



# CAV terminal unit

EN

**TROX GmbH**

Heinrich-Trox-Platz

47504 Neukirchen-Vluyn

Germany

Phone: +49 (0) 2845 202-0

Fax: +49 (0) 2845 202265

E-mail: trox-de@troxgroup.com

<http://www.troxtechnik.com>**Product overview***Fig. 1: Air terminal unit type EN*

- 1 Damper blade
- 2 Bellows
- 3 Bellows inlet
- 4 Scales sticker
- 5 Display damper blade position ⇒ Fig. 3
- 6 Hand wheel
- 7 Vmin-/Vmax actuator (optional)

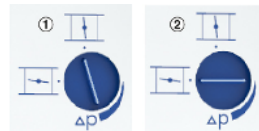
*Fig. 2: EN-Ex*

- 1 Damper blade
- 2 Bellows
- 3 Bellows inlet
- 4 Scales sticker
- 5 Connection for equipotential bonding (latch) (2 × ground strap in supply package))
- 6 Display damper blade position ⇒ Fig. 3
- 7 Hand wheel

**Damper blade position display**

The display is used to evaluate the throttle position of the damper blade, e.g. in order to optimise the control of the fan or the section regulation.

**Attention:** The display must not be adjusted.

*Fig. 3: Display of the damper blade position*

- 1 Damper blade in maximum throttle position - Reduce system pressure
- 2 Damper blade in open position - System pressure too low

**Vmin/Vmax actuator (optional)**

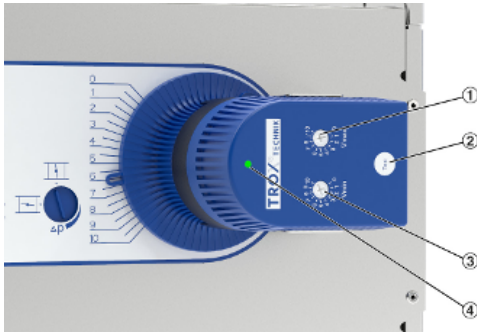


Fig. 4: Vmin/Vmax actuator

- 1 Vmax potentiometer
- 2 'Test' push button
- 3 Vmin potentiometer
- 4 LED status display

LED status display:

- LED lit - Set position reached
- LED flashes once per second - Actuator moves
- LED flashes twice per second - Actuator blocks
- LED off - No power

**Functional test actuator**

- ▶ Press the test push button (> 2 s)
  - ⇒ ■ Actuator runs toward Vmin
  - Actuator runs toward Vmax
  - Actuator returns to starting position

**Important notes**

**Information on the installation manual**

This manual enables operating or service personnel to correctly install the product described below and to use it safely and efficiently.

It is essential that these individuals read and fully understand this manual before starting any work. The basic prerequisite for safe working is to comply with the safety notes and all instructions in this manual.

The local regulations for health and safety at work and general safety regulations also apply.

**Correct use**

CAV terminal units of type EN are used for constant air volume control in supply and extract air ducts of ventilation and air conditioning systems.

In kitchen exhaust air systems, CAV terminal units may only be used if it is ensured that the extract air is cleaned as well as possible by highly effective aerosol separators, observe VDI2052.

Installation in humid rooms and rooms with dust-laden or aggressive air has to be assessed individually.

**TROX Technical Support**

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

- Product name
- TROX order number
- Delivery date
- Brief description of defect or issue

Online	<a href="http://www.trox.de">www.trox.de</a>
Phone	+49 2845 202-0

**Qualified staff**

**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 rel-

evant 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.

### Skilled 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.

### Personal protective equipment

Personal protective equipment must be worn for any work in order to reduce health or safety hazards to the minimum.

The appropriate protective equipment for a job must be worn for as long as the job takes.

### 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 slipping on slippery ground.

### Limitation of liability

The information in this manual has been compiled with reference to the applicable standards and guidelines, the state of the art, and our expertise and experience of many years.

