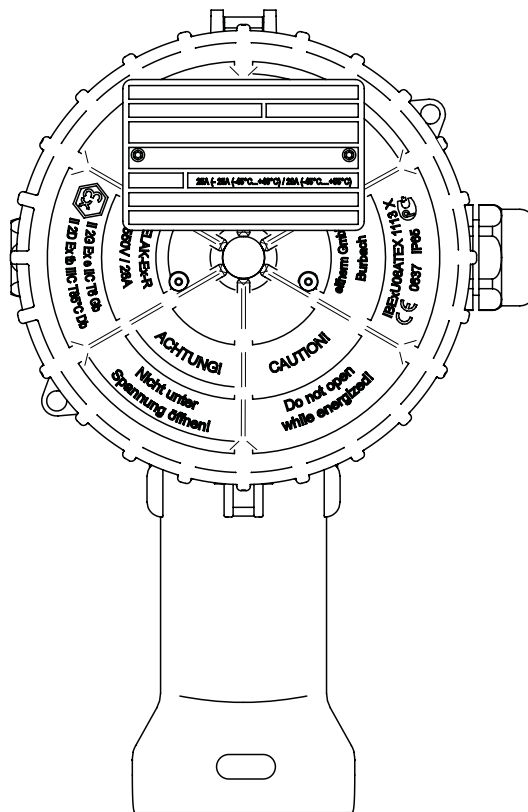


OPERATION- MANUAL



Ex-TC/...-It

Temperature controller up to 450°C
for pipe mounting

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IMPORTANT INFORMATION

- RETAIN FOR LATER USE



Please follow these instructions for proper and safe use of the Ex-TC/...-It temperature controller.
Please retain these instructions for later reference purposes (for example in the system documentation).

- FOR DISPOSAL



The WEEE logo indicates that this product must not be disposed of with residential waste.
Further information about disposal and recycling of old electrical and electronic devices and where to find collection points is available from your local disposal company or from the manufacturer from which you bought the product.

RECEIPT OF GOODS

Upon receipt of the goods, check the controllers and accessories and compare the information on the type plate with the information on the delivery bill to ensure that the correct material has been delivered.

STORAGE

NOTE

Storage should be in a dry place at an ambient temperature of 0°C to 50°C.

Display conventions

Particularly important points in these instructions are indicated by the following symbols:



ATTENTION

Refers to a potentially dangerous situation.
If it is not prevented, there is a risk of damage or malfunction.



DANGER

Refers to an extremely dangerous situation. If it is not prevented there is risk of death or at least a high risk of serious injuries.



NOTE

Important information and instructions for safe, effective and environmentally compatible usage.



WARNING

Refers to a dangerous situation. If it is not prevented there is risk of injury or at least a high risk of material damage.

Proviso

We reserve the right to make technical changes. Changes, errors or misprints shall not form the basis for any claim to compensation for damages. Comply with the applicable and currently valid standards and regulations for safety-related components and systems.

eltherm GmbH Ernst-Heinkel-Str. 6-10 57299 Burbach T.: +49 2736 4413-0 F.: +49 2736 4413-50 info@eltherm.com	Document: 8643050X601X1		Operation Manual Ex-TC/...-It Temperature controller up to 450°C for pipe mounting	
	Author:	Peter Schmidt	Date:	30.10.2019
	Revision: 05	Julian Engel	Date:	04.06.2025

FUNCTIONAL DESCRIPTION & TECHNICAL DATA

TECHNICAL DATA

HOUSING

Material	Polyamide, non-conductive, UV-resistant
IP protection type	IP 65
Cable entries for mounting base	1x flat, 1x round
Line dimensions	Ø 3-5 mm (sensor) 4.0x11 mm - 5.5x14 mm (trace heater - suitable for ELSR-N, -LS, -H, -H+, -SH, -SHH)
Permitted jacket materials	TPE min. 0.7 mm; fluoropolymer min. 0.4 mm
Cable entries housing	Polyamide
Max. width of strap	16 mm
Possible pipe diameters	≥ 20 mm
Interference immunity	min. 7 J
Weight	approx. 1.5 kg

CONTROLLER

Nominal voltage	230 ± 10% V AC, 50 Hz	
Nominal load	Single pole Max. 25 A (+ 40 °C) Max. 20 A (+ 50 °C)	T6 with connecting line ≥ 2.5 mm ² T6 with connecting line ≥ 2.5 mm ²
External fuse protection	25 A (20 A)	
Power consumption approx.	5 VA without load	
Sensor connection	Intrinsically safe 2-wire connection (jumper required between terminals 2 and 3) or 3-wire connection with automatic conductor compensation up to max. 20 Ω	
Relay output for collective alarm (not /M)	1 N/O contact 3 A, 250 VAC, 100 VA or 5 A, 24 VDC, 100 W	
Modbus (/M only)	RS485 RTU (max. 120 devices), Um = 6Vmax	
Temperature unit	°C	
Measuring range	-99 ... 450 °C	
Setpoint range	1 ... 450 °C (T1), factory setting: 5 °C	
Undertemperature alarm (not /L)	1 ... 450 °C, factory setting: 5 °C	
Overtemperature alarm (/AL only)	1 ... 450 °C, factory setting: 180 °C	
Switching accuracy	± 2 K	
Hysteresis	< 100 °C: + 3 K > 100 °C: + 3%	
Limiter reset value (only /L & /AL)	5 K below trigger value	
Setpoint setting	One rotary knob each for hundreds, tens and ones place (0...9)	
Connection cross-sections	0.2 ... 4 mm ²	
Terminal tightening torque	0.6 ... 0.8 Nm	

Intrinsically safe measuring circuit (maximum values) U₀=2.5 V, I₀=36.8 mA, P₀=40 mW, R=155 ohms

Ex ib	IIC			IIB, IIIC		
Max. external inductance	44 mH	10 mH	1 mH	100 mH	10 mH	1 mH
Max. external capacitance	1,2 µF	7,1 µF	14 µF	28 µF	65 µF	110 µF

OPERATING TEMPERATURE

Adapter	-20 °C up to +100 °C
Mounting post	-20 °C up to +200 °C
Housing (depending on the cable gland)	-45 °C up to +50 °C
Controller (depending on load)	-55 °C to +40°C (25 A) / +50 °C (20 A)

