°LAUDA

# Operation manual

ECO Gold

°FAHRENHEIT. °CELSIUS. °LAUDA.

# Operation manual

## ECO GOLD

Heating and cooling thermostats with control head GOLD

**Immersion thermostat**
ECO GOLD

**Heating thermostats**
E 4 G, E 10 G, E 20 G, E 25 G, E 40 G, ET 6 G, ET 12 G, ET 15 G, ET 20 G

**Cooling thermostats**
RE 415 G, RE 415 GW, RE 420 G, RE 630 G, RE 1225 G, RE 2025 G, RE 1050 G

**Viscothermostats**
Viscotemp 15 G, Viscotemp 18 G, Viscotemp 24 G, Viscotemp 40 G

**Calibration thermostat**
RE J 1225 G

Read the instructions before starting work!

Translation of the original operation manual
Version 10/2019 i YACE0088
replaces version 05/2019 h, 11/2018 g, 05/2017 f, 04/2017 e, 11/2016 d1, 08/2016 a3, 08/2011 a2, 08/2011 a1
Valid from:
Software of Control System version 1.54
Software of Safety System version 1.43
Software of Chilling System version 1.37
Software Analog IO module version 3.21
Software Serial IO RS 232 module version 3.22
Software Digital IO module version 3.14
Software Solenoid valve version 3.06
Software EtherCAT module version 1.08
Software Ethernet module version 1.23

LAUDA DR. R. WOBSER GMBH & CO. KG
Pfarrstraße 41/43
97922 Lauda-Königshofen
Germany
Phone: +49 (0)9343 503-0
Fax: +49 (0)9343 503-222
E-mail info@lauda.de
Internet http://www.lauda.de

LAUDA

Table of contents

# 1 Safety

## 1.1 Safety information


| Type and source |
| --- |
| *Consequences of non-compliance* |
| • Action 1<br>• Action ... |

"DANGER" indicates an immediate dangerous situation which – if the safety requirements are ignored – may result in fatal or severe, irreversible injuries.


| Type and source |
| --- |
| *Consequences of non-compliance* |
| • Action 1<br>• Action ... |

"WARNING" indicates a possible dangerous situation which – if the safety requirements are ignored – may result in fatal or severe, irreversible injuries.


| Type and source |
| --- |
| *Consequences of non-compliance* |
| • Action 1<br>• Action ... |

"CAUTION" indicates a possible dangerous situation which – if the safety requirements are ignored – may result in slight, reversible injuries.


| Type and source |
| --- |
| *Consequences of non-compliance* |
| • Action 1<br>• Action ... |

"NOTICE" warns of possible property or environmental damage.

 Reference Refers to further information in other sections.

## 1.2 General safety

Read through the operating instructions carefully. They contain important information for working with this device. If you have any queries, please contact our Service Department (⇨ 8.7).

Follow all the directions in these operating instructions. Only in this way is the correct procedure ensured when working with the device.

- Make sure that the device is only operated by instructed specialist personnel.
- Never operate the device without heat transfer liquid.
- Never operate the device,
  - if it is damaged,
  - if it is leaking,
  - if the mains cable is damaged.
- Switch off the device and withdraw the mains plug:
  - when carrying out service or repair work,
  - when moving the device,
  - when installing or removing modules or accessories,
  - in case of danger.
- Do not make technical modifications to the device. Infringements in this respect invalidate the warranty.
- Have service and repair work carried out only by specialists.
- Follow the safety information in the following sections and read it through carefully.

The devices are <u>not</u> designed for use in medical applications in accordance with DIN EN 60601-1 and IEC 601-1!

| Classification in accordance with EMC requirements | | | |
|---|---|---|---|
| Device | Immunity | Emissions Class | Customer power supply |
| Heating thermostat ECO Gold | Type 1 in accordance with DIN EN 61326-1 | Emissions Class B in accordance with CISPR 11 | Worldwide No limitation |

| Device | Immunity | Emissions Class | Customer power supply |
|---|---|---|---|
| Cooling thermostat ECO Gold | Type 1 in accordance with DIN EN 61326-1 | Emissions Class B in accordance with CISPR 11 | Worldwide No limitation |

Instructions for Class A digital device, USA:

"Note: This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC (Federal Communication Commission) Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense".

Instructions for Class A digital device, Canada:

"This Class A digital apparatus complies with Canadian ICES-003" (ICES = Interference Causing Equipment Standards).

