# Type TVZ

## FOR SUPPLY AIR SYSTEMS WITH DEMANDING ACOUSTIC REQUIREMENTS

VAV terminal units for the supply air control in buildings with variable air volume systems and demanding acoustic requirements

- Highly effective integral attenuator
- Box style construction for the reduction of the airflow velocity
- Electronic control components for different applications (Easy, Compact, Universal, and LABCONTROL)
- Suitable for airflow velocities up to 13 m/s
- Closed blade air leakage to EN 1751, up to class 4
- Casing air leakage to EN 1751, class A

Optional equipment and accessories

- Acoustic cladding for the reduction of case-radiated noise
- Secondary silencer Type TS for the reduction of air-regenerated noise
- Hot water heat exchanger of Type WT for reheating the airflow


## APPLICATION

### Application

- VARYCONTROL VAV terminal units of Type TVZ for the supply air control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- Integral attenuator for demanding acoustic requirements
- Shut-off by means of switching (equipment supplied by others)

### Special characteristics

- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Hygiene tested and certified
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary
- Inspection access for cleaning to VDI 6022

### Nominal sizes

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

## DESCRIPTION

### Variants

- TVZ: Supply air unit
- TVZ-D: Supply air unit with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TS for very demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

### 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
- Integral attenuator

- Inspection access
- Factory assembled control components complete with wiring and tubing
- Aerodynamic functional testing on a special test rig prior to 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, differential pressure transducer and actuator
- Compact controller: Compact unit consisting of controller, differential pressure transducer and actuator
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

**Accessories**

- Lip seal (factory fitted)

**Useful additions**

- Secondary silencer Type TS
- Heat exchanger Type WT

**Construction features**

- Rectangular casing
- Spigot on the fan end suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Connection on the room end suitable for air duct profiles
- Baffle plate is fitted after the damper blade for optimum aerodynamic performance
- Position of the damper blade indicated externally at shaft extension
- Thermal and acoustic insulation (lining)

**Materials and surfaces**

- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic

- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)

- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

Mineral wool

- To EN 13501, fire rating class A1, non-combustible
- RAL quality mark RAL-GZ 388
- Biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

**Standards and guidelines**

- Hygiene conforms to VDI 6022
- VDI 2083, air cleanliness class 3, and US standard 209E, class 100
- Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).
- Nominal sizes 125 and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class A

**Maintenance**

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

# TECHNICAL INFORMATION

Function, Technical data, Quick sizing, Specification text, Order code, Produktbeziehungen

## FUNCTION

**Functional description**

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; the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal or LABCONTROL).

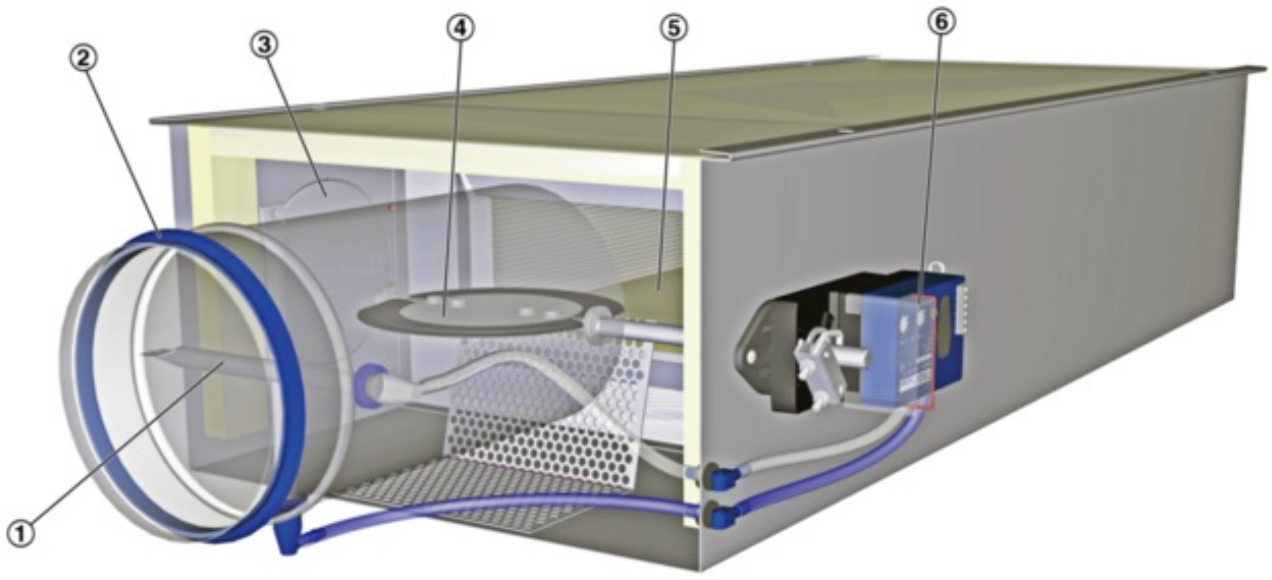
For most applications, the setpoint value comes from a room temperature controller.