DESCRIPTION

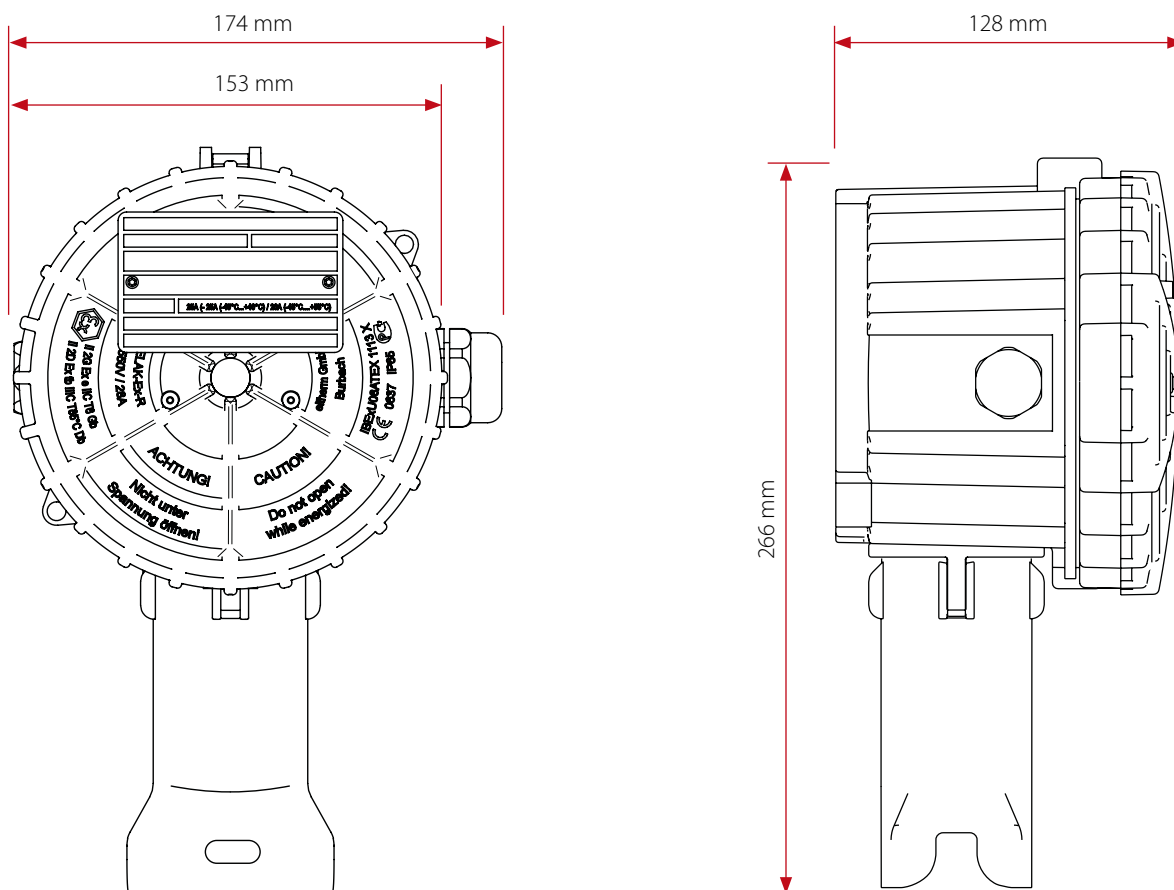
The electronic temperature controller Ex-TC/...-It is part of an eltherm family of microcontroller-supported electronic temperature controllers and limiters. It is designed for operation with electrical trace heating systems and can be used to maintain temperatures and for frost-protection applications in areas subject to explosion hazard. The control keys and sensor connections are designed to be intrinsically safe.

All models have a sturdy plastic housing to IP 65 and a mounting base flanged onto the housing that is optimally suited for mounting pipelines. Depending on the intended purpose, the Ex-TC/... is available as a temperature controller with alarm relay, temperature controller including RS 485 interface with Modbus protocol or a controller/limiter combination with alarm relay. The Ex-TC/...-It is able to switch high nominal currents and with its round shape it ensures optimum mechanical safety. The cover closes quickly with a snap lock, making it easy to handle where it is used. All variants are suitable for use with our self-regulating trace heaters (ELSR) and resistance heating cables (ELK, ELP).

MODEL OVERVIEW

MODEL	ITEM-NUMBER	TYPE	ALARM	BUS
Ex-TC / A - It	0X60101	Controller (with collective alarm)	x	
Ex-TC / AL - It	0X60121	Controller and limiter (with collective alarm)	x	
Ex-TC / M - It	0X60131	Controller (with Modbus connection)		x

MODEL VIEWS



EXPLOSION PROTECTION

ATEX	II 2G Ex eb ib mb IIC T5/T6 Gb II 2D Ex ib tb IIIC T100°C...T85°C Db
IEC-Ex	Ex eb ib mb IIC T5/T6 Gb Ex ib tb IIIC T100°C...T85°C Db

CERTIFICATION

IBExU20ATEX1015X
IECEx IBE 20.0002X

STANDARDS

EN IEC 60079-0:2018
EN 60079-7:2016; EN 60079-11:2012; EN 60079-18:2015

LABELLING MOUNTING STAND

eltherm GmbH Burbach Ex-It
 II 2G Ex eb IIC Gb  II 2D Ex tb IIIC Db
IBExU09ATEX1023U, IECEx IBE12.0024U

LABELLING HOUSING

eltherm GmbH, Ernst-Heinkel-Str. 6-10, 57299 Burbach	
Type: Ex-TC/...-It Art-No.:	Serial-No.:
 II 2G Ex eb ib mb IIC T5/T6 Gb; II 2D Ex ib tb IIC T100°C/85°C Db IBExU20ATEX1015X 	
Ex eb ib mb IIC T5/T6 Gb; Ex ib tb IIIC T100°C/85°C Db IECEx IBE 20.0002X	
230V / 50Hz	25A (-40°C...+40°C) / 20A (-40°C...+50°C)
Do not open while explosive Atmosphere present!	

SPECIAL CONDITIONS according to TYPE EXAMINATION CERTIFICATE



DANGER

- An overvoltage category I/II/III in accordance with IEC 60664-1 is permitted for the "MODBUS" and "power supply" circuits.
- The power circuit must have external fuse protection with max. 25 A (40 °C) or 20 A (50 °C).
- The intrinsically safe Pt100 sensor that is connected can also be viewed as a simple electrical component in accordance with sensor 5.7 of IEC 60079-11.
- Ambient temperature range: -40°C to 40°C (25 A) and -40°C to 50°C (20 A)
- The minimum ambient temperature depends on which cable entries, reductions and sealing plugs are used and may vary.
- Mounting permitted exclusively with mounting base "eltherm It"
- Only cable entries, reductions and sealing plugs of ignition protection type "e" or "t" with EPL Gb or Db may be used. They must be fitted with a sealing ring, O-ring or shaped sealing elements.
- For operation at ambient temperatures > 40°C or with currents > 20A, the connection cables with cross-sections of at least 2.5 mm² must be used.
- The cable entries must be checked to ensure they are suitable for the connecting line provided.
- In addition to an overcurrent protective device, a FI circuit breaker in conformity with EN 60079-30-1 must be installed in TT or TN systems. For more information see the assembly and operating instructions of the connected heat tracing system.
- Safe and reliable operation of the device is only ensured if the technical operating parameters are observed (including nominal voltage, switching capacity and ambient temperature, etc.).
- It is not possible for the user to repair the device.
- The manufacturer shall not be liable for damage resulting from improper use or external influences. Unauthorised changes to the device will furthermore void any warranty claims as well as conformity with Directive 2014/34/EU.
- Measurements of the insulation resistance can be conducted if necessary after the device fully disconnected from the mains power. The measurement must be made between the voltage connection and load connection with maximum 1000V.

