TROX® TECHNIK
The art of handling air

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CAV controllers

EN

Product overview

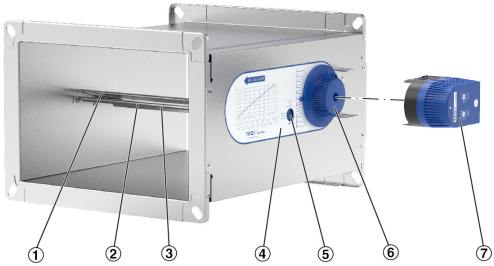


Fig. 1: Air terminal unit type EN

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

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.

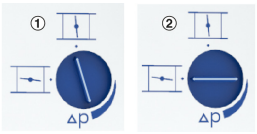


Fig. 2: Display of the damper blade position

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

Vmin-/Vmax actuator (optional)

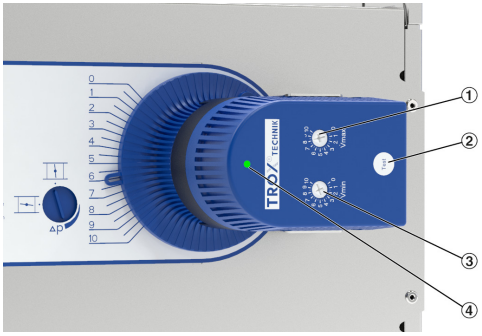


Fig. 3: Vmin-/Vmax actuator

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 supply voltage

Functional test actuator

- Press the test push button (> 2 s)

⇨
- Actuator turns toward Vmin
- Actuator turns 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 controllers of the type EN are used for constant volume flow control in supply and extract air ducts of ventilation and ventilation systems.

Do not use CAV controllers in extract air systems in commercial kitchens unless the extract air has been cleaned as much as possible with high-efficiency aerosol separators; see VDI 2052.

The installation of air terminal devices in humid rooms, areas with potentially explosive atmospheres or rooms with dust-laden or aggressive air has to be assessed for each individual case.

TROX Technical Service

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 the fault

Online	*www.troxtechnik.com*
Phone	+49 2845 202-400

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 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.

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: 14 °F to 122 °F.
- Relative humidity: 95% max., no condensation

Packaging

Properly dispose of packaging material.

Technical data

Nominal sizes	8" × 4" to 24" × 24"
Volume flow rate range	82 – 7416 cfm
Volume flow rate control range	Approx. 25 to 100% of the nominal volume flow rate
Scale accuracy	± 4%
Minimum differential pressure	0.2 in WC
Maximum differential pressure	4 in WC
Operating temperature	50 – 122 °F

Technical data actuator

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
Setpoint value signal input	–	–	0 – 10 V DC, Ra > 100 kΩ
Actual value signal output	–	–	0 – 10 V DC, max. 0.5 m A
Ambient temperature	50-122 °F		
Ambient humidity	5-90% rF		

Dimensions and weight

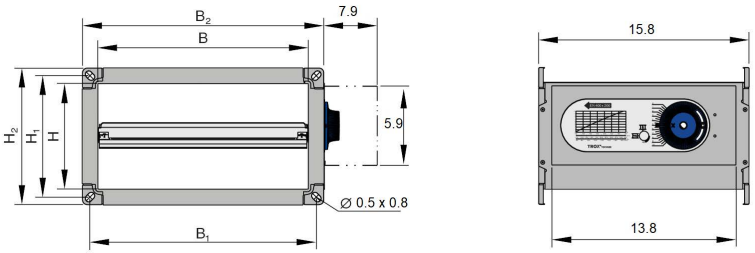


Fig. 4: EN

Product specific data EN

NG	B	H	B_1	B_2	H_1	H_2	lbs
8" × 4"	8	4	9	12	5	6	9
12" × 4"	12	4	13	14	5	6	11
12" × 6"	12	6	13	14	7	8	13
12" × 8"	12	8	13	14	9	10	13
16" × 8"	16	8	17	18	9	10	15
16" × 10"	16	10	17	18	9	12	18
16" × 12"	16	12	17	18	13	14	19
16" × 16"	16	16	17	18	17	18	29
20" × 8"	20	8	21	22	9	10	19
20" × 10"	20	10	21	22	11	12	20
20" ×12"	20	12	21	22	13	14	21
20" × 16"	20	16	21	22	17	18	32
20" × 20"	20	20	21	22	21	22	34
24" × 8"	24	8	25	26	9	10	22
24" × 10"	24	10	25	26	11	12	23
24" × 12"	24	12	25	26	13	14	25
24" × 16"	24	16	25	26	17	18	37
24" × 20"	24	20	25	26	21	22	40
24" × 24"	24	24	25	26	25	26	44

