ATEX-compliant parts and units

ATEX certification

# EXCONTROL

## TVR-Ex

## For the control of variable air volume flows in potentially explosive atmospheres (ATEX)

Circular VAV terminal units for variable air volume systems, approved and certified for potentially explosive atmospheres (ATEX)

- ATEX-compliant construction and parts
- Approved for all gases, mists and vapours in zones 1 and 2, with electronic control additionally for dusts in zones 21 and 22
- Suitable for the control of supply or extract air as well as for differential pressure control
- Electronic or pneumatic control components
- Closed blade air leakage to EN 1751, up to class 4
- Casing air leakage to EN 1751, class C

Optional equipment and accessories

- Spring return actuator
- Auxiliary switch with adjustable switching points for capturing the end positions

# General information

### Application
- Circular EXCONTROL VAV terminal units of Type TVR-Ex for the precise supply air or extract air flow control in variable air volume systems
- For use in potentially explosive atmospheres (ATEX)
- Closed-loop volume flow control using an external power supply
- Electronic or pneumatic volume flow control
- Shut-off by means of switching (equipment supplied by others)

### Special features
- ATEX mark and certification
- ATEX equipment group II, approved for use in zones 1 and 2; electronic control also for zones 21 and 22
- Volume flow rate can later be measured and adjusted on site; configuration is possible using personal computer software

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

### Classification
Electronic control: Equipment group II
- Zones 1 and 2 (atmosphere: gases):II 2 G c II T5: 10 °C - 50 °C and T6: 10 °C - 60 °C
- Zones 21 and 22 (atmosphere: dusts):II 2 D c II 80 °C

Pneumatic control: Equipment group II
- Zones 1 and 2 (atmosphere: gases):II 2 G c II T5: 10 °C - 50 °C and T6: 10 °C - 60 °C

### Construction
- Galvanised sheet steel
- P1: Inner duct powder-coated, silver grey (RAL 7001)
- A2: Inner duct in stainless steel

### Parts and characteristics
- Ready-to-commission unit which consists of mechanical parts and control components.
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blade
- Connection for equipotential bonding
- Cable bushings suitable for use in potentially explosive atmospheres
- ATEX-compliant control components, factory assembled and complete with wiring and tubing
- Aerodynamic functional testing on a special test rig prior to shipping of each unit
- Unit carries test label with relevant data
- High control accuracy (even with upstream bend R = 1D)

### Attachments
- Electronic control
- Pneumatic control

### Accessories
- Actuator with auxiliary switch for capturing the end positions
- Spring return actuator

### Technical data
- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 15 to 1680 l/s or 54 to 6048 m³ /h
- Volume flow rate control range: approx. 15 – 100 % of the nominal volume flow rate
- Maximum differential pressure: 1000 Pa

### Useful additions
- Secondary silencer Type CA for demanding acoustic requirements

### Construction features
- Construction and materials comply with the EU directive and guidelines for use in potentially explosive atmospheres (ATEX)
- Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180

### Materials and surfaces

- Casing and inner duct made of galvanised sheet steel
- Control components made of die cast aluminium (pneumatic control: plastic)
- Plastic bearings
- Damper blade of stainless steel with thermoplastic elastomer seal TPE
- Differential pressure sensor made of aluminium
- P1: Inner duct powder-coated
- A2: Inner duct in stainless steel

### Standards and guidelines

- Directive 2014/34/EU: Equipment and protective systems intended for use in potentially explosive atmospheres

### Maintenance

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

Electronic control:

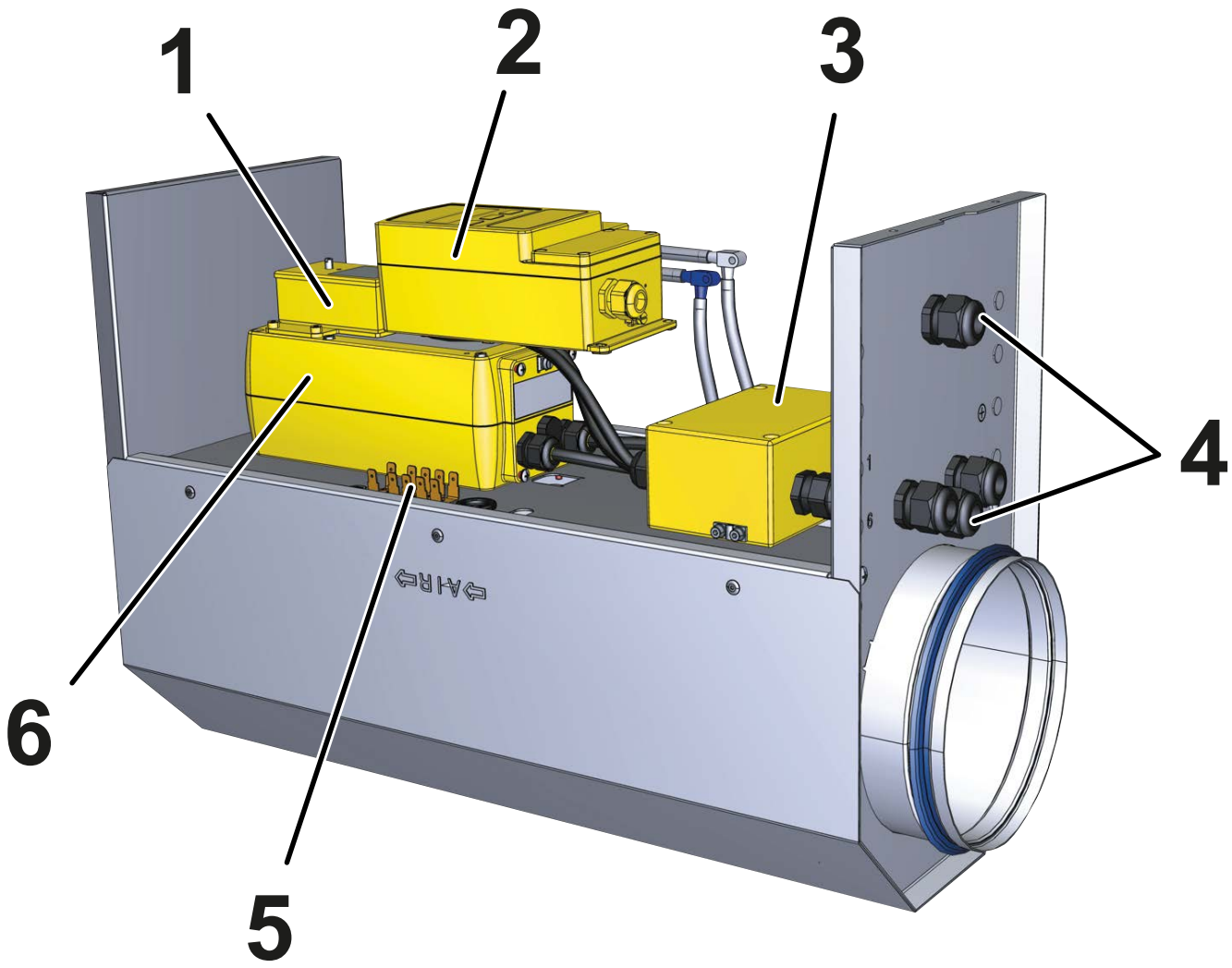
- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

## Function

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate.
The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator.
For most applications, the setpoint value comes from a room temperature controller which is installed outside of the potentially explosive atmosphere.

