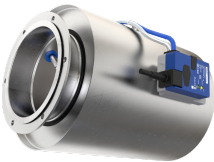




Easy controller, Compact controller



Construction with acoustic cladding and flange



Universal controller (VARYCONTROL)



TROX UNIVERSAL controller, TROX LABCONTROL controller

# VAV terminal units

## TVR



### For various standard applications

- Circular air terminal units for standard applications in supply air or extract air systems with variable volume flow rates
- 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 ( $R = 1D$ )
- 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 CA (for Germany and Switzerland), CAH (for EMEA) or CF for the reduction of air-regenerated noise
- Hot water heat exchanger WL and electric air heater EL for reheating the airflow



Tested to VDI 6022

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## General information

### Application

- Circular VAV terminal units for use in ventilation and air conditioning systems
- For controlling, restricting, or shutting off supply and 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

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

### Nominal sizes

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

### 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 circular silencer CA (for Germany and Switzerland), CH (for EMEA) 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

### Parts and characteristics

- Ready-to-commission unit which consists of mechanical parts and control components.
- Averaging effective pressure sensor for volume flow rate measurement
- Damper blade
- Factory assembled 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 or volume flow rate scale affixed to the unit
- High control accuracy (even with upstream bend R = 1D)

### Attachments

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

### Accessories

- G2: Matching flanges for both ends
- D2: Double lip seals on both ends (factory fitted)

### Useful additions

- Circular silencer CA (for Germany and Switzerland), CH (for EMEA) or CF for demanding acoustic requirements
- Heat exchanger WL
- Electric air heater EL

### Construction features

- Circular casing
- Spigot suitable for circular ducts to EN 1506 or EN 13180
- Spigots with groove for 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 plain 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 seal 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
- Non-hazardous to health thanks to being highly biosoluble in accordance with the Ordinance on Hazardous Substances and Note Q of the European Directive (EC) No. 1272/2008

**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:

NS 100

- EN 1751, Class 2
- Meets the general requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage

NS 125 – 160

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

NS > 160

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

**Maintenance**

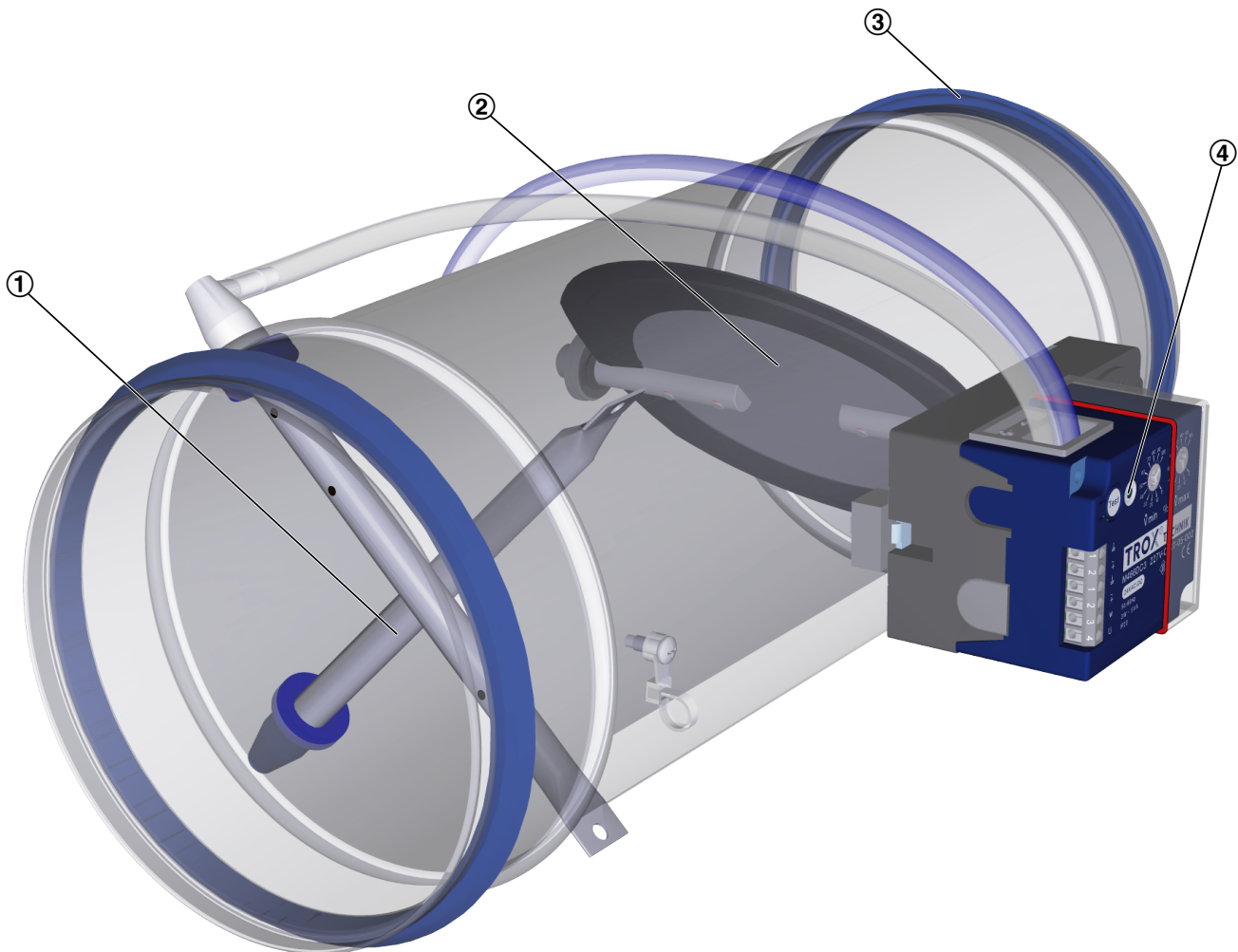
- Maintenance-free as construction and materials are not subject to wear

## 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; the control functions can be achieved with an Easy controller or 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 Effective pressure sensor
- ② Damper blade
- ③ Double lip seal
- ④ Control components, e.g. an Easy controller



## Technical data

Nominal sizes	100 – 400 mm
Volume flow rate range	34 – 7591 m <sup>3</sup> /h or 10 – 2108 l/s
Volume flow rate control range (unit for dynamic effective pressure measurements)	Approx. 10 – 100% of the nominal volume flow rate
Volume flow rate control range (unit for static effective pressure measurements)	Approx. 15 to 100% of the nominal volume flow rate
Minimum differential pressure	Up to 117 Pa (without circular silencer)
Maximum differential pressure	1000 Pa
Operating temperature	10 to 50 °C

## 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 ( $\Delta_{pstat,min}$ ) 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 dynamic pressure measurements – Easy (potentiometers)

### Attachment: Easy

NS	qv [l/s]	qv [m³/h]	Δpstmin [Pa]				Δqv [±%]
			①	②	③	④	
100	10	34	1	1	1	2	16
100	38	136	12	14	16	19	9
100	66	239	35	42	50	57	7
100	94	341	71	86	101	116	6
125	16	55	1	1	1	2	16
125	62	223	12	14	16	18	8
125	108	390	37	43	49	55	7
125	155	558	75	87	100	112	6
160	25	88	1	1	1	1	16
160	99	357	11	13	14	15	9
160	174	627	34	38	42	46	7
160	248	896	69	77	86	94	6
200	40	143	1	1	1	1	16
200	162	582	11	12	13	14	8
200	283	1020	33	36	40	43	7
200	405	1459	67	74	81	87	6
250	60	216	1	1	1	1	16
250	245	881	8	9	9	10	9
250	430	1547	23	25	28	30	7
250	614	2212	46	51	56	61	6
315	100	359	1	1	1	1	16
315	407	1464	5	6	7	7	8
315	713	2568	15	17	19	21	7
315	1020	3673	31	35	39	42	6
400	165	591	1	1	1	1	16
400	670	2413	4	5	5	6	8
400	1177	4236	12	14	15	16	7
400	1682	6058	25	27	30	33	6