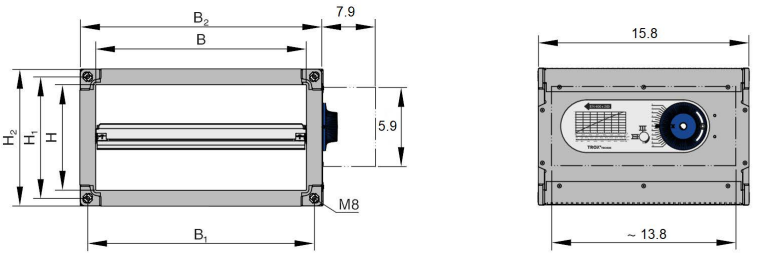


Fig. 5: EN-D (with acoustic cladding)

Product specific data EN-D

NG	B	H	B_1	B_2	H_1	H_2	lbs
8" × 4"	8	4	9	10	5	6	14
12" × 4"	12	4	13	14	5	6	18
12" × 6"	12	6	13	14	7	8	20
12" × 8"	12	8	13	14	9	10	22
16" × 8"	16	8	17	18	9	10	26
16" × 10"	16	10	17	18	11	12	29
16" × 12"	16	12	17	18	13	14	31
16" × 16"	16	16	17	18	17	18	40
20" × 8"	20	8	21	22	9	10	31
20" × 10"	20	10	21	22	11	12	32
20" × 12"	20	12	21	22	13	14	34
20" × 16"	20	16	21	22	17	18	45
20" × 20"	20	20	21	22	21	22	49
24" × 8"	24	8	25	26	9	10	34
24" × 10"	24	10	25	26	11	12	36
24" × 12"	24	12	25	26	13	14	40
24" × 16"	24	16	25	26	17	18	51
24" × 20"	24	20	25	26	21	22	55
24" × 24"	24	24	25	26	25	26	61

Installation

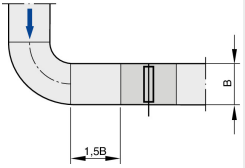
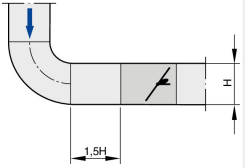
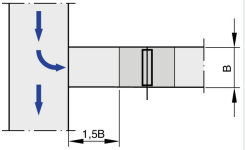
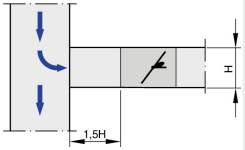
Installation orientation

Any installation orientation.
When installing in horizontal ducting, the operating side (rotary knob) must be arranged laterally (right/left) or below.

Observe airflow direction!

Upstream conditions

The volume flow rate accuracy of CAV controllers 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.

Horizontal duct	Vertical duct
Bend	Bend
	
Junction	Junction
	

Free air intake only with a straight duct section of 1B upstream.

Attaching sealing tape

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

Ensure that the sealing tape (Fig. 6/1) is attached flush with the flange.

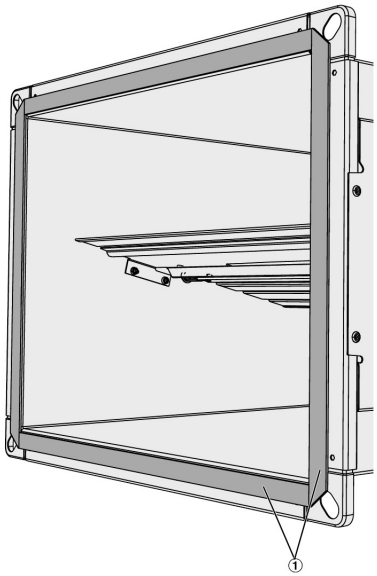


Fig. 6: Attaching the sealing tape to the flange

Installing the controller

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 controller could be subject to mechanical impact during operation, protect it accordingly; protection has to be provided by others.

