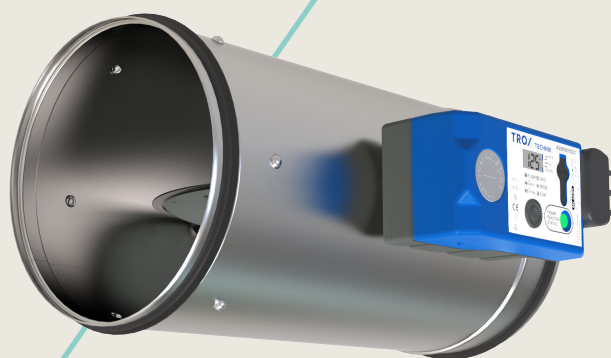


VAV terminal unit

TVE

VARYCONTROL



**TROX DOCU
PORTAL**

Read this manual
before starting
any work!



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1 General information

1.1 About this manual

This installation and operating manual enables the safe and efficient handling of the variable volume flow controller (hereinafter also referred to as the VAV control unit or device).

This manual must be kept near the unit to be available for use at all times.

The personnel performing work on the device must read and understand this manual carefully before starting any work. The basic prerequisite for safe working is to comply with all safety notes and instructions in this manual.

In addition, the local health and safety regulations and general safety regulations apply to the area of application of the device.

Illustrations in this manual are mainly for information and may differ from the actual design.

Applicable documents

In addition to this manual, the following documents shall be observed:

- Product data sheets
- Instructions for the electrical control components (attachments)
- Project-specific wiring documents, if applicable

1.2 Explanation of symbols

Safety notes

Symbols are used in this manual to alert readers to areas of potential hazard. Signal words express the degree of the hazard.

Comply with all safety instructions and proceed carefully to avoid accidents, injuries and damage to property.



DANGER

Imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

Potentially hazardous situation which, if not avoided, may result in death or serious injury.



CAUTION

Potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



NOTICE

Potentially hazardous situation which, if not avoided, may result in property damage.



ENVIRONMENT

Environmental pollution hazard.

Tips and recommendations



Useful tips and recommendations as well as information for efficient and fault-free operation.

Safety notes in the operating instructions

Safety notes can refer to specific, individual instructions. Such safety instructions are embedded in the instructions so that they do not interrupt the flow of reading when carrying out the task. The above listed signal words will be used.

Example:

1. ► Loosen the screw.

2. ►



CAUTION

Risk of jamming on the lid!

Close the lid carefully.

3. ► Tighten the screw.

Further symbols/markings

The following markings are used to highlight instructions, results, lists, references and other elements in this manual:

Marking	Explanation
 1., 2., 3. ...	Step-by-step instructions
	Results of actions
	References to sections in this manual and to other applicable documents
	Lists without a defined sequence
[Push button]	Control elements (e.g. push buttons, switches) or display elements (e.g. LEDs)
'Display'	Screen elements (e.g. buttons, assignment of function keys)

1.3 TROX contact information

To ensure that your request is processed as quickly as possible, please have the following information available:

- Product name
- TROX order number and line number
- Delivery date
- Issue or fault report ➔ [Chapter 9.1 'Troubleshooting' on page 29](#)

Please refer to your local TROX website for the latest contact information.

1.4 Legal information

Claims for material defects

Claims for material defects are subject to the seller's terms of delivery.

Copyright

This documentation – including all illustrations – is protected by copyright and pertains only to the corresponding product.

Any use without our consent may be an infringement of copyright, and the violator shall be liable for damages.

This applies in particular to:

- Publishing content
- Copying content
- Translating content
- Microfilming
- Saving and processing in electronic systems

2 Safety

2.1 Intended use

The VAV terminal unit from the TVE Type is used for variable volume flow control, restriction or shut-off in ventilation systems within closed rooms.

If the air is contaminated with dust, fluff, moisture or sticky particles, only VAV terminal units that use a control component with a static differential pressure transducer may be used.

The VAV terminal unit type TVE must not be used in ventilation systems with chemical contamination (e.g. extract air from fume cupboards or point extraction systems).

The VAV terminal unit must not be used in kitchen exhaust air systems.

Improper use



WARNING

Danger due to unauthorised use!

Incorrect use of the VAV terminal unit can lead to dangerous situations.

Do not use the VAV terminal unit:

- in areas with potentially explosive atmospheres (EX)
- in aircraft
- outdoors without sufficient protection against the effects of weather
- in wet areas
- for areas of application that are not described in the product brochure

Modifying the device or using spare parts that have not been approved by TROX is not permitted.

2.2 Safety signs

The following symbols and signs are located in the work area. They refer to the immediate surroundings in which they are attached.



WARNING

Danger due to illegible labelling!

Over time, stickers and signs may fade or become otherwise illegible, meaning that hazards cannot be identified, and necessary operating instructions cannot be followed. Therefore, there is a risk of injury.

- Keep all safety signs, warning and operating instructions in a legible condition at all times.
- Replace illegible hazard and safety signs or labels immediately.

Electrical voltage



Only qualified electricians may work in the areas labelled in this way.

Unauthorised persons may not enter or open the marked areas, nor work on the marked components.

2.3 Dangers when handling the unit

The device is designed in accordance with the latest state-of-the-art technology and current safety requirements. Residual risks cannot be excluded, however, and you should proceed with caution. The residual risks identified in a risk assessment are listed below.

To reduce health hazards and avoid dangerous situations, observe the safety instructions listed here and the safety instructions in the other chapters of this manual.

2.3.1 Electric shock hazards

Electric current



DANGER

Danger to life due to electric current!

Contact with live parts poses an immediate danger to life due to electric shock. Damage to the insulation or individual components can be life-threatening.

