

EASYLAB controller

Type TCU3





TROX GmbH

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General information

General information

About this manual

This manual enables operating and service personnel to correctly install the EASYLAB TCU3 controller and to use it safely and efficiently.

The TCU3 electronic controller is used with a VAV terminal unit; both products together form a functional unit.

If TCU3 has been ordered together with any expansion modules (EM-xx), these expansion modules are usually factory fitted; it is also possible to retrofit them later.

This operating and installation manual is intended for use by fitting and installation companies, inhouse technicians, technical staff, instructed persons, and qualified electricians or air conditioning technicians.

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.

This manual must be given to the system owner when handing over the system. The system owner must include the manual with the system documentation. The manual must be kept in a place that is accessible at all times.

Illustrations in this manual are mainly for information and may differ from the actual design. Discrepancies cannot be used to make any claims against the manufacturer.

In addition to this manual, the following documents apply

- Operating manual
 - EasyConnect configuration software
- Installation manual for VAV terminal unit(s)
- Installation manuals for EASYLAB components

- Expansion module EM-AUTOZERO
- Expansion module EM-LIGHT
- Expansion module EM-TRF/EM-TRF-USV
- Expansion module EM-LON
- Expansion module EM-BAC-MOD
- Expansion module EM-BAC-IP
- Control panel BE-SEG
- Control panel BE-LCD
- Face velocity transducer VS-TRD
- Sash distance sensor DS-TRD
- General wiring documents
- Project-specific wiring documents

All documents can be downloaded from <u>www.troxtechnik.com</u>.

Project-specific information is provided together with the order confirmation or delivered together with the product.

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

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

The obligations agreed in the order, the general terms and conditions, the manufacturer's terms of delivery, and the legal regulations in effect at the time the contract is signed shall apply.

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For details regarding defects liability please refer to Section VI, Warranty Claims, of the Delivery and Payment Terms of TROX GmbH.

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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.

Anger!

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

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

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.

Environmental pollution hazard.

Safety signs on the controller

The following symbols and signs are usually found in the work area. They apply to the very location where they are found.



Electric shock hazard!

Disconnect the power supply before you open the device.

Only skilled qualified electricians are allowed to work in areas marked as having electrical voltage.

Unauthorised persons must not enter areas, open cabinets or work on components where an electrical voltage is present and which are hence marked with this symbol.



General warning

Read the operating and installation manual before commissioning and before you open the casing.



Functional earth



WARNING!

Danger due to illegible signage!

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

- Ensure that all of the safety, warning and operating information is clearly legible.
- Replace illegible signs or stickers immediately.

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1 Safety and correct use

General safety notes

🛕 DANGER!

Risk of injury from the damper blade of the VAV terminal unit

The damper blades of VAV terminal units close or open extremely quickly (\measuredangle 90° within 3 seconds) and may crush your hands and arms.

Connect ducts to both ends of a VAV terminal unit; if one end cannot be ducted, at least fit a perforated plate to prevent people from reaching into the terminal unit.

Risk of injury from the casing cover falling shut

An open casing cover may suddenly fall shut and crush your fingers.

- Secure an open casing cover with a bracket.
- Wear protective gloves.

NOTICE!

Risk of damage to property due to large temperature differences

If any electronic components have been kept in an unheated area, condensation may form and damage the electronic components beyond repair.

 Before you start commissioning, make sure that all devices have warmed up to ambient temperature. Only after about 2 hours will the system have reached room temperature.

NOTICE!

Risk of damage to property due to electrostatic charge

Electrostatic charge can damage the electronics.

- Avoid skin contact with any components or printed circuits.
- Touch an equipotentially bonded metal surface before you touch any printed circuit boards.
- Wear conductive footwear and antistatic clothing.

NOTICE!

In an emergency

Immediately disconnect the power supply to the controller. Emergencies include, for example, a damaged mains cable, a damaged casing, the ingress of a liquid or foreign matter, a smell or smoke.

Have the device checked by the manufacturer before you put it into operation again.

Correct use

TCU3 complements TROX VAV terminal units for the fast control of variable supply air and extract air volume flows in rooms and fume cupboards.