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.

An integral attenuator reduces the noise that is created by the restriction of the airflow.

The airflow velocity at the room end is, due to the larger rectangular cross section, about half the velocity in the circular duct.

### Schematic illustration of the TVZ



① Differential pressure sensor

② Lip seal

③ Inspection access

④ Damper blade

⑤ Integral attenuator

⑥ Control components, e.g. an Easy controller

## TECHNICAL DATA

**Volume flow rate ranges**

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

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

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

| Nominal size | V l/s | V m³/h | ① $\Delta p_{st\ min}$ Pa | ② $\Delta p_{st\ min}$ Pa | ΔV ± % |
|---|---|---|---|---|---|
| 125 | 15 | 54 | 5 | 5 | 19 |
| | 60 | 216 | 15 | 25 | 8 |
| 125 | 105 | 378 | 45 | 65 | 7 |
| | 150 | 540 | 90 | 130 | 5 |
| 160 | 25 | 90 | 5 | 5 | 19 |
| | 100 | 360 | 15 | 20 | 8 |
| 160 | 175 | 630 | 40 | 50 | 7 |
| | 250 | 900 | 80 | 100 | 5 |
| 200 | 40 | 144 | 5 | 5 | 19 |
| | 160 | 576 | 15 | 20 | 8 |
| 200 | 280 | 1008 | 40 | 50 | 7 |
| | 405 | 1458 | 80 | 100 | 5 |
| 250 | 60 | 216 | 5 | 5 | 19 |
| | 250 | 900 | 15 | 20 | 8 |
| 250 | 430 | 1548 | 40 | 50 | 7 |
| | 615 | 2214 | 80 | 100 | 5 |
| 315 | 100 | 360 | 5 | 5 | 19 |
| | 410 | 1476 | 15 | 20 | 8 |
| 315 | 720 | 2592 | 40 | 60 | 7 |
| | 1030 | 3708 | 80 | 120 | 5 |
| 400 | 170 | 612 | 5 | 5 | 19 |
| | 670 | 2412 | 15 | 20 | 8 |
| 400 | 1175 | 4230 | 40 | 60 | 7 |
| | 1680 | 6048 | 80 | 120 | 5 |

| | |
|---|---|
| **Nominal sizes** | 125 – 400 mm |
| **Volume flow rate range** | 15 – 1680 l/s or 54 – 6048 m³/h |
| **Volume flow rate control range (unit with dynamic differential pressure measurement)** | Approx. 10 – 100% of the nominal volume flow rate |
| **Minimum differential pressure** | 5 – 80 Pa |
| **Maximum differential pressure** | 1000 Pa |
| **Operating temperature** | 10 – 50 °C |

## 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 programme.

The first selection criteria for the nominal size are the actual volume flow rates $V_{min}$ and $V_{max}$. 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.

**Sizing example**

**Given data**

$V_{max}$ = 280 l/s (1010 $m^3$/h)

$\Delta p_{st}$ = 150 Pa

Required sound pressure level in the room 30 dB(A)

**Quick sizing**

TVZ-D/200

Air-regenerated noise $L_{PA}$ = 23 dB(A)

Case-radiated noise $L_{PA3}$ = 24 dB(A)

Sound pressure level in the room = 27 dB(A)

(logarithmic addition since the terminal unit is installed in the suspended ceiling of the room)