- Work on the electrical system may only be carried out by qualified electricians.
- If the insulation is damaged, disconnect the power supply immediately and have the insulation repaired.
- Before starting any working on electric systems and equipment, switch off the supply voltage and secure it against being switched on accidentally. Comply with the following safety rules:
 - Switch off the supply voltage.
 - Secure it against being switched on accidentally.
 - Ensure that no voltage is present.
 - Connect to earth; and short-circuit.
 - Cover neighbouring live parts.
- Never bypass or disable any fuses. Be sure to maintain the correct current rating when replacing a fuse.
- Ensure that live parts do not come into contact with moisture. Moisture can cause a short circuit.

2.4 System owner's responsibility

System owner

The system owner is a natural or legal person who for commercial or business purposes owns or manages the ventilation system or component or allows third parties to use or operate it, but continues to bear legal responsibility for the safety of users, staff or third parties while the product is in use.

System owner's obligations

The unit is intended for use in commercial environments. The system owner is therefore subject to the legal obligations of occupational safety.

In addition to the safety notes in this manual, the applicable regulations for safety, accident prevention and environmental protection must also be complied with.

This applies in particular:

- The system owner must be aware of the applicable occupational health and safety regulations and carry out a risk assessment to determine any additional hazards that may exist or result from the specific working conditions at the installation location. The system owner has to create operating instructions for the unit that reflect the results of this risk assessment.
- The system owner has to ensure, throughout the entire operating period of the unit, that these operating instructions conform to applicable standards and guidelines. In case of any deviation, the system owner has to adapt the instructions.
- The system owner must secure the unit to prevent access by unauthorised individuals.
- The system owner must clearly define the responsibilities for operation, maintenance, cleaning, and troubleshooting.
- The system owner has to ensure that all individuals who handle the unit have read and understood this manual.
- The system owner must provide the necessary protective equipment to the personnel.
- The system owner must ensure that maintenance is carried out in the intervals specified in this manual.
- The system owner must have all safeguards checked regularly for functionality and completeness.
- The system owner must comply with the local fire regulations.

Hygiene requirements

The system owner has to comply with the local regulations and harmonised standards for hygiene requirements. These include, among other things, compliance with the corresponding maintenance and test intervals.

2.5 Personnel qualifications



WARNING

Danger of injury if insufficiently qualified!

Improper handling may cause considerable personal injury and property damage.

- All activities must only be carried out by qualified personnel.

This manual lists the following qualifications for various areas of activity.

HVAC technician

HVAC technicians are individuals who have sufficient professional or technical training in the field they are working in to enable them to carry out their assigned duties at the level of responsibility allocated to them and in compliance with the relevant guidelines, safety regulations and instructions. HVAC technicians are individuals who have in-depth knowledge and skills related to HVAC systems; they are also responsible for the professional completion of the work under consideration.

HVAC technicians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on HVAC systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Qualified electrician

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on electrical systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

2.6 Personal protective equipment

Personal protective equipment is equipment that protects the user against health or safety risks at work.

Personal protective equipment must be worn for various types of work; the protective equipment required is listed in this manual together with the description of each type of work.

Description of personal protective equipment



Industrial safety helmet

Industrial safety helmets protect the head from falling objects, suspended loads, and the effects of striking the head against stationary objects.



Protective gloves

Protective gloves protect hands from friction, abrasions, punctures, deep cuts, and direct contact with hot surfaces.



Safety shoes

Safety shoes protect the feet against crushing, falling parts, and from slipping on slippery ground.

2.7 Repair and spare parts

Only qualified personnel may repair the equipment, using only original spare parts. This particularly applies to work on the electrical equipment. Defective equipment may therefore only be repaired by TROX for safety reasons, ➔ [Chapter 1.3 'TROX contact information' on page 4.](#)

2.8 General safety measures (only for devices with electronic components)

Large temperature differences

Be careful with large temperature differences. Do not start the device immediately after bringing it from an unheated room into a warm room. Condensation may damage the electronic components beyond repair. The room temperature is only reached after about 2 hours.

Foreign matter and liquids

Be careful when objects or liquids have got into the casing, or if the device emits a smell or smoke. Remove the device from service and have it checked by the manufacturer.

Electrostatic discharges when handling electronic components

When working on electronic components, electrostatic discharges may damage electrical circuits.

- Avoid touching components and conductor tracks on the motherboard or any expansion boards that may be present.
- Work with personal protective equipment for ESD protection (ElectroStaticDischarge). For example, the following items can be used to prevent discharges:
 - Antistatic wrist strap
 - ESD protection work shoes
 - Conductive clothing
 - Grounding mat

3 Transport, storage and packaging

Safety notes on handling the device



CAUTION

Risk of injury from sharp edges and sheet metal parts!

- Always wear protective gloves during transport and installation.



NOTICE

Risk of damage to the device!

- Handle the device with care.
- Do not lift the device by its control components or the damper blade.
- Only lift the device by the casing.

3.1 Delivery check

Check delivered items immediately for transport damage and completeness. In case of transport damage or incomplete delivery, inform the forwarding agent and your supplier immediately.

3.2 Transport on site

- If possible, take the product in its transport packaging up to the installation location.
- Use only lifting and transport gear designed for the required load.
- Do not remove the protective wrapping until just before installation.

3.3 Storage

If the product has to be stored temporarily, observe the following points:

- Moisture and a lack of ventilation can lead to oxidation, even on galvan-ised components.
Remove any plastic wrapping in order to avoid oxidation.
- Protect the device from dust and contamination.
- Protect the device (even when packed) from moisture and direct sunlight.
- Do not store the device below 14 °F or above +122 °F.
- The relative humidity must not exceed 95% (**no condensation**).
- After storage and prior to installation, allow the unit to acclimatise to the installation temperatures for at least 2 hours.

3.4 Packaging

After unpacking, properly dispose of packaging material.