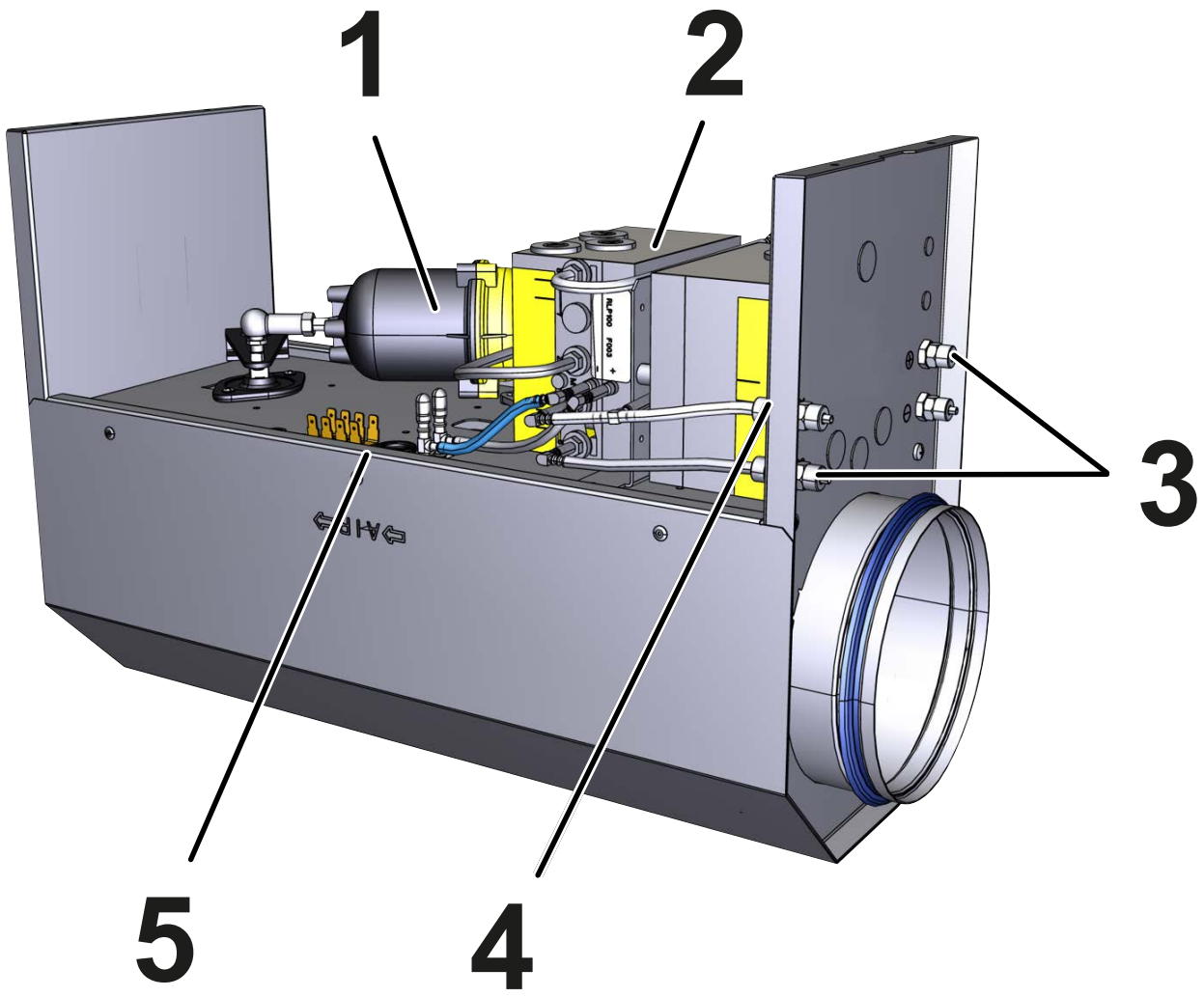
The controller compares the actual value with the setpoint value and alters the control signal of the damper actuator if there is a difference between the two values.
The connections for the supply voltage and for the voltage signals are made in a terminal box that is suitable for use in potentially explosive atmospheres.

**Schematic illustration of the TVR-Ex with electronic control**




① Auxiliary switch
② Static differential pressure transducer
③ Terminal box
④ Cable gland
⑤ Equipotential bonding
⑥ Actuator

**Schematic illustration of the TVR-Ex with pneumatic control**




① Actuator
② Room pressure controller
③ Pneumatic connections
④ Volume flow controller
⑤ Equipotential bonding

# Technical data

| | |
|---|---|
| Nominal sizes | 125 – 400 mm |
| Volume flow rate range | 15 – 1680 l/s or 54 – 6048 m³/h |
| Volume flow rate control range | Approx. 15 to 100 % of the nominal volume flow rate |
| Maximum differential pressure | 1000 Pa |
| Operating temperature | 10 to 50 °C |

**Electronic control with attachment S1S, S1F, S1X or S1Y**

| | |
|---|---|
| S1S | Schischek: Controller ExReg-V-300-A + actuator ExMax-5.10-CY |
| S1F | Schischek: Controller ExReg-V-300-A + spring return actuator ExMax-5.10-CYF |
| S1X | Schischek: Controller ExReg-V-300-A + actuator ExMax-5.10-CY + accessories ExSwitch and ExBox |
| S1Y | Schischek: Controller ExReg-V-300-A + spring return actuator ExMax-5.10-CYF + accessories ExSwitch and ExBox |
| Supply voltage | 24 V AC + 15% (24.0 ... 27.6 V AC), 50/60 Hz |
| Supply voltage | 24 V DC + 15% (24.0 ... 27.6 V DC) |
| IEC protection class | III (protective extra-low voltage) |
| EC conformity | ATEX to 2014/34/EU, EMC to 2014/30/EU, low voltage to 2014/35/EU |

The information given here is just to give you an idea.
For the latest information on the electronic attachments please refer to the technical data in the manufacturer's product documentation:
Schischek GmbH, 90579 Langenzenn, Germany, www.schischek.com, info@schischek.com
For the ExReg-V volume flow controller see the documentation from version V04 of 3 June 2022

### Electronic control with attachment TES, TEF, TEX or TEY
### Components

| | |
|---|---|
| TES | TROX controller TCU3 +<br>Schischek components: differential pressure transducer ExCos-P, actuator ExMax-5.10-Y |
| TEF | TROX: Controller TCU3 +<br>Schischek components: differential pressure transducer ExCos-P, spring return actuator ExMax-5.10-YF |
| TEX | TROX: Controller TCU3 +<br>Schischek components: differential pressure transducer ExCos-P + actuator ExMax-5.10-Y + accessories ExSwitch and ExBox |
| TEY | TROX: Controller TCU3 +<br>Schischek components: differential pressure transducer ExCos-P + spring return actuator ExMax-5.10-YF + accessories ExSwitch and ExBox |

### Controller TCU3 (TROX)

| | |
|---|---|
| Supply voltage | 24 V AC ±15% (20.4 .. 27.6 V), 50/60 Hz |
| Supply voltage | 24 V DC ±15% (20.4 .. 27.6 V) |
| Supply voltage | Optional: 230 V AC mains supply (only with expansion module EM-TRF) |
| Power rating | 8 VA |
| Protection level | IP 20 |
| IEC protection class | III (protective extra-low voltage) if 24 V AC/DC is used |
| Installation | In closed rooms, outside of Ex zones (the TCU3 has to be installed away from TVR-Ex) |
| EC conformity | EMC to 2014/30/EU |