**TVZ, Sound pressure level at differential pressure 150 Pa**

| Nominal size | V | | Air-regenerated noise | | Case-radiated noise | |
|---|---|---|---|---|---|---|
| | | | ① | ② | ① | ③ |
| Nominal size | V | | $L_{PA}$ | $L_{PA1}$ | $L_{PA2}$ | $L_{PA3}$ |
| | l/s | m³/h | dB(A) | | | |
| 125 | **15** | **54** | 17 | 16 | 21 | <15 |
| | **60** | **216** | 24 | 20 | 24 | 16 |
| 125 | **105** | **378** | 29 | 24 | 27 | 19 |
| | **150** | **540** | 34 | 29 | 32 | 23 |
| 160 | **25** | **90** | 18 | 16 | 20 | <15 |
| | **100** | **360** | 28 | 24 | 25 | 18 |
| 160 | **175** | **630** | 35 | 29 | 29 | 21 |
| | **250** | **900** | 36 | 30 | 35 | 27 |
| 200 | **40** | **144** | 16 | <15 | 22 | 15 |
| | **160** | **576** | 21 | 17 | 27 | 20 |
| 200 | **280** | **1008** | 23 | 17 | 31 | 23 |
| | **405** | **1458** | 31 | 24 | 39 | 31 |
| 250 | **60** | **216** | 16 | 15 | 22 | 16 |
| | **250** | **900** | 17 | <15 | 26 | 19 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **250** | **430** | **1548** | 22 | 15 | 29 | 22 |
| | **615** | **2214** | 31 | 21 | 37 | 28 |
| **315** | **105** | **378** | 18 | 15 | 21 | 15 |
| | **410** | **1476** | 21 | 16 | 27 | 19 |
| **315** | **720** | **2592** | 24 | 18 | 33 | 24 |
| | **1030** | **3708** | 29 | 22 | 38 | 29 |
| **400** | **170** | **612** | 17 | <15 | 25 | 17 |
| | **670** | **2412** | 19 | 15 | 29 | 20 |
| **400** | **1175** | **4230** | 26 | 20 | 33 | 25 |
| | **1680** | **6048** | 32 | 27 | 43 | 35 |

① TVZ

② TVZ with secondary silencer TS

③ TVZ-D

## SPECIFICATION TEXT

Rectangular VAV terminal units for variable and constant air volume systems, suitable for supply air, available in 6 nominal sizes.

High control accuracy (even with upstream bend R = 1D).

Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement, a damper blade, and an integral attenuator. Factory-assembled control components complete with wiring and tubing.

Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution)

On the fan end, spigot with groove for lip seal, suitable for connecting ducts according to EN 1506 or EN 13180.

Room end suitable for the connection of air duct profiles.

Baffle plate is fitted after the damper blade for optimum acoustic and aerodynamic performance.

Casing with acoustic and thermal insulation.

Position of the damper blade indicated externally at shaft extension.

Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).

Casing air leakage to EN 1751, class B.

Complies with VDI 2083, clean room class 3, and US standard 209E, class 100. Hygiene complies with VDI 6022, DIN 1946, part 4, as well as EN 13779 and VDI 3803.

**Special characteristics**

- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Hygiene tested and certified
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary
- Inspection access for cleaning to VDI 6022

**Materials and surfaces**

- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)

- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

Mineral wool

- To EN 13501, fire rating class A1, non-combustible
- RAL quality mark RAL-GZ 388
- Biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG

- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

**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 (unit with dynamic differential pressure measurement): approx. 10 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 80 Pa
- Maximum differential pressure: 1000 Pa

**Attachments**

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

- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC
- Possible override controls with external switches using volt-free contacts: CLOSED, OPEN, $V_{min}$ and $V_{max}$
- Potentiometers with percentage scales to set the volume flow rates $V_{min}$ and $V_{max}$
- The actual value signal relates to the nominal volume flow rate such that commissioning and subsequent adjustment are simplified
- Volume flow rate control range: approx. 10 – 100 % of the nominal volume flow rate
- Clearly visible external indicator light for signalling the functions: Set, not set, and power failure

Electrical connections with screw terminals. Double terminals for looping the supply voltage, i.e. for the simple connection of voltage transmission to the next controller.