4 Product description

4.1 Product overview

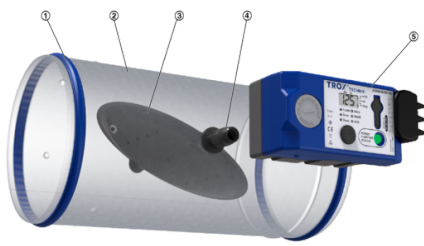


Fig. 1: TVE product overview

- 1 Double lip seal (optional)
- 2 Casing
- 3 Damper blade including differential pressure sensor
- 4 Shaft with effective pressure channel
- 5 Electronic control component

4.2 Functional description

The damper blade of the TVE works as a control element and as a differential pressure sensor. Through the differential pressure duct in the shaft, the detected differential pressure reaches the transducer (static or dynamic), and is converted into an electrical signal and compared with the setpoint value. In case of a control deviation, the integrated actuator changes the position of the damper blade. Thereby, the volume flow rate is kept constant in close tolerances over the entire differential pressure range.

4.3 Position of the damper blade

The position of the damper blade corresponds to the mark on the unlocking button and is therefore recognisable from the outside.

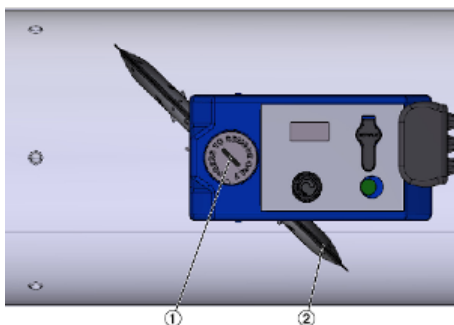


Fig. 2: Position indicator of the damper blade

- 1 Unlocking button with marking for position indication
- 2 Damper blade

4.4 Labelling on unit

4.4.1 Rating plate

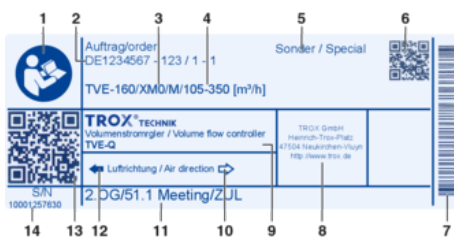


Fig. 3: Rating plate (example)

- 1 Note on observing the operating instructions
- 2 Order data commission number – position number; if necessary, serial number if there are several pieces in the position
- 3 Order code
- 4 Order code detail of the control component
- 5 Information on devices that deviate from the standard
- 6 QR code containing the customer text (11) below in machine-readable form
- 7 Barcode with the serial number (for manufacturing processes at TROX)
- 8 Manufacturer's address
- 9 Product and type

- 10 Airflow direction arrow (alternative airflow direction) ➔ [Chapter 5.2 'General installation details' on page 15](#)
- 11 Customer text for installation/use (tagging text from the order)
- 12 Airflow direction arrow (preferred airflow direction)
- 13 QR code with link in myTrox to individual product documentation matching the serial number
- 14 Serial number of the complete product, including the installed attachment

4.4.2 Scale sticker (Easy control component only)

The 'Easy' control component also has a scale sticker on the regulating device. Using the scale sticker, the desired volume flow rate control range can be set as a percentage value on the potentiometer of the control component.

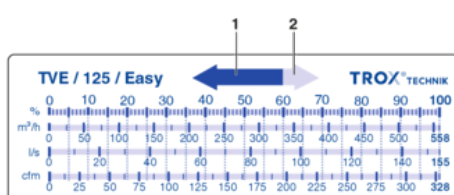


Fig. 4: Scale sticker TVE Easy

- 1 Airflow direction arrow (preferred airflow direction)
- 2 Air direction arrow (alternative airflow direction)

4.4.3 Adjustment sticker

The adjustment sticker documents the factory-set settings of the individual air terminal unit and the attachments.

Type and variant information only includes the order code details required for this process.

Fig. 5: Example of an adjustment sticker

Line	Explanation	Entered values (example)
COM	Order number. Position number	"000000000.0001"
TYPE	Type name of air terminal unit	"TVE"
	Nominal size	"4"
	Control component	
	Operating mode abbreviation	■ "M" ⇒ Modbus
OP	Operating mode	■ Modbus
		"58.86 – 176.57 cfm"
LIM	Nominal volume flow q_{vNom}	"208.36 cfm"
	Engine torque	"10 Nm"
	K factor	"1.00"
HW	Hardware type designation	
	Delivery condition	■ "OF" ⇒ factory-fitted ■ "SP" ⇒ spare part
SN	Serial number	"#240126193091"
ID	Test ID	"DE.4.01.2025106.0005"

4.4.4 CE marking / declaration of incorporation

The TVE unit complies with the Machinery Directive 2006/42/EC as partly completed machinery, as it does not fulfil an independent function on its own. A CE mark and a Declaration of Conformity are therefore not permitted in accordance with the Machinery Directive.

In accordance with the Machinery Directive, partly completed machinery obtains a Declaration of Incorporation. This Declaration of Incorporation confirms that the basic safety aspects of the Machinery Directive and any other directives are observed.

The Declaration of Incorporation can be accessed via the QR code on the rating plate. You can download the document on the Internet at [➡ www.troxtechnik.com](http://www.troxtechnik.com).

5 Installation

5.1 Safety

Personnel:

- HVAC technician

Protective equipment:

- Protective gloves
- Safety shoes
- Industrial safety helmet

Only specialist personnel are allowed to perform the described work on the VAV terminal unit.

Only trained and qualified electricians are allowed to work on the electrical system.



CAUTION

Risk of injury from sharp edges and sheet metal parts!

- Always wear protective gloves during transport and installation.



NOTICE

Risk of damage to the device!

- Handle the device with care.
- Do not lift the device by its control components or the damper blade.
- Only lift the device by the casing.

5.2 General installation details

- **ATTENTION:** Pay attention to the air direction arrow on the rating plate on the unit! → [Chapter 4.4 'Labelling on unit' on page 12](#)
- Observe EN 1506 for fittings and bridges, in particular:
 - No sharp-edged bridges
 - At reductions and expansions: slants max. 7.5° per leg
- Select the installation location such that the VAV terminal unit, inspection accesses and the control components remain accessible for the following work:
 - Wiring
 - Adjustment work (service socket if necessary)
 - Servicing and maintenance, e.g. to replace control components, if necessary in several parts (controllers, transducers, actuators).