### Differential pressure transducer (Schischek)

| | |
|---|---|
| Supply voltage | 24 V AC ±20% (19.2 .. 28.8 V), 50/60 Hz |
| Supply voltage | 24 V DC ±20% (19.2 .. 28.8 V) |
| IEC protection class | I (earthed) |
| Protection level | IP 66 |
| EC conformity | ATEX to 2014/34/EU, EMC to 2014/30/EU |

### Actuator/spring return actuator (Schischek)

| | |
|---|---|
| Supply voltage | 24... 240 V AC/DC, ±10%, self-adjusting, 50 – 60 Hz ±20% |
| Supply voltage | We recommend a mains connection for the actuator |
| Power rating | Be sure to see the additional information in the Schischek documentation |
| IEC protection class | I (earthed) |
| Protection level | IP 66 |
| EC conformity | ATEX to 2014/34/EU, EMC to 2014/30/EU, low voltage to 2014/35/EU |

The information given here is just to give you an idea.
For the latest information on the electronic attachments please refer to the technical data in the manufacturer's product documentation:
Schischek GmbH, 90579 Langenzenn, Germany, www.schischek.com, info@schischek.com

### Pneumatic

| | |
|---|---|
| Operating pressure | 1.3 bar ± 0.1 bar |
| Air consumption – volume flow control | 50 ln/h |
| Air consumption – pressure and volume flow cascade | 100 ln/h |
| Control pressure | 0.2 – 1.0 bar |
| Maximum pressure | 1.5 bar |
| Compressed air | Compressed air for instruments, free of oil, water and dust |
| Protection level | IP 42 |

# Quick sizing

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

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

**Volume flow rate ranges**

The minimum differential pressure of VAV terminal units is an important factor in designing the ductwork and in rating the fan including speed control. Sufficient duct pressure must be ensured for all operating conditions and for all control units. The measurement points for fan speed control must be selected accordingly. The volume flow rates given for VAV terminal units depend on the nominal size and on the control component (attachment) that is installed. The tables give the minimum and maximum values for a VAV terminal unit. Some control components may only have a limited volume flow rate range. This applies in particular to control components with a static differential pressure transducer. For volume flow rate ranges for all control components refer to our Easy Product Finder design program.

**TVR-Ex – electronic, volume flow rate ranges and minimum differential pressures**

| NS | | | ① | ② | ③ | ④ | |
|---|---|---|---|---|---|---|---|
| | $q_v$ [l/s] | $q_v$ [m³/h] | $\Delta p_{stmin}$ [Pa] | | | | $\Delta q_v$ [±%] |
| 125 | 22 | 79 | 5 | 5 | 5 | 5 | 15 |
| 125 | 60 | 216 | 15 | 20 | 20 | 20 | 7 |
| 125 | 105 | 378 | 45 | 50 | 55 | 60 | 6 |
| 125 | 150 | 540 | 90 | 100 | 110 | 115 | 5 |
| 160 | 35 | 126 | 5 | 5 | 5 | 5 | 15 |
| 160 | 100 | 360 | 15 | 15 | 15 | 15 | 8 |
| 160 | 175 | 630 | 35 | 40 | 45 | 45 | 7 |
| 160 | 250 | 900 | 70 | 80 | 85 | 95 | 5 |
| 200 | 60 | 216 | 5 | 5 | 5 | 5 | 15 |
| 200 | 160 | 576 | 15 | 15 | 15 | 15 | 7 |
| 200 | 280 | 1008 | 35 | 35 | 40 | 40 | 5 |
| 200 | 405 | 1458 | 65 | 70 | 75 | 80 | 5 |
| 250 | 90 | 324 | 5 | 5 | 5 | 5 | 15 |
| 250 | 245 | 882 | 10 | 10 | 10 | 10 | 7 |
| 250 | 430 | 1548 | 25 | 25 | 30 | 35 | 5 |
| 250 | 615 | 2214 | 45 | 50 | 55 | 65 | 5 |
| 315 | 145 | 522 | 5 | 5 | 5 | 5 | 15 |
| 315 | 410 | 1476 | 5 | 10 | 10 | 10 | 7 |
| 315 | 720 | 2592 | 15 | 20 | 20 | 20 | 7 |
| 315 | 1030 | 3708 | 30 | 35 | 40 | 40 | 5 |
| 400 | 240 | 864 | 5 | 5 | 5 | 5 | 15 |
| 400 | 670 | 2412 | 5 | 5 | 5 | 5 | 7 |
| 400 | 1175 | 4230 | 15 | 15 | 15 | 15 | 6 |
| 400 | 1680 | 6048 | 25 | 30 | 30 | 35 | 5 |

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

### TVR-Ex – pneumatic, volume flow rate ranges and minimum differential pressures

| NS | | | ① | ② | ③ | ④ | |
|---|---|---|---|---|---|---|---|
| | $q_v$ [l/s] | $q_v$ [m³/h] | $\Delta p_{st\ min}$ [Pa] | | | | $\Delta q_v$ [±%] |
| 125 | 15 | 54 | 5 | 5 | 5 | 5 | 15 |
| 125 | 40 | 144 | 10 | 10 | 10 | 10 | 10 |
| 125 | 70 | 252 | 20 | 25 | 25 | 25 | 7 |
| 125 | 100 | 360 | 40 | 45 | 50 | 55 | 5 |
| 160 | 25 | 90 | 5 | 5 | 5 | 5 | 15 |
| 160 | 75 | 270 | 10 | 10 | 10 | 10 | 10 |
| 160 | 125 | 450 | 20 | 20 | 25 | 25 | 7 |
| 160 | 175 | 630 | 35 | 40 | 45 | 45 | 5 |
| 200 | 40 | 144 | 5 | 5 | 5 | 5 | 15 |
| 200 | 125 | 450 | 10 | 10 | 10 | 10 | 10 |
| 200 | 210 | 756 | 20 | 20 | 25 | 25 | 7 |
| 200 | 300 | 1080 | 40 | 40 | 45 | 45 | 5 |
| 250 | 60 | 216 | 5 | 5 | 5 | 5 | 15 |
| 250 | 200 | 720 | 5 | 10 | 10 | 10 | 10 |
| 250 | 340 | 1224 | 15 | 15 | 20 | 20 | 7 |
| 250 | 475 | 1710 | 30 | 30 | 35 | 40 | 5 |
| 315 | 105 | 378 | 5 | 5 | 5 | 5 | 15 |
| 315 | 330 | 1188 | 5 | 5 | 5 | 5 | 10 |
| 315 | 555 | 1998 | 10 | 10 | 15 | 15 | 7 |
| 315 | 775 | 2790 | 20 | 20 | 25 | 25 | 5 |
| 400 | 170 | 612 | 5 | 5 | 5 | 5 | 15 |
| 400 | 545 | 1962 | 5 | 5 | 5 | 5 | 10 |
| 400 | 920 | 3312 | 10 | 10 | 10 | 10 | 7 |
| 400 | 1300 | 4680 | 15 | 20 | 20 | 20 | 5 |

