

Weather-based temperature controller for heating of reflectors and feed system holders

About these instructions

This document is part of the product. These instructions describe how to install and connect the ESO 99 S temperature controller.

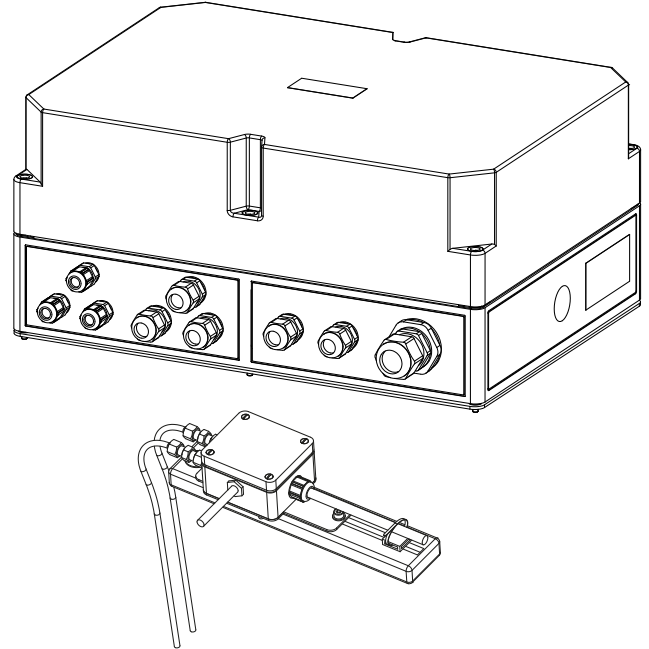
- ▶ Do not install and use the device until you have read and understood this document.
- ▶ Keep this document for reference throughout the life of the device. Pass this document on to any subsequent owners and users.

The latest version of these instructions for use can be found on our website: www.kathrein-ds.com

Features

The ESO 99 S is a temperature controller for ESO 120/124/180 H and ESO 124/180 HL reflector heaters and ESO 126 and ESO 129 feed system holders. It prevents snow, ice and frost building up on the reflector surface of the antennas:

- Automatic activation of the heating when the outside temperature falls below 4° C and there is snow, ice, frost or water on the reflector
- Electronic two-point controller with adjustable temperature threshold for the heating pad
- With fastening strap for mast installation
- Excess temperature switch-off
- Less than 25% energy consumption compared to ESO 97 S and ESO 97 SL controllers



Transport and storage

- ▶ If possible, transport and store the temperature controller in the original packaging.
- ▶ Store the temperature controller in a dry location and protect it against mechanical damage.

Items supplied

- 1 x Controller with mounting plate
- 1 x Sensor assembly
- 1 x Earth strap clamp
- 1 x Earth cable
- 2 x Straps for mast diameter 70 - 90 mm
- 10 x Cable ties 360 mm long
- 4 x Caps M16
- 1 x Cable gland M32 x 1.5
- English instructions for use

Intended use

Do not use the ESO 99 S for any purposes other than that specified in these instructions. Any use other than that specified above will invalidate the warranty or guarantee.

In particular, **never**:

- Modify any of the components.
- Use any components other than those explicitly specified by the manufacture for use with the ESO 99 S.

The ESO 99 S is used to control the ESO 120/124/180 H and ESO 124/180 HL reflector heaters and prevents snow, ice and frost from building up on the antenna reflector surface. Any use other than that specified above will invalidate the warranty or guarantee.

The following circumstances result in the loss of all warranty and liability claims towards the manufacturer:

- Improper installation
- Use of non-specified fixing materials, which cannot guarantee mechanical stability
- Non-permitted use
- Structural changes or interference with the components and fixing accessories in the kit, which could jeopardise both the mechanical stability and functional reliability
- Use of cleaners containing solvents, such as acetone, nitro-cellulose combination thinner, petrol etc.
- Failure to observe the installation and safety instructions in this manual



Installation and connection may only be performed by qualified specialist personnel.

To prevent hazards during installation and operation, the instructions and information provided must be strictly adhered to. Proper installation and connection are prerequisites for compliance with the corresponding standards.

Safety and installation instructions



WARNING!

When carrying out installation work in locations where there is a risk of falling, take appropriate safety precautions, e.g. use of a working platform. Make sure that the roof is sufficiently strong and stable to carry out the installation work (risk of damage or collapse). There is also a risk of serious injuries due to falling parts.

Make sure that:

- ▶ The connected devices are disconnected from the power supply.
- ▶ The person carrying out the installation or repair does not suffer from vertigo and can move around safely on the roof.
- ▶ The person carrying out the installation or repair is wearing sturdy and non-slip footwear.
- ▶ The person carrying out the installation or repair has a secure position to stand and hold on while working.
- ▶ The roof and the climbing equipment used (e.g. ladder) are dry and non-slip.
- ▶ The roof can withstand the weight of the person carrying out the repairs.
- ▶ Nobody is below the antenna during installation/removal.