## 1.3 Special safety information

The use of the thermostat is only admissible under the following conditions:

- The siting surface must be impervious, flat, non-slip and non-combustible. Do not position the thermostat at the edge of the bench or table.
- Keep to the specified wall spacing (⇨ 6.1).
- Protect the thermostat from dripping or condensing water.
- Do not store any liquids or combustible objects above the device.
- Do not work with flammable liquids in the direct vicinity of the device.
- Only connect the device to an earthed mains socket which is freely accessible.
- At higher operating temperatures parts of the bath cover can take on temperatures of over 70 °C. There is a danger of burns.
- Only use suitable hoses. (⇨ 6.4)
- Ensure that the hoses are not kinked during operation.
- Check the hoses at certain inspection intervals (⇨ 8.3.2) for material fatigue.
- Hoses with hot heat transfer liquid and other hot parts must not come into contact with the mains cable.
- When using the thermostat as a circulation thermostat, hot liquid can escape due to hose fracture and become a danger to personnel and materials.
- Irritant vapors may be generated depending on the heat transfer liquid used and the operating mode.
  - Ensure sufficient extraction of the vapors.
  - Use the bath cover.
- Carefully mount the immersion thermostat on the bath vessel.
- Only use bath vessels which are suitable for the intended operating temperatures.
- When filling, set the overtemperature switch-off point according to the heat transfer liquid used.
- When changing the heat transfer liquid from water to other liquids for temperatures above 100 °C, carefully remove all residues of water including from the hoses and consumers, otherwise there is a risk of scalding due to delay in boiling.
  To do this also remove the blank plugs on the pump inputs and outputs and blow them out with compressed air.

- Use the cooling coil with cooling water only at operating temperatures below 100 °C.
  At higher temperatures there is danger of hot vapors forming.
- Have repairs carried out only by specialists.
- Keep to all the service and maintenance intervals (⇨ 8.3.2).
- Take note of all safety instructions on the device and in these operating instructions. .

Applicable to water-cooled devices:

- Secure the return hose of the water cooling in the discharge area in order to prevent the hose sliding off uncontrollably, also during pressure surges.
- Secure the return hose of the water cooling in the discharge area so that it is not possible of hot cooling water to splash out.
- Avoid kinking or crushing the return hose of the water cooling. Excessive pressure can cause the cooling water hoses to tear and hot water to escape.
- To avoid damage due to a leak in the cooling water system we recommend the use of a water leakage sensor with water cut-off.

# 2 General remarks

## 2.1 Description of the device

This device is a laboratory thermostat. It is obtainable as:

- Immersion thermostat (optionally with cooling coil), which is used for heating (and optionally for cooling) liquids in existing vessels.
- Heating bath and circulation thermostat, designated in the following as a heating thermostat, which is used for heating liquids.
- Heating bath and circulation thermostat (a cooling/heating thermostat), also designated in the following as a "cooling thermostat", which is used for cooling and heating liquids.

## 2.2 Intended application

This LAUDA thermostat is manufactured exclusively for cooling/heating liquid baths. In the case of the immersion thermostat the baths used must have methods of secure mounting.

- The device may only be put into operation in suitable interior rooms.
- Operation up to a height of 2000 m above sea level is admissible.

The devices must only be operated as intended and under the conditions stated in these operating instructions. Any other operating mode is not regarded as used as intended.

The thermostat may only be operated with the following heat transfer liquids:

- Aqua 90
- Kryo 20
- Kryo 30
- Kryo 51
- Therm 160
- Therm 180
- Therm 250
- Decalcified water

Take into account the properties of the heat transfer liquids. (⇨ 6.4)

## 2.3 Use other than that intended

The device must not be used:

- in areas subject to explosion hazards
- when sited outdoors
- with combustible or highly flammable gases
- for heating or cooling foodstuffs.

## 2.4 Responsibility of the operating body - safety information

The operating body is responsible for the qualifications of the operating personnel.

– The thermostat must only be configured, installed, maintained and repaired by specialist personnel.
– Persons operating the device must be instructed in their work by a specialist.
– Make sure that specialist personnel and operators have read and understood the operating instructions.
– The device must be used as intended (⇨ 2.2).

## 2.5 Materials

All parts that are exposed to heat transfer liquid are manufactured from high-quality materials adapted to withstand the operating temperature. High-quality stainless steel, brass, bronze, high-quality heat-resistant plastics and elastomers are used.

## 2.6 EU conformity

The device complies with the basic health and safety requirements outline in the Directives listed below.

- Machinery Directive 2006/42/EC
- EMC Directive 2014/30/EU

LAUDA DR. R. WOBSER GMBH & CO. KG – Pfarrstraße 41/43 –
97922 Lauda-Königshofen – Germany

The device does not fall under Pressure Equipment Directive 2014/68/EU because the device is only classified as high as Category 1 and is covered by the Machinery Directive.