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

### TVR-Ex, electronic, sound pressure level at differential pressure 150 Pa

| NS | $p_v$ [l/s] | $p_v$ [m³/h] | Air-regenerated noise | | | | Case-radiated noise |
|---|---|---|---|---|---|---|---|
| | | | ① | ② | ③ | ④ | ① |
| | | | $L_{PA}$ [dB(A)] | $L_{PA1}$ [dB(A)] | | | $L_{PA2}$ [dB(A)] |
| 125 | 22 | 79 | 36 | 25 | 16 | <15 | 16 |
| 125 | 60 | 216 | 45 | 36 | 30 | 28 | 25 |
| 125 | 105 | 378 | 49 | 40 | 34 | 32 | 31 |
| 125 | 150 | 540 | 52 | 41 | 34 | 32 | 35 |
| 160 | 35 | 126 | 41 | 30 | 22 | 19 | 22 |
| 160 | 100 | 360 | 47 | 39 | 34 | 31 | 28 |
| 160 | 175 | 630 | 50 | 42 | 37 | 34 | 32 |
| 160 | 250 | 900 | 53 | 44 | 39 | 36 | 37 |
| 200 | 60 | 216 | 41 | 32 | 24 | 22 | 21 |
| 200 | 160 | 576 | 47 | 40 | 34 | 33 | 29 |
| 200 | 280 | 1008 | 50 | 44 | 40 | 38 | 32 |
| 200 | 405 | 1458 | 54 | 45 | 39 | 38 | 38 |
| 250 | 90 | 324 | 38 | 30 | 24 | 22 | 22 |
| 250 | 245 | 882 | 47 | 40 | 34 | 32 | 35 |
| 250 | 430 | 1548 | 48 | 42 | 38 | 37 | 37 |
| 250 | 615 | 2214 | 52 | 44 | 38 | 37 | 42 |
| 315 | 145 | 522 | 43 | 36 | 29 | 26 | 29 |
| 315 | 410 | 1476 | 47 | 42 | 35 | 34 | 39 |
| 315 | 720 | 2592 | 49 | 44 | 39 | 38 | 42 |
| 315 | 1030 | 3708 | 53 | 48 | 42 | 41 | 46 |
| 400 | 240 | 864 | 43 | 36 | 29 | 26 | 31 |
| 400 | 670 | 2412 | 44 | 38 | 32 | 30 | 37 |
| 400 | 1175 | 4230 | 47 | 42 | 36 | 35 | 41 |
| 400 | 1680 | 6048 | 50 | 44 | 38 | 37 | 46 |

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

### TVR-Ex, pneumatic, sound pressure level at differential pressure 150 Pa

| NS | $q_v$ [l/s] | $q_v$ [m³/h] | Air-regenerated noise | | | | Case-radiated noise |
|---|---|---|---|---|---|---|---|
| | | | ① | ② | ③ | ④ | ① |
| | | | $L_{PA}$ [dB(A)] | $L_{PA1}$ [dB(A)] | | | $L_{PA2}$ [dB(A)] |
| 125 | 22 | 79 | 36 | 25 | 16 | <15 | 16 |
| 125 | 60 | 216 | 45 | 36 | 30 | 28 | 25 |
| 125 | 105 | 378 | 49 | 40 | 34 | 32 | 31 |
| 125 | 150 | 540 | 52 | 41 | 34 | 32 | 35 |
| 160 | 35 | 126 | 41 | 30 | 22 | 19 | 22 |
| 160 | 100 | 360 | 47 | 39 | 34 | 31 | 28 |
| 160 | 175 | 630 | 50 | 42 | 37 | 34 | 32 |
| 160 | 250 | 900 | 53 | 44 | 39 | 36 | 37 |
| 200 | 60 | 216 | 41 | 32 | 24 | 22 | 21 |
| 200 | 160 | 576 | 47 | 40 | 34 | 33 | 29 |
| 200 | 280 | 1008 | 50 | 44 | 40 | 38 | 32 |
| 200 | 405 | 1458 | 54 | 45 | 39 | 38 | 38 |
| 250 | 90 | 324 | 38 | 30 | 24 | 22 | 22 |

| NS | $q_v$ [l/s] | $q_v$ [m³/h] | Air-regenerated noise | | | | Case-radiated noise |
|---|---|---|---|---|---|---|---|
| | | | ① | ② | ③ | ④ | ① |
| | | | $L_{PA}$ [dB(A)] | $L_{PA1}$ [dB(A)] | | | $L_{PA2}$ [dB(A)] |
| 250 | 245 | 882 | 47 | 40 | 34 | 32 | 35 |
| 250 | 430 | 1548 | 48 | 42 | 38 | 37 | 37 |
| 250 | 615 | 2214 | 52 | 44 | 38 | 37 | 42 |
| 315 | 145 | 522 | 43 | 36 | 29 | 26 | 29 |
| 315 | 410 | 1476 | 47 | 42 | 35 | 34 | 39 |
| 315 | 720 | 2592 | 49 | 44 | 39 | 38 | 42 |
| 315 | 1030 | 3708 | 53 | 48 | 42 | 41 | 46 |
| 400 | 240 | 864 | 43 | 36 | 29 | 26 | 31 |
| 400 | 670 | 2412 | 44 | 38 | 32 | 30 | 37 |
| 400 | 1175 | 4230 | 47 | 42 | 36 | 35 | 41 |
| 400 | 1680 | 6048 | 50 | 44 | 38 | 37 | 46 |

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

# Specification text

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

### Specification text

VAV terminal units for variable and constant air volume systems in potentially explosive atmospheres, suitable for supply or extract air, available in 6 nominal sizes.
High control accuracy (even with upstream bend R = 1D).
Ready-to-commission unit which consists of the mechanical parts, the electronic control components, and parts for equipotential bonding and for use in potentially explosive atmospheres. Each unit contains an averaging differential pressure sensor for volume flow rate measurement and a damper blade.
Factory mounted control components complete with wiring and tubing.
Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
Spigot with lip seal, for circular connecting ducts to EN 1506 or EN 13180.
Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).
Casing air leakage to EN 1751, class C.

### Special features

- ATEX mark and certification
- ATEX equipment group II, approved for use in zones 1 and 2; electronic control also for zones 21 and 22
- The volume flow rate can later be measured and adjusted on site; configuration is possible using personal computer software

### Materials and surfaces

- Casing and inner duct made of galvanised sheet steel
- Control components made of die cast aluminium (pneumatic control: plastic)
- Plastic bearings
- Damper blade of stainless steel with thermoplastic elastomer seal TPE
- Differential pressure sensor made of aluminium
- P1: Inner duct powder-coated
- A2: Inner duct in stainless steel

### Construction

- Galvanised sheet steel
- P1: Inner duct powder-coated, silver grey (RAL 7001)
- A2: Inner duct in stainless steel

### Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 15 to 1680 l/s or 54 to 6048 m³/h
- Volume flow rate control range: approx. 15 – 100% of the nominal volume flow rate
- Maximum differential pressure: 1000 Pa

### Attachments

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

- Supply voltage 24 V AC/DC (controller/differential pressure transducer)
- Supply voltage 24 V AC/DC (actuator for attachment S1*)
- Supply voltage 230 V AC (actuator for attachment TE*)
- Signal voltages 0 – 10 V DC
- The actual value signal relates to the nominal volume flow rate so that commissioning and subsequent adjustment are simplified
- Volume flow rate control range: approx. 15 – 100% of the nominal volume flow rate
- Actuator with adjustable running time, 7.5 – 120 s

### Sizing data

- $q_v$ _____[m³/h]
- Δpst _____[Pa]

Air-regenerated noise

- LPA _____[dB(A)]

Case-radiated noise

- LPA _____[dB(A)]

# Order code

### TVR-Ex with ATEX control component Universal

**TVR-Ex – P1 / 125 / S1F / V 0 / 200 – 400 [m³/h] / NO**
**1 2 3 4 5 6 7 8**

**1 Type**
**TVR-Ex** VAV terminal unit for use in potentially explosive atmospheres

**2 Material**
No entry: galvanised sheet steel
**P1** Inner duct powder-coated, silver grey (RAL 7001)
**A2** Inner duct in stainless steel