It is typically used in a group of several controllers for complete room control, but it may also be used as a single controller.

- Use the controller only for the applications described in this manual.
- Install the controller only as intended as otherwise volume flow rate measurement will be impaired; the installation orientation is indicated on a sticker.
- Ensure that permitted values (see Technical Data) are not exceeded.

Incorrect use

Do not use the controller in an installation orientation or for areas of application that are not described in this manual.

Do not use the controller outdoors, in wet areas, or in areas with potentially explosive atmospheres.

Residual risks

Power failure

If the power fails, the damper blade of the VAV terminal unit remains in the position at that time; the controller will resume operation once power returns.

For safety related applications you may use expansion module EM-TRF-USV, which ensures uninterruptible power supply. If the emergency power unit has been correctly connected and charged, it will supply power for the set operating times (&Technical Data for EM-TRF-USV).

Insufficient volume flow

If the volume flow rate provided by the ventilation and air conditioning system is too low, i.e. if the setpoint flow rate is not achieved, the controller emits an alarm \Leftrightarrow 16.

For safety related applications you should check whether then safety measures are required, such as alarms. You may use the alarm relay for switching operations.

Volume flow despite shut-off

If a volume flow is detected although the damper blade is in shut-off mode, the controller emits an alarm \Leftrightarrow on page 17.

For safety related applications you should check whether then safety measures are required, such as alarms. You may use the alarm relay for switching operations.



2 Technical data

Technical data										
Supply voltage	24 V AC ±15% 50-60 Hz 24 V DC ±15%									
	A Do not use 24 V AC and 24 V DC power supplies at the same time!									
	Optional: 230 V AC mains supply, only with the EM-TRF expansion module; optional: 230 V AC mains supply with UPS, only with the EM-TRF USV expansion module									
Power rating	The maximum power required depends on the construction of the tions with different equipment result in the following values:	controller. Typical construc-								
	Fume cupboard controller with control panel	35 VA								
	Room controller	29 VA								
	Room controller with room control panel	33 VA								
	Including all expansion modules	40 VA max.								
Connecting cable	Double-stack terminal blocks for cables with a cross section up to	2.5 mm ²								
	Note: Only up to 5 TCU3 controllers may be connected to the same 24 V voltage supply.									
Micro fuse	2 A, slow blow, 250 V, as glass fuse 5 x 20 mm									
Volume flow rate	Differential pressure transducer with room air induction to protect the measurement point									
measurement	Optional: Automatic zero point correction only with expansion module EM-AUTOZERO									
Actuator	Fast-running high-precision actuator, ∡ 90°: 3 s									
Flow rate setting time	≤ 2 s, depending on duct pressure									
Controller recovery time after supply voltage failure	< 500 ms									
Plug and play commu-	With automatic detection of the connected equipment and equipment	nent functions:								
nication system	Communication cable: 300 m max.									
	Number of controllers: max. 24 per segment									
Temperature range	Operation: 0 +50 °C									
	Storage: -10 +70 °C									
Humidity	<90 % no condensation									
Area of application	Enclosed spaces									
Protection level	IP 20									
IEC protection class	III (protective extra-low voltage)									

Technical data



Dimensions







Fig. 1: Dimensions

- ① Keep clear to provide access
- ¹ When combined with TAM, TVRK, TVR, TVA, TVZ, TVJ or TVT

3 Transport, storage and packaging

Delivery check

Check delivered items immediately after arrival for transport damage and completeness. In case of any damage or an incomplete shipment, contact the shipping company and your supplier immediately.

A complete shipment includes:

- Electronic controller in a closed two-part casing, including:
 - Bracket for the cover
 - 2 cable glands, plastic (black)
 - 2 cable clips for strain relief (reusable)
 - Flow rate transducer (with tubes connected)
 - 2-pin plug connector for connection X1
 - 3-pin plug connector for connection X5 (sensor AI)
 - Network patch cable, 5 m, S-FTP green (only for fume cupboard controllers, equipment function FH-xxx)
- Expansion modules as ordered (see delivery note)
- Operating and installation manual

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TCU3 is usually factory mounted to a TROX VAV terminal unit.