SAFETY INSTRUCTIONS



ATTENTION

- Mounting of the Ex-TC/...It should only be carried out by persons trained in working with Ex devices.
- Strict compliance with the applicable safety requirements in areas subject to explosion hazard is a precondition for the safety of persons, systems and devices.
- The persons tasked with planning, installation and maintenance have a special responsibility and must therefore be familiar with the exact details of the applicable regulations. This manual is intended for that group of persons and contains all important information required for working safely with Ex-TC control devices.
- The manual must be retained with the system documentation for later use and must be kept and made available throughout the entire service life of the product.

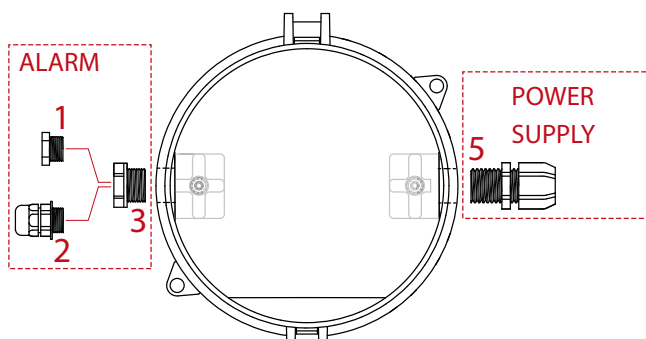
SCOPE OF DELIVERY



NOTE

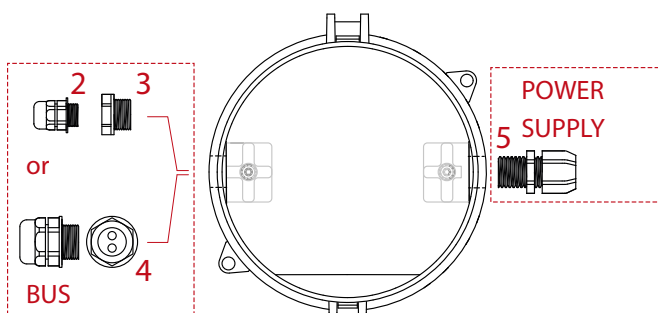
The connection sets required for safely and properly connecting the eltherm ELSR trace heaters are not included with delivery

Ex-TC/A-It & Ex-TC/AL-It



POS	Art.no.	Type	Tightening-torque [Nm]	Clamping-range
1	2576020056	Plug M20x1.5	2.00	
2	2576020058	Cable gland M20x1,5	2.30	4-13
3	2572580009	Reduction M25x1.5/M20x1.5	3.00	
5	2576025092	Cable gland M25x1.5	5.00	9-17

Ex-TC/M-It



POS	Art.no.	Type	Tightening-torque [Nm]	Clamping-range
2	2576020058	Cable gland M20x1.5	2.30	4-13
3	2572580009	Reduction M25x1.5/M20x1.5	3.00	
4	2576025050	Cable gland M25x1.5	3.00	2x7.2-8
5	2576025092	Cable gland M25x1.5	5.00	9-17

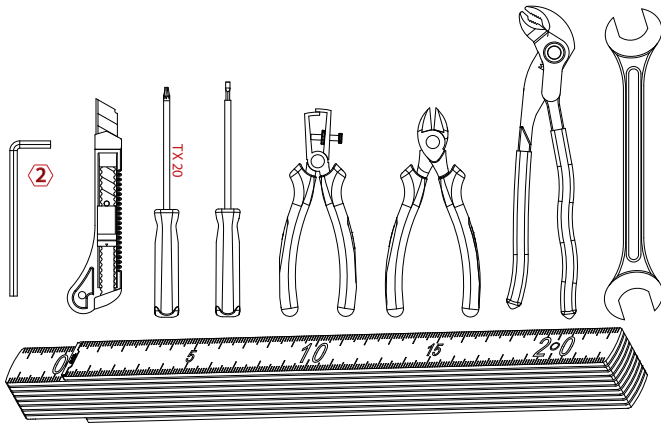
MOUNTING



ATTENTION

When selecting the mounting location, take into account the degree of mechanical hazard for the terminal housing as well as the IP protection type and the permitted operating temperature.

RECOMMENDED TOOLS

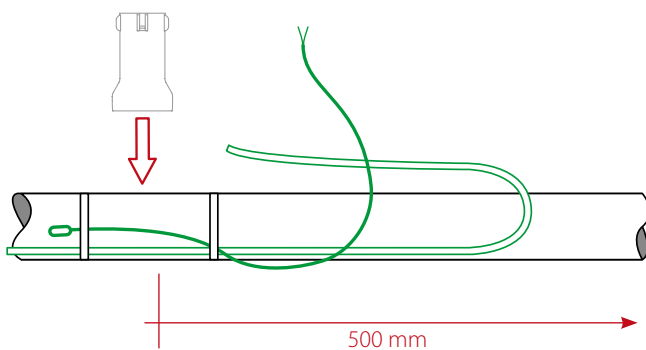


REQUIRED WRENCH SIZES

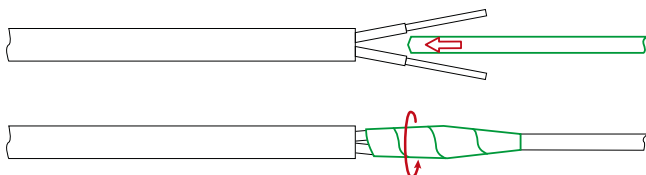
Fitting	Wrench sizes [mm]
M20x1.5	23, 24
M25x1.5	24, 29

MOUNTING ON THE PIPE

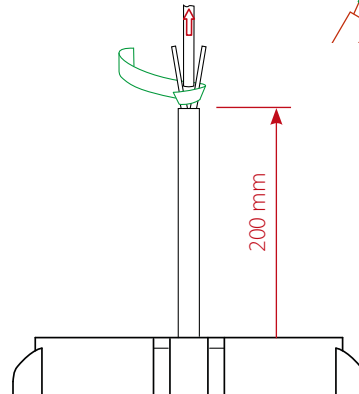
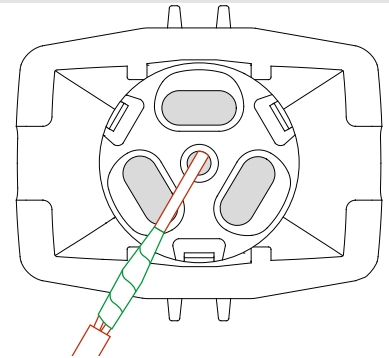
1 Do not fasten trace heater and sensor line at the planned measurement point approx. 500 mm.