DANGER!

Risk of death due to electric shock in the event of contact with electrical equipment!

Correct performance of the installation and electrical connection is a crucial safety factor.

Observe the installation conditions and steps described as precisely as possible.

Modifications to the electrical installation may only be carried out by a specialist electrician. Do not make any modifications yourself.

Functional description

Using the ESO 120/124/180 electric heaters prevents the build-up of snow, ice and frost on the antenna reflector surface, thus avoiding faults with reception.

The control unit described in detail below performs the following tasks:

- Automatic activation of the heating in the event of snow, ice or frost build-up
- Automatic deactivation of the heating if the reflector temperature exceeds the set value
- Manual activation of the heating is possible (failure of sensors/electronics, test operation in summer)
- Operating condition display
- Potential-free indication of faults

Brief description of controller

All electrical components are located in a light, dust and moisture-proof polycarbonate housing.

When the housing cover is opened, all components are accessible with contact protection. The terminal strip connects all the incoming and outgoing cables (sensors, heating, power supply) to the electrical components.

Operating mode: Automatic

The electronics switch on the power circuit if:

- The ambient temperature and heating temperature fall below the set value P(+4 °C SRR; factory setting: +40 °C ELTC-21), and
- The sensor electrodes detect moisture, snow, ice or frost on the antenna surface.

The heating switches off when one of the above conditions is no longer true. However, the integral timer function can be used to set a post heating time between 1 and 10 min (factory setting: 5 min). The post heating time thus covers a short period during which the sensor signal drops out, perhaps due to a brief burst of sunshine or to the influence of wind on one of the sensors. Pressing "POWER OFF" resets the post heating time.

When the load circuit is activated, the operating RGB on the SRR lights up in yellow to indicate "AUTOMATIC HEATING ON".

Operating mode: Manual

In "MANUAL" mode, the electronics are bypassed except for the function of the ELTC-21 when switch 1S1 is actuated.

The manual operating mode can also be switched on via the telecontrol operating signal (5 - 30 V). In this case, the operation LED of the SRR flashes yellow "HEATING MANUAL ACTIVE". In "MANUAL" mode, the heating runs e.g. in the event of a sensor malfunction in heating mode via the heating temperature-controlled via the ELTC-21 heating controller.

In the summer months, the function of the heating can be checked by 1S1. In this case, the LED does not flash.

Functional description

Two electronic control units are installed in the ESO 99 S controller housing.

The frost controller (SRR) is used to detect the ambient conditions and the heating controller (ELTC-21) is used as a surface thermostat with remote sensor for detecting the heating temperature. Cable glands and terminals are installed for the electrical connection.

SRR frost controller function (device 1)

The SRR frost controller detects the ambient temperature and also detects any frost, snow or ice build-up on the antenna surface.

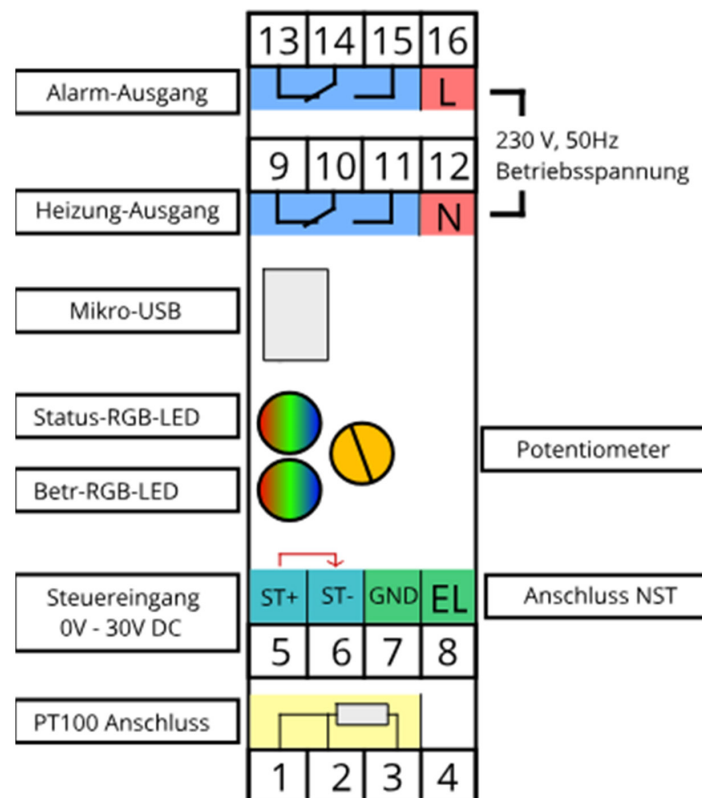
PT100 sensors are used to detect the ambient temperature. The limit value is factory set to a fixed +4°C. Frost and potential ice build-up are only expected at temperatures above this value. The coat forming on the monitored surface is registered using a 2-rod probe. A window function in the SRR 200 enables the parameters to differentiate between water and ice to be set.