① Basic unit

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

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

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

## Volume flow rate ranges and minimum differential pressure values

Control component dynamic measurement principle –  $q_v$  Extended

Attachments: BC0, BL0 \*\*, BM0, BM0-J6

NS	$q_v$ [l/s]	$q_v$ [m³/h]	$\Delta p_{stmin}$ [Pa]				$\Delta q_v$ [±%]
			①	②	③	④	
100	10	34	1	1	1	2	16
100	46	165	17	20	24	28	8
100	83	297	54	65	77	88	6
100	118	428	111	135	158	182	5
125	16	55	1	1	1	2	16
125	75	270	18	21	24	27	8
125	134	484	57	66	75	84	6
125	194	699	117	137	156	175	5
160	25	88	1	1	1	1	16
160	120	433	17	18	20	22	8
160	216	777	52	58	64	71	6
160	311	1122	108	121	134	147	5
200	40	143	1	1	1	1	16
200	196	705	16	18	19	21	8
200	352	1266	51	56	61	66	6
200	507	1828	105	116	126	137	5
250	60	216	1	1	1	1	16
250	297	1068	11	12	13	15	8
250	533	1919	35	38	42	46	6
250	769	2771	72	80	87	95	5
315	100	359	1	1	1	1	16
315	493	1774	8	9	9	10	8
315	886	3188	24	26	29	32	6
315	1278	4603	49	55	60	66	5
400	165	591	1	1	1	1	16
400	812	2924	6	7	7	8	8
400	1461	5258	19	21	23	25	6
400	2108	7591	38	43	47	51	5

① Basic unit

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

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

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

\*\* Control component to be discontinued - do not include in new projects

## Volume flow rate ranges and minimum differential pressure values

Control component for dynamic pressure measurements – qv standard

Attachments: BUDN, BUDNF, LN0, LK0, LB0, XB0, XB4, (B13 \*, B1B \*)

NS	qv [l/s]	qv [m³/h]	Δpstmin [Pa]				Δqv [±%]
			①	②	③	④	
100	10	34	1	1	1	2	16
100	39	141	12	15	18	20	9
100	69	247	37	45	53	61	7
100	98	354	76	92	109	125	6
125	16	55	1	1	1	2	16
125	64	229	13	15	17	19	8
125	112	404	40	46	52	59	7
125	160	578	80	94	107	120	6
160	25	88	1	1	1	1	16
160	102	368	12	13	15	16	8
160	180	648	36	41	45	49	7
160	257	928	74	83	92	101	6
200	40	143	1	1	1	1	16
200	166	599	12	13	14	15	8
200	293	1056	35	39	42	46	6
200	420	1512	72	79	86	94	6
250	60	216	1	1	1	1	16
250	252	908	8	9	10	11	8
250	444	1600	24	27	29	32	7
250	636	2292	49	55	60	65	6
315	100	359	1	1	1	1	16
315	419	1508	6	6	7	8	8
315	738	2658	17	19	20	22	6
315	1057	3807	33	37	42	46	6
400	165	591	1	1	1	1	16
400	691	2487	5	5	5	6	8
400	1218	4383	13	15	16	17	6
400	1744	6279	26	29	32	35	5

① Basic unit

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

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

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

\* Control component has been discontinued

## Volume flow rate ranges and minimum differential pressure values

Control component of static measurement principle

Attachments: **BUSN, BUSNF, BUSS, XD0, XD4, TUN, TUNF, TUS, TUSD, ELAB (BP3 \*, BPG \*, BPB \*, BB3 \*, BBB \*)**

NS	qv [l/s]	qv [m³/h]	Δpstmin [Pa]				Δqv [±%]
			①	②	③	④	
100	14	50	2	2	3	3	14
100	42	151	14	17	20	23	8
100	70	253	39	47	56	64	7
100	98	354	76	92	109	125	6
125	23	81	2	2	3	3	13
125	69	247	15	18	20	22	8
125	114	412	41	48	54	61	6
125	160	578	80	94	107	120	6
160	36	129	2	2	2	2	14
160	110	395	14	15	17	19	8
160	184	662	38	42	47	51	7
160	257	928	74	83	92	101	6
200	59	210	2	2	2	2	13
200	179	644	13	15	16	17	8
200	299	1078	37	41	44	48	6
200	420	1512	72	79	86	94	6
250	89	318	1	2	2	2	14
250	271	976	9	10	11	12	8
250	454	1634	25	28	31	33	7
250	636	2292	49	55	60	65	6
315	147	529	1	1	1	1	13
315	451	1622	6	7	8	9	8
315	754	2714	17	19	21	23	6
315	1057	3807	33	37	42	46	6
400	242	871	1	1	1	1	13
400	743	2674	5	6	6	7	8
400	1243	4476	14	15	17	18	6
400	1744	6279	26	29	32	35	5

① Basic unit

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

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

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

\* Control component has been discontinued

## 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
100	10	34	32	18	< 15	< 15	43	27	20	15
100	46	165	48	36	31	27	58	45	38	34
100	83	297	53	42	37	33	64	51	45	41
100	118	428	57	45	n.V.	n.V.	67	55	49	45
125	16	55	34	19	< 15	< 15	46	30	23	18
125	75	270	47	36	31	28	59	46	41	37
125	134	484	52	42	37	34	63	52	47	43
125	194	699	53	44	n.V.	n.V.	65	54	49	46
160	25	88	39	25	19	15	51	36	30	25
160	120	433	50	39	35	32	62	50	45	42
160	216	777	52	42	38	35	64	53	49	46
160	311	1122	53	44	40	37	65	55	51	47
200	40	143	41	30	24	20	51	41	36	31
200	196	705	50	42	38	36	61	52	48	44
200	352	1266	52	44	41	39	62	54	51	48
200	507	1828	52	46	43	41	63	56	52	50
250	60	216	41	32	26	23	51	41	37	33
250	297	1068	48	41	37	35	57	51	47	45
250	533	1919	49	43	40	38	58	53	50	47
250	769	2771	49	44	42	40	59	54	51	48
315	100	359	44	36	31	27	54	47	42	37
315	493	1774	49	42	39	36	60	53	49	46
315	886	3188	50	44	41	39	61	55	51	49
315	1278	4603	51	46	43	41	62	56	53	50
400	165	591	45	38	33	29	58	53	48	43
400	812	2924	46	40	36	34	59	54	50	47
400	1461	5258	46	41	38	36	60	55	51	48
400	2108	7591	47	42	40	39	60	55	52	49

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

① Basic unit

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

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

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

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



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

Controller including acoustic cladding

(total flow rate range of type)

NS	qv [l/s]	qv [m³/h]	150 Pa		500 Pa	
			①	②	①	②
100	10	34	15	< 15	26	15
100	46	165	31	20	41	30
100	83	297	36	25	47	36
100	118	428	40	29	50	39
125	16	55	17	< 15	28	17
125	75	270	30	19	41	30
125	134	484	35	24	46	35
125	194	699	38	27	49	38
160	25	88	19	< 15	30	23
160	120	433	30	23	42	35
160	216	777	34	27	46	39
160	311	1122	37	30	48	41
200	40	143	21	< 15	31	16
200	196	705	32	17	42	27
200	352	1266	36	21	46	31
200	507	1828	39	24	49	34
250	60	216	25	< 15	34	19
250	297	1068	35	20	45	30
250	533	1919	39	24	48	33
250	769	2771	41	26	51	36
315	100	359	29	< 15	39	21
315	493	1774	40	22	50	32
315	886	3188	44	26	54	36
315	1278	4603	46	29	57	39
400	165	591	30	< 15	43	27
400	812	2924	39	23	52	36
400	1461	5258	42	26	55	39
400	2108	7591	44	28	57	41

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

① Basic unit

② Basic unit with acoustic cladding

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

Note:

Information on case-radiated noise for combinations of basic unit and optional acoustic cladding 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 for variable and constant air volume systems, suitable for supply or extract air, available in 7 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 control 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).