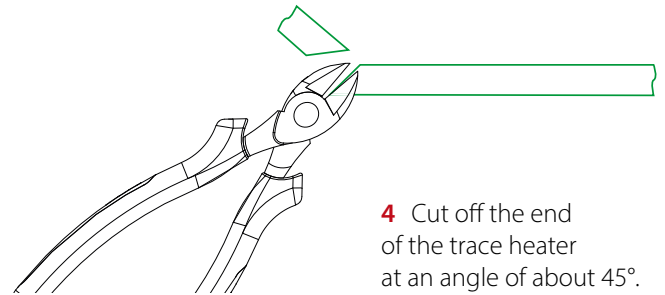
2 Prepare the end of the sensor line with a strong wire and by using adhesive tape to lead a sensor line into the mounting base.



2 Lead a sensor line into the opening provided and pull it about 200 mm into the mounting base.

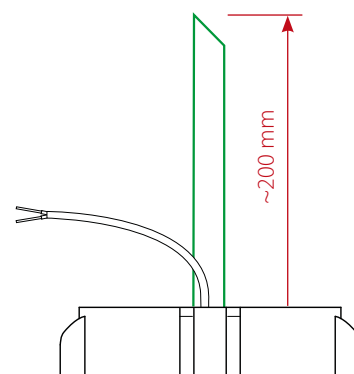
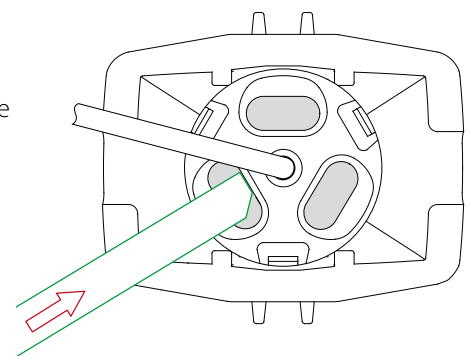


3 Remove the adhesive tape and strong wire from the sensor line.

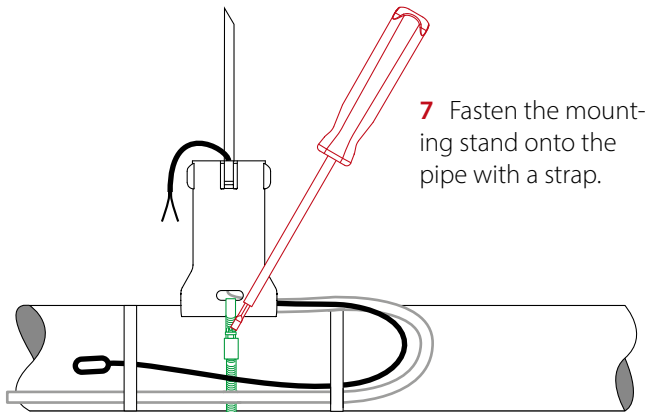


4 Cut off the end of the trace heater at an angle of about 45°.

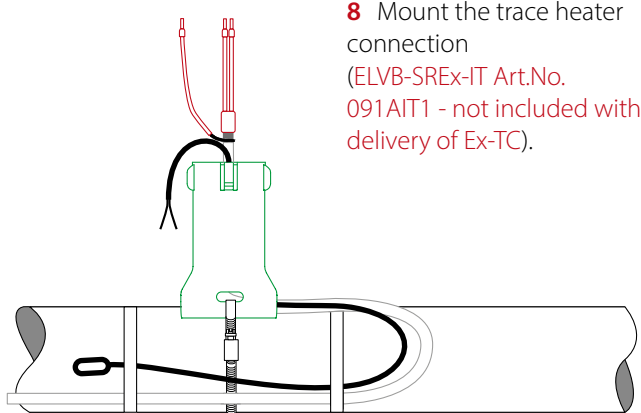
5 Guide the trace heater into the mounting stand.



6 Guide the trace heater about 200 mm through the mounting stand.



7 Fasten the mounting stand onto the pipe with a strap.

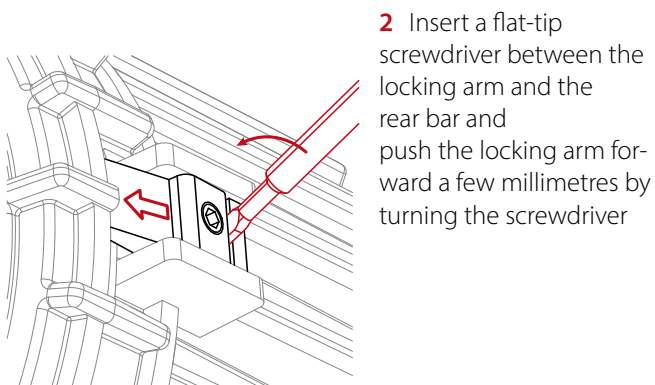
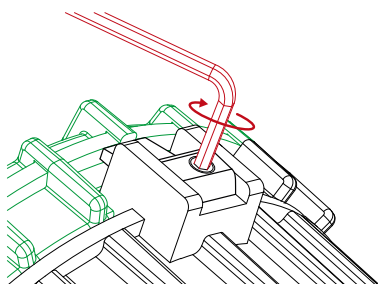


8 Mount the trace heater connection (ELVB-SREx-IT Art.No. 091AIT1 - not included with delivery of Ex-TC).

PREPARATION FOR THE ELECTRICAL CONNECTION

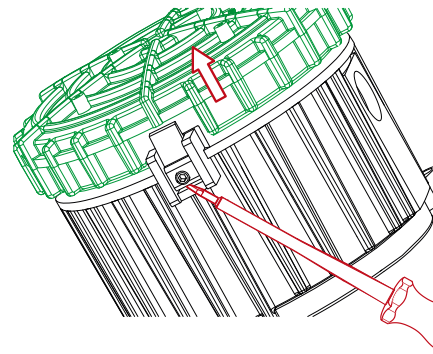
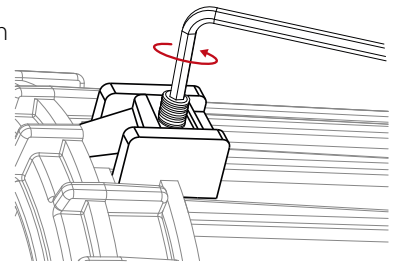
OPENING THE HOUSING

1 Tighten the headless screw with an Allen wrench (size 2) until the locking arm is flush with the side bars



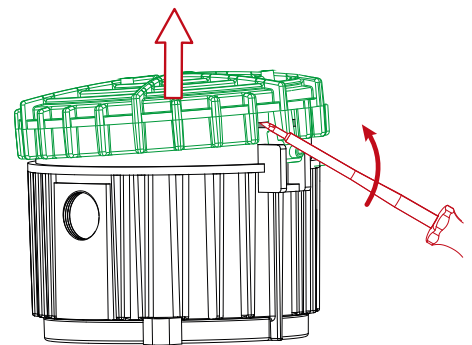
2 Insert a flat-tip screwdriver between the locking arm and the rear bar and push the locking arm forward a few millimetres by turning the screwdriver