If any expansion modules have been ordered, the controller is factory fitted with these modules and shipped as a complete unit.

Transport on site

- If possible, take the controller in its transport packaging up to the installation location.
- Do not remove the protective wrapping until just before installation.

Storage

For temporary storage please note:

- Leave the device in its packaging and do not expose it to the effects of weather.
- Store the product in a dry place and away from direct sunlight
- Temperature -10 ... +70 °C, humidity 90% max. (no condensation)

Packaging

Properly dispose of packaging material.



4 Product description

Volume flow control with TCU3



Fig. 2: Example

- 1 VAV terminal unit, e.g. TVR
- 2 Differential pressure sensor
- 3 Electronic controller TCU3
- 4 Actuator
- 5 Sticker showing installation orientations

TCU3 is used together with a VAV terminal unit for the control of variable supply or extract air flows.

TCU3 includes a diaphragm pressure transducer that transforms the differential pressure (effective pressure) into an electric signal. The controller compares the actual value with the setpoint value and alters the control signal of the actuator if there is a difference between the two values.



Interfaces and signal lamps on the controller casing



Fig. 3: Controller casing

Status LEDs

No.	Colour	Meaning	LED	Description						
1 Red	Red	Error	LED on	Up to 3 s: Switch-on procedure. Permanent: Switch-on procedure error						
			LED blinking	Error; for detailed diagnosis use EasyConnect software						
			LED blinking slowly	Undefined equipment function; for detailed diagnosis use EasyConnect software						
			LED off	Normal operation; if no. 5 is also off \Rightarrow Equipment not ready for operation						
2	Yellow	Cable termina-	LED on	Cable termination is enabled						
		tion	LED off	Cable termination is inactive						
3	Green	Not used								
4	Yellow	Data reception	LED on	Data is being received from several controllers						
		in progress	LED on with brief inter- ruptions	Data is being received from few controllers						
			LED off	No data reception						
5	Green	Controller opera-	LED blinking slowly	Normal operation						
		tion (heartbeat)	LED flickering	Controller operation; PC communication with EasyCon- nect configuration/diagnosis software						
			LED off	Device not ready						



External interfaces

No.	Meaning	Connection point for	Description
6	Contact 500 mm (X1)	Sash	Connection for a volt-free switch contact used to monitor the maximum operational sash opening (to EN 14175, only for fume cupboard controllers)
7	Terminal-1 (X2)	Control panel 1	Connection point for:
	Terminal-2 (X3)	Control panel 2	 EASYLAB control panel, e.g. BE-SEG-xx, BE-LCD-01 PC with EasyConnect software with BlueCon adapter Special configuration cable
8	Actuator (X4)	Actuator	The damper actuator is factory fitted if the actuator is part of the supply package (not for TAM).
9	Sensor (X5)	Analogue input Al5	On a fume cupboard controller: Equipment function FH-VS \Rightarrow face velocity transducer; can otherwise be used for the connection of variable extract air or supply air volume flows with a 0-10 V DC signal. (Characteristic can be configured)
10	Comm-1 (X6)	Communication 1	RJ45 socket for SF-UTP network patch cables
	Comm-2 (X7)	Communication 2	
11		Fume cupboard lighting	230 V AC socket, switching with control panel Only for use with expansion module EM-LIGHT.Max. switch rating of TCU3 relays: 250 V AC 8 A; switch-on current 12 A.