These parameters are determined once and cannot be changed without the corresponding software.

If both conditions are met (temperature below +4°C and ice build-up detected), the heating controller is enabled by a potential-free switching relay in the SRR 200 and heating of the antenna surface begins. As soon as one of the two conditions is no longer met, the post heating time begins (the time is adjustable using potentiometers on the front panel of the SRR). The heating process is only ended when the post heating time has elapsed. If the conditions are met again during the post heating time, the post heating time is (automatically) reset and the control process starts again.

The heating controller keeps the antenna temperature at the set limit value (factory setting +40 °C). A control input allows the heating controller to be enabled manually.

The USB port is used for communication with a computer. The frost controller can be set using the SRR 200 Config Tool parameter setting software. Monitoring is also possible. The instructions for using this software can be found in the "SRR 200 Config Tool" operating manual.



Interval heating

Interval heating can be set in this area. This function is used in addition to ice detection for snow removal.

If the temperature falls below the limit temperature (+3.5 °C), the heating is switched on within the set interval for the set duration when interval heating is activated. This ensures that even if the snow layer is very dry, it is melted in intervals.

The SRR 200 Config Tool has the following addition:

On delivery, all values are set to 0.

For extreme antenna locations, the following setting could be adjusted during commissioning:

Interval 0 h 30 min 0 s

Heating time 0 h 5 min 0 s

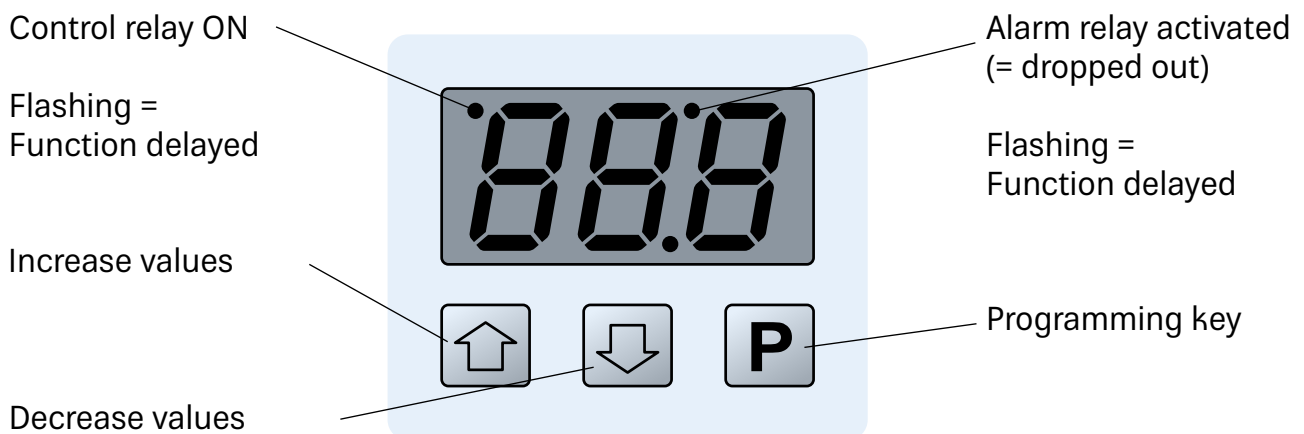
The interval time and heating duration may also have to be optimised again on site.

SRR function status

LED	Colour	Condition	Explanation
Status LED	Green 	OK	The ambient temperature is above the set limit value. No ice detected.
	White 	Temperature	The ambient temperature is below the set limit value. No ice detected.
	Blue 	Ice	The ambient temperature is below the set limit value. Ice detected.
Operating LED	Green 	ON	Device is switched on and ready for operation.
	Red flashing  	Alarm	Sensor fault
	Yellow 	Heating Auto	Heating output ON due to current ambient conditions or active post heating time.
	Yellow flashing  	Heating Manual	Heating ON due to manual switch-on via the telecontrol operating signal. When the overrun time has expired, this state is terminated.

ELTC 21 heating controller function (device 2):

If the actual value (P01) is lower than the setpoint (P10 minus hysteresis P11), the power relay switches on the heating. The integrated alarm relay has a changeover contact that allows fault messages in the event of temperature too high / low, sensor failure or sensor short circuit. In the event of sensor faults, the control relay switches the heating cable off or on depending on the controller configuration. If the sensor fails or there is a sensor short circuit, the heating is switched off.



Operation

Operation is very easy. After switching on, the device type number (C-2) appears, followed around three seconds later by the measured actual value. Briefly pressing the "P" button displays "Set", followed by the setpoint display, which automatically reverts after 5 seconds. Pressing the "P" button for around 3 seconds opens the parameter list "P10". Holding down the "P" button for a further 3 seconds displays "dC" for degrees Celsius or "dF" for degrees Fahrenheit.