3 Turn the headless screw back with the Allen wrench (size 2) until it is protruding slightly out of the locking arm.



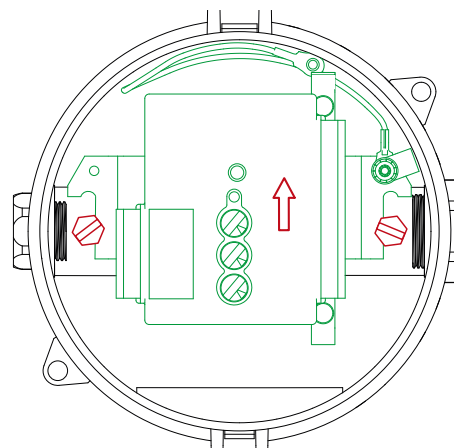
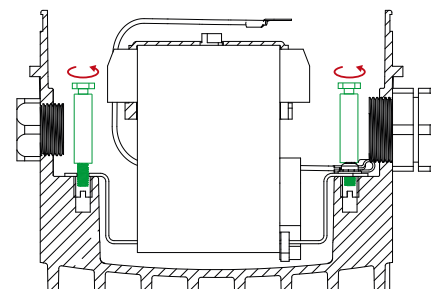
4 Raise the cover (using the-screwdriver)

5 Open the cover (using the-screwdriver)



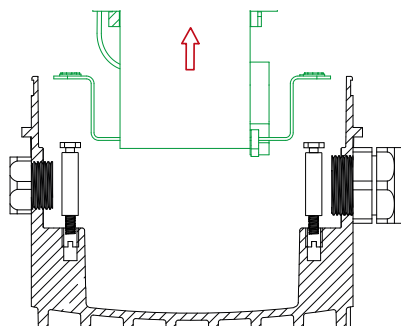
REMOVING THE CONTROLLER

6 Loosen retaining screws

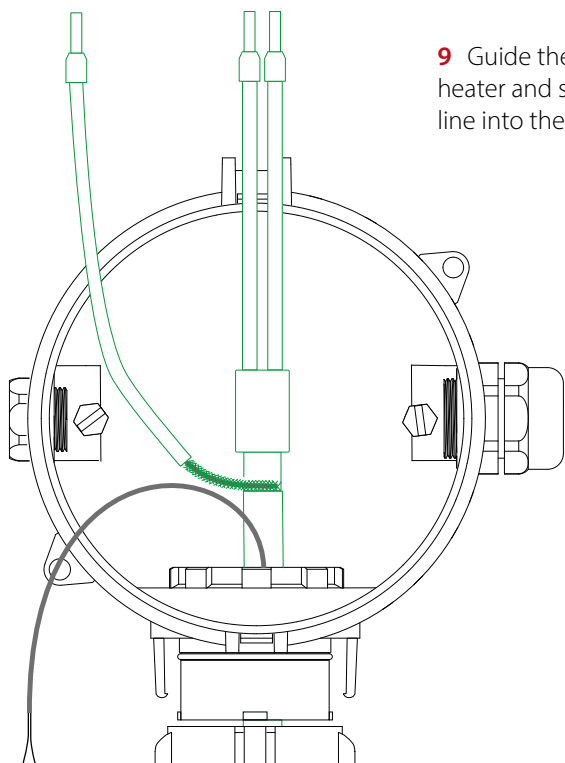


7 Slide controller out of the locking mechanism

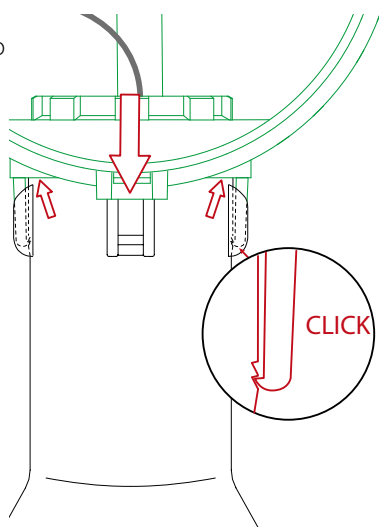
8 Remove controller from the housing



9 Guide the trace heater and sensor line into the housing.



10 Insert the housing into the mounting base until the holder is resting completely on the mounting base and the housing has audibly engaged.



i NOTE

Guide the cables into the cable glands provided for them - see section "Scope of delivery". Do not tighten the screw connections yet.

INSTALLATION



WARNING

Before starting work on trace heaters or connection cables, or on connection terminals, make certain the relevant power circuit is turned off and protected against being turned on again unintentionally

- Then check all the parts of the Ex-TC as well as any seals and O-rings in or on it to make certain they are clean and not damaged
- All the cables that are inserted must be laid permanently in place
- Connecting threads can be fitted with suitable reductions. Reductions must not be nested
- The electrical connections must not be made until after the lines and wall housing have been fixed in place
- Follow the order of assembly without exception!
- Guide a cable of the correct type and fitted appropriately into the housing. Do not tighten the cable glands yet.
- Prepare the cable ends for mounting (strip them)
- Connect the **power supply** and the **temperature sensor** to the corresponding terminals on the controller (see connection diagram, section "**CONNECTING THE CONTROLLER**").
- Do not connect the trace heater yet.



DANGER

Make certain there is no explosive atmosphere present and that none can occur.

Then turn on the power supply and make the settings as described in section "**ALARM & SETPOINT SETTINGS**" page 12.



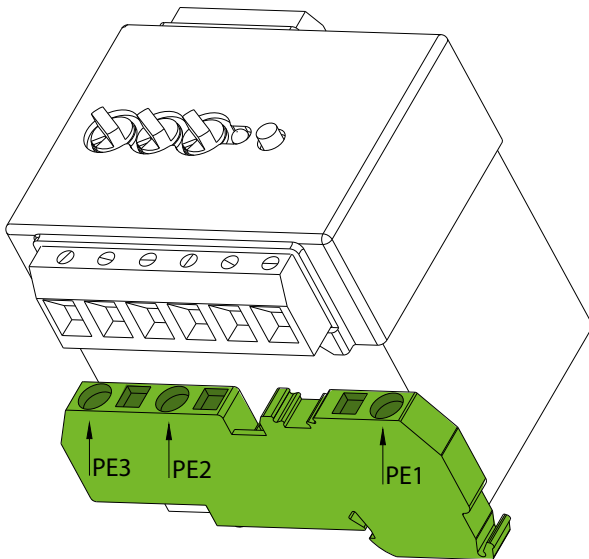
NOTE

Retain the settings that are made in the system documentation.