**Sizing data**

- V _____ [m³/h]
- $\Delta p_{st}$ _____ [Pa]

Air-regenerated noise

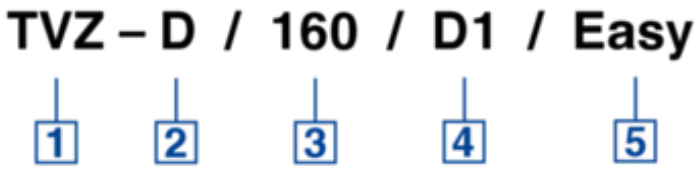
- $L_{PA}$ _____ [dB(A)]

Case-radiated noise

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

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

## ORDER CODE

**1 Type**

**TVZ** VAV terminal unit, supply air

**2 Acoustic cladding**

No entry: none

**D** With acoustic cladding

**3 Nominal size [mm]**

**125**

**160**

**200**

**250**

**315**

**400**

**4 Accessories**

No entry: none

**D1** Lip seal

**5 Attachments (control component)**

Example

**Easy** Easy controller

**BC0** Compact controller

**B13** Universal controller

**6 Operating mode**

**E** Single

**M** Master

**S** Slave

**F** Constant value

**Z** Differential pressure control – supply air

**7 Signal voltage range**

For the actual and setpoint value signals

**0** 0 – 10 V DC

**2** 2 – 10 V DC

**8 Volume flow rates [m³/h or l/s], differential pressure [Pa]**

$V_{min}$ – $V_{max}$ for factory setting

$\Delta p_{min}$ for factory setting (operating mode A)

**9 Damper blade position**

Only with spring return actuators

**NO** Power off to OPEN

**NC** Power off to CLOSE

## Variants, Attachments, Dimensions and weight, Product details

## VARIANTS

**TVZ**

- VAV terminal unit for the control of variable supply air volume flows

**TVZ-D**

- VAV terminal unit with acoustic cladding for the control of variable supply air volume flows
- 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 end
- Acoustic cladding cannot be retrofitted

## ATTACHMENTS

**TVZ, VARYCONTROL control components**

| Order code detail | Controlled variable | Controller | Differential pressure transducer | Actuator |
|---|---|---|---|---|
| **Easy controller** | | | | |
| **Easy** | Volume flow rate | Easy controller TROX | Dynamic, integral | Integral |
| **Compact controller, dynamic** | | | | |
| **BC0** | Volume flow rate | Compact controller with MP bus interface TROX/Belimo | Dynamic, integral | Integral |
| **BL0** | Volume flow rate | Compact controller with LonWorks interface TROX/Belimo | Dynamic, integral | Integral |
| **BM0** | Volume flow rate | Compact controller with Modbus RTU interface (with connecting cable) TROX/Belimo | Dynamic, integral | Integral |

| | | | | |
|---|---|---|---|---|
| **BM0-J6** | Volume flow rate | Compact controller with Modbus RTU interface (with socket) TROX/Belimo | Dynamic, integral | Integral |
| **XB0** | Volume flow rate | Compact controller TROX/Gruner | Dynamic, integral | Integral |
| **LN0** | Volume flow rate | Compact controller Siemens | Dynamic, integral | Integral |
| **LK0** | Volume flow rate | Compact controller with KNX interface Siemens | Dynamic, integral | Integral |
| **Compact controller, static** | | | | |
| **SA0** | Volume flow rate | Compact controller with SLC interface Sauter | Static, integral | Integral |
| **SC0** | Volume flow rate | Compact controller with SLC interface Sauter | Static, integral | Fast-running actuator, integral |
| **Universal controller, dynamic** | | | | |
| **B13** | Volume flow rate | Universal controller TROX/Belimo | Dynamic, integral | Actuator |
| **B1B** | Volume flow rate | Universal controller TROX/Belimo | Dynamic, integral | Spring return actuator |
| **XC3** | Volume flow rate | Universal controller TROX/Gruner | Dynamic, integral | Spring return actuator |
| **Universal controller, static** | | | | |
| **BP3** | Volume flow rate | Universal controller with MP bus interface TROX/Belimo | Static | Actuator |