For information on space requirements, see product data sheets.

- Do not swap supply and extract air units.
- Ensure that associated control units are not confused within control and sequencing arrangements (e.g. supply air and extract air).
- Installation in kitchen exhaust systems is not permitted.

5.2.1 Installation of silencers, fire dampers and heat exchangers

If additional components are arranged upstream of an air terminal unit in the airflow direction, the distances specified in the table must be observed. Shorter distances lead to measurement inaccuracies on the air terminal unit. The components can be arranged directly behind the air terminal unit.

Tab. 1: Distances to other components

Component	Distance in airflow direction in front of TVE
Circular silencer without core, e.g. TROX Types CA, CAH, CF	No distance
Circular silencer with core, e.g. TROX Type CK	7 x splitter width ¹⁾
Fire damper	At least 3D
Heat exchanger	Behind air terminal unit only
¹⁾ Depending on the size of the silencer: splitter width 1.97, 3.94 or 5.91 in.	

5.2.2 Installation orientation

The installation orientation is freely selectable, but the upstream conditions for the unit must be met, ➔ [Chapter 5.2.4 'Upstream conditions' on page 16](#).

A zero-point adjustment must be carried out for commissioning ➔ [Chapter 7 'Commissioning and operation' on page 23](#).

5.2.3 Airflow direction

On the VAV terminal unit TVE there is an arrow indicating the correct airflow direction ➔ [Chapter 4.4.1 'Rating plate' on page 12](#)

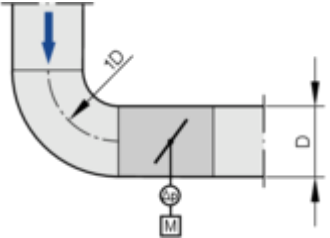
The intended airflow direction depends on the control component:

- Static - Install the air terminal unit (with control component XS0, XS0-J6) in the direction of the arrow.
- Dynamic - The air terminal unit can be installed independent of the airflow direction (airflow in both directions).

5.2.4 Upstream conditions

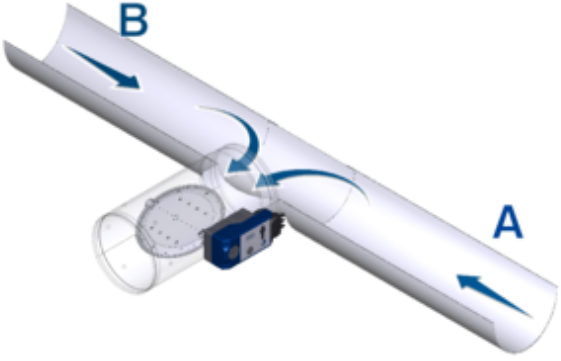
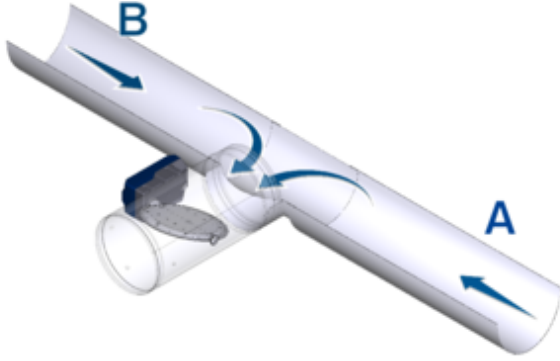
The differential pressure, which is decisive for the volume flow, is recorded and averaged on the damper blade. The volume flow accuracy Δq_v is therefore independent of the upstream duct section, but in the case of junctions from the main line, dependent on the installation variant of the air terminal unit in the branch duct. The conditions shown below must be adhered to.

Bend

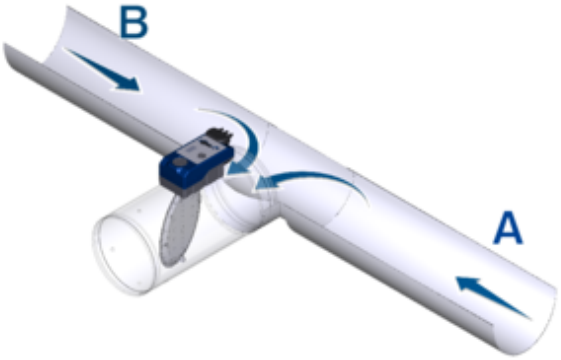
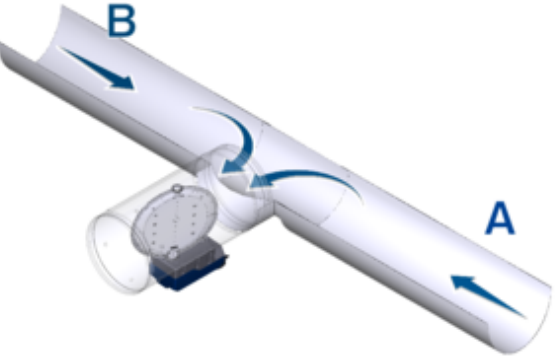
Vertical/horizontal main line	
 <i>Fig. 6: Connection to the main duct</i>	In front of the unit, a bend with a curvature radius of $\geq 1D$ has only a negligible effect on the volume flow accuracy Δq_v.

Junction from a main duct

A junction from a main duct causes strong turbulence. The specified volume flow accuracy Δq_v can be achieved for installation variants 1, 2, 3, 4 without an upstream section. In installation variants 3 and 4, the airflow direction can have an influence on Δq_v .

Installation variant 1, horizontal damper blade position	Installation variant 2, horizontal damper blade position
 <i>Fig. 7: TVE control component to the side</i>	 <i>Fig. 8: TVE control component to the side</i>

Airflow direction A or B have no significant influence on Δq_v .