The manufacturer does not accept any liability for damages resulting from:

- Non-compliance with this manual
- Incorrect use
- Operation or handling by untrained individuals
- Unauthorised modifications

The actual scope of delivery may differ from the information in this manual for special constructions, additional order options or as a result of recent technical changes.

### Transport and storage

#### Delivery check

Upon delivery, carefully remove the packaging and check the unit for transport damage and completeness. In case of any damage or an incomplete shipment, contact the shipping company and your supplier immediately. Put the product back into its packaging after the delivery check to protect it from dust and contamination.



#### **Fixing and installation material**

*Fixing and installation material is not part of the supply package (unless stated otherwise), but has to be provided by others; it has to be suitable for the installation situation.*

## Transport on site

### CAUTION!

#### **Danger of injury from sharp edges, sharp corners and thin sheet metal parts!**

Sharp edges, sharp corners and thin sheet metal parts may cause cuts or grazes.

- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Please note:

- Be careful when unloading or moving the product, and pay attention to the symbols and information on the packaging.
- 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.
- Always secure the load against tipping and falling.
- Do not move bulky items just by yourself. Get help to prevent injuries and damage.
- Only lift or hold the control unit at the housing, not at the damper blade, at the flow rate adjustment or at the actuator.

## Storage

Please note:

- Store the product only in its original packaging
- Protect the product from the effects of weather
- Protect the product from humidity, dust and contamination
- Storage temperature: -10 °C to 50 °C.
- Relative humidity: 95% max., no condensation

## Packaging

Properly dispose of packaging material.

**Technical data**

Nominal sizes	200 × 100 to 600 × 600 mm
Volume flow rate range	39 – 3500 l/s or 140 – 12600 m³/h
Volume flow rate control range	Approx. 25 to 100% of the nominal volume flow rate
Scale accuracy	± 4%
Minimum differential pressure	50 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

**Technical data of actuators**

Actuator	E01	E02	E03
Supply voltage	24 V AC/DC	230 V AC/DC	24 V AC/DC
Mains frequency	AC: 50/60 Hz		
Power rating	DC: 2,5 W; AC: 4,5 VA		
Protection level	IP42		
IEC protection class	III	II	III
Signal input setpoint value	–	–	0 – 10 V DC, Ra > 100 kΩ
Signal output actual value	–	–	0 – 10 V DC, max. 0,5 mA
Ambient temperature	10-50 °C		
Ambient humidity	5-90% r.h.		

**Dimensions and weight**

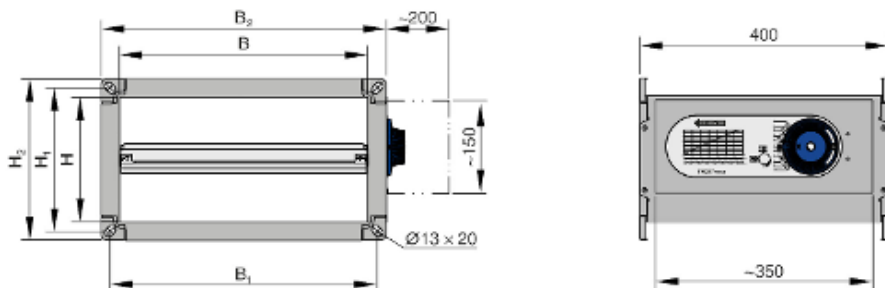


Fig. 5: EN

**Product-specific data for EN**

NS	B	H	B <sub>1</sub>	B <sub>2</sub>	H <sub>1</sub>	H <sub>2</sub>	kg
200 × 100	200	100	230	260	130	160	4
300 × 100	300	100	330	360	130	160	5
300 × 150	300	150	330	360	180	210	6
300 × 200	300	200	330	360	230	260	6
400 × 200	400	200	430	460	230	260	7
400 × 250	400	250	430	460	280	310	8
400 × 300	400	300	430	460	330	360	8.5
400 × 400	400	400	430	460	430	460	13
500 × 200	500	200	530	560	230	260	8.5
500 × 250	500	250	530	560	280	310	9
500 × 300	500	300	530	560	330	360	9.5
500 × 400	500	400	530	560	430	460	14.5
500 × 500	500	500	530	560	530	560	15.5
600 × 200	600	200	630	660	230	260	10
600 × 250	600	250	630	660	280	310	10.5
600 × 300	600	300	630	660	330	360	11.5
600 × 400	600	400	630	660	430	460	17
600 × 500	600	500	630	660	530	560	18
600 × 600	600	600	630	660	630	660	20