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

**4 Attachments (control components)**
Electronic control
**S1S** ExReg controller and actuator
**S1F** ExReg controller and spring return actuator
**S1X** ExReg controller, actuator and auxiliary switch
**S1Y** ExReg controller, spring return actuator and auxiliary switch

**5 Operating mode**
**V** Variable operation (adjustable setpoint value range)

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

**7 Operating values for factory setting**
Volume flow rate [m³/h or l/s]
$q_{v_{min}} – q_{v_{max}}$

**8 Damper blade position**
Only with spring return actuators (S1F and S1Y)
**NO** Power off to open (Normally Open)
**NC** Power off to close (Normally Closed)

### Order example: TVR-Ex-P1/125/S1F/V0/200-400[m³/h]/NO

| | |
|---|---|
| **Type** | TVR-Ex |
| **Material** | Inner duct powder-coated, silver grey (RAL 7001) |
| **Nominal size [mm]** | 125 |
| **Attachments (control components)** | ExReg controller and spring return actuator |
| **Operating mode** | Variable operation (adjustable setpoint value range) |
| **Signal voltage range** | 0 – 10 V DC |
| **Operating values for factory setting** | 200 – 400 [m³/h] |
| **Damper blade position** | Power off to open (Normally Open) |

### Order example: TVR-Ex/200/S1S/V0/400-1200[m³/h]

| | |
|---|---|
| **Type** | TVR-Ex |
| **Material** | Galvanised sheet steel |
| **Nominal size [mm]** | 200 |
| **Attachments (control components)** | ExReg controller and actuator |
| **Operating mode** | Variable operation (adjustable setpoint value range) |
| **Signal voltage range** | 0 – 10 V DC |
| **Operating values for factory setting** | 400 – 1200 [m³/h] |
| **Damper blade position** | - |

## TVR-Ex with ATEX control component based on TCU3

**TVR-Ex – P1 / 160 / TEF / EC – E0 / M / 200 – 400 [m3/h] / NO**
**1 2 3 4 5 6 7 8 9**

### 1 Type
**TVR-Ex** VAV terminal unit for use in potentially explosive atmospheres

### 2 Material
No entry: galvanised sheet steel
**P1** Inner duct powder-coated, silver grey (RAL 7001)
**A2** Inner duct in stainless steel

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

### 4 Attachments (control components)
Electronic control (controller outside of the Ex zone)
**TES** TCU3 controller and actuator
**TEF** TCU3 controller and spring return actuator
**TEX** TCU3 controller, actuator and auxiliary switch
**TEY** TCU3 controller, spring return actuator and auxiliary switch

### 5 Equipment function
Single operation
**SC** Single controller – supply air (Supply Controller)
**EC** Single controller – extract air (Extract Controller)

### 6 External volume flow rate default 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)

### 7 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

### 8 Operating values for factory setting
Volume flow rate [$m^3$/h or l/s]

Depends on external volume flow rate setting
E0: $q_{v_{min}} – q_{v_{max}}$
E2: $q_{v_{min}} – q_{v_{max}}$
2P: $q_{v_1}/q_{v_2}$
3P: $q_{v_1}/q_{v_2}/q_{v_3}$
F: $q_{v_1}$

### 9 Damper blade position
Only with spring return actuators (TEF and TEY)
**NO** Power off to open (Normally Open)
**NC** Power off to close (Normally Closed)

**Order example: TVR-Ex-P1/160/TEF/EC-E0/M/200-400[m³/h]/NO**

| | |
|---|---|
| **Type** | TVR-Ex |
| **Material** | Inner duct powder-coated, silver grey (RAL 7001) |
| **Nominal size [mm]** | 160 |
| **Attachments (control components)** | TCU3 controller installed outside of the Ex zone (away from the terminal unit) |
| **Actuator** | Spring return actuator |
| **Equipment function** | Single controller – extract air (Extract Controller) |
| **External volume flow rate setting** | Variable, signal voltage range 0 – 10 V DC |
| **Expansion modules** | 24 V AC/DC power supply, EM-BAC-MOD for Modbus RTU communication interface |
| **Operating values for factory setting** | 200 – 400 [$m^3$/h] |
| **Damper blade position** | Power off to open (Normally Open) |

## TVR-Ex with pneumatic attachments

**TVR-Ex – P1 / 125 / PG5 / V / 200 – 400 [m³/h] / NO**
**| | | | | | |**
**1 2 3 4 5 6 7**

### 1 Type
**TVR-Ex** VAV terminal unit for use in potentially explosive atmospheres

### 2 Material
No entry: galvanised sheet steel
**P1** Inner duct powder-coated, silver grey (RAL 7001)
**A2** Inner duct in stainless steel

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

### 4 Attachments (control components)
Pneumatic control
**PG5** Volume flow controller with actuator
**PJ5** Pressure and volume flow cascade (±20 Pa)
**PL5** Pressure and volume flow cascade (±50 Pa)

### 5 Operating mode
**V** Variable operation (adjustable setpoint value range)

### 6 Operating values for factory setting
Volume flow rate [m³/h or l/s]

For attachment PG5
Volume flow rate $q_{v_{min}}$ – $q_{v_{max}}$

For attachments PJ5 and PL5
Pressure and volume flow cascade $q_{v_{min}}$ – $q_{v_{max}}$ / $\Delta p_{set}$

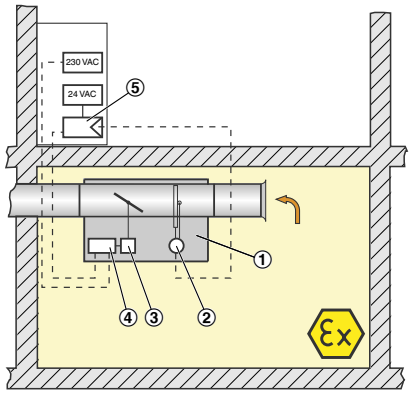
### 7 Damper blade position
Pneumatic actuators
**NO** Pressure off to open (Normally Open)
**NC** Pressure off to close (Normally Closed)

### Order example: TVR-Ex-P1/125/PG5/V/200-400[m³/h]/NO

| | |
|---|---|
| **Type** | TVR-Ex |
| **Material** | Inner duct powder-coated, silver grey (RAL 7001) |
| **Nominal size [mm]** | 125 |
| **Attachments (control components)** | Volume flow controller with actuator |
| **Operating mode** | Variable operation (adjustable setpoint value range) |
| **Operating values for factory setting** | 200 – 400 [m³/h] |
| **Damper blade position** | Power off to open (Normally Open) |

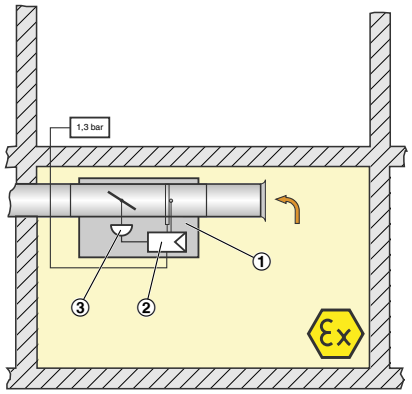
# Variants

**Schematic illustration of the TVR-Ex with electronic control**




① VAV terminal unit
② Static differential pressure transducer
③ Actuator
④ Terminal box
⑤ Electronic volume flow controller