Installation variant 3, vertical damper blade position	Installation variant 4, vertical damper blade position
 <i>Fig. 9: TVE control component on top</i>	 <i>Fig. 10: TVE control component on bottom</i>

Airflow direction A in the main duct: The specified volume flow accuracy Δq_v is achieved.

Airflow direction B in the main duct: For the specified volume flow accuracy Δq_v , a 10% allowance must be taken into account in the upper third of the nominal air flow rate range.

Airflow direction A in the main duct: For the specified volume flow accuracy Δq_v , a 10% allowance must be taken into account in the upper third of the nominal air flow rate range.

Airflow direction B in the main duct: The specified volume flow accuracy Δq_v is achieved.

5.2.4.1 Inflow via an open duct (extract air mode)

When the airflow enters the open end of a duct, the following conditions must be observed with regard to the positioning of the air terminal units in order to obtain a laminar airflow and thus sufficient measuring accuracy.

Inflow via an open duct

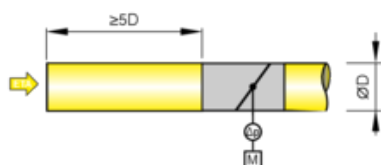


Fig. 11: Upstream flow conditions at open duct end

The inflow at the open end of a duct causes strong turbulence.

The specified volume flow rate accuracy is achieved with a minimum straight upstream duct section of 5D.

Inflow via flow straightener

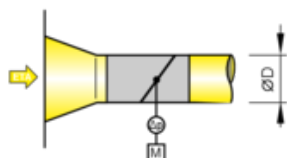


Fig. 12: Upstream flow conditions with flow straightener

Alternatively, a flow straightener can be installed at the open end of the duct before the control unit:

The specified volume flow accuracy is achieved when a flow straightener is connected directly to the control unit.

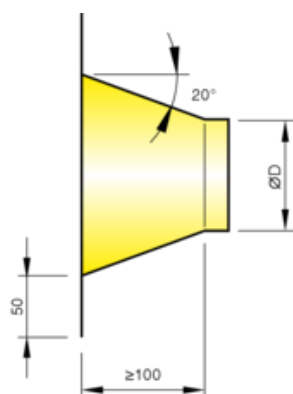


Fig. 13: Dimensions of flow straightener [mm]

5.3 Fixing/suspension

General installation information

- When designing and constructing ventilation and air conditioning systems, take into account the requirements of VDI 6022, in particular:
 - Hygienic, clean installation of all components and their air distribution surfaces.
 - Planning inspection/cleaning openings in the ducting system.
 - Avoidance of leaks.
- Affix the unit proficiently and only to load-bearing components.
- Load suspension systems only with the dead weight of the unit. Adjacent components and connecting air ducts must be supported separately.
- Only use approved and sufficiently dimensioned suspensions for fixing. Ensure screw connections cannot loosen on their own, e.g., by locking them. Fixing material is not included in the scope of delivery.
- Only use the shortest possible drilling screws for fixing into place; these screws must not be screwed into the movement and sealing area of the damper blade.

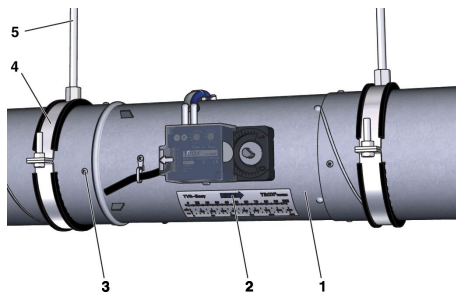


Fig. 14: Installation example using a VAV terminal unit TVR-*

- 1 VAV terminal unit, circular, e.g. TVR
- 2 Air direction arrow e.g., on the scale label
- 3 Drilling screw for fixing to the ducting
- 4 Pipe clamp
- 5 Suspension, e.g., with threaded rod

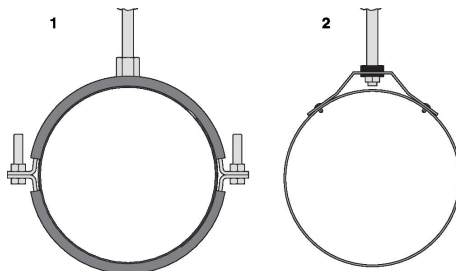


Fig. 15: Examples of fixings for circular units

- 1 Fixing to pipe clamps
- 2 Fixing to suspension element

5.4 Installation of circular silencers

Circular silencers are supplied separately and are to be installed at the installation location between the VAV terminal unit and the room. Suspend the silencers separately, ➞ Installation instructions for circular silencers.

5.5 Connecting the air duct

When connecting the ducting, the customer must ensure that the connection points are installed as air-tight as possible in order to avoid negative influences from leakages such as air volume deviations, power consumption, etc. Unless otherwise stated, the connecting material is not included in the supply package.

In the case of one-sided connection of the ductwork, interference with the damper blade is to be prevented by suitable measures (e.g. a grille).

Before connecting the ducting:

- Check the inside of the unit for damage and loose parts.
 - Remove any contamination from the ducting.
 - Plug-in mounting on ducting in accordance with EN 1506 or EN 13180.
 - Fixing and sealing with ventilation tape, e.g., KLP180.
- When using heat-shrinkable tape, carefully heat up the plastic parts near the spigot.

