Easy controller, Compact controller

Construction with acoustic cladding and flange

Universal controller (VARYCONTROL)

TROX UNIVERSAL controller,
TROX LABCONTROL controller

Tested to VDI 6022

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

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 secondary silencer Type CA, CS or CF for demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

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

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

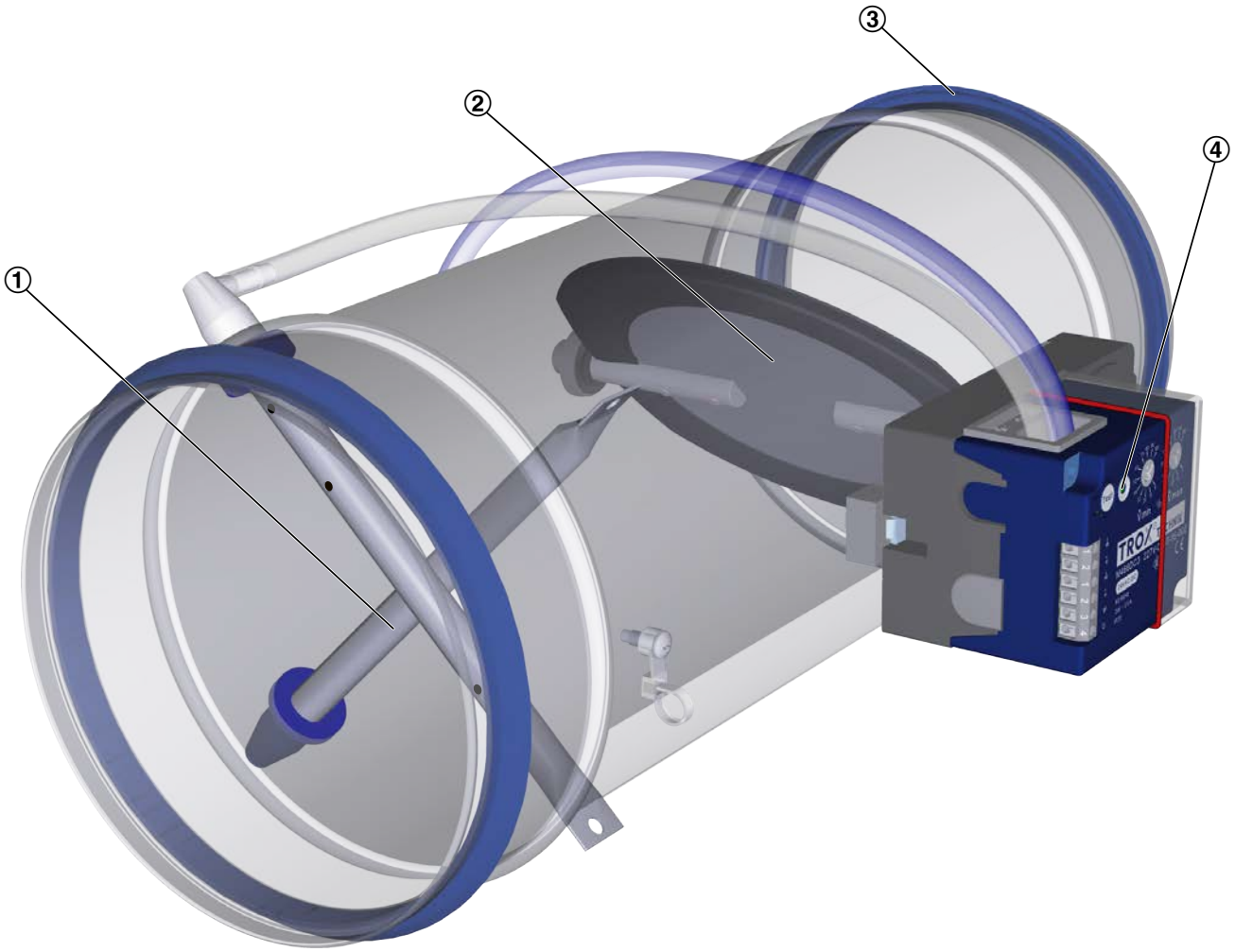
Maintenance

- 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 m³/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. It must be ensured that for all operating conditions and for all terminal units a sufficient pressure differential is applied to each controller ($\Delta_{pstat,min}$). 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