Be careful to not damage the controller 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.

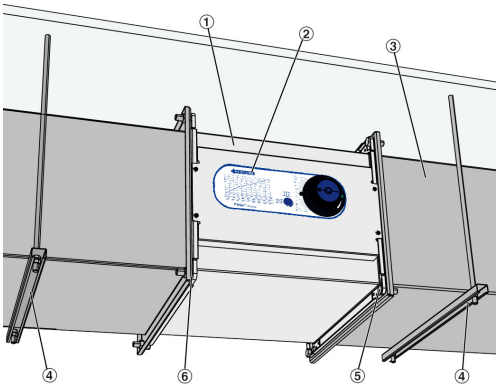


Fig. 7: Installation example

1. Install suspension rods and bars (Fig. 7/4) at the installation location, at a distance of approx. L+4".
2. Assemble the ducts (Fig. 7/3) and lead them up to the installation location of the controller.
3. Insert seals (Fig. 7/6) between the flanges *'Attaching sealing tape' on page 7* (on-site).

   Observe the air direction arrow (Fig. 7/2) during installation.
4. Screw the controller (Fig. 7/1) together with screws, washers and nuts M10 (Fig. 7/5).

   For version with acoustic cladding (EN-D)

   - Screw connection (Fig. 7/5) with screws and washers M8;
   - Insulate ducts up to the acoustic cladding of the controller (on-site).

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, the supply voltage and, if necessary, signal lines, must be connected for electrical actuators.

The connection is made according to the information given on the actuators or connection diagrams in this manual. These must be observed for project-specific wiring diagrams. The voltage ranges and the terminal connections specified on the actuators must be observed!

Personnel:

- Skilled qualified electrician

Please note during installation:

- Legal and official regulations, in particular VDE guidelines.
- Consideration of the technical connection rules (TCR) of the local network operators.
- Wiring work for supply voltage and signal lines on site.
- The rating and manufacture 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 made if the installation has been carried out correctly.
- The 24 V supply voltage may only be supplied with a safety transformer.
- If several actuators are connected to a 24 V mains supply, it must be ensured that a common zero or ground 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 connecting cables in such a way that they cannot be accidentally damaged by mechanical impact or by heat.
- Terminals for 0.0008 – 0.004 in², cables, rigid and flexible, AWG 22–10

Strain relief

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

Connection diagram Vmin / Vmax switching E01, E02

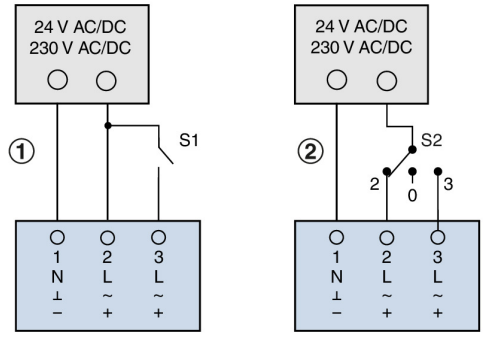


Fig. 8: Connection diagrams actuator E01, E02

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 assignment 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

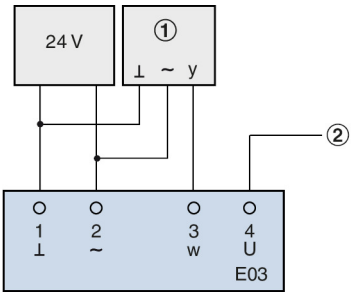


Fig. 9: Constant control input signal E03

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. 9

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

Before you start commissioning:

- Ensure that the device or unit has been correctly fixed and connected to the ducting.
- 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 controller 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'.