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

### Special features

- Integral effective pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Factory set-up or programming and aerodynamic function testing
- Parameters can also later be set on the control component; 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
- Aluminium sensor tubes
- Plastic plain bearings

### Connection

- Spigot with groove for lip seal, suitable for connecting ducts according to EN 1506 or EN 13180

### Equivalence criteria

- Declaration of hygiene conformity in accordance with VDI 6022, Sheet 1 (01/2018), ÖNORM H 6020 (02/2007) and ÖNORM H 6021 (09/2003)
- Setting the volume flow rates without adjustment device via  $V_{min}$  and  $V_{max}$  potentiometers

- Electrical connections with screw terminals, no additional terminal boxes required
- Aerodynamic functional testing of each volume flow controller on test rigs at the factory, before a label is affixed to the controller
- Acoustic data measured to ÖNORM EN ISO 5135:1999

### Technical data

- Nominal sizes: 100 to 400 mm
- Volume flow rate range: 34 – 6058 m<sup>3</sup>/h or 10 – 1682 l/s
- Volume flow rate control range (unit for dynamic effective pressure measurements): approx. 10 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 1 – 117 Pa
- Maximum differential pressure: 1000 Pa
- Closed blade air leakage, class 2, 3 or 4 depending on nominal size.

### Specification text for attachment

Variable volume flow control with electronic Easy controller to connect an external control signal; actual value signal can be integrated into the central BMS.

- 24 V AC/DC supply voltage
- Signal voltages 0 – 10 V DC
- Possible override controls with external switches using volt-free contacts: CLOSE, OPEN,  $q_{vmin}$  and  $q_{vmax}$
- Potentiometers with percentage scales to set the volume flow rates  $q_{vmin}$  and  $q_{vmax}$
- The actual value signal relates to the nominal volume flow rate such that commissioning and subsequent adjustment are simplified
- Clearly visible external indicator light for signalling the functions: Set, not set, and power failure
- Electrical connections with screw terminals
- Single or double terminals (depending on control component) for looping the supply voltage, i.e. for the simple connection of voltage transmission to the next controller.

### Sizing data

- $q_v$  \_\_\_\_\_ [m<sup>3</sup>/h]
- $\Delta_{pst}$  \_\_\_\_\_ [Pa]

### Air-regenerated noise

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

### Case-radiated noise

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

Order code

Order code for volume flow control (with Easy attachment)

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

**5 Nominal size [mm]**

100, 125, 160, 200, 250, 315, 400

Order example: TVR-D/200/D2/Easy

Type	TVR
Acoustic cladding	With acoustic cladding
Nominal size [mm]	200
Accessories	Double lip seal both ends
Attachments (control components)	Volume flow controller, dynamic, analogue interface, setting of $q_{v_{min}}$ and $q_{v_{max}}$ with potentiometers (by others)

Order example: TVR/125/D2/Easy

Type	TVR
Acoustic cladding	Without acoustic cladding
Nominal size [mm]	125
Accessories	Double lip seal both ends
Attachments (control components)	Volume flow controller, dynamic, analogue interface, setting of $q_{v_{min}}$ and $q_{v_{max}}$ with potentiometers (by others)

Order code for volume flow control (with VARYCONTROL attachment)

TVR – D – A2 – FL / 160 / G2 / XD4 / V 0 / 200 – 900 [m³/h] / NO  
 | | | | | | | | | | | |  
 1 2 3 4 5 6 7 9 10 11 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 Duct connection**

No entry: push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal

**FL** Flanges both ends (not for TVR-D-P1)

**5 Nominal size [mm]**

100, 125, 160, 200, 250, 315, 400

**6 Accessories**

No entry: without accessories

**D2** Double lip seal both ends

**G2** Matching flanges for both ends

**7 Attachments (control components)**

For example

**BC0** Compact controller

**XD4** Universal controller (VARYCONTROL)

**9 Operating mode**

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

**V** Variable operation (adjustable setpoint value range)

**10 Signal voltage range**

For the actual and setpoint value signals

**0** 0 – 10 V DC

**2** 2 – 10 V DC

**11 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)

**12 Damper blade position**

Only with spring return actuators

**NO** Power off to open (Normally Open)**NC** Power off to close (Normally Closed)**Order example: TVR-D-A2-FL/160/G2/XD4/V0/200-900[m<sup>3</sup>/h]/NO**

Type	TVR
Acoustic cladding	With acoustic cladding
Material	Stainless steel construction
Duct connection	Flanges on both ends
Nominal size [mm]	160
Accessories	Matching flanges for both ends
Attachments (control components)	VARYCONTROL Universal controller; static transducer; analogue control; safe position with spring return
Operating mode	Variable operation
Signal voltage range	0 – 10 V DC
Operating values for factory setting	200 – 900 [m <sup>3</sup> /h]
Damper blade position	Power off to open (Normally Open)

**Order example: TVR/200/XD4/V2/500-1200[m<sup>3</sup>/h]/NO**

Type	TVR
Acoustic cladding	Without acoustic cladding
Material	Galvanised sheet steel
Duct connection	Push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal
Nominal size [mm]	200
Accessories	Without accessories
Attachments (control components)	VARYCONTROL Universal controller; static transducer; analogue control; safe position with spring return
Operating mode	Variable operation
Signal voltage range	2 – 10 V DC
Operating values for factory setting	500 – 1200 [m <sup>3</sup> /h]
Damper blade position	Power off to open (Normally Open)

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

TVR	-	D	-	A2	-	FL	/	160	/	G2	/	TUNF	/	RS	/	M	/	0	/	UMZ	/	...	/	NC
1		2		3		4		5		6		7		8		9		10		11		12		13

### 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 Duct connection

No entry: push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal

**FL** Flanges both ends (not for TVR-D-P1)

### 5 Nominal size [mm]

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

### 6 Accessories

No entry: without accessories

**D2** Double lip seal both ends

**G2** Matching flanges for both ends

### 7 Attachments (control components)

TROX UNIVERSAL controller with

**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)

### 8 Equipment function

Room control

**RS** Supply air controller (Room Supply)

**RE** Extract air controller (Room Extract)

### 9 Operating mode

**F** Room master or single controller, constant setpoint value

**M** Room master or single controller, variable setpoint value

**S** Slave controller (only with room solutions)

### 10 Signal voltage range

**0** 0 – 10 V DC

**2** 2 – 10 V DC

### 11 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: without communication interface

**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: no zero point correction

**Z** With EM-AUTOZERO solenoid valve for automatic zero point correction

### 12 Operating values for factory setting

Volume flow rate [m<sup>3</sup>/h or l/s]

#### For operating mode F

$q_{v\text{const}}$ : constant volume flow rate<sup>1,2</sup>

Other parameters are only relevant for the room master as part of a room solution<sup>3</sup>; for single controllers enter 0

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

$q_{v\text{const\_ext}}$ : 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<sup>1,2</sup>

$q_{v\text{max}}$ : maximum volume flow rate<sup>1,2</sup>

Other parameters are only relevant for the room master as part of a room solution<sup>3</sup>; for single controllers enter 0

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

$q_{v\text{const\_ext}}$ : 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:

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

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

<sup>3</sup> For more information on room solutions with several TROX UNIVERSAL controllers connected with plug and play and for order examples please refer to the product datasheet