NS	qv [l/s]	qv [m³/h]	Δpstmin [Pa]				Δqv [±%]
			①	②	③	④	
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 CS/CF, insulation thickness 50 mm, length 500 mm
③ Basic unit with circular silencer CS/CF, insulation thickness 50 mm, length 1000 mm
④ Basic unit with circular silencer CS/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	qv [l/s]	qv [m³/h]	Δpstmin [Pa]				Δqv [±%]
			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

NS	qv [l/s]	qv [m³/h]	Δpstmin [Pa]				Δqv [±%]
			①	②	③	④	
400	2108	7591	38	43	47	51	5

① Basic unit
② Basic unit with circular silencer CS/CF, insulation thickness 50 mm, length 500 mm
③ Basic unit with circular silencer CS/CF, insulation thickness 50 mm, length 1000 mm
④ Basic unit with circular silencer CS/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 CS/CF, insulation thickness 50 mm, length 500 mm
③ Basic unit with circular silencer CS/CF, insulation thickness 50 mm, length 1000 mm
④ Basic unit with circular silencer CS/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 CS/CF, insulation thickness 50 mm, length 500 mm
③ Basic unit with circular silencer CS/CF, insulation thickness 50 mm, length 1000 mm
④ Basic unit with circular silencer CS/CF, insulation thickness 50 mm, length 1500 mm
* Control component has been discontinued

Quick sizing table for sound pressure level

The quick sizing tables are based on generally accepted attenuation and insulation 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

NS	qv [l/s]	qv [m³/h]	150 Pa				500 Pa			
			①	②	③	④	①	②	③	④
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 Δ_{pst} of 150 or 500 Pa

① Basic unit

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

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

④ Basic unit with circular silencer CS/CF, 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}

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

NS	qv [l/s]	qv [m³/h]	150 Pa		500 Pa	
			①	②	①	②
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 Δ_{pst} of 150 or 500 Pa

① Basic unit

② Basic unit with acoustic cladding

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 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 Vmin and Vmax 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 m³/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 _____ [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 Easy attachment)

TVR – D / 200 / D2 / Easy
| | | | | |
1 2 5 6 7

1 Type
TVR VAV terminal unit

2 Acoustic cladding
No entry required: None
D With acoustic cladding

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

6 Accessories
No entry required: None
D2 Double lip seal both sides

7 Attachments (control components)
Easy Volume flow controller, dynamic, interface analogue, setting q_{vmin} and q_{vmax} with potentiometers

Order example: TVR/125/D2/Easy

Acoustic cladding	Without
Material	Galvanised sheet steel
Nominal size	125 mm
Duct connection	Push-fit
Accessories	Double lip seal both sides
Attachments (control components)	Easy controller; volume flow controller, dynamic, analogue interface, setting of q_{vmin} and q_{vmax} with potentiometers

Order code for volume flow control (with VARYCONTROL attachment)

TVR – D – ... – 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 required: None
D With acoustic cladding

3 Material
No entry required: Galvanised sheet steel
P1 Powder-coated RAL 7001, silver grey
A2 Stainless steel construction

4 Duct connection
No entry required: Attachment for duct in accordance with EN 1506; with groove for optional seal
FL Flange on both ends (not for TVR-D-P1)

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

6 Accessories
No entry required: None
D2 Double lip seal both sides
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 (one setpoint value)
V Variable (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 rates [m³/h or l/s]
$q_{vconst.}$ (with operating mode F)
q_{vmin} – q_{vmax} (with operating mode V)