Call up and change parameters

To open the parameter list, press "P" for about 3 seconds until "P10" appears.

- Press "P" for 3 seconds: Parameter number is displayed
- Press "▲/▼": Select the parameter
- Press "P" for 3 seconds: Parameter is displayed
- Press "▲/▼": Change the parameter value
- Press "P" for 3 seconds: New value was saved, back to parameter number
- By keeping the "▲/▼" keys pressed, the values are progressing automatically. Press until "P1" or T>1 minute is displayed and exit the input mode

Protection against unauthorised access

The control target value can be set as desired, unless limited by P13/14. All other parameters are protected by a code.

If a code is required, the display shows "C00". Use the arrow keys to set the required code number (C42) and confirm with "P".

If no key is pressed for approx. 1 minute, the code is requested again.

Auto-scrolling

By keeping the "▲/▼" keys pressed, the values are progressing automatically.

Error messages

If an error occurs, the display shows an error code. Sensor errors are displayed with a delay of about 20 seconds.

Error codes

- | | |
|-----|---|
| E01 | Sensor short circuit or temperature < -60°C |
| E02 | Sensor disconnection or temperature > 410°C |
| E03 | Temperature sensor, 3rd wire is missing or $R \geq 10 \Omega$ |
| C00 | Protected parameters, code is required |

Device type

After switching on, the display shows the type number of the unit (C-2) and after about 3 seconds the measured actual value.

Parameters and their mean

H = Device 2 heating temperature

- | | |
|-----|--|
| P01 | Actual value on temperature sensor (number only) |
| P10 | Controller setpoint, effective on relay 1, range P13...P14 [H +40 °C] |
| P11 | Switching hysteresis of P10, range 2...10K, [H 2K] |
| P12 | Minimum down time (relay K1); range 0...30 min, [5 min] |
| P13 | Maximum permitted setpoint, range P14...+390 °C, [H +60 °C] |
| P14 | Minimum permitted setpoint, range -50 °C...P13, [H -5 °C] |
| P20 | Sensor type
0 = Pt100, 3-wire, °C (resolution 1K)
[1] = Pt100, 2-wire, °C (resolution 1K)
2 = Pt100, 3-wire, °F (resolution 2°F)
3 = Pt100, 2-wire, °F (resolution 2°F) |
| P21 | Sensor correction -30...+10 K, [0] |
| P30 | High temperature alarm, P31...400°C [60 °C] |
| P31 | Low temperature alarm, -60...P30 [-60 °C] |
| P32 | Alarm delay in operation, 0...99 min [0 min] |
| P33 | Alarm delay after switch on, 0...500 min [0 min] |
| P34 | Relay mode (power relay K1 and signal relay K2)
0 = Relay K2 (active) energised on sensor fault, power relay K1 de-energised on sensor fault
[1] = Relay K2 (passive) de-energised on sensor fault, power relay K1 de-energised on sensor fault
2 = K2 operates as release relay, power relay K1 de-energised on sensor fault
3 = Relay K2 (active) energised on sensor fault, power relay K1 energised on sensor fault
4 = Relay K2 (passive) de-energised on sensor fault, power relay K1 energised on sensor fault
5 = K2 operates as release relay, power relay K1 energised on sensor fault |



P34=3, P34=4 and P34=5 is only permitted for frost protection applications and when using self-regulating heating cables. The values in square brackets [...] represent the factory settings.

Release relay mode

In this mode (P34=2 and P34=5), relay K2 switches independently of P32 and P33 as soon as the actual value lies between P30 and P31.

Alarm relay mode

(P34 = 0 or 1): If the actual temperature is below P31 when the device is started, P33 is used once as the alarm delay to give the system more time. In normal operation, P32 is used as the alarm delay.

Commissioning



Reliable operation of the controller requires all components to be installed and started up properly taking into account the warnings set out in these installation instructions.

Before starting the installation, check the material list to ensure that all parts have been supplied.

1. Use the installation instructions and circuit diagrams supplied to check that the installation is correct.
2. Before connecting the connecting cable in the controller housing, test the heating for continuity and insulation resistance (Ri) (see installation instructions for the heating). These measurements (Ri) should be repeated after replacement of a defective heating plate.

Heating functional test (the functional state of the SRR does not matter)

1. Measure the mains input voltage: 230 VAC + 6/- 10%
2. The colours of the "Status" and "Operation" LEDs does not matter
3. Switch 1S1 to position ON = "Manual ON".
4. Yellow "Heating Manual" LED flashes
5. Measure the heating circuit voltage and heating circuit current at terminals X1: 1-10.
During this time, the ELTC-21 monitors the heating temperature.
Change the heating temperature setting on the ELTC-21 (P10) to lower the setpoint from +40 °C, e.g. to +10 °C to +1 °C.
The contactor 1K1 is de-energised.
Set the old value (+40 °C) and the contactor K1 is energised again.