### 13 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

**BE-LCD** with 40-character display

**Order example: TVR-FL/250/TUNF/RE/M0/306-2205-0-0-0[m³/h]/NC**

Type	TVR
Acoustic cladding	Without acoustic cladding
Material	Galvanised sheet steel
Duct connection	Flanges on both ends
Nominal size [mm]	250
Accessories	Without accessories
Attachments (control components)	TROX UNIVERSAL controller with spring return actuator (150 s)
Equipment function	Extract air controller (Room Extract)
Operating mode	Room master or single controller, variable setpoint value
Signal voltage range	0 – 10 V DC
Expansion modules	24 V AC/DC supply, without digital communication interface, without automatic zero point correction
Operating values for factory setting	$q_{V_{min}}$ : 306 [m³/h] $q_{V_{max}}$ : 2205 [m³/h] $q_{V_{const\_sup}}$ : 0 $q_{V_{const\_ext}}$ : 0 $q_{V_{diff}}$ : 0
Damper blade position	Power off to close (Normally Closed)

**Order code for differential pressure control (with VARYCONTROL attachment)**

**TVR – D – A2 – FL / 160 / G2 / XF4 / PDS / V 0 / 300-500 [Pa] / NO**  
 |     |     |     |     |     |     |     |     |     |     |     |  
 1    2    3    4    5    6    7    8    9 10    11    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 Duct connection**

No entry: push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal

**FL** Flanges both ends (not for TVR-D-P1)

**5 Nominal size [mm]**
**100, 125, 160, 200, 250, 315, 400**
**6 Accessories**

No entry: without accessories

**D2** Double lip seal both ends

**G2** Matching flanges for both ends

**7 Attachments (control components)**

For example

**XF0** Compact controller for duct pressure

**XF4** Universal controller for duct pressure (VARYCONTROL)

**8 Equipment function/installation location**
**Order example: TVR-D-A2-FL/160/G2/XF4/PDS/V0/300-500[Pa]/NO**

Type	TVR
Acoustic cladding	With acoustic cladding
Material	Stainless steel construction
Duct connection	Flanges on both ends

**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)

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

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

**V** Variable operation (adjustable setpoint value range)

**10 Signal voltage range**

For the actual and setpoint value signals

**0** 0 – 10 V DC

**2** 2 – 10 V DC

**11 Operating values for factory setting**

Differential pressure [Pa]

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

 $\Delta p_{const}$  (with operating mode F)

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

**12 Damper blade position**

Only with spring return actuators

**NO** Power off to open (Normally Open)

**NC** Power off to close (Normally Closed)



Nominal size [mm]	160
Accessories	Matching flanges for both ends
Attachments (control components)	VARYCONTROL Universal controller for duct pressure; analogue interface
Equipment function	Duct pressure control, supply air (Pressure Duct Supply)
Operating mode	Variable operation
Signal voltage range	0 – 10 V DC
Operating values for factory setting	300 – 500 [Pa]
Damper blade position	Power off to open (Normally Open)

### Order example: TVR-FL/250/G2/XF4/PDS/F0/450[Pa]/NC

Type	TVR
Acoustic cladding	Without acoustic cladding
Material	Galvanised sheet steel
Duct connection	Flanges on both ends
Nominal size [mm]	250
Accessories	Matching flanges for both ends
Attachments (control components)	VARYCONTROL Universal controller for duct pressure; analogue interface
Equipment function	Duct pressure control, supply air (Pressure Duct Supply)
Operating mode	Constant value mode
Signal voltage range	0 – 10 V DC
Operating value	450 [Pa]
Damper blade position	Power off to close (Normally Closed)

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

**TVR – D – ... – FL / 160 / G2 / TUNF / PRS / MFP / 0 / UMZ / ... / NC**  
 |     |     |     |     |     |     |     |     |     |     |     |     |  
 1     2     3     4     5     6     7     8     9     10    11    12    13

#### 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 Duct connection

No entry: push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal

**FL** Flanges both ends (not for TVR-D-P1)

#### 5 Nominal size [mm]

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

#### 6 Accessories

No entry: without accessories

**D2** Double lip seal both ends

**G2** Matching flanges for both ends

#### 7 Attachments (control components)

TROX UNIVERSAL controller

**TUN** with actuator (150 s)

**TUNF** with spring return actuator (150 s)

**TUS** with fast-running actuator (3 s)

**TUSD** with fast-running actuator (3 s) and digital communication interface (TROX HPD)

#### 8 Equipment function

**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)

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

#### 9 Operating mode

**MFP** Room master or single controller, constant pressure setpoint value

**MVP** Room master or single controller, variable pressure setpoint value

With room solutions

**SFP** Slave, constant pressure setpoint

**SVP** Slave, variable pressure setpoint

#### 10 Signal voltage range

For the actual and setpoint value signals

**0** 0 – 10 V DC

**2** 2 – 10 V DC

#### 11 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: without digital communication interface  
**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: without volume flow rate measurement  
**V** With EM-V for volume flow rate measurement with the differential pressure controller

Option 4: Automatic zero point correction  
 No entry: no automatic zero point correction  
**Z** With EM-AUTOZERO solenoid valve for automatic zero point correction (only together with EM-V)

## 12 Operating values for factory setting

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

For operating mode MFP or SFP

$\Delta p_{\text{const}}$ : constant differential pressure

For operating mode MVP or SVP

$\Delta p_{\text{min}}$ : minimum differential pressure

$\Delta p_{\text{max}}$ : maximum differential pressure

Other parameters for operating modes MFP and MVP

Only relevant for the room master as part of a room solution<sup>1</sup>; for

## Order example: TVR-D-FL/160/G2/TUNF/PRS/MFP/0/UMZ/250[Pa]/NC

Type	TVR
Acoustic cladding	Without acoustic cladding
Material	Galvanised sheet steel
Duct connection	Push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal
Nominal size [mm]	160
Accessories	Matching flanges for both ends
Attachments (control components)	TROX UNIVERSAL controller with spring return actuator (150 s)
Equipment function	Room pressure controller – supply air (Pressure Room Supply)
Operating mode	Room master or single controller, constant pressure setpoint value
Signal voltage range	0 – 10 V DC
Expansion modules	With EM-TRF-USV (including battery pack) for uninterruptible 230 V AC power supply (UPS) With EM-BAC-MOD for Modbus RTU Without volume flow rate measurement With EM-AUTOZERO solenoid valve for automatic zero point correction
Damper blade position	250 [Pa]
Operating values for factory setting	Power off to close (Normally Closed)

single controllers enter 0  
 $q_{v_{\text{min}}}$ : minimum volume flow rate (room value)  
 $q_{v_{\text{max}}}$ : maximum volume flow rate (room value)  
 $q_{v_{\text{const\_sup}}}$ : constant supply air (room value)  
 $q_{v_{\text{const\_ext}}}$ : constant extract air (room value)  
 $q_{v_{\text{diff}}}$ : supply air/extract air difference (room value)

### Please note

<sup>1</sup> For more information on room solutions with several TROX UNIVERSAL controllers connected with plug and play and for order examples please refer to the product datasheet

## 13 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 pressure measurement kit

Optional room control panel

**BE-LCD** with 40-character display

## Order code for room control (with EASYLAB attachment)

TVR – D – ... – FL / 160 / G2 / ELAB / S / RS / UMZ / LAB / ...  
 | | | | | | | | | | | |  
 1 2 3 4 5 6 7 8 9 11 12 13

### 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 Duct connection**

No entry: push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal

**FL** Flanges both ends (not for TVR-D-P1)

**5 Nominal size [mm]**

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

**6 Accessories**

No entry: none

**D2** Double lip seal both ends

**G2** Matching flanges on both ends

**7 Attachments (control components)**

**ELAB** EASYLAB controller TCU3

**8 Actuators**

**S** Fast-running actuator (3 s)

**SD** Fast-running actuator (3 s) with digital communication

interface (TROX HPD)