12 Damper blade position
Only with spring return actuators
NO power off to OPEN
NC power off to CLOSE

Order example: TVR/200/XD4/V2/500–1200 m³/h/NO

Acoustic cladding	Without

Material	Galvanised sheet steel
Duct connection	Push-fit
Nominal size	200 mm
Accessories	Without
Attachments (control components)	VARYCONTROL Universal controller; static transducer; analogue control; safe position with spring return
Operating mode	Variable operation with setpoint value range q_{vmin} – q_{vmax}
Signal voltage range	2 – 10 V DC
Volume flow rate	q_{vmin} = 500 m³/h q_{vmax} = 1200 m³/h
Damper blade position	NO power off to OPEN

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

TVR	–	D	–	…	–	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 required: 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 Flange both ends (not for TVR-D-P1)

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

6 Accessories
No entry required: None
D2 Double lip seal both sides
G2 Matching flanges both sides

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 control (Room Supply)
RE Extract air control (Room Extract)

9 Volume flow rate setting
M Master (RMF function)
S Slave
F Constant flow rate controller

10 Signal voltage range
0 0 – 10 V DC
2 2 – 10 V DC

11 Expansion of attachments
Option 1: Power supply
No entry required: 24 V AC/DC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Digital communication interface
No entry required: None
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP: EM-IP for BACnet/IP, Modbus/IP and web server
R EM-IP with real time clock

Option 3: Automatic zero point correction
No entry required: None
Z EM-AUTOZERO with solenoid valve

12 Operating values [m³/h or l/s]
Master (RMF function)
q_{vmin}: minimum volume flow rate
q_{vmax}: maximum volume flow rate
$q_{vconst\_Supply\ air}$: constant supply air
$q_{vconst\_Extract\ air}$: constant extract air
q_{vDiff}: Supply air/extract air difference

Constant value
q_{vconst}: constant volume flow rate

Slave
No entry required

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

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

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

Acoustic cladding	Without
Material	Galvanised sheet steel
Duct connection	Flanges on both ends
Nominal size	250 mm
Accessories	Without
Attachments (control components)	TROX UNIVERSAL controller with spring return actuator; static transducer; analogue interface

Equipment function	Room control, extract air
Volume flow rate setting	Master
Signal voltage range	0 – 10 V DC
Operating values	q_{vmin} = 306 m³/h q_{vmax} = 2205 m³/h
Damper blade position	NC Power off to CLOSE

Order code for differential pressure control (with VARYCONTROL attachment)

TVR – D – ... – 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 required: None
D With acoustic cladding

3 Material
No entry required: Galvanised sheet steel
P1 Powder-coated RAL 7001, silver grey
A2 Stainless steel construction

4 Duct connection
No entry required: Attachment for duct in accordance with EN 1506; with groove for optional seal
FL Flange on both ends (not for TVR-D-P1)

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

6 Accessories
No entry required: None
D2 Double lip seal both sides
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
PDS Duct pressure control, supply air
PDE Duct pressure control, extract air
PRS Room pressure control, supply air
PRE Room pressure control, extract air

9 Operating mode
F Constant value (one setpoint value)
V Variable (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
For duct pressure control, give the differential pressure [Pa] as an absolute
Δ_{pconst} (with operating mode F)
Δ_{pmin} – Δ_{pmax} (with operating mode V)

12 Damper blade position
Only with spring return actuators
NO power off to OPEN
NC power off to CLOSE

Order example 1: TVR-FL/250/G2/XF4/PDS/F0/450 Pa/NC

Acoustic cladding	Without
Material	Galvanised sheet steel
Duct connection	Flanges on both ends
Nominal size	250 mm
Accessories	Matching flanges both sides
Attachments (control components)	VARYCONTROL Universal controller for duct pressure; analogue interface
Equipment function	Duct pressure control, supply air
Operating mode	Constant value mode
Signal voltage range	0 – 10 V DC
Operating value	Δp_{const} = 450 Pa
Damper blade position	NC Power off to CLOSE