| | | | | |
|---|---|---|---|---|
| **BPB** | Volume flow rate | Universal controller with MP bus interface TROX/Belimo | Static | Spring return actuator |
| **BPG** | Volume flow rate | Universal controller with MP bus interface TROX/Belimo | Static | Fast-running actuator |
| **BB3** | Volume flow rate | Universal controller TROX/Belimo | Static | Actuator |
| **BBB** | Volume flow rate | Universal controller TROX/Belimo | Static | Spring return actuator |
| **XD1** | Volume flow rate | Universal controller TROX/Gruner | Static, integral | Actuator |
| **XD3** | Volume flow rate | Universal controller TROX/Gruner | Static, integral | Spring return actuator |
| **BR3** | Differential pressure | Universal controller with MP bus interface TROX/Belimo | Static, integral 100 Pa | Actuator |
| **BRB** | Differential pressure | Universal controller with MP bus interface TROX/Belimo | Static, integral 100 Pa | Spring return actuator |
| **BRG** | Differential pressure | Universal controller with MP bus interface TROX/Belimo | Static, integral 100 Pa | Fast-running actuator |
| **BG3** | Differential pressure | Differential pressure controller TROX/Belimo | Static, integral 100 Pa | Actuator |
| **BGB** | Differential pressure | Differential pressure controller TROX/Belimo | Static, integral 100 Pa | Spring return actuator |
| **XE1** | Differential pressure | Differential pressure controller TROX/Gruner | Static, integral 100 Pa | Actuator |
| **XE3** | Differential pressure | Differential pressure controller TROX/Gruner | Static, integral 100 Pa | Spring return actuator |

**TVZ, LABCONTROL control components**

| Order code detail | Controlled variable | Controller | Differential pressure transducer | Actuator |
|---|---|---|---|---|
| **EASYLAB** | | | | |
| **ELAB** | Room supply air Room pressure Single controller | EASYLAB controller TCU3 | Static, integral | Fast-running actuator |