**9 Equipment function**

Room control

**RS** Supply air controller (Room Supply)

**RE** Extract air controller (Room Extract)

**PC** Room pressure controller (Pressure Control)

**11 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

**Z** With EM-AUTOZERO solenoid valve for automatic zero point correction

**12 Additional functions**

Without room management function

**LAB** extract air led system (Laboratory)

**CLR** supply air led system (Clean Room)

With active room management function

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

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

**13 Operating values for factory setting**

Volume flow rate [m<sup>3</sup>/h or l/s], pressure [Pa]

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

q<sub>v1</sub>: standard mode

q<sub>v2</sub>: reduced operation

q<sub>v3</sub>: increased operation

q<sub>v4</sub>: constant supply air

q<sub>v5</sub>: constant extract air

q<sub>v6</sub>: Supply air/extract air difference

Δp<sub>set</sub>: setpoint pressure (only with differential pressure control)

**Useful additions**

Room control panel (only for devices with RMF)

**BE-LCD** 40-character display

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

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

**PT-GB604** Measuring range ±100 Pa

**Order example: TVR-D-FL/200/D2/ELAB/SD/RS/MZ/LAB-RMF/2000/1500/2500/100/100/200**

Acoustic cladding	With
Duct connection	Flanges on both ends
Material	galvanised sheet steel
Nominal size	200 mm
Accessories	Double lip seal both ends
Attachments (control components)	EASYLAB controller TCU3
Actuator	Fast-running actuator (3 s) with digital communication interface (TROX HPD)
Equipment function	Supply air controller (Room Supply)
Expansion modules	Expansion modules EM-BAC-MOD for Modbus RTU and EM-AUTOZERO for automatic zero point correction
Additional function	Room management function for extract air led system, e.g. laboratory
Operating values	Standard mode = 2000 m <sup>3</sup> /h
	Reduced operation = 1500 m <sup>3</sup> /h
	Increased operation = 2500 m <sup>3</sup> /h
	Constant supply air = 100 m <sup>3</sup> /h
	Constant extract air = 100 m <sup>3</sup> /h
	Supply air/extract air difference = 200 m <sup>3</sup> /h

**Order code for single operation (with EASYLAB attachment)**

TVR - D - ... - FL / 160 / G2 / ELAB / S / EC - E0 / UMZ / ...  
 | | | | | | | | | | | |  
 1 2 3 4 5 6 7 8 9 10 11 13

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 Duct connection

No entry: push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal

**FL** Flanges both ends (not for TVR-D-P1)

## 5 Nominal size [mm]

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

## 6 Accessories

No entry: none

**D2** Double lip seal both ends

**G2** Matching flanges on both ends

## 7 Attachments (control components)

**ELAB** EASYLAB controller TCU3

## 8 Actuators

**S** Fast-running actuator (3 s)

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

## 9 Equipment function

Single operation

**SC** Single controller – supply air (Supply Controller)

**EC** Single controller – extract air (Extract Controller)

## 10 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)

## 11 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

**Z** With EM-AUTOZERO solenoid valve for automatic zero point correction

## 13 Operating values for factory setting

Volume flow rate [ $\text{m}^3/\text{h}$  or  $\text{l/s}$ ]

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:  $q_{v_1}$

## Order example: TVR-P1/100/ELAB/S/EC-2P/100/300

Acoustic cladding	Without
Duct connection	Push-fit
Material	Galvanised sheet steel – surface powder-coated, RAL 7001, silver grey
Nominal size	100 mm
Accessories	Without
Attachments (control components)	EASYLAB controller TCU3
Actuator	Fast-running actuator (3 s)
Equipment function	Single controller – extract air Switch contact for 2 volume flow rate values (by others)
Expansion modules	Without
Operating values	$q_{v_1} = 100 \text{ m}^3/\text{h}$ $q_{v_2} = 300 \text{ m}^3/\text{h}$

**Order code for fume cupboard control (with EASYLAB attachment)**

TVR	-	D	-	...	-	FL	/	160	/	G2	/	ELAB	/	S	/	FH-VS	/	UMZS	/	200 - 900	[m³/h]
1		2		3		4		5		6		7		8		9		10		11	

**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 Duct connection**

No entry: push-fit, suitable for ducts according to EN 1506; with groove for optional lip seal

**FL** Flanges both ends (not for TVR-D-P1)

**5 Nominal size [mm]**

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

**6 Accessories**

No entry: none

**D2** Double lip seal both ends

**G2** Matching flanges on both ends

**7 Attachments (control components)**

**ELAB** EASYLAB controller TCU3

**8 Actuators**

**S** Fast-running actuator (3 s)

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

**9 Equipment function**

Fume cupboard control

With face velocity transducer

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

With face velocity transducer and sash distance sensor

**FH-VD** Fume cupboard control – optimised control strategy based on face velocity (with face velocity transducer and 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 (by others) for switching steps

**FH-2P** Fume cupboard control – 2 switching steps (for one switch contact, by others)

**FH-3P** Fume cupboard control – 3 switching steps (for two switch contacts, by others)

**Order example: TVR/200/D2/ELAB/FH-2P/TS/200 – 700**

**Acoustic cladding**

**Nominal size**

**Duct connection**

**Accessories**

**Attachments (control components)**

**Actuator**

**Equipment function**

**Expansion modules**

Without signalling

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

**10 Expansion modules**

Option 1: Supply voltage

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

Option 4: Lighting

No entry: none

**S** with 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)

**11 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 EN 14175

**BE-SEG-02** OLED display

**BE-LCD** 40-character display

<b>Acoustic cladding</b>	Without
<b>Nominal size</b>	200 mm
<b>Duct connection</b>	Push-fit
<b>Accessories</b>	Double lip seal both ends
<b>Attachments (control components)</b>	EASYLAB controller TCU3
<b>Actuator</b>	Fast-running actuator (3 s)
<b>Equipment function</b>	Fume cupboard control with 2 switching steps (for one switch contact, by others)
<b>Expansion modules</b>	With expansion module EM-TRF, transformer for 230 V AC mains supply with expansion module EM-LIGHT for the connection of lighting and for switching the lighting on/off using the control panel on the fume cupboard controller



Operating values

$q_{v1} = 200 \text{ m}^3/\text{h}$

$q_{v2} = 700 \text{ m}^3/\text{h}$



## Variants

### VAV terminal unit, variant TVR



### TVR with attachment BC0

- Spigot
- 

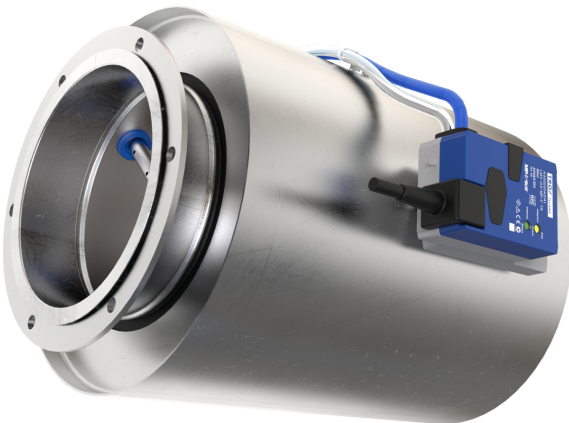
### VAV terminal unit, variant TVR-D



- With acoustic cladding
  - 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
-

**VAV terminal unit, variant TVR-FL**

- With flanges on both ends to make detachable connections to the ducting
- 

**VAV terminal unit, variant TVR-D-FL**

- With flanges on both ends to make detachable connections to the ducting
  - With acoustic cladding
  - 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
  - The acoustic cladding is always galvanised steel, also for powder-coated (P1) and stainless steel (A2) terminal units
  - TVR variants that are powder-coated (P1) or stainless steel (A2) constructions and have a flange (FL) cannot have acoustic cladding (D)
-