- Tighten the terminals finger-tight (torque between 0.6 and 0.8 Nm).
- Isolate the power circuit from the power supply again and connect the **signal lines** and **trace heater** to the corresponding terminals
- Tighten the terminals finger-tight (torque between 0.6 and 0.8 Nm)
- Tighten unused terminals as well
- Push the controller back into the lower position of the slotted holes and tighten the retaining screws (see following page "**INSTALLING THE CONTROLLER**" page 12).
- Close all openings (covers, threaded holes, cable entries). Take into account the torques in the "**TECHNICAL DATA**" section.
- Tightening the cable entries too tightly can adversely affect the IP protection type!

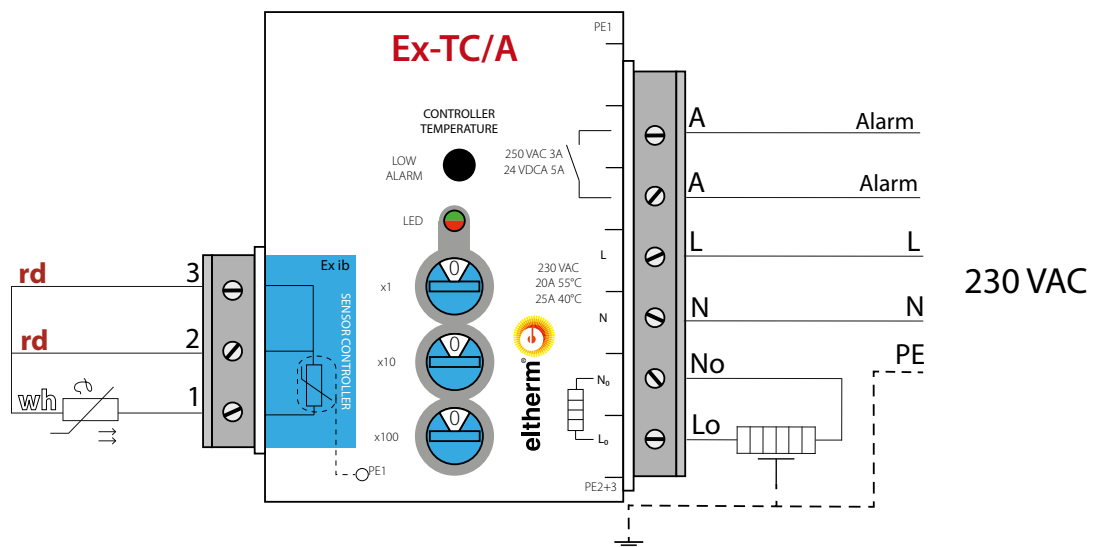
CONNECTING THE CONTROLLER

PE TERMINALS (for all Ex-TC devices)

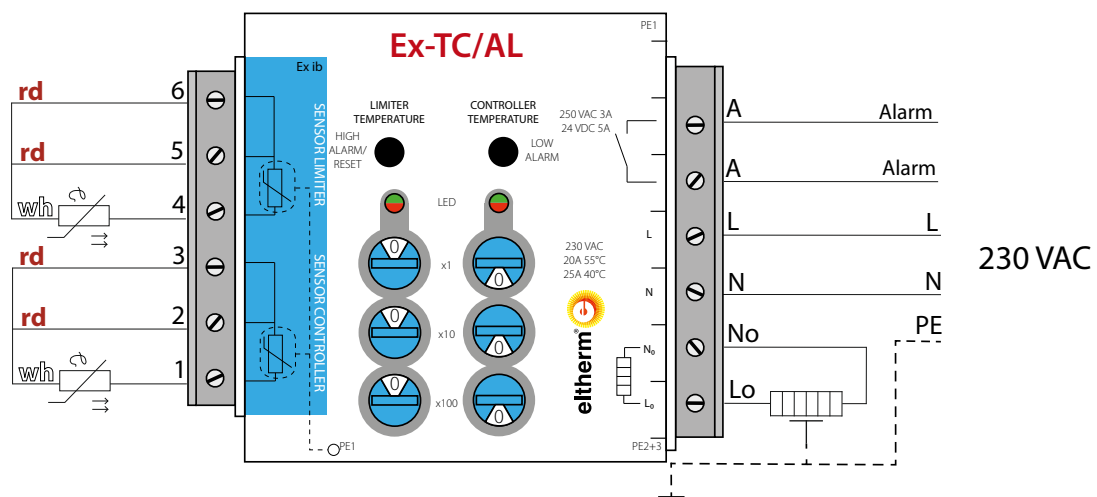


CONNECTION PLAN

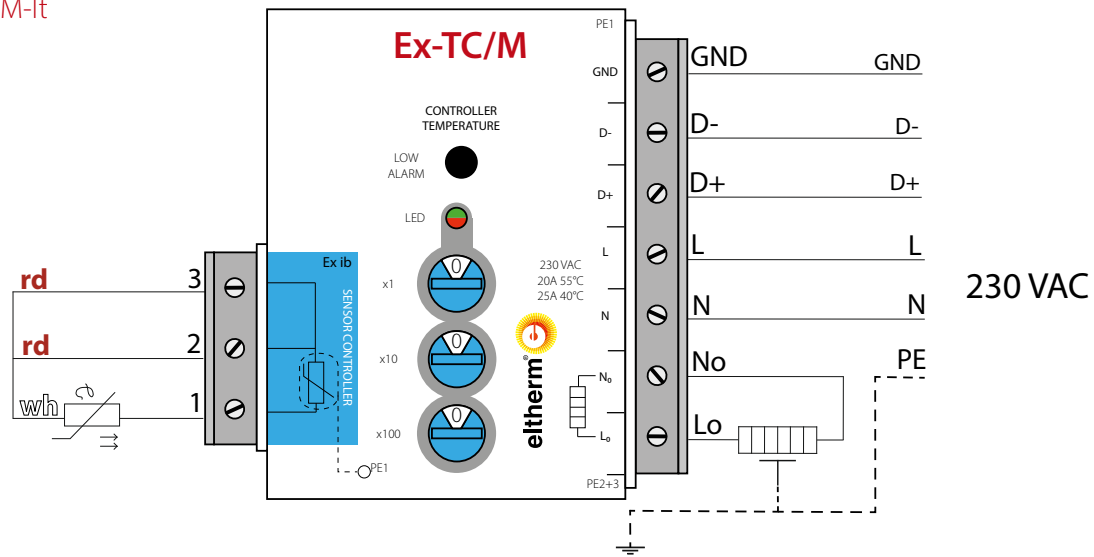
Ex-TC/A-It



Ex-TC/AL-It

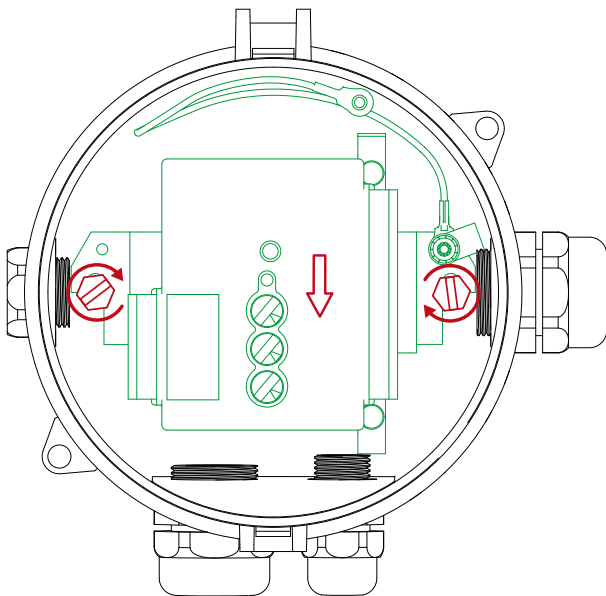


Ex-TC/M-It



INSTALLING THE CONTROLLER

1 Slide controller into the locking mechanism. Tighten retaining screws. Move the cable into its final position and tighten the cable glands