Switch 1S1 to the OUT position = "Auto ON"

Controller functional test

1. The "Status" and "Operation" LEDs on the SRR light up green
2. Cool down the ambient temperature sensor to below + 3°C using iced water or coolant spray.
The status LED must light up white for "Temperature".
Touch the two rod electrodes with wet hands.
The status LED must now light up blue for "Ice".
The operating LED must now light up yellow for "Heating Auto".
The contactor 1K1 is energised.
3. As soon as the "Ice" or "Temperature" condition is no longer met, the set post heating time (1 - 10 min) starts running. This value can be changed on the potentiometer on the SRR using a screwdriver. When the post heating time has elapsed, the contactor 1K1 is de-energised.
4. Fault detection and signalling
 - Disconnect the sensor cable from the "Ambient temperature" PT100. (Open the cable connection at terminal 3 on the SRR control unit). The operating LED flashes red for "Alarm".
 - Disconnect the sensor cable from the "Reflector temperature" PT 100 (open the cable connection at terminal 17 on the ELTC-21 control unit). Fault signal E02 appears in the display.For both faults, the alarm contact at terminal X1, 11 / 12 opens (closed circuit principle).

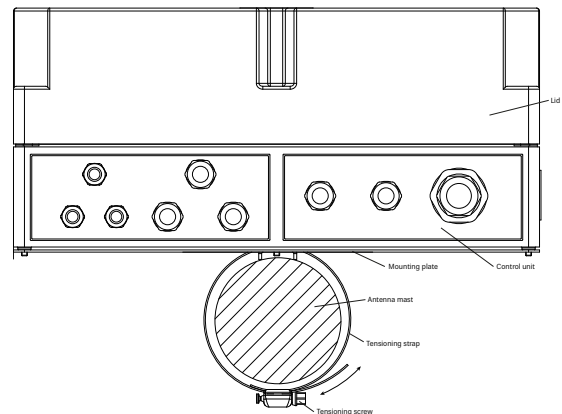
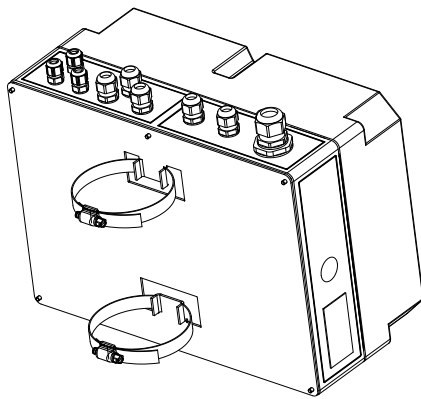
Installation and connection

Required tools and equipment

- Side cutters
- Long nose pliers
- Water pump pliers
- Flat-bladed screwdriver
- Coolant spray for functional test
- Hexagon socket wrench 5 mm
- Drill and metal drill bit $\varnothing$ 6.2 mm

Installing the temperature controller

1. Attach the straps supplied to the mounting plate as shown in the figure. The straps allow the controller to be attached to masts with a diameter of 60 to 85 mm.
2. Attach the controller to the mast by tightening the slotted screws in the straps, so that all cable glands point downwards.



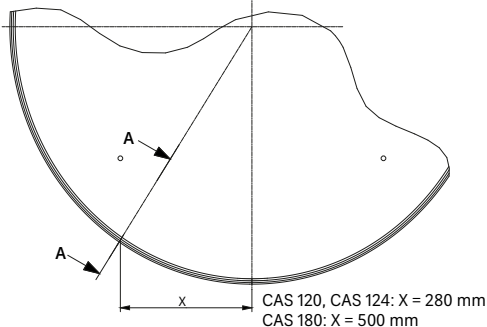
Installing the sensor unit

Preparation

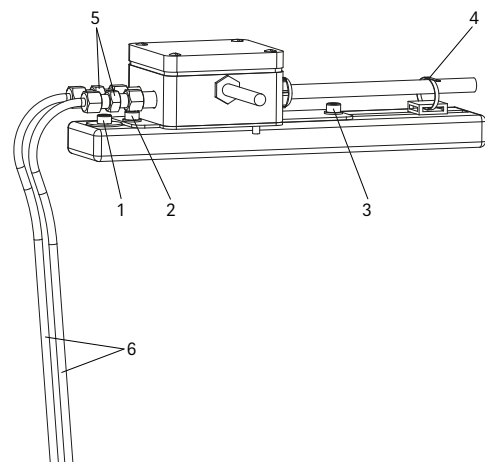
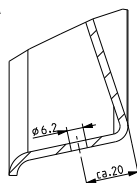
- Drill a fixing hole $\varnothing$ 6.2 mm in the edge of the reflector

- Remove the screw and washer (1) from the sensor unit and loosen the screws (2 + 3) so that the unit can be moved in the aluminium profile
- Leave cable tie (4) loose
- Electrodes (6) can be adjusted individually at the cutting ring screw connection (5)