**Material**

Standard construction

Order code detail	Part	Material
-	Shaft	Galvanised steel
	Effective pressure sensor	Aluminium tube
	Casing	Galvanised sheet steel
	Plain bearings	Thermoplastic polyurethane (TPU)
	Damper blade	Galvanised sheet steel
	Damper blade seal	Thermoplastic elastomer (TPE)
	Anti-rotation lock	Easy, BC0: EPDM; other: galvanised steel

Powder-coated construction

Order code detail	Part	Material
P1	Shaft	Stainless steel, material no. 1.4305
	Effective pressure sensor	Aluminium - powder coated, RAL 7001, silver grey
	Casing	Galvanised sheet steel - powder coated, RAL 7001, silver grey
	Plain bearings	Thermoplastic polyurethane (TPU)
	Damper blade	Stainless steel, material no. 1.4301
	Damper blade seal	Thermoplastic elastomer (TPE)
	Anti-rotation lock	Easy, BC0: EPDM; other: galvanised steel

Stainless steel construction

Order code detail	Part	Material
A2	Shaft	Stainless steel, material no. 1.4305
	Effective pressure sensor	Aluminium - powder coated, RAL 7001, silver grey
	Casing	Stainless steel, material no. 1.4301
	Plain bearings	Thermoplastic polyurethane (TPU)
	Damper blade	Stainless steel, material no. 1.4301
	Damper blade seal	Thermoplastic elastomer (TPE)
	Anti-rotation lock	Easy, BC0: EPDM; other: galvanised steel

## Optional acoustic cladding

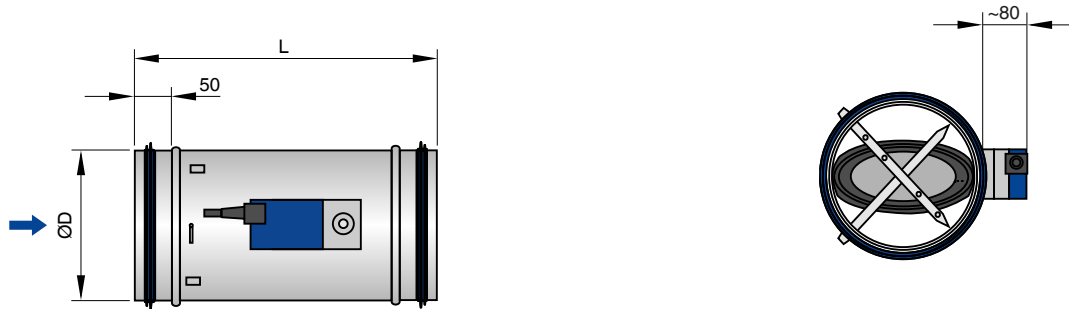
Order code detail	Part	Material
D	Lining	Mineral wool to EN 13501, fire rating class A1, non-combustible
	Acoustic cladding casing	Galvanised sheet steel
	Insulation of structure-borne noise	Polyethylene, PE

## Optional double lip seal

Order code detail	Part	Material
D2	Double lip seal	Rubber, EPDM

## Dimensions and weight

### Terminal units without acoustic cladding (TVR)



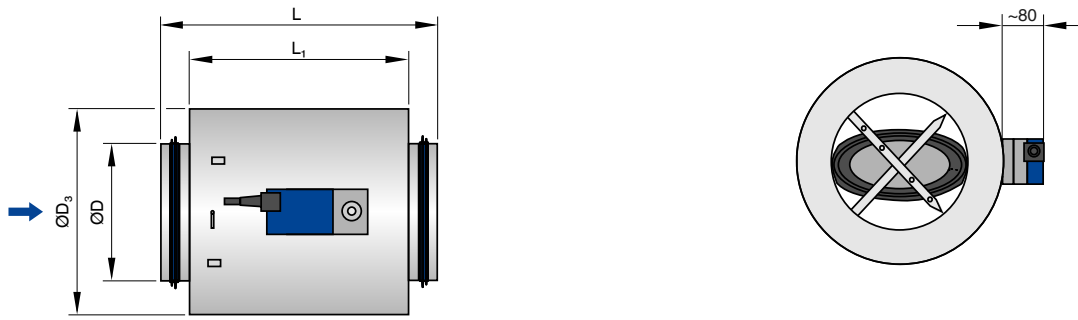
Note:  
The overall length L depends on nominal size and selected control component.

Note:  
The illustration shows control component types Easy, Compact.  
For individual dimensions, see section on space requirements for commissioning and maintenance.

### Dimensions/weight of TVR

NG	Easy, Compact	Universal, LABCONTROL		
	L		ØD	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

VAV terminal unit with acoustic cladding (TVR-D)



Note:  
The overall lengths L and L1 depend on nominal size and selected control component.

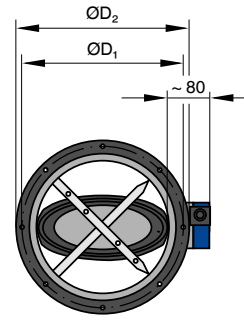
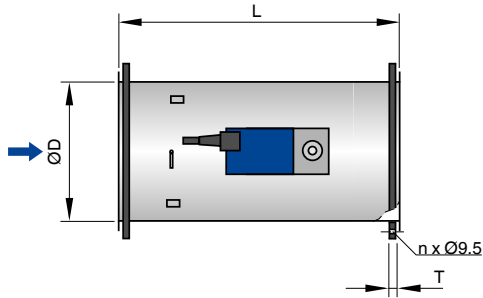
Note:  
The illustration shows control component types Easy, Compact.  
For individual dimensions, see section on space requirements for commissioning and maintenance.

Dimensions/weight of TVR-D

NG	Easy, Compact		Universal, LABCONTROL		ØD	ØD <sub>3</sub>	kg
	L	L1	L	L1			
100	310	232	600	517	99	199	7,2
125	310	232	600	517	124	219	8,5
160	400	312	600	517	159	261	11
200	400	312	600	517	199	299	13,9
250	400	312	600	517	249	354	15,9
315	500	417	600	517	314	416	18
400	500	417	600	517	399	498	22,6



Terminal unit with flange (TVR-FL)



Note:  
The overall length L depends on nominal size and selected control component.

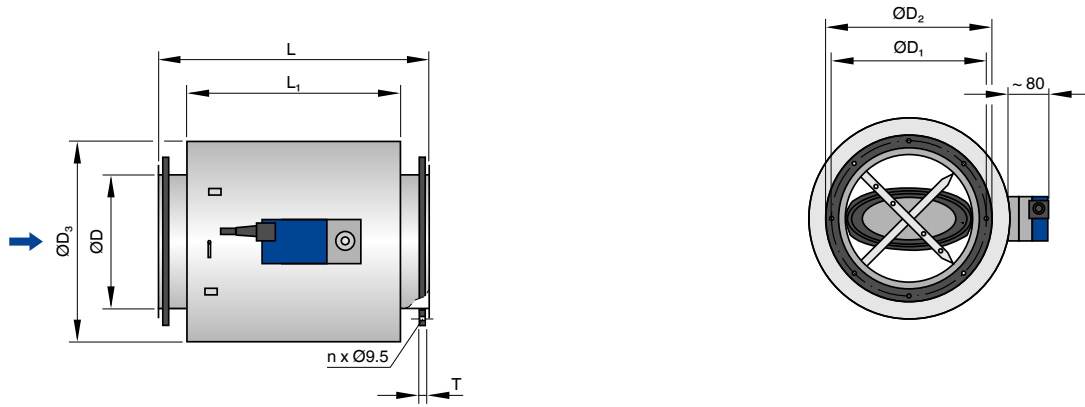
Note:  
The illustration shows control component types Easy, Compact.  
For individual dimensions, see section on space requirements for commissioning and maintenance.