# 3 Device description

## 3.1 Device types

### Heating thermostats

The type designation of the LAUDA heating thermostats is composed of the prefix E for ECO, the approximate bath volume in liters and a G for the GOLD device variant.

Example: E 10 G is a heating thermostat with a maximum bath volume of 10 liters in the GOLD device variant.

With the heating thermostats with a transparent bath there is the prefix of ET for the ECO transparent bath, followed by the bath volume in liters and a G for the device variant GOLD.

Example: E 6 G is a heating thermostat with a transparent bath with a maximum bath volume of 6 liters in the GOLD device variant.

### Cooling thermostats

The type designation of LAUDA cooling thermostats is composed of the prefix R (to identify the cooling thermostat: Refrigerated), an E for ECO, the bath volume in liters, the minimum attainable temperature (without arithmetical sign) and a G for the device variant GOLD.

Example: RE 420 G is a heating thermostat with a maximum bath volume of 4 liters and a minimum temperature of -20 °C. Where applicable the type designations are supplemented by a W for "water-cooled".

### Viscothermostats

The name of LAUDA viscothermostats is composed of "Viscotemp" at the start followed by the approximate bath volume in liters and a G for the model, GOLD.

## 3.2 Pump

All devices are equipped with a pressure pump. The pump has an output with a pivotable outflow elbow. With the heating thermostats this is joined to the pump connection set for external temperature control circuits. An additional output is used for internal bath circulation. By switching the selector at the front on the control head, the flow can be manually selected or divided between the two outputs.

Using the operating menu, one of six flow-rate levels can be selected for the pump. For thermostats with a small bath a power level of 1 to 3 is practicable.

When operated as a circulation thermostat with an external consumer, a higher power level is practicable to keep the temperature difference between the bath and external consumer small even a higher temperatures.

The pump connection of the outflow can be closed without any detrimental effects on the pump.

Pump characteristics (⇨ 10)

## 3.3 Programmer

The devices are equipped with a programming function (⇨ 16).

## 3.4 Interfaces

In the basic version the devices are equipped with a USB interface. This enables, for example, the connection of a PC and operation with the thermostat control software "Wintherm Plus". In addition software updates are possible via the USB interface. The connecting lead is not included in the items supplied with the thermostat. When connecting up, make sure the correct plug is used.

## 3.5 Interface modules (Accessories)

The devices can be supplemented with further interface modules, which are connected to the rear of the control head in two module slots (⇨ 6.7) and are inserted.
The following modules are currently available:

1. Analogue Module (LAUDA catalogue no. LRZ 912) with two inputs and two outputs on a six-pole DIN socket. The inputs and outputs can be set independently of one another as a 0 - 20 mA, 4 – 20 mA or 0 – 10 V interface, 20 V is brought out on the socket as a power supply for an external sensor with evaluation electronics.

2. RS 232/485 Interface Module (LAUDA catalogue no. LRZ 913) with nine-pole SUB-D socket. Electrically isolated using optocouplers. Using the LAUDA instruction set, extensively compatible to the ECO, Proline, Proline Kryomat, Integral XT and Integral T series. The RS 232 interface can be connected using a 1:1 contacted cable (LAUDA catalogue no. EKS 037) directly to the PC.

3. Contact Module (LAUDA catalogue no. LRZ 914) with connector to NAMUR NE28. Range of functions as for LRZ 915, but only one output and one input on each of two DIN sockets. Coupling socket, 3-pole (LAUDA catalogue no. EQD 047) and coupling plug 3-pole (LAUDA catalogue no. EQS 048).

4. Contact Module (LAUDA catalogue no. LRZ 915) on a 15-pole SUB-D socket. With three relay contact outputs (changeover, max. 30V/0.2A) and three binary inputs for control via external voltage-free contacts. Plug 15-pole, (LAUDA catalogue no. EQM 030) and Plug Housing (LAUDA catalogue no. EQG 017).

5. Profibus Module (LAUDA catalogue no. LRZ 917).
   You will find further information in the Operating Instructions YAAE0020 for the Profibus Module.

6. Pt100/LiBus Module (LAUDA catalogue no. LRZ 918)

   External Pt100: For the connection of an external temperature sensor.

   LiBus: For the connection of the Command remote control unit from the Proline equipment line and other accessories, such as a solenoid valve for cooling water control or a reverse-flow protection device.