**Attachments: VARYCONTROL control components**

| ☒ | Controlled variable | Interface | $V_{min}$ -/ $V_{max}$ - adjustment | Differential pressure transducer | Actuator | Manufacturer | LVC | TVR | TVJ | TVT | TZ-S | TA-S | TVZ | TVA | TVM | TVRK | TVLK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |
| | **Easy controller** | | **Dynamic** | | | | | | | | | | | | | | |
| **Easy** | V | | | Integral | Integral | ① | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| | | **Compact controller** | | **Dynamic** | | | | | | | | | | | | | |
| **BC0** | V | MP bus | | Integral | Integral | ② | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| **BF0** | V | MP bus | | Integral | Integral | ② | | | | | | | | | ● | | |
| **BL0** | V | LonWorks | | Integral | Integral | ② | | ● | ● | ● | ● | ● | ● | ● | | | |
| **BM0** | V | Modbus | | Integral | Integral | ② | | | | | | | | | | | |
| **BM0-J6** | V | Modbus and plug-in connecting cable | | Integral | Integral | ② | | | | | | | | | | | |
| **XG0** | V | | | Integral | Integral | ③ | | | | | | | | | ● | | |
| **XB0** | V | | | Integral | Integral | ③ | | ● | ● | ● | ● | ● | ● | ● | | | |
| **LN0** | V | | | Integral | Integral | ⑤ | | ● | ● | ● | ● | ● | ● | ● | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LK0** | V | KNX | | | | ⑤ | | | | | | | | | | | |
| **LY0** | V | | | Integral | Integral | ⑤ | | | | | | | | ● | | | |
| | | **Compact controller** | | **Static** | | | | | | | | | | | | | |
| **SA0** | V | | | Integral | Integral | ④ | | | | | | | | | | | |
| **SC0** | Δp | | | Integral | Fast-running actuator, integral | ④ | | | | | | | | | | | |
| | | **Universal controller** | | **Dynamic** | | | | | | | | | | | | | |
| **B11** | V | | | Integral | Actuator, torque for TVT | ② | | | | ● | | | | | | | |
| **B13** | V | | | Integral | Actuator | ② | | ● | ● | | ● | ● | ● | ● | | | |
| **B27** | V | | | Integral | Actuator | ② | | | | | | | | ● | | | |
| **B1B** | V | | | Integral | Spring return actuator | ② | | ● | ● | ● | ● | ● | ● | ● | | | |
| **XC3** | V | | | Integral | Spring return actuator | ③ | | ● | ● | ● | ● | ● | ● | ● | | | |
| | | **Universal controller** | | **Static** | | | | | | | | | | | | | |
| **BP1** | V | MP bus | | Separate part | Actuator, torque for TVT | ② | | | | ● | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BP3** | V | MP bus | | Separate part | Actuator | ② | | ● | ● | | ● | ● | ● | ● | | ● | ● |
| **BPB** | V | MP bus | | Separate part | Spring return actuator | ② | | ● | ● | ● | ● | ● | ● | ● | | ● | |
| **BPG** | V | MP bus | | Separate part | Fast-running actuator | ② | | ● | ● | ● | ● | ● | ● | ● | | ● | ● |
| **BB1** | V | | | Separate part | Actuator, torque for TVT | ② | | | | ● | | | | | | | |
| **BB3** | V | | | Separate part | Actuator | ② | | ● | ● | | ● | ● | ● | ● | | ● | ● |
| **BBB** | V | | | Separate part | Spring return actuator | ② | | | ● | ● | ● | ● | ● | ● | | ● | |
| **XD1** | V | | | Integral | Actuator | ③ | | ● | ● | ● | ● | ● | ● | ● | | ● | |
| **XD3** | V | | | Integral | Spring return actuator | ③ | | ● | ● | ● | ● | ● | ● | ● | | ● | |
| **BR1** | Δp | MP bus | | 100 Pa | Actuator, torque for TVT | ② | | | | ● | | | | | | | |
| **BR3** | Δp | MP bus | | 100 Pa | Actuator | ② | | ● | ● | | ● | ● | ● | ● | | ● | |
| **BRB** | Δp | MP bus | | 100 Pa | Spring return actuator | ② | | ● | ● | ● | ● | ● | ● | ● | | ● | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BRG** | Δp | MP bus | | 100 Pa | Fast-running actuator | ② | | ● | | | ● | ● | ● | ● | | ● | |
| **BS1** | Δp | MP bus | | 600 Pa | Actuator, torque for TVT | ② | | | | ● | | | | | | | |
| **BS3** | Δp | MP bus | | 600 Pa | Actuator | ② | | ● | ● | | | | | ● | | ● | |
| **BSB** | Δp | MP bus | | 600 Pa | Spring return actuator | ② | | ● | ● | ● | | | | | | ● | |
| **BSG** | Δp | MP bus | | 600 Pa | Fast-running actuator | ② | | ● | ● | ● | | | | | | ● | |
| **BG1** | Δp | | | 100 Pa | Actuator, torque for TVT | ② | | | | ● | | | | | | | |
| **BG3** | Δp | | | 100 Pa | Actuator | ② | | ● | ● | | ● | ● | ● | ● | | ● | |
| **BGB** | Δp | | | 100 Pa | Spring return actuator | ② | | ● | ● | ● | ● | ● | ● | ● | | ● | |
| **BH1** | Δp | | | 600 Pa | Actuator, torque for TVT | ② | | | | ● | | | | | | | |
| **BH3** | Δp | | | 600 Pa | Actuator | ② | | ● | ● | | | | | | | ● | |
| **BHB** | Δp | | | 600 Pa | Spring return actuator | ② | | ● | ● | ● | | | | | | ● | |
| **XE1** | Δp | | | Integral, 100 Pa | Actuator | ③ | | ● | ● | ● | ● | ● | ● | ● | | ● | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **XE3** | Δp | | | Integral, 100 Pa | Spring return actuator | ③ | | ● | ● | ● | ● | ● | ● | ● | | ● | |
| **XF1** | Δp | | | Integral, 600 Pa | Actuator | ③ | | ● | ● | ● | | | | | | ● | |
| **XF3** | Δp | | | Integral, 600 Pa | Spring return actuator | ③ | | ● | ● | ● | | | | | | ● | |