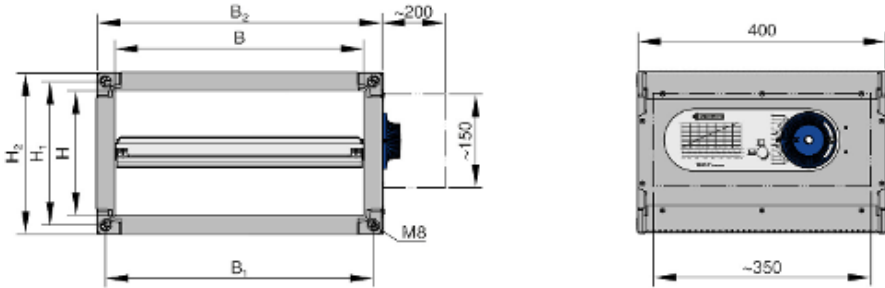


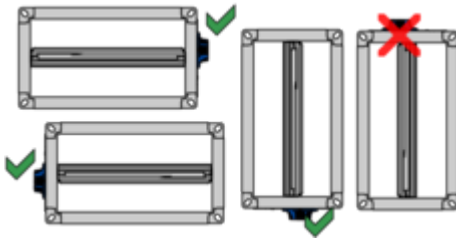
Fig. 6: EN-D (with acoustic cladding)

**Product specific data EN-D**

NS	B	H	B <sub>1</sub>	B <sub>2</sub>	H <sub>1</sub>	H <sub>2</sub>	kg
200 × 100	200	100	230	260	130	160	6.5
300 × 100	300	100	330	360	130	160	8
300 × 150	300	150	330	360	180	210	9
300 × 200	300	200	330	360	230	260	10
400 × 200	400	200	430	460	230	260	12
400 × 250	400	250	430	460	280	310	13
400 × 300	400	300	430	460	330	360	14
400 × 400	400	400	430	460	430	460	18
500 × 200	500	200	530	560	230	260	14
500 × 250	500	250	530	560	280	310	14.5
500 × 300	500	300	530	560	330	360	15.5
500 × 400	500	400	530	560	430	460	20.5
500 × 500	500	500	530	560	530	560	22
600 × 200	600	200	630	660	230	260	15.5
600 × 250	600	250	630	660	280	310	16.5
600 × 300	600	300	630	660	330	360	18
600 × 400	600	400	630	660	430	460	23
600 × 500	600	500	630	660	530	560	25
600 × 600	600	600	630	660	630	660	27.5

**Installation**

**Installation orientation**



*Fig. 7: Installation position for horizontal ducting*

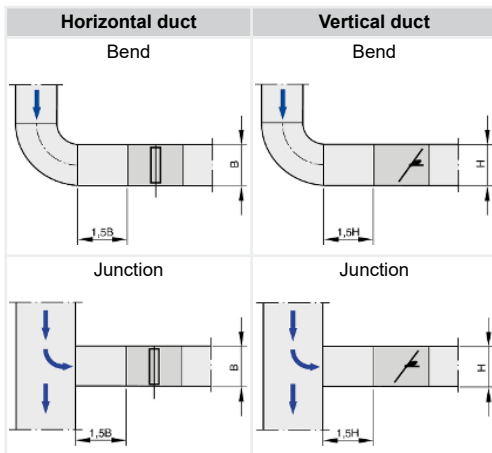
Installation position of handwheel (actuator) on top not permitted.

**Observe the airflow direction!**

**Upstream conditions**

The volume flow rate accuracy of CAV terminal units applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect volume flow rate measurement. Depending on the respective installation situation, information on the straight duct section upstream of the control unit must be observed.