For details on the electrical data for each connection see & Appendix 'List of terminal connections' on page 28



Interfaces and signal lamps in the controller casing



Fig. 4: Interfaces and signal lamps on the PCB

No.	Meaning	Description	lescription									
1	Valve connection	Connection point for expansion module EM-AUTOZERO										
2	Analogue input 1 (Al1)	Connection point for the inter 0-10 VDC, 10 mA max.	connection point for the integral diaphragm pressure transducer, analogue voltage -10 VDC, 10 mA max.									
3	Expansion slot 1 (ESP- KOM)	Connection point for expanse Modbus expansion EM-BAC	ion modules, e.g. LonWorks® EM-LON, or BACnet or C-MOD-01									
4	Power 24 V	LED on	24 V supply voltage OK									
		LED off	24 V supply voltage failed / sags									
5	Connection of mains supply	Connection for EM-TRF and	I EM-TRF-USV expansion modules									
6	Status display for digital	LED on	Digital input DI is used									
	inputs DI1DI6	LED off	Digital input DI is not used									

Product description



No.	Meaning	Description									
7	Status display for digital	LED on	Digital output DO switched								
	outputs DO1DO6	LED off	Digital output DO not switched								
8	Terminal block DO1DO6	Digital output 16	Changeover relays								
			max. 250 V AC 8 A, switch-on current 12 A max.								
9	Terminal block, 24 V supply	Supply voltage 24 V AC or 2	24 V DC								
	voltage	▲ Do not use 24 V AC and 24 V DC power supplies at the same time!									
10	Terminal block AO1 AO3	Analogue outputs 13	Can be configured for 0-10 V DC, 10 mA max.								
11	Terminal block DI2DI6	Digital inputs 26	For volt-free switching contacts 5 V DC xx mA								
12	Terminal block TI1	Input for temperature senso	or PT1000								
13	Terminal block AI1AI4	Analogue inputs 14	Can be configured for 0-10 V DC, 10 mA max.								
14	Clip / connection	Strain relief / connection for	r communication cable shield								
15	↓ Functional earth	Connection point for the fun (EMV)	ctional earth to improve electromagnetic compatibility								
16	COMM-1 connection	Alternative terminals for the communication cable; in general, however, connection									
	COMM-2 connection	points Comm-1 (X6) and Comm-2 (X7) should be used (Fig. 3/10).									
		SF-UTP network cable									
17	COMM terminal resistor	Switch ON	Communication cable termination is active								
		Switch OFF	Communication cable termination is inactive								
18	Not used	ot used									

For details on the electrical data for each connection see & Appendix 'List of terminal connections' on page 28

Volume flow rate monitoring

The controller monitors the volume flow rate. If the actual value deviates by more than 4% from the setpoint value, a signal is emitted:

- The red LEDs (on opposite sides of the controller casing) blink continuously.
- The alarm relay contact of the controller opens.

External signalling (only with optional equipment):

 Displayed on the control panel (BE-SEG-02 and BE-LCD):

- Red light and sound (flow rate below setpoint)
- Yellow light (flow rate above setpoint)
- Signalling to the central BMS (only with expansion module EM-LON, EM-IP or EM-BAC-MOD)

When installed, the controller is usually not accessible and the LEDs are not visible; for safety related applications, however, signals should be made visible (with an alarm relay, by others).

Shut-off monitoring

The controller monitors the damper blade position; if a volume flow is detected although the damper blade is in shut-off mode (override control), an alarm is emitted:

- The red LEDs (on opposite sides of the controller casing) blink continuously.
- The alarm relay contact of the controller opens.

External signalling (only with optional equipment):

- Displayed on the control panel (BE-SEG-02 and BE-LCD):
 - Yellow light (flow rate above setpoint)
- Signalling to the central BMS (only with EM-LON, EM-IP or EM-BAC-MOD)

When installed, the controller is usually not accessible and the red LEDs are not visible; for safety related applications, however, signals should be made visible, either on the control panel or by the central BMS, or with an alarm relay (alarm relay by others).

5 Installation

Installation orientation

The installation orientation of the controller is critical because of the diaphragm pressure transducer; approved installation orientations are shown on a sticker (Fig. 5) on the controller casing.





- Installation orientation OK
- Installation orientation not OK

Install the controller only as follows:

- On horizontal ducts (left side of the sticker)
 - Only on the side of a duct
 Do not install the controller above or below a duct and neither anywhere in between.
- On vertical ducts (right side of the sticker)
 - Any installation orientation

Alternative installation orientation

The installation orientations shown on the sticker apply to the controller at the time of shipping. They depend on the position of the diaphragm pressure transducer in the controller casing. If you install the controller above or below a duct, you have to adapt the position of the diaphragm pressure transducer § 18.