① TROX, ② TROX/Belimo, ③ TROX/Gruner, ④ Sauter, ⑤ Siemens

☒ order code detail, V volume flow rate, Δp differential pressure

**Attachments: LABCONTROL control components**

| ☒ | Controlled variable | Interface | $V_{min}$ -/ $V_{max}$ - adjustment | Differential pressure transducer | Actuator | | TVR | TVJ | TVT | TZ-S | TA-S | TVZ | TVA | TVRK | TVLK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | **Easylab controller** | | **Static** | | | | | | | | | | | | |
| **Elab** | Room supply air<br>Room extract air<br>Room pressure<br>Single controller | TCU3 | | Integral | Fast-running actuator | | ● | ● | ● | | | | | | |
| | Room supply air<br>Room pressure<br>Single controller | TCU3 | | Integral | Fast-running actuator | | | | | ● | | ● | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Elab** | Room extract air<br>Room pressure<br>Single controller | TCU3 | | Integral | Fast-running actuator | | | | | | ● | | ● | | |
| | Room supply air<br>Room extract air<br>Room pressure<br>Fume cupboard<br>Single controller | TCU3 | | Integral | Fast-running actuator | | | | | | | | | ● | ● |
| | | **Electronic controller** | | **Static** | | | | | | | | | | | |
| **TMA** | Room supply air<br>Room extract air<br>Room pressure | TCU-LON-II with LonWorks interface | Integral | Fast-running actuator | | ● | ● | ● | | | | | | | |
| **TMB** | Fast-running actuator (brushless motor) | | ● | ● | ● | | | | | | | | | | |
| **TMA** | Room supply air<br>Room pressure | TCU-LON-II with LonWorks interface | Integral | Fast-running actuator | | | | | ● | | ● | | | | |
| **TMB** | Fast-running actuator (brushless motor) | | | | | ● | | ● | | | | | | | |
| **TMA** | Room extract air<br>Room pressure | TCU-LON-II with LonWorks interface | Integral | Fast-running actuator | | | | | | ● | | ● | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TMB** | Fast-running actuator (brushless motor) | | | | | | ● | | ● | | | | | |
| **TMA** | Room supply air<br>Room extract air<br>Room pressure<br>Fume cupboard | TCU-LON-II with LonWorks interface | Integral | Fast-running actuator | | | | | | | | | ● | ● |
| **TMB** | Fast-running actuator (brushless motor) | | | | | | | | | ● | ● | | | |

## DIMENSIONS AND WEIGHT

| Nominal size | ØD mm | L mm | $B_3$ mm | $H_3$ mm | B mm | $B_1$ mm | H mm | $H_1$ mm | A mm | W mm | m kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **125** | 124 | 1185 | 300 | 236 | 198 | 232 | 152 | 186 | 150 | 115 | 21 |
| **160** | 159 | 1235 | 410 | 236 | 308 | 342 | 152 | 186 | 200 | 115 | 25 |
| **200** | 199 | 1520 | 560 | 281 | 458 | 492 | 210 | 244 | 200 | 115 | 33 |
| **250** | 249 | 1690 | 700 | 311 | 598 | 632 | 201 | 235 | 250 | 215 | 55 |
| **315** | 314 | 1690 | 900 | 361 | 798 | 832 | 252 | 286 | 250 | 215 | 73 |
| **400** | 399 | 2070 | 1000 | 446 | 898 | 932 | 354 | 388 | 250 | 215 | 118 |

| Nominal size | ØD mm | L mm | $B_3$ mm | $H_3$ mm | B mm | $B_1$ mm | H mm | $H_1$ mm | A mm | W mm | m kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **125** | 124 | 1185 | 380 | 316 | 198 | 232 | 152 | 186 | 110 | 155 | 41 |
| **160** | 159 | 1235 | 490 | 316 | 308 | 342 | 152 | 186 | 160 | 155 | 50 |
| **200** | 199 | 1520 | 640 | 361 | 458 | 492 | 210 | 244 | 160 | 155 | 63 |
| **250** | 249 | 1690 | 780 | 391 | 598 | 632 | 201 | 235 | 210 | 255 | 95 |
| **315** | 314 | 1690 | 980 | 441 | 798 | 832 | 252 | 286 | 210 | 255 | 133 |
| **400** | 399 | 2070 | 1080 | 526 | 898 | 932 | 354 | 388 | 210 | 255 | 193 |

# Installation details, Basic information and nomenclature

## INSTALLATION DETAILS

**Installation and commissioning**

- Any installation orientation (except units with static differential pressure transducer)

- Return edges of the casing with drilled holes suitable for M10 threaded rods
- TVZ-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 ΔV 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.