Duct connections, e.g. branches off the main duct, must comply with EN 1505.



**Note:** If there is a shut-off damper installed in the flow direction upstream of the EN terminal unit, ensure that the shut-off damper is installed so that its damper blade shaft is located opposite the damper blade shaft of the EN and rotated by 90°.



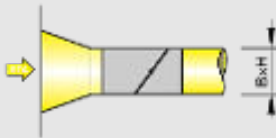
**Inflow at the open duct end (extract air mode)**



*Fig. 8: Upstream conditions at open duct end*

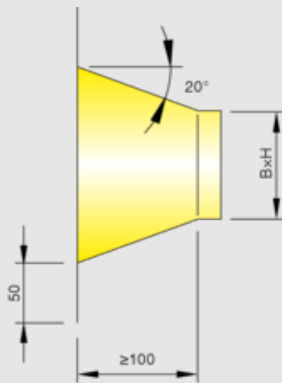
The inflow at the open end of a duct causes strong turbulence. The stated volume flow rate accuracy can only be achieved with a straight upstream length, at least 5B or 5H (use larger dimension).

Alternatively, an inflow aid must be installed at the open line end upstream of the control unit:



*Fig. 9: Upstream conditions with inflow aid*

The stated volume flow rate accuracy is achieved when an inflow aid is connected directly to the control unit.

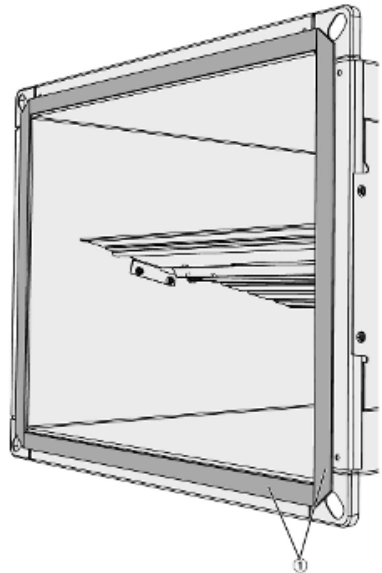


*Fig. 10: Dimensions of inflow aid*

**Attaching sealing tape**

To achieve the tightness class of the ducting, sealing tapes have to be installed between the ducting and the terminal unit at both sides of the flange, e.g. self-adhesive sealing tape.

Ensure that the sealing tape (Fig. 11/1) is attached flush with the flange.



*Fig. 11: Attaching the sealing tape to the flange*

## Installing the CAV terminal unit

### Personnel:

- HVAC technician

### Protective equipment:

- Industrial safety helmet
- Protective gloves
- Safety shoes

Before you install the product, take suitable precautions to protect air distribution components from contamination during installation (VDI 6022). If this is not possible, at least cover the product or take other precautions to protect it from contamination. In this case you have to ensure that the product cannot be started. Ensure that all components are clean before you install them. If necessary, clean them thoroughly. If you have to interrupt the installation procedure, protect all openings from the ingress of dust or moisture.

For installation please note:

- Fix the product only to load-bearing structural elements.
- Load suspension systems only with the weight of the product. Adjacent components and connecting ducts must be supported separately.
- Use only approved and adequately sized fixing material (fixing material is not included in the supply package).
- For maintenance or adjustment work, the device must be accessible after installation.
- **Important:** If there is a risk that the terminal unit could be subject to mechanical impact during operation, protect it accordingly; protection has to be provided by others.

Be careful to not damage the unit accidentally:

- Handle the unit with care.
- Lift the unit only by lifting the entire casing.
- Never lift the unit by the damper blade, rotary knob or actuator.