## 3.6 Chiller

The chiller mainly consists of a fully hermetically sealed compressor. The dissipation of the condensation and motor heat takes place via a fan-ventilated lamellar condenser for water-cooled devices via heat exchanger. Here, atmospheric air is drawn in at the front of the device, heated up and discharged at the back and sides. To ensure proper air circulation the ventilation openings must not be covered up.

The compressor is equipped with a thermal release which responds to the compressor temperature and current consumption. The chiller is normally switched in automatically, but can also be switched in manually via the operating menu (⇨ 12.3).

The chiller is switched off when a malfunction occurs which affects safety.

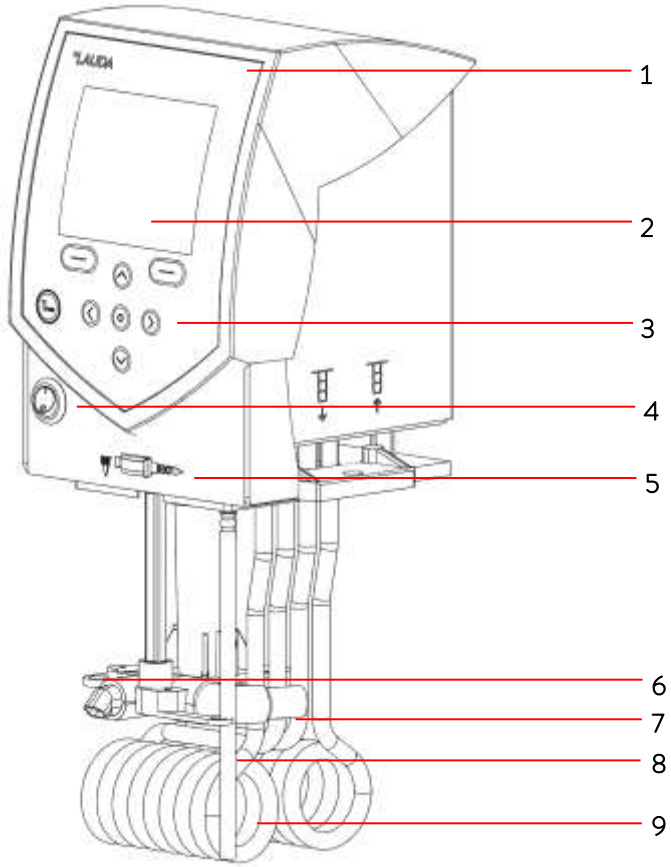
The Cooling Thermostat RE 1050 G is equipped with the SmartCool technology which makes optimum use of the compressor and only chills when cooling output is demanded by the controller. To achieve this, several sensors in the cooling circuit monitor the operating status.

Cooling times for the various cooling thermostats can be taken from the **cooling curves** (⇨ 10).

# 4 Operating and functional controls

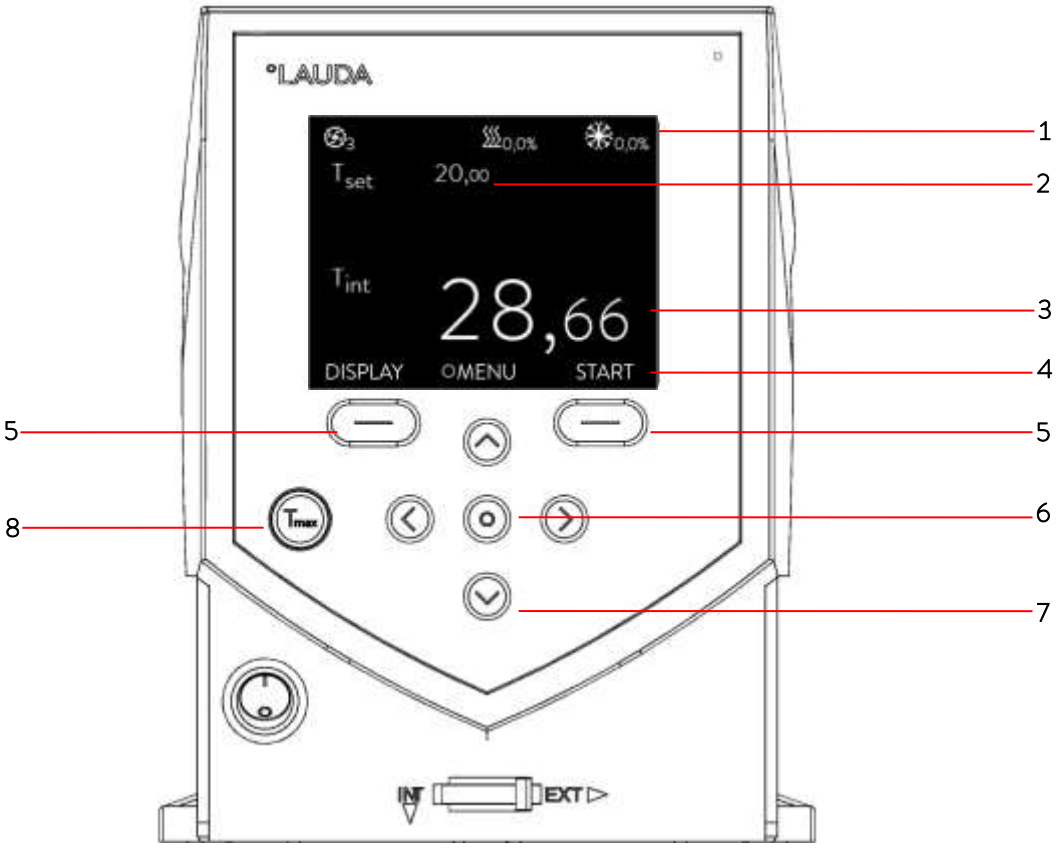
On the following pages the ECO GOLD control head, the control panel and the heating/cooling thermostat device types are presented.