**Space required**

| Attachments | ① | ② | ③ |
|---|---|---|---|
| | mm | | |
| **VARYCONTROL** | | | |
| **Easy controller** | 400 | 300 | 300 |
| **Compact controller** | 400 | 300 | 300 |
| **Universal controller** | 700 | 300 | 300 |
| **LABCONTROL** | | | |
| **EASYLAB** | 900 | 350 | 400 |

**Space required for inspection access**

| Part | ① | ② | ③ |
|---|---|---|---|
| | mm | | |
| **Inspection access** | 400 | 300 | 300 |

## BASIC INFORMATION AND NOMENCLATURE

**Principal dimensions**

**ØD [mm]**

VAV terminal units made of stainless steel: Outside diameter of the spigot

VAV terminal units made of plastic: Inside diameter of the connecting spigot

**$ØD_1$ [mm]**

Pitch circle diameter of flanges

**$ØD_2$ [mm]**

Outside diameter of flanges

**$ØD_4$ [mm]**

Inside diameter of the screw holes of flanges

**L [mm]**

Length of unit including connecting spigot

**$L_1$ [mm]**

Length of casing or acoustic cladding

**B [mm]**

Duct width

**$B_1$ [mm]**

Screw hole pitch of flange (horizontal)

**$B_2$ [mm]**

Outside dimension of flange (width)

**$B_3$ [mm]**

Width of device

**H [mm]**

Duct height

**$H_1$ [mm]**

Screw hole pitch of flange (vertical)

**$H_2$ [mm]**

Outside dimension of flange (height)

**$H_3$ [mm]**

Unit height

**n [ ]**

Number of flange screw holes

**T [mm]**

Flange thickness

**m [kg]**

Unit weight including the minimum required attachments (e.g. Compact controller)

**Acoustic data**

**$f_m$ [Hz]**

Octave band centre frequency

**$L_{PA}$ [dB(A)]**

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

**$L_{PA1}$ [dB(A)]**

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

**$L_{PA2}$ [dB(A)]**

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

**$L_{PA3}$ [dB(A)]**

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

All sound pressure levels are based on 20 µPa.

**Volume flow rates**

**$V_{nom}$ [m³/h] and [l/s]**

Nominal volume flow rate (100 %)

- The value depends on product type and nominal size
- Values are published on the internet and in technical leaflets, and stored in the Easy Product Finder design software.
- Reference value for calculating percentages (e.g. $V_{max}$)
- Upper limit of the setting range and maximum volume flow rate setpoint value for the VAV terminal unit

**$V_{min\ unit}$ [m³/h] and [l/s]**

Technically possible minimum volume flow rate

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

**$V_{max}$ [m³/h] and [l/s]**

Upper limit of the operating range for the VAV terminal unit that can be set by customers

- $V_{max}$ can only be smaller than or equal to $V_{nom}$
- In case of analogue signalling to volume flow controllers (which are typically used), the set maximum value ($V_{max}$) is allocated to the setpoint signal maximum (10 V) (see characteristic)

**$V_{min}$ [m³/h] and [l/s]**

Lower limit of the operating range for the VAV terminal unit that can be set by customers

- $V_{min}$ should be smaller than or equal to $V_{max}$
- Do not set $V_{min}$ smaller than $V_{min\ unit}$, otherwise the control may become unstable or the damper blade may close
- $V_{min}$ may equal zero
- In case of analogue signalling to volume flow controllers (which are typically used), the set minimum value ($V_{min}$) is allocated to the setpoint signal minimum (0 or 2 V) (see characteristic)

**V [m³/h] and [l/s]**

Volume flow rate

**ΔV [± %]**

Volume flow rate tolerance from setpoint value

**$\Delta V_{warm}$ [± %]**

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

**Differential pressure**

**$\Delta p_{st}$ [Pa]**

Static differential pressure

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

Static differential pressure, minimum

- The static minimum differential pressure is equal to the pressure loss of the VAV terminal unit when the damper blade is open, caused by flow resistance (sensor tubes, damper mechanism)
- If the pressure on the VAV terminal unit is too low, the setpoint volume flow rate may not be achieved, not even when the damper blade is open
- Important factor in designing the ductwork and in rating the fan including speed control
- Sufficient duct pressure must be ensured for all operating conditions and for all terminal units, and the measurement point or points for speed control must have been selected accordingly to achieve this

**Construction**

**Galvanised sheet steel**

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

**Powder-coated surface (P1)**

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

**Stainless steel (A2)**

- Casing made of stainless steel 1.4201
- Parts in contact with the airflow are powder-coated or made of stainless steel
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel


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