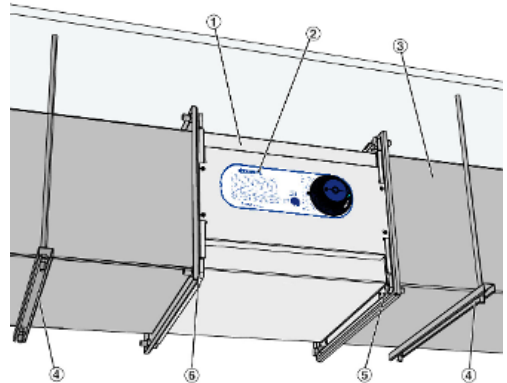


Fig. 12: Installation example

1. ▶ Install suspension rods and bars (Fig. 12/4) at the installation location, at a distance of approx. L+100 mm.
2. ▶ Assemble the ducts (Fig. 12/3) and lead them up to the installation location of the terminal unit.
3. ▶ Insert seals (Fig. 12/6) between the flanges ↻ 'Attaching sealing tape' on page 9 (on-site).  
Observe the air direction arrow (Fig. 12/2) during installation.
4. ▶ Screw the terminal unit (Fig. 12/1) together with screws, washers and nuts M10 (Fig. 12/5).

### For version with acoustic cladding (EN-D)

- Screw connection (Fig. 12/5) with screws and washers M8;
- Insulate ducts up to the acoustic cladding of the terminal unit (on-site).

## Electrical wiring



### 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.
- Switch off the power supply before working on any electrical equipment.

## Installation instructions

For installation of electrical actuators, the supply voltage and, if necessary, signal lines, must be connected.

The connection is made according to the information on the actuators or connection diagrams in these instructions. Any project-specific wiring diagrams must be observed. The voltage ranges and the terminal connections specified on the actuators must be observed!

### Personnel:

- Skilled qualified electrician

Observe the following during installation:

- Legal and official regulations, in particular VDE guidelines.
- Observe the technical connection rules (TCR) of the local grid operator.
- Wiring work for supply voltage and signal lines on site.
- The rating and manufacturing of customer-side connections and wiring must be carried out in accordance with the recognised rules of electrical engineering.
- Observe wiring guidelines and project-specific circuit diagrams of the actuators.
- The electrical connection to the actuator may only be performed if the installation has been carried out correctly.
- The 24 V supply voltage must only be provided with a safety transformer.
- If several actuators are connected to a 24 V mains supply, make sure that a common zero or earthing line is defined and not interchanged.
- The actuator contains no parts that can be replaced or repaired by the user and may only be opened by the manufacturer.
- Lay power supply lines in such a way that mechanical or thermal damage is excluded.
- Terminals for cables 0,5 – 2,5 mm<sup>2</sup>, rigid and flexible, AWG 22-10

### Strain relief

Units that are permanently installed in buildings are stationary electrical equipment for which no strain relief on the connecting cables is required.

**Connection diagram Vmin-/Vmax switching E01, E02**

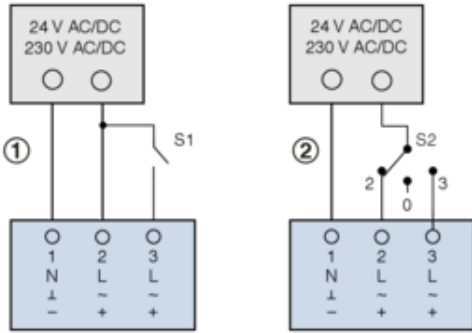


Fig. 13: Connection diagrams actuator E01, E02

- 1 1-wire control
- 2 3-point control

S1	S2	Function
–	Pos. 0	Actuator has stopped (undefined position)
open	Pos. 2	Vmin
closed	Pos. 3	Vmax

**Colour coding of the connecting cables E01, E02**

Pos.	Colour	Connection	AC	DC
1	BU	Supply	N	GND
2	BN	Supply	L	+
3	BK	Switch input	L	+

**Connection diagram variable volume flow E03**

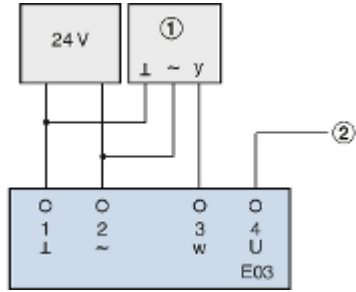


Fig. 14: Constant control input signal E03

- 1 Room temperature controller
- 2 Actual value output (value to be set)

**Colour assignment of the connecting cables E03**

Pos.	Colour	Connection	AC	DC
1	BU	Supply	N	GND
2	BN	Supply	L	+
3	BK	Signal w		
4	GY	Signal U		

**Room temperature control Fig. 14**

A suitable room temperature controller or a DDC outstation with 0-10 VDC output 2-wire (terminals 1 and 3) connected. With a common supply voltage of 24 V, note that terminal 1 is also ground for the control signal.