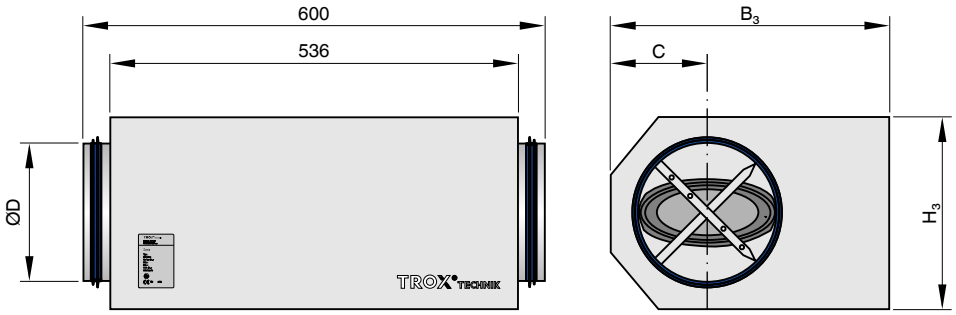
**Schematic illustration of the TVR-Ex with pneumatic control**




① VAV terminal unit
② Pneumatic volume flow controller
③ Pneumatic actuator

# Dimensions and weight

TVR-Ex




**TVR-Ex**

| NS | ØD | $B_3$ | $H_3$ | C |
|---|---|---|---|---|
| 125 | 124 | 372 | 221 | 129 |
| 160 | 159 | 372 | 221 | 111 |
| 200 | 199 | 463 | 311 | 182 |
| 250 | 249 | 463 | 311 | 157 |
| 315 | 314 | 627 | 461 | 289 |
| 400 | 399 | 627 | 461 | 246 |

① TVR-Ex
② TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 500 mm
③ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1000 mm
④ TVR-Ex with secondary silencer CA, insulation thickness 50 mm, length 1500 mm

**TVR-Ex**

| NS | TVR-Ex/.../TEx | TVR-Ex/.../Pxx |
|---|---|---|
| | kg | |
| 125 | 17.5 | 15.5 |
| 160 | 17.5 | 15.5 |
| 200 | 19 | 17 |
| 250 | 19 | 17 |
| 315 | 23 | 21 |
| 400 | 23 | 21 |

① TVR-Ex with electronic control
② TVR-Ex with pneumatic control

# Installation details

### Installation and commissioning

- Connections for equipotential bonding: Suitable cables must be connected by others

Electronic control

- Any installation orientation
- Zero point correction required

Pneumatic control

- Installation orientation must be as shown on the sticker

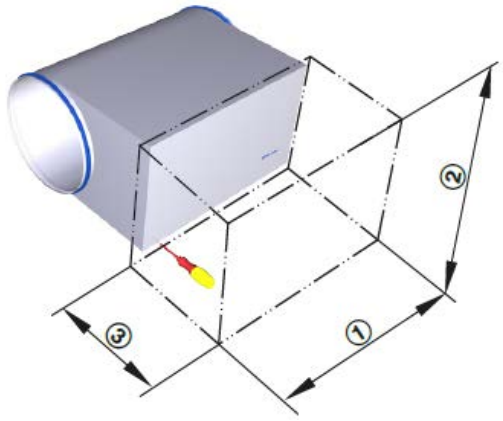
### Upstream conditions

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

### Space required for commissioning and maintenance

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

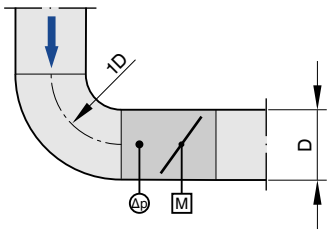
### Access to control equipment box and reset device for the thermal cut-out




### Space required

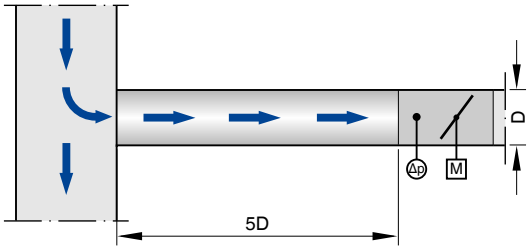
| NS | ① | ② | ③ |
|---|---|---|---|
| 125 | 600 | 220 | 300 |
| 160 | 600 | 220 | 300 |
| 200 | 600 | 310 | 300 |
| 250 | 600 | 310 | 300 |
| 315 | 600 | 460 | 300 |
| 400 | 600 | 460 | 300 |

### 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.

# Nomenclature

### Dimensions of rectangular units

**B** [mm]
Duct width

**$B_1$** [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 $q_{vnom}$ For analogue signalling to volume flow controllers (typically used), the maximum value of the setpoint signal (10 V) is assigned the set maximum value ($q_{vmax}$) (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]; [l/s]
Volume flow rate

**$\Delta_{qv}$** [%]
Volume flow rate accuracy in relation to the setpoint (tolerance)

**$\Delta p_{st}$** [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.

# Basic information and nomenclature

## VAV terminal units

- Basic information and nomenclature
- Volume flow rate ranges and quick sizing
- Acoustics and quick sizing
- Measurement of air-regenerated and case-radiated noise
- Correction values for acoustic quick sizing
- Easy Product Finder (EPF)

# Basic information and nomenclature

### 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 option or integrated sound attenuator), volume flow rate range

### Control component

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

Important distinguishing features:
Transducer
- Dynamic transducer for clean air
- Static transducer for contaminated air

Actuator
- Standard actuator, slow-running
- Spring return actuator for damper blade safety function
- Fast-running actuator

Interface technology
- Analogue interface
- Digital interface or digital bus interface for connection and tapping of signals and information

### Volume flow controller

Consists of a basic unit with an attached control component.

# Volume flow rate and quick sizing

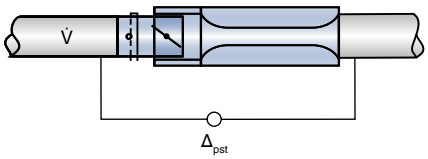
### Volume flow rate ranges

The volume flow rate design tables shown in the product data sheet show the usable volume flow rate ranges of the basic unit in combination with the electronic control components.
Each basic unit offers a certain volume flow rate range due to its aerodynamic properties. Due to the installed component properties and in particular the differential pressure transducer technology used, each control component enables complete or limited utilisation of the volume flow rate range of the basic unit.
Both the basic unit and the selected control component are therefore decisive for the selection of a volume flow controller and the required volume flow rate control range. The quick sizing therefore shows the volume flow rate ranges for the basic unit type in combination with various control components (TROX attachments).

### Static minimum differential pressure $\Delta_{pstmin}$ [Pa]

The static minimum differential pressure is equal to the pressure loss of the VAV terminal unit when the damper blade is open, caused by flow resistance (sensor tubes, blade mechanism). 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 completely open. The static minimum differential pressure is an important factor in designing the ductwork as well as for sizing the fan including speed control, and is therefore a component of the quick sizing for the volume flow rate ranges. Sufficient static differential pressure must be ensured for all operating conditions and for all terminal units, and the measurement point or points for speed control must have been selected accordingly to achieve this.