Front of the reflector



A-A



Installation

1. Pivot the sensor unit over the edge of the reflector (Fig. 1), guide the screw and washer (1) through the pre-drilled hole and screw into the aluminium profile (Fig. 2) but do not tighten securely yet

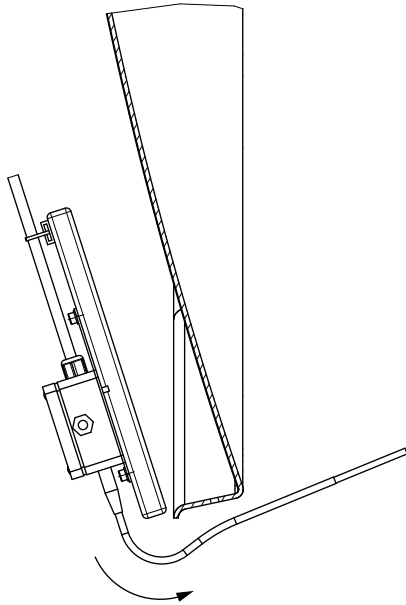


Fig. 1

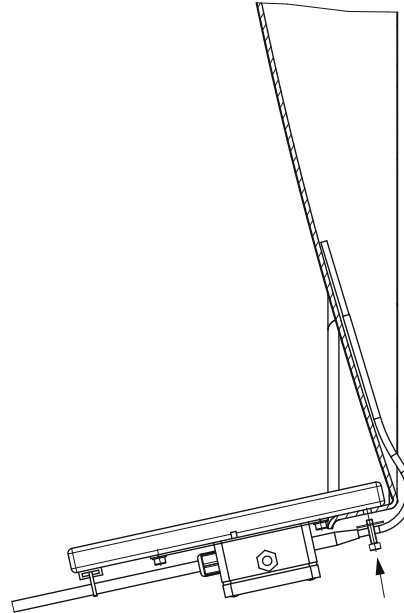


Fig. 2

2. Slide the aluminium profile up to the reflector plate and securely tighten the screw (1) ($M_A = 5 \text{ Nm}$) (Fig. 3).
3. Slide the sensor housing and plate in the aluminium profile until the ends of the two electrodes are located on the reflector surface and under tension, then securely tighten the screws (2 + 3) again ($M_A = 5 \text{ Nm}$) (Fig. 4).
4. The electrodes can be brought together as tightly as possible by loosening the cutting ring screw connection (5). Electrodes must not make contact.
5. Securely tighten the cable tie (4) on the unit.

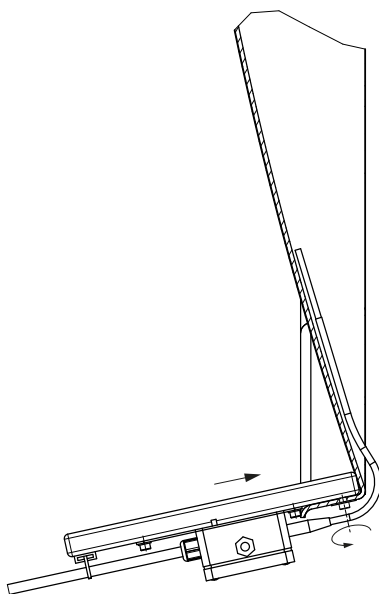


Fig. 3

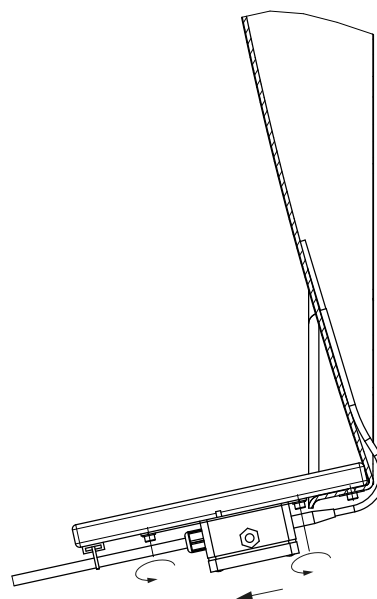


Fig. 4

Electrical connection

1. Run the connecting cables for the heating pads, feed system holder, heating sensor unit and heating pad temperature sensor along the antenna support to the control unit and secure with cable ties.
2. Feed the cables into the control unit / connection box from below through the M16 cable glands (heating pads, feed system holder heating) and M12 cable glands (temperature sensors, sensor unit).
3. Feed the mains cable into the control unit through the M32/ M25 cable gland from below.

