terminal unit.

q_{vmin Unit} [m³/h]; [l/s]; [CFM]
Technical minimum volume flow: The value depends on product type, nominal size and control component (attachment). Values are defined in the Easy Product Finder design programme Lower limit of the setting range and minimum volume flow rate setpoint value for the VAV terminal unit. Setpoint values below q_{vmin unit} (if q_{vmin} equals zero) may result in unstable control or shut-off.

q_{vmax} [m³/h]; [l/s]; [CFM]
Adjustable by others at upper limit of the operating range for the VAV terminal unit: q_{vmax} can be set to less than or equal to q_{vnom} on the terminal unit. In case of analogue control of volume flow controllers (typically used), the maximum value of the setpoint signal (10 V) is assigned to the set maximum value (q_{vmax}) (see characteristics).

q_{vmin} [m³/h]; [l/s]; [CFM]
Adjustable by others at lower limit of the operating range for the VAV terminal unit: q_{vmin} should be set to less than or equal to q_{vmax}. q_{vmin} to less than q_{vmin unit}, as the control may become unstable or the damper blade may close. q_{vmin} may equal zero. In case of analogue control of volume flow controllers (typically used), the minimum value of the setpoint signal (0 or 2 V) is assigned to the set minimum value (q_{vmin}) (see characteristics).

q_v [m³/h]; [l/s]; [CFM]
Volume flow rate

Δ_{qv} [%]
Volume flow rate accuracy in relation to the setpoint (tolerance)

Δp_{st} [Pa]; [inWg]
Static differential pressure

Δp_{stmin} [Pa]; [inWg]

Static minimum differential pressure: 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 (damper blade). If the pressure on the CAV controller is too low, the setpoint volume flow rate may not be achieved, not even when the damper blade is open. Important factor in designing the ductwork and in rating the fan including speed control. Sufficient static differential pressure must be ensured for all operating conditions and for all controllers, and the measurement point or points for speed control must have been selected accordingly to achieve this.

Lengths [mm]; [in]

All lengths are given in millimetres [mm] unless stated otherwise.

Basic unit

Unit for controlling volume flow rates without an attached control component. The main components include the casing with sensor(s) to measure the differential pressure and the damper blade to restrict the volume flow. The basic unit is also referred

to as a VAV terminal unit. Important distinguishing features: Geometry or unit shape, material and connection variants, acoustic characteristics (e.g. optional acoustic cladding or integrated silencers), range of volume flow.

Control component

Electronic unit(s) mounted on the basic unit to control the volume flow rate, or the duct pressure, or the room pressure by adjusting the damper blade position. The electronic unit essentially consists of a controller with differential pressure transmitter (integrated or external) and an integrated actuator (Easy and Compact controller).

Important distinguishing features:

- Transmitter: dynamic transmitter for clean air or static transmitter for contaminated air
- Actuator: Standard actuator, slow-running
- Interface technology: analogue interface or digital bus interface for connecting and recording signals and data

Volume flow controller

Consists of a basic unit with an attached control component.