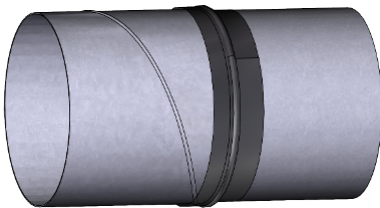


Fig. 16: Spigot without lip seal

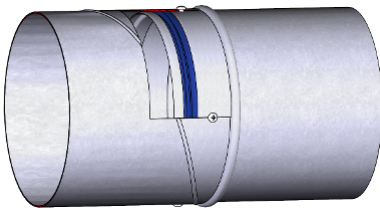


Fig. 17: Spigot with optional lip seal

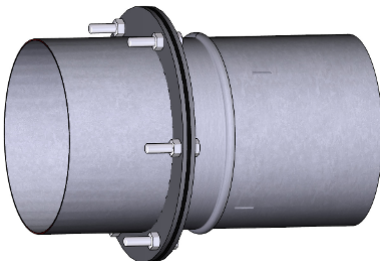


Fig. 18: Spigot with optional flanges

- Plug-in mounting on ducting in accordance with EN 1506 or EN 13180.
- Connect the spigot with the ducting, e.g., using drilling screws.
- No further sealing required.
- Matching flanges available as accessories
- Seal and screw connection M8 (to be provided by others)
- Dimensions and number of holes in accordance with EN 12220.
- Position the ducting exactly. Do not pull the distances together via the flange connection.

5.6 Air terminal unit with acoustic cladding

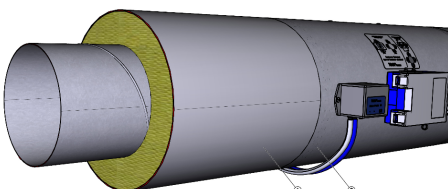


Fig. 19: Air terminal unit with insulation, e.g. TVR-D

For VAV terminal units with acoustic cladding (Fig. 19/1), run the insulation of the room side air duct up to the acoustic cladding (Fig. 19/2) of the air terminal unit.



Retrofitting acoustic cladding

It is not possible to retrofit an acoustic cladding to the VAV terminal unit.

6 Electrical connection

6.1 Safety notes



DANGER

Danger of electric shock! Do not touch any live components. Electrical equipment carries a dangerous electrical voltage.

- Only skilled qualified electricians are allowed to work on the electrical system.
- Before working on the electrical system, switch off the supply voltage and secure it against being switched on again.

6.2 Installation instructions

The VAV terminal unit was manufactured and configured on a project-specific basis. The control components are prewired at the factory. For devices with electrical control components, the supply voltage and, if applicable, signal or bus lines must be connected.

The connection is made according to the information on the control components or connection diagrams in the product data sheet or commissioning instructions of the respective control component, ➔ www.trox.de. The voltage ranges specified on the control components and the terminal assignments must be observed!

Personnel:

- Qualified electrician

Observe the following during installation:

- Legal and official regulations, in particular VDE guidelines.
- Observe the Technical Connection Conditions of the local grid operator.
- All wiring work for supply voltage and signal cables is to be carried out by the customer.
- Supply voltage and signal cables must be routed separately. It is recommended to use shielded signal cables and to connect the shield at one end.
- For maintenance work, it must be possible to disconnect all poles of the appliance from the power supply (e.g. fuse, circuit breaker) contact spacing of at least 3 mm must be provided in the vicinity of the unit.
- Sizing and establishing customer-side connections and wiring must be carried out in accordance with the recognised rules of electrical engineering.
- The responsibility for planning, sizing, design of the electrical and network installations as well as their on-site execution lies with the planner, plant engineer and commissioning engineer commissioned by the operator of the plant. This includes in particular the rating of the power supplies as well as cable types and cross-sections.
- For network installations, the specifications of the respective network variant must be observed. For information, see here:
 - BACnet MS/TP or BACnet/IP ➔ ➔ BACnet.org
 - Modbus RTU or Modbus TCP ➔ ➔ Modbus.org
- Follow wiring guidelines and project-specific connection diagrams.
- The electrical connection must only be made after the unit has been fully installed.

- For units with 24 V supply voltage, note the following:
 - Electrical connection only via safety transformer.
 - Ensure that all connected devices use the same ground reference point for their power supply.
- Suitable strain relief must be provided for all connecting cables.
- When laying the cables, ensure that the measuring hoses between the differential pressure sensor and the differential pressure transmitter are not kinked or disconnected.
- Electronic components contain no user-replaceable or repairable parts and may only be opened by the manufacturer!

7 Commissioning and operation

7.1 Factory-set preparation

TROX VAV terminal units are prepared, calibrated and tested at the factory. The commissioned operating parameters are set and the device is checked in terms of airflow performance.

The following exceptions apply:

- For VAV terminal units with Easy control component, operating parameters q_{vmin} and q_{vmax} must be set on the potentiometer by the customer (screwdriver required).

The factory-set adjustment is documented on the silver adjustment label, ➔ [Chapter 4.4.3 'Adjustment sticker' on page 13](#).

7.2 Requirement for commissioning

Contamination, e. g. construction dust, can impair the functionality of the VAV terminal unit and cause irreparable damage to units that use a control component with a dynamic differential pressure transducer.

Therefore, the ventilation and air conditioning system and its components may not be put into operation for the first time until the rooms connected to the ventilation system have been cleaned of any contamination resulting from construction work. Contamination of the ventilation system by construction dust and sucked-in dirt particles must be eliminated. In the case of systems that are heavily contaminated due to construction activities, the system may need to be cleaned before commissioning.

7.3 Commissioning



Recognized standards of technology for commissioning

Commissioning is governed by the standard "DIN EN 12599 Test procedures and measurement methods to hand over air conditioning and ventilation systems", and, if applicable, contractually agreed services between HVAC contractors, system owners and installation engineers. The standard describes the essential commissioning steps of the completeness check, function check, function measurement as well as report documents and handover.

7.3.1 Installation and connection

Once the electrical connections have been correctly installed and made, the VAV terminal unit is ready for operation.

7.3.2 Parameterisation and setting by the customer

Subsequent adjustment of settings

Subsequent adjustments to the volume flow operating range may require manufacturer-specific adjustment devices or PC software, depending on the control component.

Network integration

Bus compatible control components may require integration into the building's network infrastructure to be provided by the customer (network commissioning, e.g. setting the participant address and communication

parameters). Manufacturer-specific tools such as adjustment devices or software packages and associated interface adapters may be required for this.