Volume flow rate setting ranges

Nominal size	$\dot{V}$ [l/s]		$\dot{V}$(cfm)	
	min	max	min	max
8" × 4"	39	164	82	347
12" × 4"	65	260	138	551
12" × 6"	82	460	174	975
12" × 8"	120	515	254	1091
16" × 8"	200	875	424	1854
20" × 8"	180	900	381	1907
24" × 8"	225	1010	477	2140
16" × 10"	200	885	424	1875
20" × 10"	235	1190	498	2521
24" × 10"	300	1310	636	2776
16" × 12"	310	1280	657	2712
20" × 12"	365	1580	773	3348
24" × 12"	350	1750	742	3708
16" × 16"	400	1750	848	3708
20" × 16"	360	1800	763	3814
24" × 16"	450	2020	953	4280
20" × 20"	470	2380	996	5043
24" × 20"	600	2620	1271	5551
24" × 24"	700	3500	1483	7416

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.

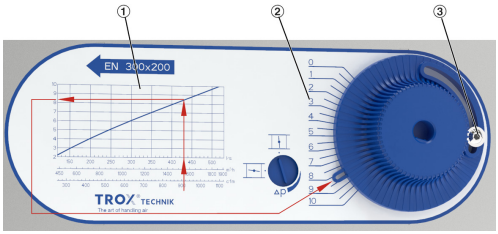


Fig. 10: Setting the volume flow rate

1. ▸ Using the volume flow rate scale (Fig. 10/1), determine the setting value (1-10) for the desired volume flow rate (cfm).
2. ▸ Loosen the hexagon socket screw (Fig. 10/3).
3. ▸ Set the rotary knob to the determined value of the setting scale (Fig. 10/2) and fix it with the hexagon socket screw (Fig. 10/3).

   No further measurement or adjustment is necessary.

Setting Vmin/Vmax actuators

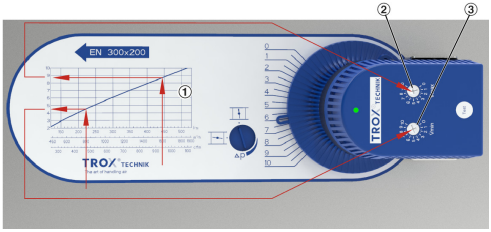


Fig. 11: Setting the volume flow rate

Factory setting:

Vmin: 4

Vmax: 8

1. ▸ Using the volume flow rate scale (Fig. 11/1), determine the setting value (1-10) for the desired volume flow rate (cfm).
2. ▸ Set the desired value at the Vmin potentiometer (Fig. 11/3).
3. ▸ Set the desired value at the Vmax potentiometer (Fig. 11/2).
4. ▸ 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 12"x8"
  - Vmin 254 cfm
  - Vmax 1091 cfm
- Volume flow rate night-time operation 471 cfm
- Volume flow rate day-time operation 942 cfm

Settings according to scale Fig. 11:

Vmin potentiometer: 4.5

Vmax potentiometer: 9

Characteristics E03

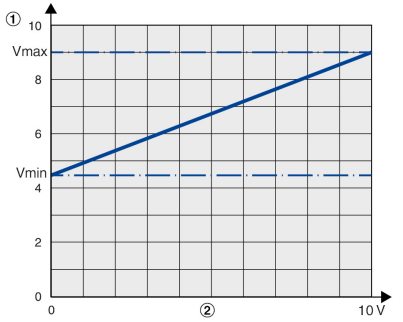


Fig. 12: Characteristics of the control signal

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

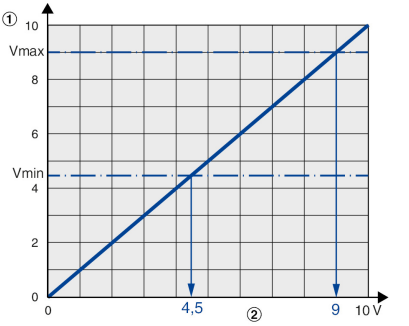


Fig. 13: Characteristic actual value signal

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

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 controller 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 controller for contamination, damage and corrosion. Remove contamination; if the controller has been damaged, or if there is any corrosion, replace the controller.
- Check the fixing of the controller and of the connected ductwork.

Replacement parts and retrofit

Incorrect replacement parts

WARNING!

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.

Retrofit of electric actuator

The EN controller 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.