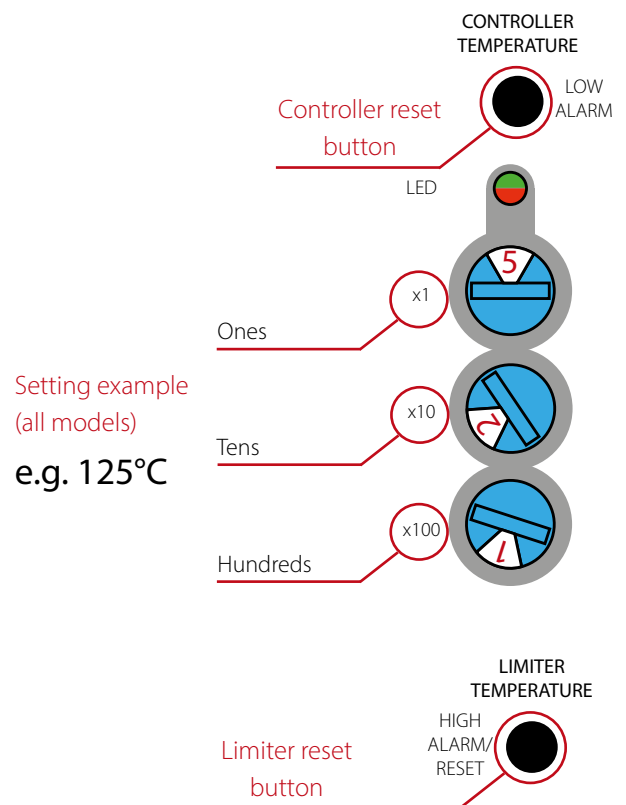


ALARM & SETPOINT SETTINGS



ATTENTION

Theoretical setting range 999°C.
Max. permitted setting range $\leq 450^{\circ}\text{C}$!



i NOTE

If the ACTUAL temperature is below the low temperature alarm during commissioning, the LED flashes **red** until the set low temperature alarm value is exceeded.

i NOTE

When powering on, switch the limiters in the Ex-TC/**AL** devices to "on" if there are no errors present and the **ACTUAL** temperature is below the limiter **SETPOINT** values.

Setting the undertemperature alarm (Ex-TC/A, /AL and /M)

Factory setting: 0°C

If the rotary knobs are set to "0 0 0" during initial commissioning, no settings can be made on the controller and the LED flashes **green** and **red**.

To make settings, the rotary knobs (labeled **CONTROLLER TEMPERATURE** above) must be set to a temperature >0°C, e.g. 5°C.

The selected value is visible in a recess at the edge of the rotary knob (see page 12).

To set the low temperature alarm, press and hold the programming button on the controller (**LOW ALARM**) until the LED flashes **green** (>5 sec.).

Set the desired lower temperature limit using the blue rotary knobs on the controller.

The selected value can be seen in a recess at the edge of the rotary knob.

To confirm press the programming button (**LOW ALARM**) for 1 to 2 seconds.

- **After 100 seconds the setting menu closes automatically without any values being saved.**

Then the desired temperature setpoint must be set again.

Setting the temperature setpoint (Ex-TC/A, /AL and /M)

Factory setting: 5 °C

Once the low temperature alarm setting has been completed, set the temperature setpoint.

Select the desired setpoint using the blue rotary knobs on the controller (see page 12).

It is not necessary to press the programming button to confirm the setpoint. Values outside of the setting range (> 450) will be indicated by a flashing LED alternating between **green** and **red**.

Temperature control remains inactive for this time.

Setting the overtemperature alarm (Ex-TC/AL)

Factory setting: 0°C

If the rotary knobs are set to "0 0 0" during initial commissioning, no settings can be made on the limiter and the LED flashes **green** and **red**.

To make settings, the rotary knobs (labeled **LIMITER TEMPERATURE** above) must be set to **1°C**.

To set the overtemperature alarm, press and hold the limiter reset button (**HIGH ALARM/RESET**) until the LED flashes **green** (>5 sec.).

Set the desired upper temperature limit using the blue rotary knobs on the limiter.

Confirm by pressing the reset button (**HIGH ALARM/RESET**) for 1 to 2 seconds.

The desired maximum temperature must then be set again.

- **After 100 seconds the setting menu closes automatically without any values being saved.**

Setting the maximum temperature (Ex-TC/AL)

Factory setting: 0°C

Once the overtemperature alarm settings have been completed, set the maximum temperature for the limiter using the blue rotary knobs on the limiter selector (see page 12).

The selected value is visible in a recess at the edge of the rotary knob.

It is not necessary to press the reset button to confirm the set maximum temperature.

MODBUS SETTINGS (Ex-TC/M)

- Disconnect the Ex-TC/M from the power supply
- Set the temperature adjustment buttons to 9 9 9 and connect Ex-TC/M to the power supply -> LED flashes **green** quickly
- Set the Modbus address with the temperature setting buttons (hundreds / tens / ones)
- Confirm the setting with the reset button -> LED flashes more slowly and is then lit continuously.
- Disconnect the Ex-TC/M from the power supply
- Connect the Ex-TC/M to the power supply, set the temperature setpoint and place the device in operation.