7.3.3 Functional test

Prerequisites for the functional test

- VAV terminal unit has been correctly installed in the air duct:
 - Airflow direction, according to airflow direction arrows ➔ [Chapter 4.4.1 'Rating plate' on page 12](#)
 - Upstream conditions correct, ➔ [Chapter 5.2 'General installation details' on page 15](#)
 - Electrical connections have been correctly installed and tested.
 - Ventilation and air conditioning system is in operation (fans running).
 - Air circulation is guaranteed (shut-off dampers and fire dampers are open).
 - Supply voltage or the compressed air supply is switched on.
1. ▶ Compare volume flow actual value signal with setpoint value signal. The setpoint signal can be variable or constant, depending on the intended application.
 2. ▶ Check damper blade positions:
 - Damper blade in control position
 - Damper blade open
 - Damper blade closed
 3. ▶ Check override control functions
 4. ▶ Further function tests on the VAV terminal unit can only be carried out if it is known which control component has been fitted.

Information on this can be found in the documentation of the TROX control components or in the product information of the control component manufacturer.

7.4 Operation

! NOTICE

Control components of the air terminal units TVE and TVE-Q undergo a referencing operation of the damper blade to move it into an OPEN position when the supply voltage is turned on and after usage of the service socket (e. g. through the adjustment device). When the referencing operation is completed, they return to the normal operation in accordance with actuation. Starting from the respective damper blade position at the beginning of the referencing operation, the entire damper adjustment range from CLOSED to OPEN may be traversed.

Depending on the application and actuation, this can lead to temporary pressure changes in the room.

Once commissioning has been completed, the VAV terminal unit operates automatically and requires no intervention from the system owner.

Depending on the area of application of the VAV terminal unit, inspection procedures and intervals may have to be observed; for example, when used on fume cupboards, an annual functional test must be carried out and documented.

In case of a malfunction, the VAV terminal unit has to be removed from service and repaired before commissioning it again.

7.5 Volume flow measurement

For air terminal units of type TVE air flow measurement/calculation is not possible, as the differential pressure Δp_w (effective pressure) cannot be measured by the differential pressure sensor. In addition, the unit-related constant C required for the volume flow calculation depends on the current blade angle.

7.5.1 C values

With the type TVE VAV terminal unit, it is not possible to calculate the volume flow using the C value.

8 Maintenance

8.1 System owner's responsibility



WARNING

Only authorised specialist personnel may perform the described maintenance measures.

The system owner is responsible for maintenance. With their maintenance management, the system owner is responsible for creating a maintenance plan, for defining the maintenance goals, and for the functional reliability of the equipment.

The legal regulations must be observed during maintenance, e.g. the system owner is responsible for hygienic operation in accordance with VDI 6022.

8.2 Maintenance

The VAV terminal unit, the actuator and the control components are maintenance-free with regard to wear and tear, but the VAV terminal unit must still be included in the regular cleaning of the ventilation system. Regular care and maintenance ensure operational readiness, operational safety and a long service life of the air terminal unit.

8.3 Inspection measures



DANGER

Danger of electric shock! Do not touch any live components. Electrical equipment carries a dangerous electrical voltage.

- Only skilled qualified electricians are allowed to work on the electrical system.
- Before working on the electrical system, switch off the supply voltage and secure it against being switched on again.



CAUTION

Risk of crushing!

The damper blade may suddenly open or close.

Switch off the voltage supply before you start working on the unit.

Personnel:

- Qualified electrician

Protective equipment:

- Safety shoes

Testing measures:

1. ▶ Remove any contamination on the VAV terminal unit that could impair functionality, particularly in the area of the air inflow openings on the damper blade.
2. ▶ Check all screw connections for tightness and retighten them, if necessary.
3. ▶ Check electrical supply cables for damage and firm seating in the terminals.

4. ▶ Test the functions of the closed circuits (including volume flow) and, if necessary, correct the set operating parameters.
5. ▶ Check if the measured values are plausible.
6. ▶ Check special functions (override controls, alarm suppression on monitoring systems) and make corrections, if necessary.
7. ▶ Check sequence control functions (room balancing) and make corrections, if necessary.
8. ▶ Document maintenance measures and measurement results.

8.4 Repair work

Repair work may only be carried out by specialist personnel or by the manufacturer. Only original spare parts may be used.

8.5 Maintenance service

To ensure the operational readiness, operational safety and service life of your units, we recommend regular maintenance by TROX.

Our experts can assess the actual condition of the unit and verify that it is in proper condition after maintenance. Setting and adjustment work is integrated directly into the maintenance process so that the ventilation system maintains a high level of safety.

9 Faults

9.1 Troubleshooting

To troubleshoot the problem, check and log the following points. Take appropriate action if necessary. If sending inquiries to TROX Service, please send the fault log.

System/area:			
TROX VAV terminal unit type (see adjustment sticker):			
Control component (see adjustment sticker):			
Operating mode (see adjustment sticker):			
Complete order code (see rating plate):			

Description	Yes	No	Not applicable
Installation situation			
■ Accessibility to the VAV terminal unit and the control component sufficient?	☐	☐	☐
■ Specified airflow direction maintained? ➔ Chapter 5.2 'General installation details' on page 15	☐	☐	☐
■ Required upstream section maintained? ➔ Chapter 5.2 'General installation details' on page 15	☐	☐	☐
■ Are the specified distances to other ventilation components, such as silencers, fire dampers and heat exchangers, observed? ➔ Chapter 5.2 'General installation details' on page 15	☐	☐	☐
■ Installation orientation of control component observed? Depending on the transducer type of the control component (observe the installation orientation sticker) ➔ Chapter 5.2 'General installation details' on page 15	☐	☐	☐
System readiness			
■ Fan switched on?	☐	☐	☐
■ Sufficient pre-charge pressure available at the VAV terminal unit, i.e. minimum differential pressure in accordance with the data sheet?	☐	☐	☐
■ Fire dampers/shut-off devices opened in the duct section?	☐	☐	☐
Check control component (for additional details, see commissioning instructions for control components)			
■ Error-free wiring and supply voltage within tolerance zone?	☐	☐	☐
■ Characteristic curve of the setpoint value control matching the control component or its set characteristic curve parameterisation? Example: Operating mode V2 = characteristic 2-10 V DC; also see silver adjustment sticker and product data sheets of the control components	☐	☐	☐
■ If necessary, adapt the actuators again (only required for certain control components)	☐	☐	☐
Check control operation			
■ Setpoint control within the control range of the VAV terminal unit and its control component. If the setpoint value is not reached from the control mode, check whether an override control (Closed, q_{vmin} , q_{vmax} , Open) suppresses the normal control mode via setpoint signal.	☐	☐	☐