Installation



Alternative installation position of the diaphragm pressure transducer



Fig. 6: Original position of the diaphragm pressure transducer at the time of shipping

The diaphragm pressure transducer (Fig. 6/1) and its holder (Fig. 6/2) are factory fitted in such a way that the installation orientations of the controller correspond to the sticker.

If necessary, you can adapt the controller for installation above or below a duct. To do so, you have to turn the diaphragm pressure transducer by 90°.



 Grasp the diaphragm pressure transducer together with the holder and carefully lift it out of the casing. Be careful so as not to kink the pneumatic measuring tubes or to inadvertently disconnect any wires or cables.



 Turn the diaphragm pressure transducer by 90°.



Insert the holder with the diaphragm pressure transducer again.

If the position of the diaphragm pressure transducer has been adapted, the controller must not be installed on the side of horizontal or vertical ducts.



Wall installation

In restricted spaces you can detach the controller from the VAV terminal unit and install it on the wall next to the terminal unit or anywhere else nearby; to fix the controller on a wall, you can use a mounting bracket (Part no. E346GL3).

Do not extend the actuator cable or any measuring tubes.

Be sure to install the controller according to the sticker showing the correct installation orientations § 17.



Fig. 8: Detaching the controller

1. Use a screwdriver to flip up the lug (1) and lift the controller.

In some cases, e.g. with TVLK, the controller is factory fitted to the terminal unit without a bracket.

Fig. 7: Tubing

 Check all connections and make sure that the tubes and wires of the transducer are properly connected and have not been kinked.

Connect any disconnected wires on the PCB:

Valve (1) - Connection to 'Valve' (Fig. 4/1)

Diaphragm - Connection to pressure *'Transducer'* (Fig. 4/2) transducer (2)

Wiring





2. ► Use suitable screws Ø 4 mm to fix the mounting bracket to the wall.



 Press the controller casing as shown onto the mounting bracket until it clicks into place.

6 Wiring

Safety notes

A 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.

Risk of damage to the controller

For wiring please note:

- Do not connect the 24 V supply if the EM-TRF or EM-TRF-USV expansion module has been installed.
- Do not connect 230 V and 24 V supply voltage at the same time.
- Do not connect Terminals 1 + 2 with Comm 1 + 2.
- Do not connect 24 V AC and 24 V DC supply voltage at the same time.

Notes on wiring

Use only cables that are designed for the supply voltage for which they will be used. The length and cross section as well as any contact resistance may increase voltage losses. The power rating of each unit must also be considered. A skilled qualified electrician has to select the correct cable types and sizes. This job must only be carried out by specialist electrical companies.

- For the electrical connection comply with any applicable regulations and follow the code of good practice. Be sure to comply with the applicable VDE guidelines and local regulations.
- The connection data can be found on the rating plate or in the wiring diagrams.
- Protect any connections from physical damage.
- Feed cables through the cable glands on the controller casing.
- Ensure that the device can be de-energised (all phases) for maintenance such that no voltage is present. This requires separators (e.g. fuses or RCBOs) near the controller; the distance between contacts should be at least 3 mm.

Additional information on wiring

See the following wiring documents:

- List of terminal connections, & Appendix 'List of terminal connections' on page 28
- Notes on wiring EASYLAB controller TCU3 (separate document)
- Project-specific wiring documents, if any

Voltage supply for a limited number of controllers

Only up to 5 TCU3 controllers may be connected to the same 24 V AC or 24 V DC voltage supply and using double-stack terminals (limitation of currents on the PCB and terminals).

Polarity of the power supply

Be sure to maintain the correct polarity when you wire up controllers to AC and DC voltage supplies.

Functional earth



The controller is fitted with a functional earth connection. It is used to improve electromagnetic compatibility (EMC)

We recommend you to connect the device to equipotential bonding in order to improve electromagnetic compatibility.

Strain relief

Use the cable clips in the casing for all connection cables inside the casing.

Cabling

Be careful so as not to kink or disconnect the measuring tubes on the VAV air terminal unit.