Control Head ECO GOLD (can be used as immersion thermostat with screw clamp)




1 Light sensor for automatic control of display brightness
2 Color TFT display
3 Control panel (refer to following page)
4 Mains switch
5 Selector switch for dividing up the external and internal pump flow
6 Pump output for internal bath circulation
7 Pump output for bath circulation or connection to the pump connection set
8 Pt100 temperature sensor
9 Heater

Control panel and display ECO GOLD




## Display

1 Expanded status display

2 Status display

3 Display of the internal or external temperature value ($T_{int}$ or $T_{ext}$)

4 Soft-key bar

## Control panel

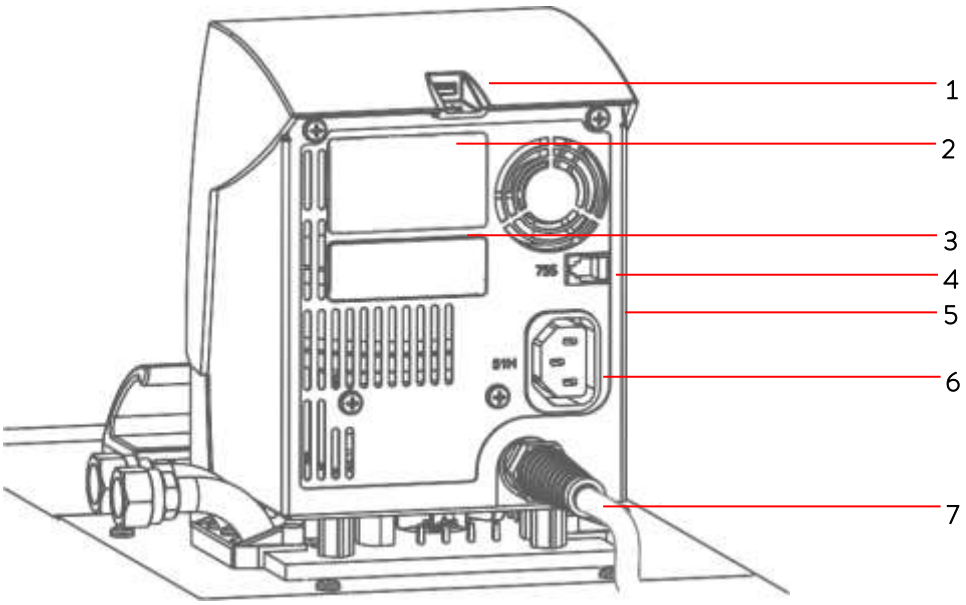