Dimensions/weight of TVR-FL

NG	Easy, Compact	Universal, LABCONTROL						kg
	L		ØD	ØD <sub>1</sub>	ØD <sub>2</sub>	D	n	
100	298	588	99	132	152	4	4	3,9
125	298	588	124	157	177	4	4	4,2
160	388	588	159	192	212	4	6	5,3
200	388	588	199	233	253	4	6	6,5
250	388	588	249	283	303	4	6	7,8
315	488	588	314	352	378	4	8	10,3
400	488	588	399	438	464	4	8	13,3

Note: Tolerance for dimension L: ± 5 mm

**Terminal unit with acoustic cladding and flange (TVR-D-FL)**



Note:  
The overall lengths L and L1 depend on nominal size and selected control component.

Note:  
The illustration shows control component types Easy, Compact.  
For individual dimensions, see section on space requirements for commissioning and maintenance.

**Dimensions/weight of TVR-D-FL**

NG	Easy, Compact		Universal, LABCONTROL		ØD	ØD <sub>1</sub>	ØD <sub>2</sub>	ØD <sub>3</sub>	D	n	kg
	L	L1	L	L1							
100	298	232	588	517	99	132	152	199	4	4	7,8
125	298	232	588	517	124	157	177	219	4	4	9,1
160	388	312	588	517	159	192	212	261	4	6	12,1
200	388	312	588	517	199	233	253	299	4	6	14,3
250	388	312	588	517	249	283	303	354	4	6	17,6
315	488	417	588	517	314	352	378	416	4	8	21,2
400	488	417	588	517	399	438	464	498	4	8	26,5

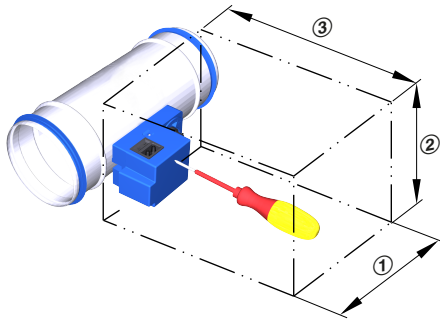
Note: Tolerance for dimension L: ± 5 mm

**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.

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**



Schematic illustration of required installation space

**Product example**



Attachments, for example Easy, XB4, BUDN, ELAB

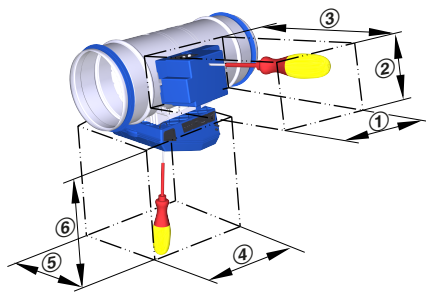
Space requirement, control component on one side

Attachment	①	②	③
<b>VARYCONTROL</b>			
Easy controller: Easy	250	200	300
Compact controllers: BC0, BL0 **, BM0, BM0-J6, LNO, LK0, XB0, XD0, XF0	250	200	250
Universal controller: BUDN, BUSN, BUSS, BUPN, BURN, XB4, XD4, XF4, B13 *, B1B *, BG3 *, BR3 *, BRG *, BB3 *, BP3 *, BPG *, BH3 *, BS3 *, BSG *	520	250	250
<b>TROX UNIVERSAL</b>			
TROX UNIVERSAL: TUN, TUS, TUSD	550	350	400
<b>LABCONTROL</b>			
EASYLAB: ELAB	550	350	400

\* Control component has been discontinued

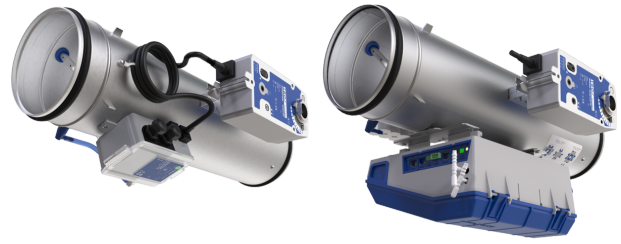
\*\* Control component to be discontinued - do not include in new projects

Access to attachments on two sides



Schematic illustration of required installation space

Product example



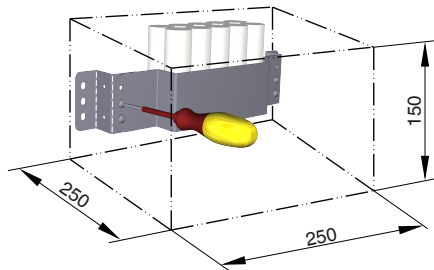
Attachments, for example BUDNF, TUNF

Space requirement, control components on two sides

Attachment	①	②	③	④	⑤	⑥
<b>VARYCONTROL</b>						
Universal controller: BUSNF, BUPNF, BURNF, BGB *, BRB *, BBB *, BPB *, BHB *, BSB *	520	250	250	250	250	250
<b>TROX UNIVERSAL</b>						
TROX UNIVERSAL: TUNF	250	250	350	400	400	350

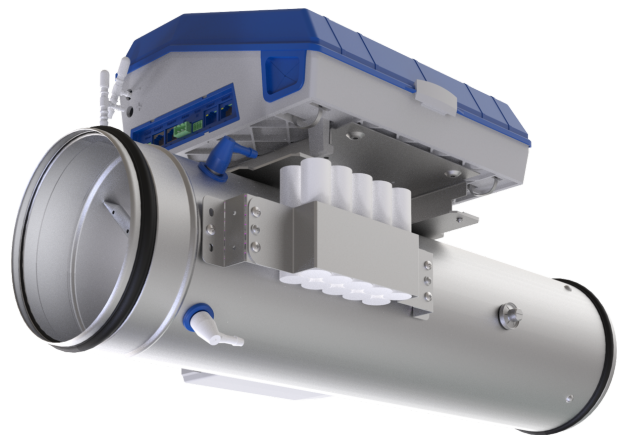
\* Control component has been discontinued

Accessibility to the battery pack



Schematic illustration of required installation space

Product example



Attachment TUN / ... / U

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

## Product details

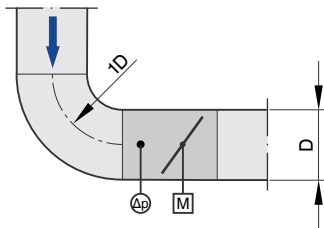
### Installation and commissioning

- Any installation orientation (except units with static effective 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

### Upstream conditions

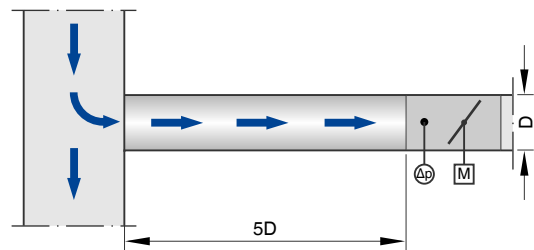
The volume flow rate accuracy  $\Delta_{qv}$  applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations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

**VARYCONTROL control components**

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
Easy controller, dynamic					
Easy	qv	0 – 10 V	integral	Slow running integral	①
Compact controller, dynamic					
BL0 **	qv	LonWorks FTT 10 interface	integral	Slow running integral	②
BM0-J6	qv	Modbus RTU/BACnet MS/TP with RJ12 socket (for X-AIRCONTROL)	integral	Slow running integral	②
XB0	qv	0 – 10 V or 2 – 10 V	integral	Slow running integral	①
LN0	qv	0 – 10 V or 2 – 10 V	integral	Slow running integral	⑤
LK0	qv	KNX interface	integral	Slow running integral	⑤
Compact controller, static					
XD0	qv	0 – 10 V or 2 – 10 V	integral	Slow running integral	③
XF0	$\Delta p$	0 – 10 V or 2 – 10 V	integral, control range adjustable 25 - 550 Pa	Slow running integral	③
Universal controller, dynamic					
B13 *	qv	0 – 10 V or 2 – 10 V	integral	Slow running separate	②
B1B *	qv	0 – 10 V or 2 – 10 V	integral	spring return actuator separate	②
BUDN	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral	Slow running separate	②
BUDNF	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral	spring return actuator separate	②
XB4	qv	0 – 10 V or 2 – 10 V	integral	spring return actuator separate	③
VARYCONTROL Universal controller, static					
BP3 *	qv	0 – 10 V or 2 – 10 V or MP bus interface	individual component	Slow running separate	②
BPB *	qv	0 – 10 V or 2 – 10 V or MP bus interface	individual component	spring return actuator separate	②
BPG *	qv	0 – 10 V or 2 – 10 V or MP bus interface	individual component	fast-running separate	②
BB3 *	qv	2 – 10 V	individual component	Slow running separate	②