7 Commissioning

Checking / adjusting the configuration settings

Controller parameters are factory set as ordered.

Carry out commissioning based on any project-specific data and the project-specific wiring documents..

Connection setup using the EASYLAB configuration cable



 Using a PC or notebook and the TROX EasyConnect configuration software, you can verify the configuration settings and adjust them if necessary.

To do so, use a configuration cable (USB-RS485) to connect a PC or notebook with the controller.

The required cables and adapters are available as accessories (part no. B588NF4).

Connect your PC or notebook to Terminal-1/-2 on the controller (Service X2 / X3); if a control panel has been connected, you can use the service socket on the control panel to connect your PC or notebook.

Alternatively: BlueCon Bluetooth adapter



You can also establish a wireless connection (Bluetooth) between the controller and your PC. To do so, plug in the BlueCON module at the controller. This requires a Bluetooth interface on the PC or notebook (either integral hardware or external, e.g. with a USB stick).

Connect your PC or notebook to Terminal-1/-2 on the controller (Service X2 / X3); if a control panel has been connected, you can use the service socket on the control panel to connect your PC or notebook.

Zero point correction of the diaphragm pressure transducer



2.

Commissioning

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Zero point correction of the diaphragm pressure transducer is required as part of commissioning (not required for controllers with expansion module EM-AUTOZERO).

The EasyConnect software recognises the system configuration and guides you through the required steps. Zero point correction: Remove the two measuring tubes (blue and white) (1) from the angled pieces (2) on the sensor tube or from the T pieces (3) on the controller.

When the zero point correction is finished, reconnect the measuring tubes.

Adjusting (adapting) the actuator



4. VAV terminal units with a TROX actuator NMQ24A-SR TR (M466EQ0) have to be adjusted as part of commissioning. This ensures that any incorrect position, e.g. due to shipping or installation, is corrected. To adjust the actuator, press the green 'Adaption' button. The status LED lights up (orange) and the actuator is moved to its end position. When adjustment is complete, the status LED goes off.

Functional test

 As the final step of commissioning, test the function of the controller according to the project specifications for the required operating modes. Compare the volume flow rate setpoint value for each operating mode with the actual value and document the results. Also check if alarms are emitted and signalled.



8 Maintenance

Operation and maintenance

The electronic components of the controller do not require maintenance. Special maintenance requirements may apply to the VAV terminal unit, however, depending on where it is installed.

For example, the function of fume cupboard controllers should be checked once a year according to DIN 12924, EN 14175, BGR 120 (Rules for safety and health protection/laboratories) and the German TRGS 526 (Technical Rules for Hazardous Substances).

The system owner is responsible for operational reliability. Switch off the supply voltage and secure it against being switched on accidentally before working on any electrical equipment.

Zero point correction

To ensure continued accuracy of volume flow measurements, zero point correction of the diaphragm pressure transducer is required in regular intervals (not required for controllers with expansion module EM-AUTOZERO). Carry out manual zero point correction at least once per year as part of a functional test or maintenance. Zero point correction is automatically carried out in regular intervals for controllers with expansion module EM AUTOZERO.



- For manual zero point correction remove the two measuring tubes (blue and white) (1) from the angled piece (2) on the sensor tube or from the T pieces (3) on the controller.
- Connect the controller to your PC (EasyConnect software is required), see
 Connection setup using the EASYLAB configuration cable' on page 22.
- Start zero point correction with the EasyConnect software, 'Diagnosis I/O ' function.
- When the zero point correction is finished, reconnect the measuring tubes.

Replacing the fuse

If the glass fuse has blown, replace it only after the error has been diagnosed and solved. Replacement fuse \Leftrightarrow on page 9.

9 Decommissioning

Removing the electronic controller

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.
- 1. Interrupt the voltage supply to the controller.
- 2. Disconnect tubes and wires.
- Detach the controller from the mounting bracket, Fig. 8.
- Dispose of the controller in compliance with legal requirements.