### Static differential pressure

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# Acoustics

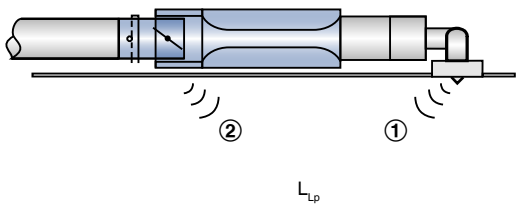
### Air-regenerated noise

The noise generated at the installations (damper blade, sensor tubes, etc.) propagates **in the ducting** as air-regenerated noise and reaches the rooms to be ventilated through air terminal devices. The level reduction due to the ducting and its installations – such as changes of direction and junctions as well as end reflection and room attenuation – can be taken into account in the acoustic calculation and thus contributes to the reduction of the required attenuation by sound attenuators.

### Case-radiated noise

The noise generated at the installations (damper blade, sensor tubes, etc.) penetrates **through the enclosure wall** into the adjacent surroundings and thus, depending on the installation location, also into the rooms to be ventilated. Consideration of the level reduction through ceiling insulation and room attenuation can also positively influence the result of the acoustic calculation.

### Definition of noise




① Air-regenerated noise
② Case-radiated noise

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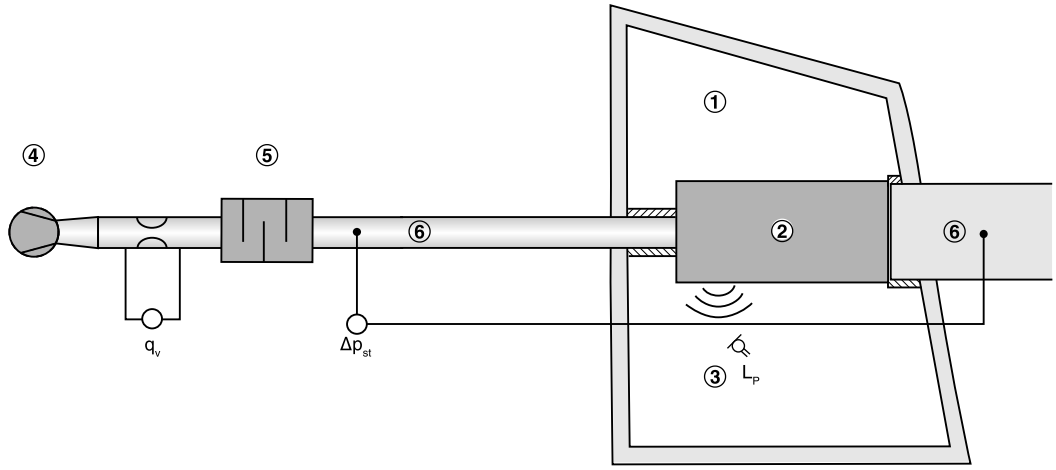
### Measurements

The acoustic data for the air-regenerated noise and case-radiated noise are determined according to EN ISO 5135. All measurements are carried out to EN ISO 3741 in a reverberation chamber.

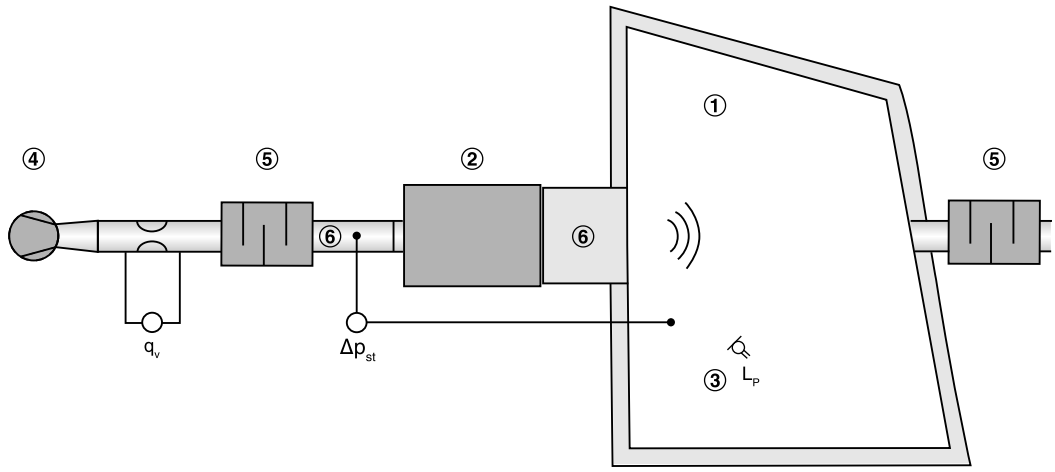
### Technical laboratory investigation of case-radiated noise and air-regenerated noise of the products for representation in the product data sheets

### Measuring the case-radiated noise




① Reverberation chamber
② Terminal unit
③ Microphone (recording case-radiated noise of VAV terminal unit)
④ Fan
⑤ Sound attenuator
⑥ Duct

### Measuring the air-regenerated noise



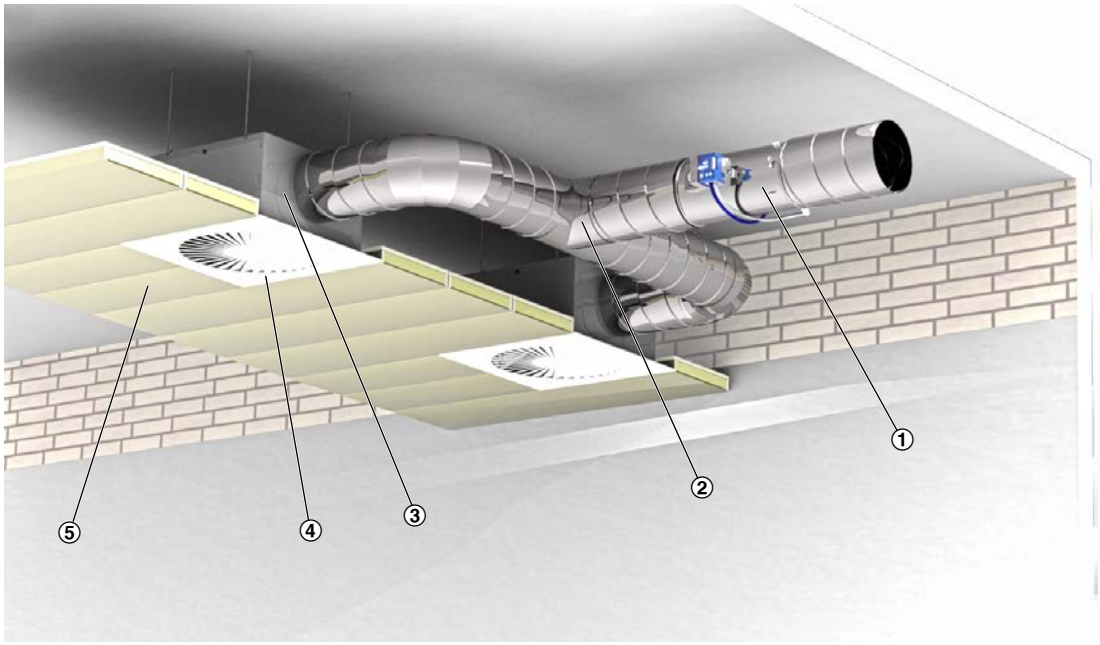

① Reverberation chamber
② Terminal unit
③ Microphone (recording air-regenerated noise of VAV terminal unit)
④ Fan
⑤ Sound attenuator
⑥ Duct

# Acoustic quick sizing

### Fundamentals as explanation

The quick sizing tables in the product data sheets show the sound pressure levels that can be expected in a room both for the air-regenerated noise and for the case-radiated noise. The sound pressure level in a room results from the sound power level of the products – for a given volume flow rate and differential pressure – as well as the attenuation and insulation on site.