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
BBB *	qv	2 – 10 V	individual component	spring return actuator separate	②
BR3 *	$\Delta p$	0 – 10 V or 2 – 10 V or MP bus interface	individual component 100 Pa	Slow running separate	②
BRB *	$\Delta p$	0 – 10 V or 2 – 10 V or MP bus interface	individual component 100 Pa	spring return actuator separate	②
BRG *	$\Delta p$	0 – 10 V or 2 – 10 V or MP bus interface	individual component 100 Pa	fast-running separate	②
BS3 *	$\Delta p$	0 – 10 V or 2 – 10 V or MP bus interface	individual component 600 Pa	Slow running separate	②
BSB *	$\Delta p$	0 – 10 V or 2 – 10 V or MP bus interface	individual component 600 Pa	spring return actuator separate	②
BSG *	$\Delta p$	0 – 10 V or 2 – 10 V or MP bus interface	individual component 600 Pa	fast-running separate	②
BG3 *	$\Delta p$	2 – 10 V	individual component 100 Pa	Slow running separate	②
BGB *	$\Delta p$	2 – 10 V	individual component 100 Pa	spring return actuator separate	②
BH3 *	$\Delta p$	2 – 10 V	individual component 600 Pa	Slow running separate	②
BHB *	$\Delta p$	2 – 10 V	individual component 600 Pa	spring return actuator separate	②
BUPN	$\Delta p$	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral Control range adjustable 25 – 450 Pa	Slow running separate	②
BURNF	$\Delta p$	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral Control range adjustable -50 ... -10 Pa or 10 ... 50 Pa	spring return actuator separate	②
BURN	$\Delta p$	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral Control range adjustable -50 ... -10 Pa or 10 ... 50 Pa	Slow running separate	②
BUPNF	$\Delta p$	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral Control range adjustable 25 – 450 Pa	spring return actuator separate	②
BUSN	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral	Slow running separate	②
BUSNF	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral	spring return actuator separate	②
BUSS	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TP	integral	fast-running separate	②

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
XD4	qv	0 – 10 V or 2 – 10 V	integral	spring return actuator separate	③
XF4	Δp	0 – 10 V or 2 – 10 V	integral, control range adjustable 25 - 550 Pa	spring return actuator separate	③

\* Control component has been discontinued

\*\* Control component to be discontinued - do not include in new projects

qv, Volume flow rate

Δp, Differential pressure

① TROX, ② TROX/Belimo, ③ TROX/Gruner, ⑤ Siemens

**TROX UNIVERSAL control components**

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
TROX UNIVERSAL-Regler – statisch					
TUN	qv, Δp	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	qv = integral Δp = separate	Slow running separate	①
TUNF	qv, Δp	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	qv = integral Δp = separate	spring return actuator separate	①
TUS	qv, Δp	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	qv = integral Δp = separate	fast-running separate	①
TUSD	qv, Δp	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	qv = integral Δp = separate	fast-running with digital communication interface (TROX HPD), separate	①

qv, 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	qv, $\Delta p$ *	TROX plug and play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: Modbus, BACnet, web server	qv = integral  $\Delta p$ = separate	fast-running, separate  or  fast-running with digital communication interface (TROX HPD), separate	③

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]

Duct width

**B<sub>1</sub>** [mm]

Screw hole pitch of flange (horizontal)

**B<sub>2</sub>** [mm]

Overall dimension of flange (width)

**H** [mm]

Duct height

**H<sub>1</sub>** [mm]

Screw hole pitch of flange (vertical)

**H<sub>2</sub>** [mm]

Overall dimension of flange (height)

### Dimensions of circular units

**ØD** [mm]

Basic units made of sheet steel: Outer diameter of the spigot;  
basic units made of plastic: Inside diameter of the spigot

**ØD<sub>1</sub>** [mm]

Pitch circle diameter of flanges

**ØD<sub>2</sub>** [mm]

Outer diameter of flanges

**L** [mm]

Length of unit including connecting spigot

**L<sub>1</sub>** [mm]

Length of casing or acoustic cladding

**n** [ ]

Number of flange screw holes

**T** [mm]

Flange thickness

### General information

**m** [kg]

Unit weight including the minimum required attachments (control component)

**NS** [mm]

Nominal size

**f<sub>m</sub>** [Hz]

Octave band centre frequency

**L<sub>PA</sub>** [dB(A)]

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

**L<sub>PA1</sub>** [dB(A)]

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

**L<sub>PA2</sub>** [dB(A)]

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

**L<sub>PA3</sub>** [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<sub>vNom</sub>** [m<sup>3</sup>/h]; [l/s]

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 stored in the Easy Product Finder design program. Reference value for calculating percentages (e.g. q<sub>vmax</sub>). Upper limit of the setting range and maximum volume flow rate setpoint value for the VAV terminal unit.

**q<sub>vmin Unit</sub>** [m<sup>3</sup>/h]; [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 program. Lower limit of the setting range and minimum volume flow rate setpoint value for the VAV terminal unit. Setpoint values below q<sub>vmin unit</sub> (if q<sub>vmin</sub> equals zero) may result in unstable control or shut-off.

**q<sub>vmax</sub>** [m<sup>3</sup>/h]; [l/s]

Upper limit of the operating range for the VAV terminal unit that can be set by customers: q<sub>vmax</sub> can be set to less than or equal to q<sub>vnom</sub>. For analogue signalling to volume flow controllers (typically used), the maximum value of the setpoint signal (10 V) is assigned the set maximum value (q<sub>vmax</sub>) (see characteristic).

**q<sub>vmin</sub>** [m<sup>3</sup>/h]; [l/s]

Lower limit of the operating range for the VAV terminal unit that can be set by customers: q<sub>vmin</sub> should be set to less than or equal to q<sub>vmax</sub>. Do not set q<sub>vmin</sub> to less than q<sub>vmin unit</sub> as the control may become unstable or the damper blade may close. q<sub>vmin</sub> may equal zero. In case of analogue signalling to volume flow controllers (which are typically used), the set minimum value (q<sub>vmin</sub>) is allocated to the minimum setpoint signal (0 or 2 V) (see characteristic).

**q<sub>v</sub>** [m<sup>3</sup>/h]; [l/s]

Volume flow rate

**Δ<sub>qv</sub>** [%]

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

**Δp<sub>st</sub>** [Pa]

Static differential pressure

**$\Delta_{pst\ min}$  [Pa]**

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 differential 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 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**

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

**Basic unit**

Unit for controlling a volume flow without an attached control component. The main components include the casing with sensor(s) to measure the effective 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 types of connection, acoustic characteristics (e.g. acoustic cladding or integral sound attenuator), volume flow rate range.

**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 consists basically of a controller with effective pressure transducer (integral or external) and an integral actuator (Easy and Compact controllers) or external actuator (Universal or LABCONTROL controllers). Important distinguishing features: Transducer: dynamic transducer for clean air or static transducer for contaminated air. Actuator: slow-running actuator as standard, spring return actuator for safe position, or fast-running actuator. Interface: analogue interface or digital bus interface for the capturing of signals and data.

**VAV terminal unit**

Consists of a basic unit with an attached control component.