Appendix

A Wiring example



Max. Isolationsspannung Klemme	Breakdown voltage of terminal	1.6 KV	1.6 KV	1000 VAC	1000 VAC	1.6 KV	1000 VAC	1000 V	1.6 KV	1.6 KV	1.6 KV	1.6 KV	1.6 KV	1.6 KV	1.6 KV	1.6 KV	1.6 KV	1.6 KV	1.6 KV	1.6 KV	2.5 KV	1.6 KV					
Max. Strom	Max. current	10 mA	10 mA	200 m.A	200 m.A	10 mA		8A	8A	8A	8A	8A	8A	10 mA	10 mA	10 mA	10 mA	10 mA	10 mA	10 mA			10 m.A				2 A
Max. Spannung	Max. voltage	10 VDC	5 VDC	24 VDC	24 VSC	24 / 10 VDC		230 VAC	5V	5V	5V	5V	5V	24 / 10 VDC	10 VDC			10 VDC				24 VAC / 24 VDC					
Länge	Length	1 m / 3.3 ft	max. 100 m / 330 ft	max. 40 m / 131 ft	max. 40 m / 131 ft	max. 10 m / 33 ft	max. 300 m / 984 ft							max. 40 m / 131 ft	max. 40 m / 131 ft	max. 40 m / 131 ft	max. 40 m / 131 ft	max. 40 m / 131 ft	max. 10 m / 33 ft	max. 10 m / 33 ft			max. 10 m / 33 ft			max. 10 m / 33 ft	
Adernzahl	No. of wires	3	2x2x0.8	8	8	3 x 0.34	8	2 x 0.75	2 x 0.75	2 × 0.75	2 x 0.75	2 × 0.75	2 x 0.75	3 x 0.75	2 x 0.75			2 x 0.75				2 x 1.5					
Arderquerschnitt	Wire cross section	0.2 - 2.5 mm ² / 12 - 30 AWG	0.2 - 2.5 mm ² / 12 - 30 AWG	26AWGx4P	26AWGx4P	0.2 - 2.5 mm ² / 12 - 30 AWG	26AWGx4P	0.2 - 2.5 mm ² / 12 - 30 AWG	0.2 - 2.5 mm ² / 12 - 30 AWG	0.2 - 2.5 mm ² / 12 - 30 AWG	0.2 - 2.5 mm ² / 12 - 30 AWG	0.2 - 2.5 mm ² / 12 - 30 AWG	0.2 - 2.5 mm ² / 12 - 30 AWG	0.14-1.5 mm ² /16-26 AWG	0.14-1.5 mm ² / 16-26 AWG	0.14-1.5 mm ² / 16-26 AWG	0.14-1.5 mm ² / 16-26 AWG	0.14-1.5 mm ² /16-26 AWG	0.14-1.5 mm ² / 16-26 AWG	0.14-1.5 mm ² /16-26 AWG	0.14 - 1.5 mm ² / 16 - 26 AWG	0.14 - 1.5 mm ² / 16 - 26 AWG	0.14 - 1.5 mm ² / 16 - 26 AWG	0.14 - 1.5 mm ² / 16 - 26 AWG	0.14 - 1.5 mm ² / 16 - 26 AWG	0.2 - 1.5 mm ² / 16 - 26 AWG	0.2 - 2.5 mm ² / 12 - 30 AWG
chluss	nection	Actuator (AO4)	Contact 500 mm	Teminal-1	Teminal-2	Sensor AI5	Com-1 / Com-2	NO/NC/C	NO/NC/C	NO/NC/C	NO/NC/C	NO/NC/C	NO/NC/C	DI2 - GND	DI3 - GND	DI4 - GND	DI5 - GND	DI6 - GND	AI1-GND	AI2 -GND	AI3 -GND	AI4 -GND	AO1 - GND	AO2 - GND	AO3 - GND	TI1 -GND	L1/24-L2/GND
Anso	Conr	X4	X1	x	X3	X5	X6 / X7	DO1	D02	D03	DO4	D05	D06	DI2	DI3	DI4	DI5	DI6	AI 1	AI 2	AI 3	AI 4	A01	AO2	AO3	T11	Power 24V

B List of terminal connections

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