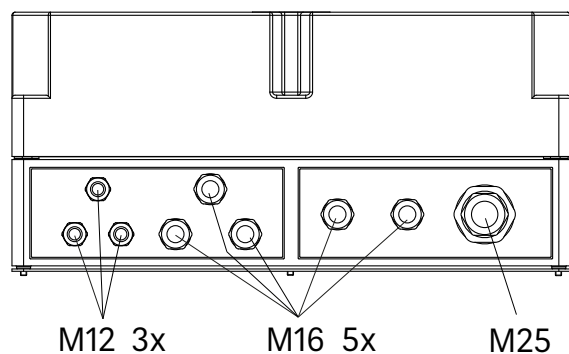
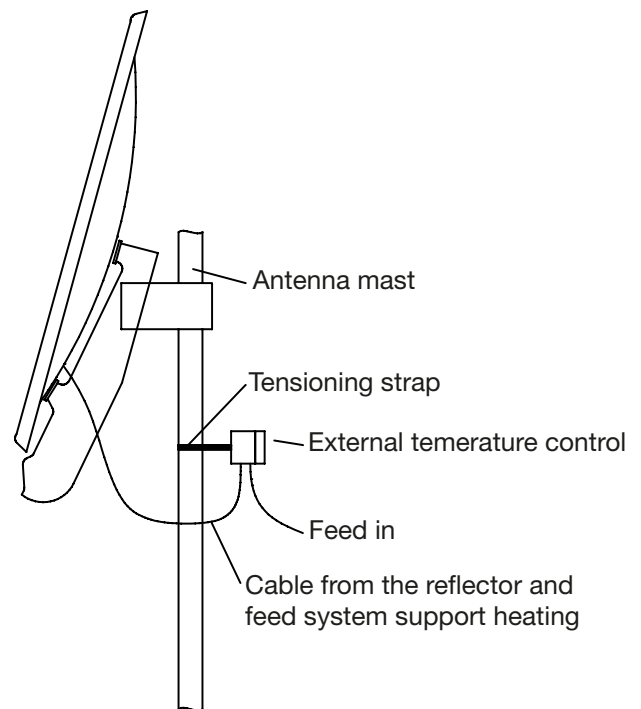


Before connecting the cables in the control unit, check the heating for continuity and insulation resistance. These measurements should also be performed after replacement of a defective heater. Refer to the operating instructions for the corresponding reflector heater for details.

4. The cables are connected as shown in the **"Connection diagram" on page 11.**



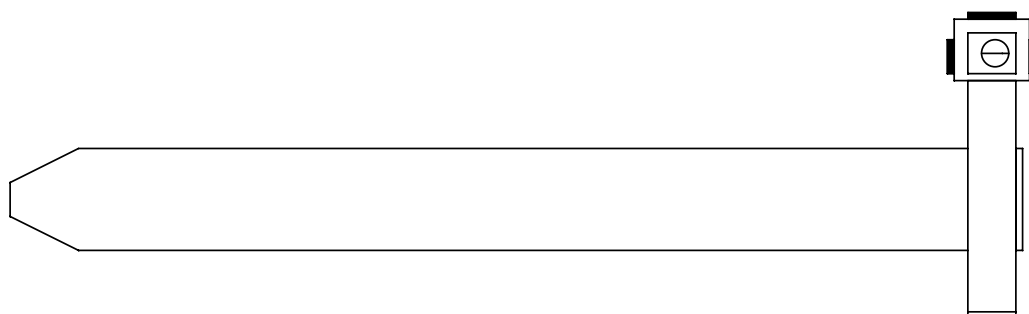
Only connect the electrical system to the voltage specified on the rating plate. Non-compliance can destroy the heating due to overheating or fire.