Description	Yes	No	Not applicable
■ Check the operating point at q_{vmin}; if necessary, temporarily disconnect the external setpoint specification to prevent the influence of the external control and only check the controller itself at the operating point q_{vmin}.	☐	☐	☐
■ Check the operating point at q_{vmax}; check the direction of rotation of the damper in each case.	☐	☐	☐
■ Check damper blade position to setpoint, detection of damper position, <i>→ Chapter 4.3 'Position of the damper blade' on page 12</i> – If the damper is fully open, the setpoint is not reached. This is an indicator for an inadequate pressure differential. – If the damper is completely closed, although control operation is actually expected, an override control may have been activated that overrides the control process. Here, too, the function can be verified at the operating point q_{vmin} when the entire wiring is removed (with the exception of the power supply)	☐	☐	☐

Room situation (pressure conditions and air transfer performance).

The overall situation in the room depends on many factors, in particular:

- Supply air volume flow and their tolerance range
- Extract air volume flow and their tolerance range
- Leaktightness of the room or size of air transfer openings
- Type of control components used (control speed) and their actuation
- Type of the selected leading control concept, control based on volume flow or pressure

Note:

The planning concept – and not the individual VAV terminal unit – is decisive for achieving compliance with the desired room situation. Even if the technical data of the installed air terminal units is complied with, the desired room situation can only be achieved if the necessary components have been selected during the design phase, taking into account the requirements.

10 Decommissioning

Once the end of its service life has been reached, the unit must be dismantled and disposed of in an environmentally responsible manner.

10.1 Safety

Personnel

- Dismantling must only be carried out by specially trained qualified personnel.
- Only trained and qualified electricians may work on the electrical system.

Electrical system



DANGER

Danger of death due to electric current!

Danger of electric shock! Do not touch any live components! Live electrical components may suddenly move uncontrollably and seriously injure people.

Therefore:

- Switch off the power supply and disconnect the product permanently before you begin to disassemble it.



WARNING

Risk of injury due to improper dismantling!

Stored residual energy and sharp edges, points or corners on or inside the unit, or on the tools used, may cause injuries.

Therefore:

- Make sure there is sufficient space before starting work.
- Handle all exposed sharp-edged components with care.
- Dismantle components properly. Note that certain components may be of considerable weight. Use lifting gear if necessary.
- Secure components to prevent them from falling or tipping over.
- When in doubt, contact the manufacturer.

10.2 Disassembly

Before you start disassembly:

- Switch off the device and secure it against being switched on accidentally.
- Physically disconnect the entire power supply from the device and discharge any stored residual energy.
- Remove operating and auxiliary materials, as well as residual processing materials, and dispose of them in an environmentally sound manner.

Then professionally clean subassemblies and components and disassemble them in compliance with local occupational safety and environmental protection regulations.

10.3 Disposal

If no return or disposal agreement has been made, disassembled components must be recycled:

- Scrap metals.
- Send plastic elements for recycling.
- Dispose of other components appropriately, depending on their material properties.



ENVIRONMENT

Environmental damage caused by improper disposal!

Electronic waste, electronic components, lubricants and other auxiliary materials are considered hazardous waste and may only be disposed of by authorised specialist companies!

Contact the local authorities or specialised disposal companies for details on environmentally safe disposal.

11 Technical data

11.1 General data

Nominal sizes	4 – 16 in.
Volume flow rate range	8-2,940.96 cfm
Volume flow rate control range (controller with dynamic differential pressure measurements)	Approx. 4 to 100 % of the nominal volume flow rate
Minimum differential pressure	Up to 0.2 in. w.g. (without circular silencer)
Maximum permissible differential pressure	Control component with dynamic transducer: 3.61 in. w.g., Control component with static transducer: 2.41 in. w.g.
Operating temperature	50 – 122 °F

11.2 Control component/attachments

The following control components are available for the VAV terminal unit TVE:

Attachment	Control variable	Interface	Differential pressure transducer	Actuator	Brand
Easy controller – dynamic					
Easy	q _v	0 – 10 V	integrated	Slow-acting, integrated	①
Compact controller – dynamic					
XB0	q _v	0 – 10 V or 2 – 10 V	integrated	Slow-acting, integrated	①
XM0	q _v	Modbus-RTU or 0 – 10 V or 2 – 10 V			①
XM0-J6	q _v	Modbus RTU with RJ12 socket (for X-AIRCONTROL)			①
XDMB0	q _v	BACnet-MS/TP or Modbus-RTU or 0 – 10 V or 2 – 10 V			①
Compact controller – static					
XS0	q _v	Modbus-RTU or 0 – 10 V or 2 – 10 V	integrated	Slow-acting, integrated	①
XS0-J6	q _v	Modbus RTU with RJ12 socket (for X-AIRCONTROL)			①
XSMB0	q _v	BACnet-MS/TP or Modbus-RTU or 0 – 10 V or 2 – 10 V			①
XSMB0-J6	q _v	Modbus RTU with RJ12 socket (for X-AIRCONTROL)			①
q _v : Volume flow ① TROX					

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