5 Soft keys, left and right

6 Enter key

7 Cursor keys (cursor keys) for Up, Down, Left and Right.

8 Taste $T_{max}$: Display and adjustment of the over-temperature switch-off point

Rear view of Control Head ECO GOLD




1 USB interface

2 Upper module receptacle approx. 51 mm x 27 mm for analogue, RS 232/485 module, Profibus module and contact modules.

3 Lower module receptacle approx. 51 mm x17 mm for Pt100/LiBus module

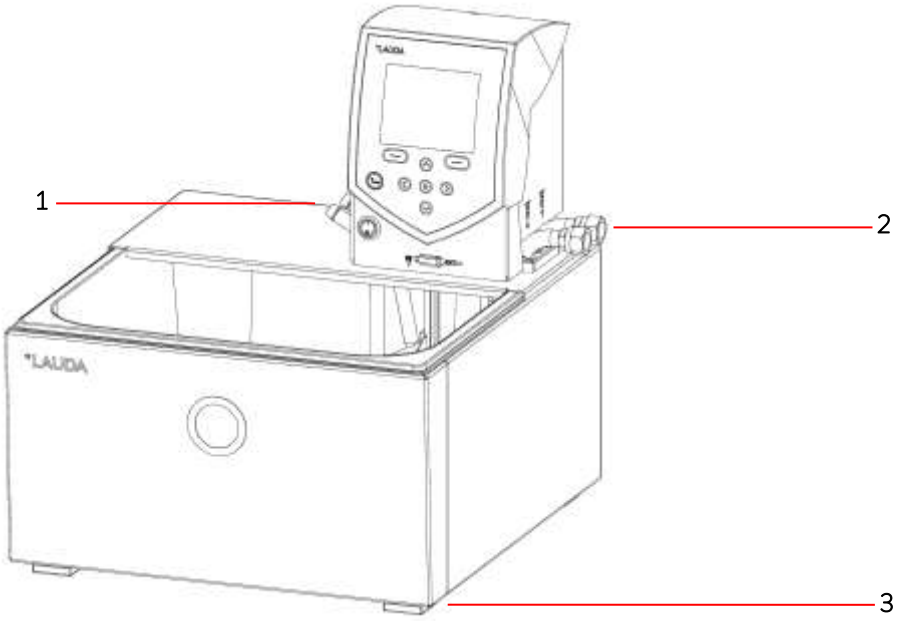
4 Connection 75S for control cable of cooling underpart for RE 1050 G

5 Rating label

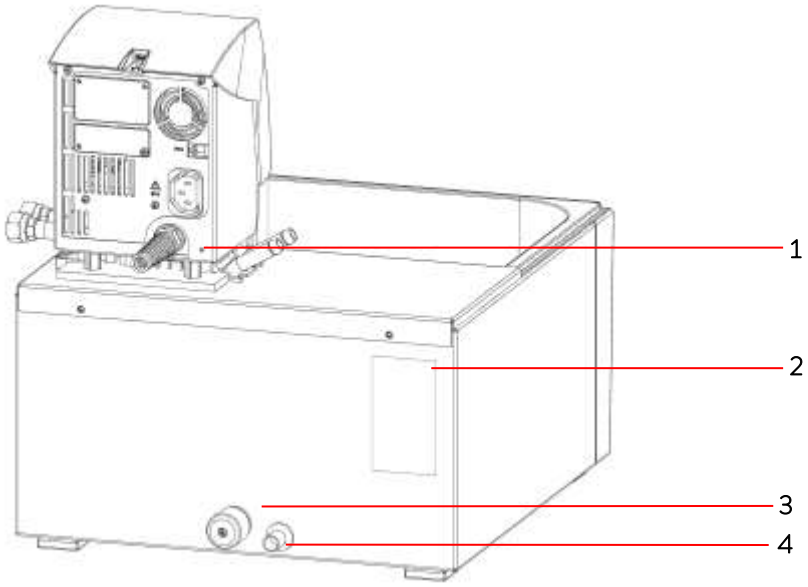
6 Connection socket 51H for power supply between the control head and cooling underpart