### Sound pressure level reduction for air-regenerated noise and case-radiated noise




① Terminal unit
② Distribution in the ducting
③ Change of direction
④ End reflection
⑤ Ceiling insulation (only relevant for case-radiated noise)
⑥ Room attenuation

**Note:** The room attenuation depends on the room size/volume and the room furnishings (surfaces, floors, walls, ceilings).

### System attenuation

System attenuation means all level-reducing influences – including the "natural" attenuation of ducting components and sound propagation in rooms or outdoors. In our product data sheets, practical attenuation and insulation values have already been taken into account as what are referred to as system attenuation in the acoustic quick sizing tables for the specified sound pressure levels. The system attenuation for air-regenerated noise is composed of the distribution in the ducting, the change of direction, the end reflection and the room attenuation, and thus influences the sound pressure level of the air-regenerated noise. The system attenuation for case-radiated noise is composed of ceiling insulation and room attenuation and thus influences the sound pressure level of the case-radiated noise.

# Correction values for acoustic quick sizing

The (correction) tables contain practical values for the influencing variables of the possible level reduction:
- Relevant for air-regenerated noise: ventilation and air conditioning system elements, end reflection and room attenuation
- Relevant for case-radiated noise: ceiling insulation and room attenuation

### Correction values for the distribution in the ducting

The correction for the distribution in the ducting is based on the number of air terminal devices assigned to any one volume flow controller. If there is just one air terminal device (assumption: 140 l/s or 500 m³/h), no correction is necessary. At higher volume flows, several air terminal devices are typically used which lead to an additional reduction in the air-regenerated noise.

### Considered reduction of air-regenerated noise through distribution in the ducting

Additional level reduction per octave

| qv [m³/h] | 500 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 |
|---|---|---|---|---|---|---|---|---|
| qv [l/s] | 140 | 280 | 420 | 550 | 700 | 840 | 1100 | 1400 |
| Number of diffusers | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 10 |
| ΔL [dB] | 0 | 3 | 5 | 6 | 7 | 8 | 9 | 10 |

### Considered reduction of air-regenerated noise through change of direction, end reflection, room attenuation

Additional level reduction per octave according to VDI 2081

| Centre frequency fm [Hz] | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|---|---|---|---|---|---|---|---|---|
| Change of direction ΔL [dB] | 0 | 0 | 1 | 2 | 3 | 3 | 3 | 3 |
| End reflection ΔL [dB] * | 10 | 5 | 2 | 0 | 0 | 0 | 0 | 0 |
| Room attenuation ΔL [dB] | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

One change of direction, e.g. at the horizontal connection of the diffuser plenum box, has been taken into consideration for the system attenuation values. Vertical connection of the plenum box does not result in a system attenuation. Additional bends result in lower sound pressure levels.

* The calculation is based on an assumed end reflection for nominal size 250.

### Considered reduction of the case-radiated noise

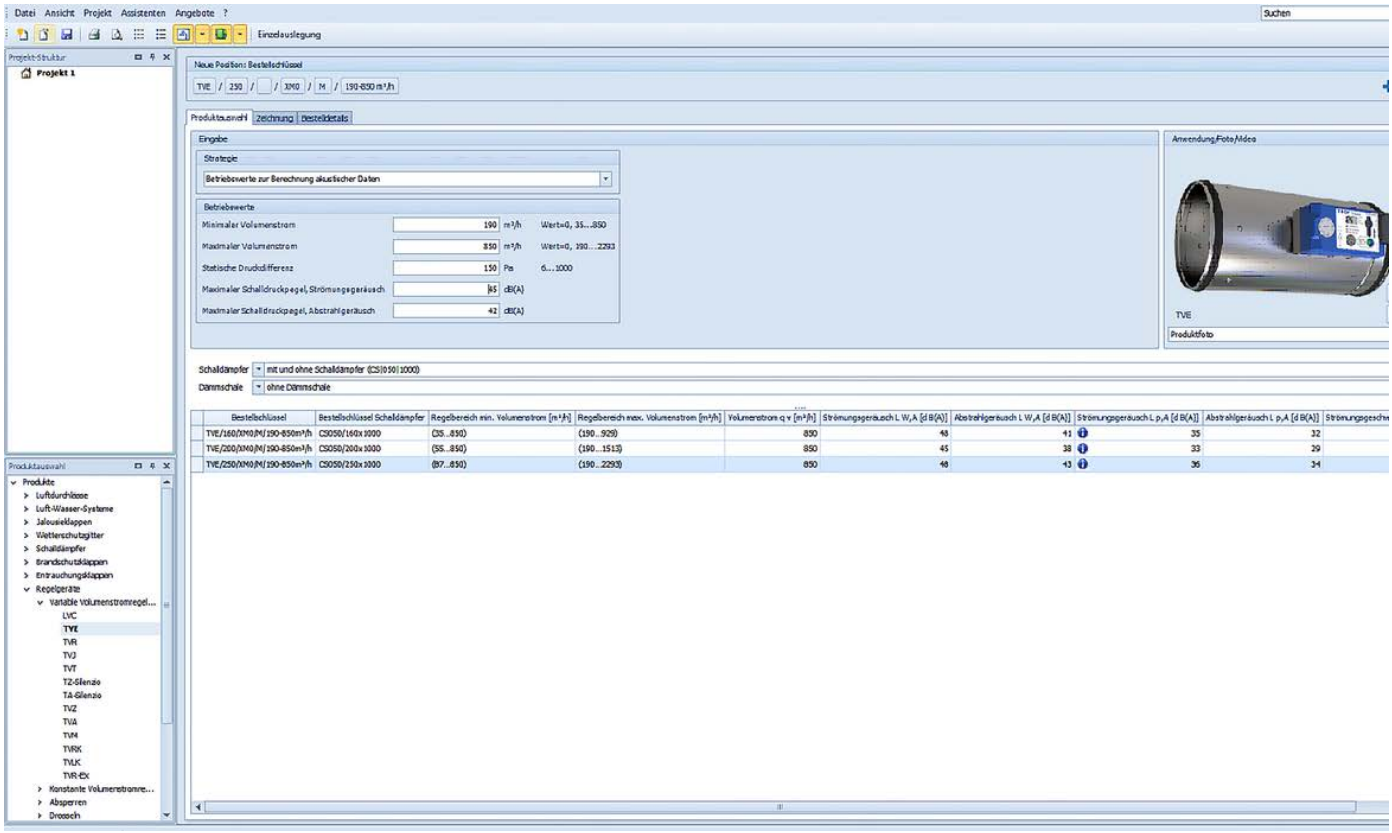
Additional ceiling insulation and room attenuation values per octave according to VDI 2081

| Centre frequency fm [Hz] | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|---|---|---|---|---|---|---|---|---|
| Ceiling insulation ΔL [dB] | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Room attenuation ΔL [dB] | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

### Note on the correction values for ceiling insulation and room attenuation

These correction values take into account the design/equipment of the room under consideration. The real attenuation values of the room and its furnishings can be higher or lower depending on the design (carpets, parquet, wall composition, curtains, etc.). We consider an average (usual) value of 5 dB in the acoustic quick sizing.

## Easy Product Finder




The Easy Product Finder allows you to size products using your project-specific data. Data on individually selectable operating points (e.g. volume flow rates, differential pressures and acoustics) can be calculated.

**Click here for the Easy Product Finder:**

**www.trox.de/epf**