Order example 2: TVR-FL/250/G2/XF0/PDE/V2/200-550 Pa

Acoustic cladding	Without
Material	Galvanised sheet steel
Duct connection	Flanges on both ends
Nominal size	250 mm
Accessories	Matching flanges both sides
Attachments (control components)	Compact controller for duct pressure; analogue interface

Equipment function	Duct pressure control, extract air
Operating mode	Constant value mode
Signal voltage range	2 – 10 V DC
Operating value	Δ_{pmin} = 200 Pa Δ_{pmax} = 550 Pa

Order code for differential pressure control (with TROX UNIVERSAL 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 required: 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 Flange both ends (not for TVR-D-P1)

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

6 Accessories
No entry required: None
D2 Double lip seal both sides
G2 Matching flanges both sides

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
Pressure control
PRS Room pressure control, supply air
PRE Room pressure control, extract air
PDS Duct pressure control, supply air
PDE Duct pressure control, extract air

9 Differential pressure setting
MFP Master, constant pressure control
MVP Master, variable differential pressure control
SFP Slave, constant pressure control
SVP Slave, variable differential pressure control

10 Signal voltage range
0 0 – 10 V DC
2 2 – 10 V DC

11 Expansion of attachments
Option 1: Power supply
No entry required: 24 V AC/DC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Digital communication interface
No entry required: None
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP: EM-IP for BACnet/IP, Modbus/IP and web server
R EM-IP with real time clock

Option 3: Volume flow rate measurement
No entry required: None
V EM-V Volume flow rate measurement for differential pressure control

Option 4: Automatic zero point correction
No entry required: None
Z EM-AUTOZERO with solenoid valve (only with V)

12 Operating values [Pa, m³/h or l/s]
Slave SVP
Δ_{pmin}: minimum differential pressure
Δ_{pmax}: maximum differential pressure
Slave SFP
Δ_{pconst}: Constant differential pressure

Master MVP and MFP – same as slave, but additionally:
q_{vmin}: minimum volume flow rate
q_{vmax}: maximum volume flow rate
$q_{vconst\_Supply\ air}$: constant supply air
$q_{vconst\_Extract\ air}$: constant extract air
q_{vDiff}: Supply air/extract air difference

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

Useful additions
Room control panel

BE-LCD 40-character display

Differential pressure transducers for room pressure control or duct pressure control
to be ordered separately, e.g.
PT-699 For room pressure control
PT-699-DUCT For duct pressure control, including tube and pressure tap

Order example: TVR/160/D2/TUS/PDS/MFP/2/TB/250 Pa

Acoustic cladding	Without
Material	Galvanised sheet steel
Duct connection	Push-fit
Nominal size	160 mm
Accessories	Double lip seal both sides
Attachments (control components)	TROX UNIVERSAL controller with fast-running actuator, analogue interface
Equipment function	Duct pressure control, supply air
Differential pressure setting	Master, constant value control
Signal voltage range	2 – 10 V DC
Expansion modules	With expansion module EM-TRF, 230 V AC transformer with expansion module EM-BAC-MOD, Communication interface for BACnet MS/TP
Operating value	Δp_{const} = 250 Pa

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 required: 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 Flange both ends (not for TVR-D-P1)

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

6 Accessories
No entry required: None
D2 Double lip seal both sides
G2 Matching flange 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 control (Room Supply)
RE Extract air control (Room Exhaust)
PC Differential pressure control (Pressure Control)

11 Expansion modules
Option 1: Power supply
No entry required: 24 V AC/DC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Digital communication interface
No entry required: None
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and web server
R EM-IP with real time clock

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

12 Additional functions
Without room management function

LAB Extract air led system (laboratories)
CLR Supply air led system (clean rooms)
With room management function
LAB-RMF Extract air led system
CLR-RMF Supply air led system