7 Mains connecting lead

Heating Thermostats ECO GOLD




1 Cooling coil connections
2 Pump connection: outflow and return (as standard only with E 4 G and ET 15 G)
3 Four feet




1 Mains connecting lead
2 Rating label
3 Bath draining tap
4 Bath drain point

Viscothermostat Viscotemp 24 G


1 Pump connector set with thread connection M16 x 1 (concealed)

2 Recessed grips (right and left)

3 Viscotemp 24 cover plate (LCZ 0734)

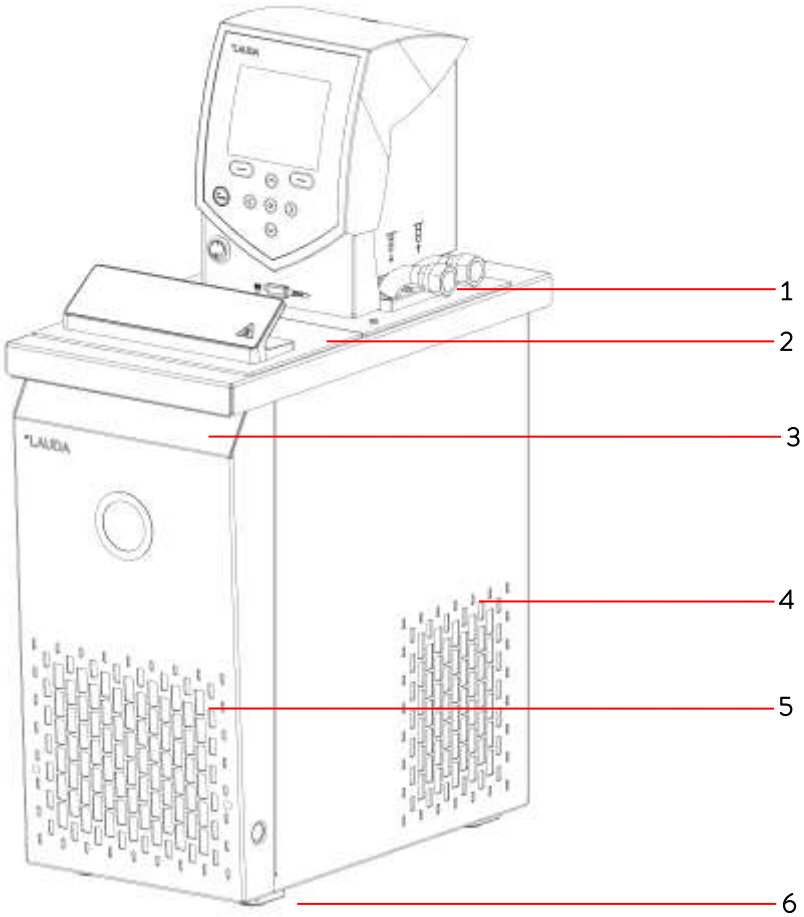
4 Bath with glass windows

5 Drain tap and draining nozzle (right side)

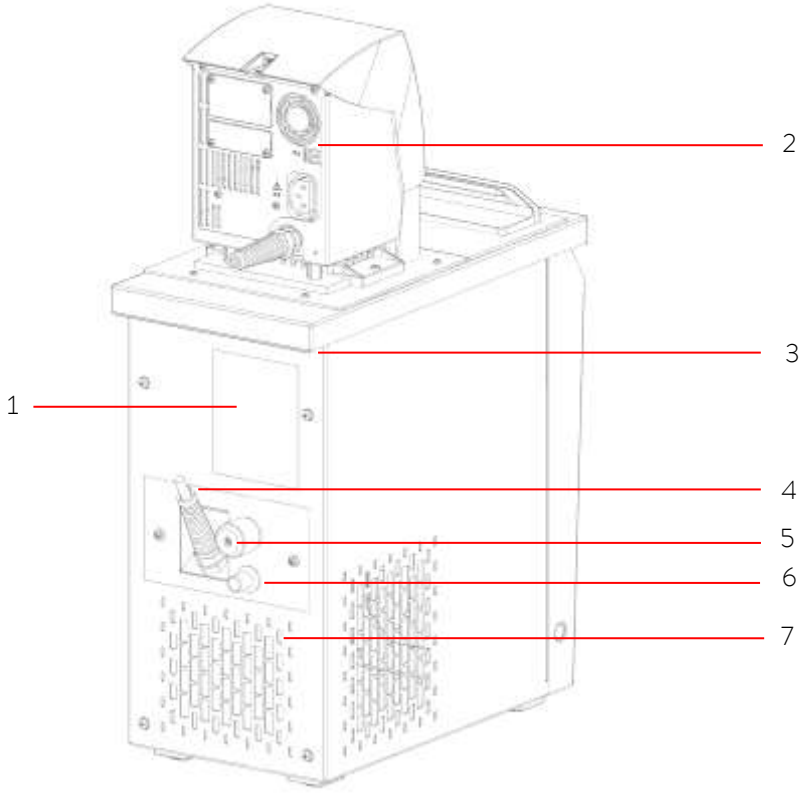
6 Type plate (right side)

7 Four feet (concealed)

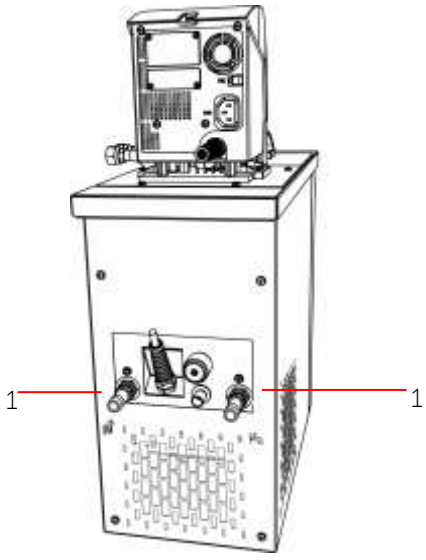
Cooling Thermostats ECO GOLD




1 Pump connection: Outflow and return with M16 x 1 thread (stainless steel)
2 Bath cover
3 Front grip recess
4 Ventilation grill (both sides)
5 Front panel (removable without tools)
6 Four feet