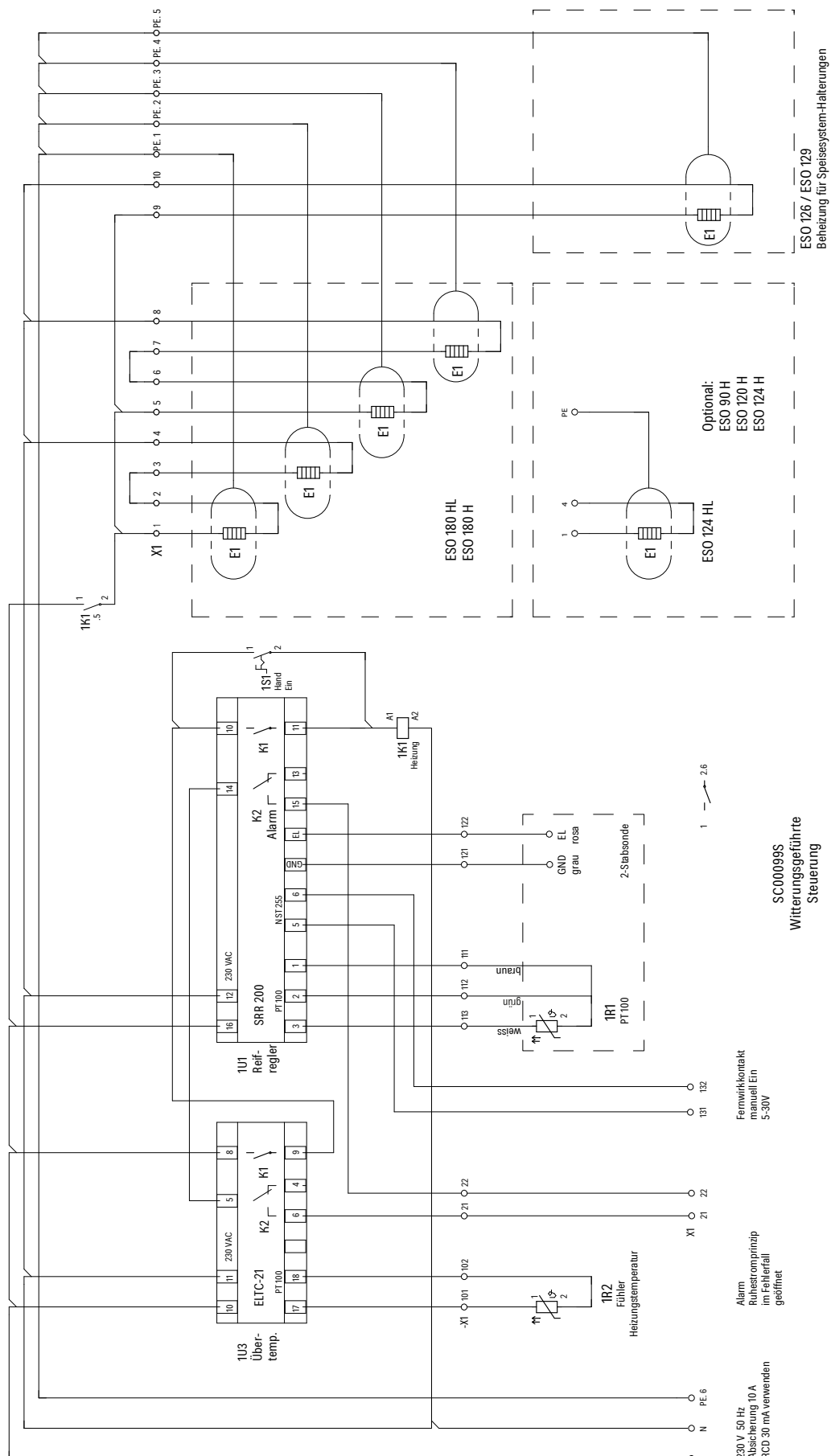
Connecting the earth clamp

The earth clamp is attached close to the terminal box on the reflector mast as follows:

1. Tension the strap around the mast. Make sure that the strap is securely attached to the antenna mast.
 2. Pull the V2A strap through the clamp.
 3. Tension the V2A strap with the tension screw.
 4. Connect the earth cable to the earth strap clamp.
 5. Feed the earth cable through an M12 cable gland in the terminal box.
 6. Connect the earth cable to the earth terminal.
- ⇒ This guarantees earthing of the entire electrical system.



Connection diagram



Maintenance recommendation

Controller

We recommend performing a regular complete functional test of the system, preferably before the onset of winter, to check that the entire antenna heating system is operating correctly (see **"Controller functional test" on page 7**).

Sensor system

Once a year, preferably before the onset of winter, the sensors should be wiped over with a moist cloth to remove any heavy dirt.

Heating plates / heating pads

The heating plate or heating pad should be checked for damage at regular intervals to ensure they are in sound condition. Other than this, the heaters are largely maintenance free once installed.

Technical data

Electrical data

Operating voltage: 230 V~, +6 %/-10 %, 50/60 Hz
Breaking capacity: 16 A
Alarm contact: 8 A / 230 V
Temperature measuring input: 2 x PT 100 temperature sensor
Moisture measuring input: 2 rod probe
Activation temperature U: +4° C (SRR factory setting)
Setpoint temperature H: +40° C (ELTC-21 P10 factory setting)
Adjustment range max. U: -10° to +30° C (SRR)
Adjustment range max. H: -5° to +60° C (ELTC-21 P13/P14)
Display range / resolution: -50° to +400° C / 1K (ELTC-21)
Type of control: Two-point controller

Mechanical data

Housing material: Polycarbonate
Dimensions: 360 x 254 x 165 mm
Weight: 5.3 kg
Cable inlets: 3 x M12, 5 x M16, 1 x M32/M25
Permissible ambient temperature: -30° to +60° C
Recommended installation temperature: +5° to +20° C
Protection class: IP66

Repair and replacement

KATHREIN Digital Systems GmbH

Customer Service

Eiselauerweg 13

89081 Ulm, Germany

Phone: +49 731 270-909 70

E-mail: support@kathrein-ds.com

Business hours (CET):

Mon-Thu: 08:00–12:00 and 12:45–17:00

Fri. 08:00–13:00

Disposal



Electronic equipment

Electronic equipment must not be disposed of in domestic waste. According to directive 2012/19/EU OF THE EUROPEAN PARLIAMENT AND COUNCIL of 04 July 2012 on waste electrical and electronic equipment, it must be disposed of professionally. At the end of its service life, take this unit to a designated public collection point for disposal.