13 Operating values [m³/h or l/s, Pa]
(only required when room management function is active)

Total extract air/supply air of room:
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 (only for devices with RMF)
BE-LCD 40-character display

Differential pressure transducer for room pressure control
equipment function must be ordered separately, 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 sides
Attachments (control components)	EASYLAB controller TCU3
Actuator	Fast-running actuator (3 s) with digital communication interface (TROX HPD)
Equipment function	Supply air control
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 m³/h Reduced operation = 1500 m³/h Increased operation = 2500 m³/h Constant supply air =100 m³/h Constant extract air = 100 m³/h supply air/extract air difference = 200 m³/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 required: 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 Flange both ends (not for TVR-D-P1)

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

6 Accessories
No entry required: None
D2 Double lip seal both sides
G2 Matching flange 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 Supply air controller
EC Extract air controller

10 External volume flow rate setting
E0 Voltage signal 0 – 10 V DC
E2 Voltage signal 2 – 10 V DC
2P Switch contacts (provided by others) for 2 switching steps
3P Switch contacts (provided by others) for 3 switching steps
F Volume flow rate constant value, without signalling

11 Expansion modules
Option 1: Power supply
No entry required: 24 V AC/DC
T EM-TRF for 230 V AC
U EM-TRF-USV for 230 V AC, provides uninterruptible power supply (UPS)

Option 2: Digital communication interface
No entry required: None
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and web server
R EM-IP with real time clock

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

13 Operating values [m³/h or l/s]
Depending on external volume flow rate setting
E0, E2: q_{vmin} / q_{vmax}
2P: q_{v1}/q_{v2}
3P: q_{v1}/q_{v2}/q_{v3}
F: q_{v1}

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 operation, extract air Switch contacts (provided by others) for 2 volume flow rate values
Expansion modules	Without
Operating values	q_{v1} = 100 m³/h q_{v2} = 300 m³/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 required: 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 Flange both ends (not for TVR-D-P1)

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

6 Accessories
No entry required: None
D2 Double lip seal both sides
G2 Matching flange 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 Face velocity control strategy

With face velocity transducer and sash distance sensor
FH-VD Optimised face velocity control strategy

With sash distance sensor
FH-DS Linear control strategy
FH-DV Safety-optimised control strategy

With switch contacts (by others) for switching steps
FH-2P Two switching steps
FH-3P Three switching steps

Without signalling
FH-F Volume flow rate constant value control

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

Option 2: Digital communication interface
No entry required: None
B EM-BAC-MOD-01 for BACnet MS/TP
M EM-BAC-MOD-01 for Modbus RTU
I EM-IP for BACnet/IP, Modbus/IP and web server
R EM-IP with real time clock

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

Option 4: Lighting
No entry required: None
S EM-LIGHT, wired socket for the connection of lighting and for switching the lighting on/off using the control panel
(only in combination with connection EM-TRF or EM-TRF-USV)

11 Operating values [m³/h or l/s]
Depending on equipment function
FH-VS: q_{vmin}/q_{vmax}
FH-VD: q_{vmin}/q_{vmax}
FH-DS: q_{vmin}/q_{vmax}
FH-DV: q_{vmin}/q_{vmax}
FH-2P: q_{v1}/q_{v2}
FH-3P: $q_{v1}/q_{v2}/q_{v3}$
FH-F: q_{v1}

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

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

Acoustic cladding	Without
Nominal size	200 mm
Duct connection	Push-fit
Accessories	Double lip seal both sides
Attachments (control components)	EASYLAB controller TCU3

Actuator	Fast-running actuator (3 s)
Equipment function	Fume cupboard control with 2 switching steps
Expansion modules	With expansion module EM-TRF, 230 V AC transformer 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 m³/h q_{v2} = 700 m³/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

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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