The following value are transferred by bus:

1. Data word **Controller IS** value, **HI, LO**
2. Data word **Controller REF** value, **HI, LO**
3. Data word **Controller Undertemperature alarm** value, **HI, LO**
4. Data word **Controller error**
Sensor error 0x01 0000 0001
Undertemperature alarm 0x02 0000 0010
Measuring range error 0x04 0000 0100

MODBUS PARAMETERS

MASTER-SLAVE application	Ex-TC/M
Interface	RS485
Format	RTU
Start bit	1
Data bit	8
Stop bit	1
Transmission rate	9600 Baud
Parity	none-parity
Slave ID	1...120

SUPPORTED MODBUS PROTOCOL FUNCTIONS

Code	MODBUS Function	Register	Action
03h	READ HOLDING REGISTERS	4xxxx	Read setpoints and error messages from controllers and limiters
08h	DIAGNOSTIC		Function test of slaves
10h	WRITE MULTIPLE REGISTERS	4xxxx	Send setpoints to controllers and limiters

i NOTE

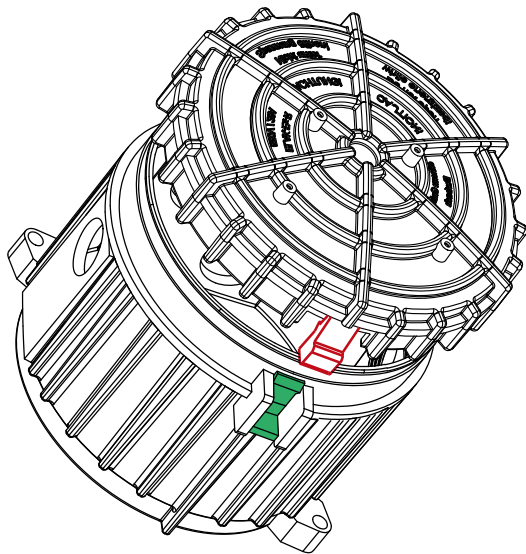
Retain the settings that are made in the system documentation.

COMPLETING THE INSTALLATION

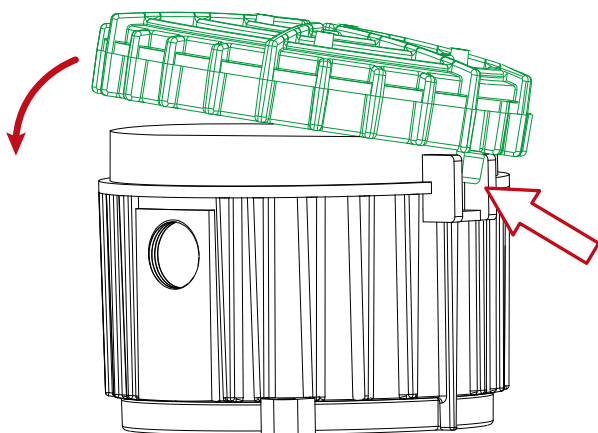
CLOSING THE HOUSING

1 Visual inspection of housing and cover to ensure they are not damaged.

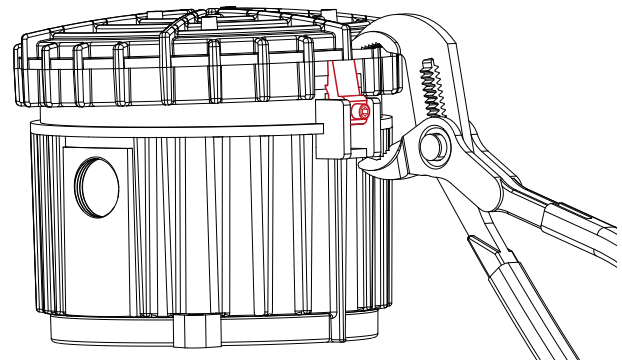
Cover can only be inserted in one position (locking arms / twist protection recesses have different width). Move the cover to the appropriate position.



2 Attach the cover with the narrower locking arm (without a headless screw), close the cover and...



3 Use the pliers to lock the cover



OPERATION & MAINTENANCE



WARNING

The junction box may only be opened (this also includes loosening cable entries!) when it is disconnected from the power supply.

- Observe the locally applicable safety regulations when the Ex-TC is in operation
- Comply with the permitted operating conditions in accordance with the "TECHNICAL DATA" section and the labelling . (type/dimensions of lines, pipe diameter, operating conditions, IP protection type).

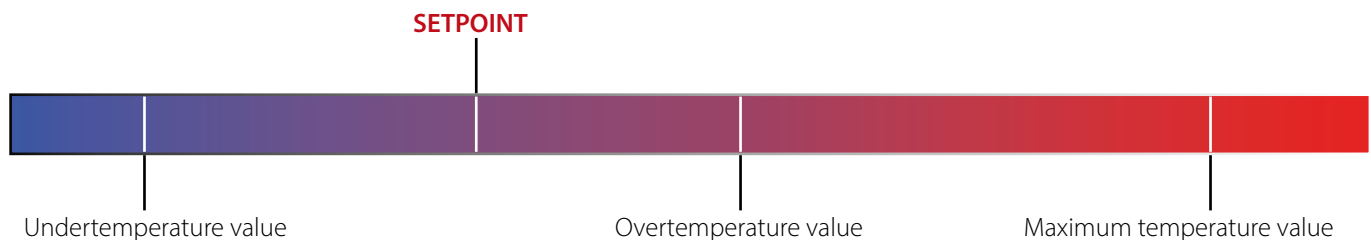


DANGER

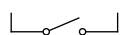
- If the temperature setpoint needs to be checked, first make certain that there is no explosive atmosphere present and that none can occur.
- Then connect the power supply and open the housing cover.
- Instead of the Pt100 sensor, connect a Pt100 simulator and check the switching function of the controller.
- After the check is complete, reconnect the Pt100 sensor and close the cover.
- Conduct a visual inspection at suitable intervals to ensure the Ex-TC is undamaged and securely seated in consideration of the installation location and application.
- Retighten the cable entries if necessary. Damaged parts must be replaced by qualified personnel
- Protect the Ex-TC devices against damage in the event of repair work to heated system parts.
- After repair work is complete, check the EX-TC again (visual inspection).
- Do not operate damaged Ex-TC devices.

OPERATING STATES

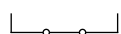
LED state	Ex-TC Model	Cause	Contact setting
Flashes red	Controller (A,AL & M)	Recorded temperature Lower Undertemperature value	- Load contact closed - Alarm contact opened => ALARM
Flashes red	LIMITER (AL)	Recorded temperature Higher Overtemperature value	- Load contact closed - Alarm contact opened => ALARM
Flashes red and green	Controller (A,AL & M)	Sensor problem or No setpoint set (000), Controller expects setpoint entry	- Load contact opened - Alarm contact opened => ALARM with /AL model: - Load contact opened and locked (can be manually reset by pressing the reset button after eliminat- ing the sensor problem or setpoint setting; status saved for possible power failure)
Continuous red (model /AL only)	LIMITER AL	Recorded temperature Higher Maximum temperature value	- Load contact opened and locked (can be manually reset by pressing the reset button after safe tem- peratures are restored; status saved for possible power failure), - Alarm contact opened => ALARM
Continuous green	Controller (A,AL & M)	Recorded temperature Lower setpoint	- Load contact closed - Alarm contact closed
Flashes green		Setting mode	- Load contact opened - Alarm contact closed
off	Controller (A,AL & M)	Recorded temperature Higher setpoint	- Load contact opened - Alarm contact closed



Position of ALARM contact



ALARM



NORMAL OPERATION

SETTINGS

COMMISSIONING		MAINTENANCE / CHANGE					
Temperature setpoint							
Undertemperature alarm							
Maximum temperature							
Overtemperature alarm							
MODBUS address							
Date							
Signature							

NOTES



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Visit our download area.