Override control: With 24 VDC at terminal 3, the volume flow rate set at the Vmax potentiometer is started.

## Initial commissioning

**WARNING!****Risk of explosion from the commissioning of damaged products**

Commissioning damaged products in areas with potentially explosive atmospheres may lead to an explosion. This can cause serious or even fatal injuries as well as considerable damage to property.

Before you commission the terminal unit, check it for damage that could impair the movement of the damper blade; if the terminal unit has been damaged, replace it.

Before you start commissioning:

- Ensure that the device or unit has been correctly fixed and connected to the ducting.
- Ensure equipotential bonding of the device or unit.
- Ensure that the devices or units as well as the ventilation system are clean and that there are no residual matter and foreign objects.
- **Important:** If there is a risk that the terminal unit could be subject to mechanical impact during operation, protect it accordingly; protection has to be provided by others.

For commissioning see also VDI 6022, part 1 – 'Hygiene requirements for ventilation and air-conditioning systems and units'.

**WARNING!****Risk of explosion!**

Ignition sources, such as sparks, open flames or hot surfaces, can lead to explosions in an area with potentially explosive atmospheres.

- Get written permission before you start working in an area with potentially explosive atmospheres.
- Do not carry out any work in a potentially explosive atmosphere.  
To remove any potentially explosive atmosphere, purge the system with fresh air before you work on it.
- Use only tools that have been approved for use in areas with potentially explosive atmospheres.

Failure to comply with these safety notes may lead to an explosion.

**Volume flow rate setting ranges**

Nominal size	V̇ [l/s]		V̇ (m³/h)	
	min	max	min	max
200 × 100	39	164	140	590
300 × 100	65	260	234	936
300 × 150	82	460	295	1656
300 × 200	120	515	432	1854
400 × 200	200	875	720	3150
500 × 200	180	900	648	3240
600 × 200	225	1010	810	3636
400 × 250	200	885	720	3186
500 × 250	235	1190	846	4284
600 × 250	300	1310	1080	4716
400 × 300	310	1280	1116	4608
500 × 300	365	1580	1314	5688
600 × 300	350	1750	1260	6300
400 × 400	400	1750	1440	6300
500 × 400	360	1800	1296	6480
600 × 400	450	2020	1620	7272
500 × 500	470	2380	1692	8568
600 × 500	600	2620	2160	9432
600 × 600	700	3500	2520	12600

### Setting the volume flow rate

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.

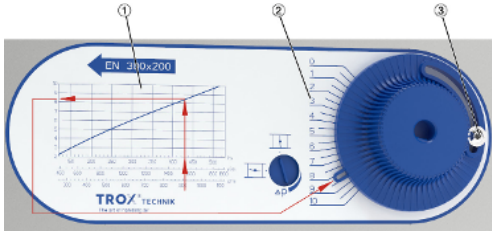


Fig. 15: Setting the volume flow rate

- ▶ Using the volume flow rate scale (Fig. 15/1), determine the setting value (1-10) for the desired volume flow rate (l/s, m³/h, or cfm).
- ▶ Loosen the hexagon socket screw (M5x12/ size 3) (Fig. 15/3).
- ▶ Set the rotary knob to the determined value of the setting scale (Fig. 15/2) and fix it with the hexagon socket screw (Fig. 15/3).

No further measurement or adjustment is necessary.