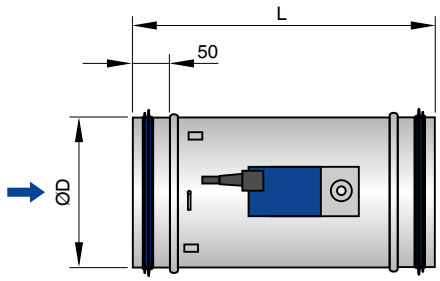
Order code detail	Part	Material
D	Lining	Mineral wool according to EN 13501, fire rating class A1, non-combustible
	Acoustic cladding casing	Galvanised sheet steel
	Insulation of structure-borne noise	Polyethylene, PE

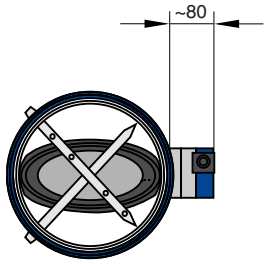
Optional double lip seal

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

Dimensions and weight

Terminal units without acoustic cladding (TVR)





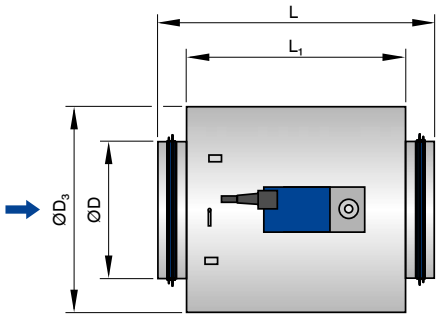
Note:
The overall length L depends on nominal size and selected control component.

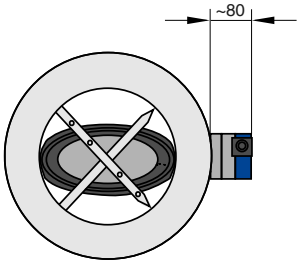
Note:
The illustration shows control component types Easy, Compact. For individual dimensions, see section on space requirements for commissioning and maintenance.

Dimensions/weight of TVR

	Easy, Compact	Universal, LABCONTROL		
NG	L		∅D	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)





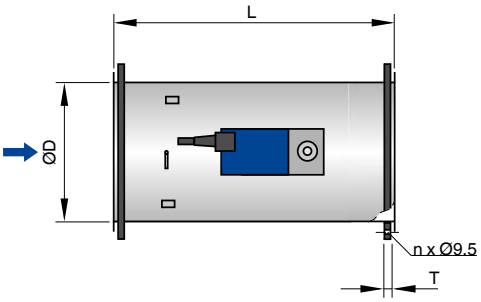
Note:
The overall lengths L and L1 depend on nominal size and selected control component.

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

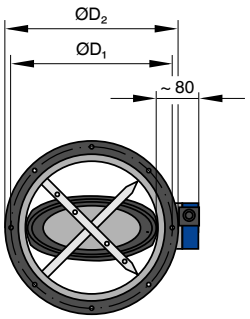
Dimensions/weight of TVR-D

	Easy, Compact		Universal, LABCONTROL				
NG	L	L1	L	L1	∅D	∅D₃	kg
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.



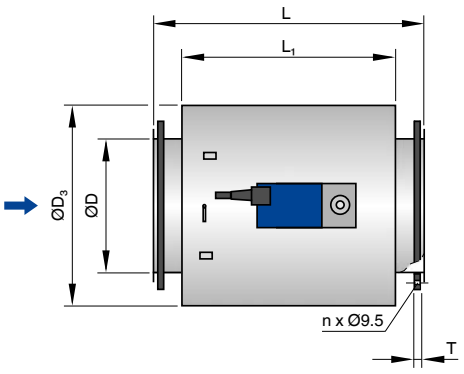
Note:
The illustration shows control component types Easy, Compact. For individual dimensions, see section on space requirements for commissioning and maintenance.

Dimensions/weight of TVR-FL

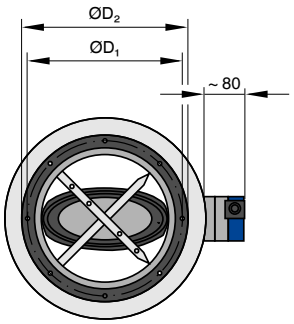
	Easy, Compact	Universal, LABCONTROL						
NG	L		∅D	∅D₁	∅D₂	T	n	kg
100	298	588	99	132	152	4	4	3.9
125	298	588	124	157	177	4	4	4.2
160	388	588	159	192	212	4	6	5.3
200	388	588	199	233	253	4	6	6.5
250	388	588	249	283	303	4	6	7.8
315	488	588	314	352	378	4	8	10.3
400	488	588	399	438	464	4	8	13.3

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

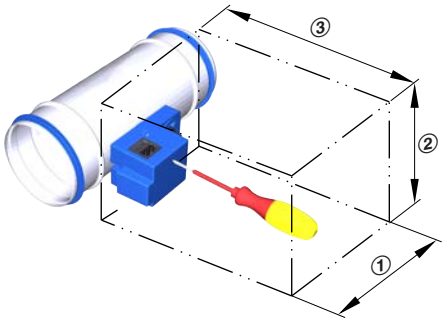
	Easy, Compact		Universal, LABCONTROL								
NG	L	L1	L	L1	ØD	ØD₁	ØD₂	ØD₃	T	n	kg
100	298	232	588	517	99	132	152	199	4	4	7.8
125	298	232	588	517	124	157	177	219	4	4	9.1
160	388	312	588	517	159	192	212	261	4	6	12.1
200	388	312	588	517	199	233	253	299	4	6	14.3
250	388	312	588	517	249	283	303	354	4	6	17.6
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

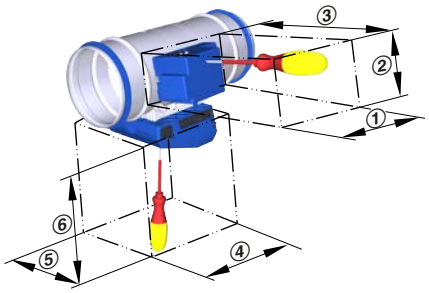
Space requirement, control component on one side

Attachment	①	②	③
VARYCONTROL			
Easy controller: Easy	250	200	300
Compact controllers: BC0, BL0 **, BM0, BM0-J6, LN0, 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
TROX UNIVERSAL			
TROX UNIVERSAL: TUN, TUS, TUSD	550	350	400
LABCONTROL			
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

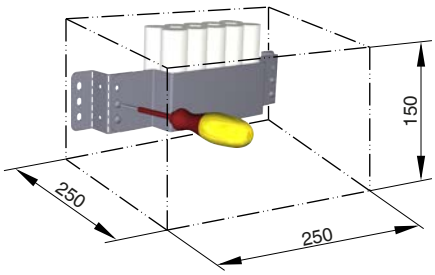
Attachments, for example BUDNF, TUNF

Space requirement, control components on two sides

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

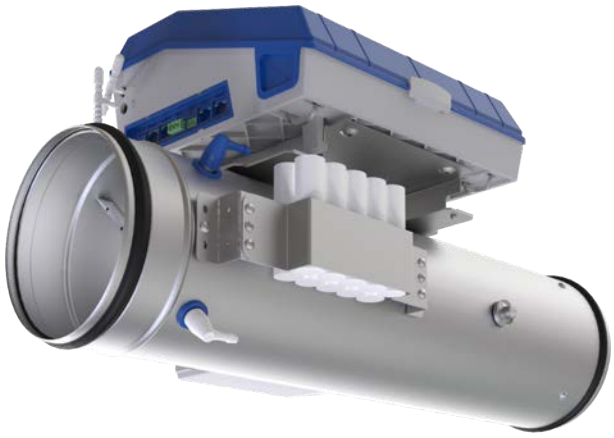
* Control component has been discontinued

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 components).