### Setting Vmin/Vmax actuators

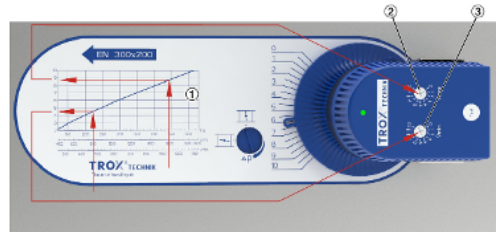


Fig. 16: Setting the volume flow rate

Factory setting:

Vmin: 4

Vmax: 8

- ▶ Using the volume flow rate scale (Fig. 16/1), determine the setting value (1-10) for the desired volume flow rate (l/s, m³/h, or cfm).
- ▶ Set the desired value at the Vmin potentiometer (Fig. 16/3).
- ▶ Set the desired value at the Vmax potentiometer (Fig. 16/2).
- ▶ Carry out a functional test using the test push button and check the scale position reached for the preset volume flow after the motorised adjustment process.

#### Example for actuator E01, E02:

Given data:

- EN 300x200
  - Vmin 432 m³/h
  - Vmax 1854 m³/h
- Volume flow rate night-time operation 800 m³/h
- Volume flow rate day-time operation 1600 m³/h

Settings according to scale Fig. 16:

Vmin potentiometer: 4.5

Vmax potentiometer: 9

**Characteristics E03**

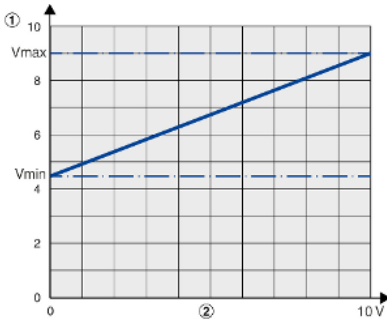


Fig. 17: Characteristics of the control signal

- 1 Scale setting
  - 2 Setpoint value w
- Vmin: 0 V ⇒ scale setting 4.5  
 Vmax: 10 V ⇒ scale setting 9

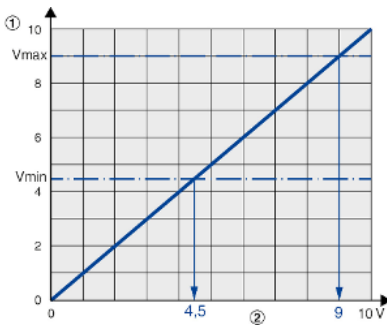


Fig. 18: Characteristic actual value signal

- 1 Scale setting
  - 2 Actual value U
- Vmin: 4.5 V  
 Vmax: 9 V

**i Actual value signal**

The actual value signal of actuator variant E03 corresponds to the current actuator position in the scale range and is not a measure of the actual volume flow rate, since the CAV terminal unit does not measure the volume flow rate but only controls it using the aerodynamic forces.

**Maintenance and cleaning**

**Maintenance**

It is the system owner's duty to set up a maintenance schedule, taking the actual operating conditions (contamination, operating time etc.) of the ventilation system into consideration.

**Important:** Do not lubricate the bearings of the damper blade.

Maintenance jobs to be carried out regularly:

- Visually check the terminal unit for contamination, damage and corrosion. Remove contamination; if the terminal unit has been damaged, or if there is any corrosion, replace the terminal unit.
- Check the fixing of the terminal unit and of the connected ductwork.
- Check equipotential bonding.

**Replacement parts and retrofitting**

**Incorrect replacement parts**



**Risk of injury from the use of incorrect replacement parts!**

Incorrect or faulty replacement parts pose a risk to health and safety, and their use can cause malfunction, damage to property and total failure of equipment.

- Use only original replacement parts from TROX.

**Retrofitting an electric actuator**

The EN control unit can easily be retrofitted with an electric actuator.

**Order code for retrofit kits:**

NR-VAV-EN-E01	24 V AC / DC actuator min / max switching
NR-VAV-EN-E02	230 V AC / DC actuator min / max switching
NR-VAV-EN-E03	24 V AC / DC constant actuator for variable operation

## Cleaning

Please note:

- The cleaning intervals given in the VDI 6022 standard apply.
- Clean surfaces with a damp cloth.
- Use only common household cleaners, do not use any aggressive cleaning agents.
- Do not use cleaning agents that contain chlorine.