Product details

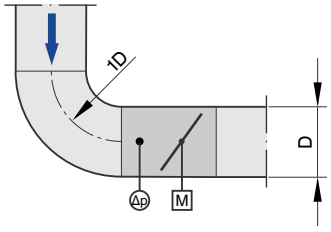
Installation and commissioning

- 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

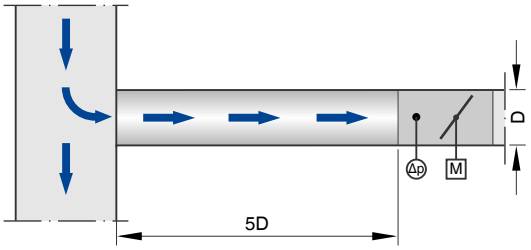
The volume flow rate accuracy Δ_{qv} applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require 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 Δ_{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					
BC0	-	0 – 10 V or 2 – 10 V or MP bus interface	integral	slow-running integral	②
BL0 **	qv	LonWorks FTT 10 interface	integral	slow-running integral	②
BM0	qv	Modbus RTU/BACnet MS/TP	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	③
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	Δp	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/TPTP	integral	slow-running separate	②
BUDNF	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TPTP	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

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

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
BUSN	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TPTP	integral	slow-running separate	②
BUSNF	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TPTP	integral	spring return actuator separate	②
BUSS	qv	0 - 10 V or 2 - 10 V or MP bus or Modbus RTU or BACnet MS/TPTP	integral	fast-running separate	②
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
q_v Volume flow rate
Δ_p 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
VARYCONTROL Universal controller, static					
TUN	qv, Δp	TROX Plug&Play communication system and 0 - 10 V or 2 - 10 V or with optional accessories: LonWorks, 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: LonWorks, 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: LonWorks, 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: LonWorks, Modbus, BACnet, Webserver	qv = integral Δp = separate	fast-running with digital communication interface (TROX HPD), separate	①

q_v Volume flow rate
Δ_p Differential pressure
① TROX

LABCONTROL EASYLAB control components

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
EASYLAB					
ELAB	qv, Δp *	TROX plug and 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 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 ‚ [mm]
Screw hole pitch of flange (horizontal)

B_2 [mm]
Overall dimension of flange (width)

H [mm]
Duct height

H_1 [mm]
Screw hole pitch of flange (vertical)

H_2 [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

$ØD_1$ [mm]
Pitch circle diameter of flanges

$ØD_2$ [mm]
Outer diameter of flanges

L [mm]
Length of unit including connecting spigot

L_1 [mm]
Length of casing or acoustic cladding

n [ ]
Number of flange screw holes

T [mm]
Flange thickness

General information

m [kg]
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 VAV terminal unit, system attenuation taken into account

L_{PA1} [dB(A)]
A-weighted sound pressure level of air-regenerated noise of the VAV terminal unit with secondary silencer, system attenuation taken into account

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

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

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

q_{vNom} [m³/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_{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]
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 $q_{vmin\ unit}$ (if q_{vmin} equals zero) may result in unstable control or shut-off.

q_{vmax} [m³/h]; [l/s]
Upper limit of the operating range for the VAV terminal unit that can be set by customers: q_{vmax} can be set to less than or equal to q_{vNom} . In case of analogue signalling to volume flow controllers (which are typically used), the set maximum value (q_{vmax}) is allocated to the maximum setpoint signal (10 V) (see characteristic).

q_{vmin} [m³/h]; [l/s]
Lower limit of the operating range for the VAV terminal unit that can be set by customers: q_{vmin} should be set to less than or equal to q_{vmax} . Do not set 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 signalling to volume flow controllers (which are typically used), the set minimum value (q_{vmin}) is allocated to the minimum setpoint signal (0 or 2 V) (see characteristic).

q_v [m³/h bzw. l/s]
Volume flow rate

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

Δ_{pst} [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.