1 Rating label
2 Control cable between the control head and cooling underpart (only with RE 1050 G)
3 Rear grip recess
4 Connecting lead between the control head and cooling underpart
5 Bath draining tap
6 Bath drain point
7 Ventilation grill




1 Connections for water cooling

# 5 Transport and unpacking

Keep your original packing of your thermostat for later transport.


| Shipping damage |
| --- |
| *Electric shock hazard* |
| • Check the device carefully for shipping damage before putting into operation.<br>• Never operate the device if you have found shipping damage. |


| Falling / toppling equipment |
| --- |
| *Crushing of hands and feet, impacts* |
| • Use the handles. (With heating thermostats grasp the device underneath)<br>• Site the device only on a level surface. |

Notice

| Falling / toppling equipment |
| --- |
| *Property damage* |
| • Do not tilt the cooling device during transport and never turn it upside down. |

Check the device and the accessories immediately after shipment for completeness and shipping damage. If contrary to expectations the device or accessories are found to be damaged, inform the shipping company immediately so that a report can be produced and the shipping damage examined.

Also, immediately inform **LAUDA Service Constant Temperature Equipment** (⇨ 8.7).

Standard accessories:

| Catalogue number | Quantity | Description | Included with thermostat |
|---|---|---|---|
| HDQ 168 | 1 | Bath Cover E 4 | E 4 G |
| HDQ 163 | 1 | Bath Cover RE 415, RE 420 | RE 415 G and RE 420 G |
| HDQ 164 | 1 | Bath Cover RE 620, RE 630 | RE 630 G |
| HDQ 165 | 1 | Bath Cover RE 1050 | RE 1050 G |
| HDQ 166 | 1 | Bath Cover RE 1225 | RE 1225 G |
| HDQ 167 | 1 | Bath Cover RE 2025 | RE 2025 G |
| LCZ 0717 | 1 | Pump Connection Set | Cooling thermostats, E 4 G, ET 15 G, Viscotemp |
| HKO 026 | 2 | Fitting ∅ 13 mm | Cooling thermostats, E 4 G, ET 15 G |
| HKM 032 | 2 | Union Nuts M16x1 | Cooling thermostats, E 4 G, ET 15 G |
| HKN 065 | 2 | Sealing Plug | Cooling thermostats, E 4 G, ET 15 G |
| LCZ 0720 | 1 | Cooling Coil | RE (cooling) devices, E 4 G, ET 6 G |
| LCZ 0721 | 1 | Cooling Coil | E 10 G, E 20 G, E 25 G, E 40 G, ET 12 G, ET 20 G |
| EZB 260 | 1 | Warning Label "HOT"  | All thermostats<br>**Note:** With applications above 70 °C attach the warning label at an easily visible point. |
| YACE0088 | 1 | Operating Instructions | All thermostats |

# 6 Before putting the device into operation

Please note:

- The device can be operated up to an ambient temperature of 40 °C.
- A higher ambient temperature can have a negative effect on the cooling output of the thermostats used.
- When putting the chiller into operation after a lengthy shut-down, up to 30 minutes may pass until the rated refrigerating power is available depending on room temperature and device type.

## 6.1 Assembly and siting

Always comply with the following safety information:

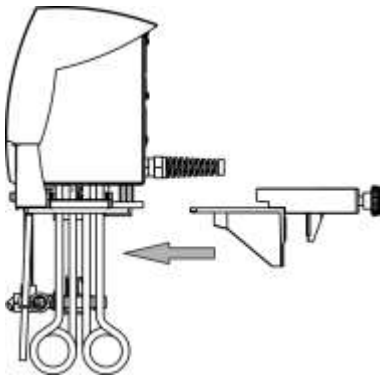

| Falling / toppling equipment on sloping surfaces / table edge |
|---|
| *Crushing of hands and feet* |
| • Only site the device on flat surfaces, not near the edge of the bench or table. |

Affix the symbol "Hot surface".

The ECO thermostat is used as:

- Immersion thermostat (optionally with cooling coil and/or pump connection set),
- Heating thermostat (heating bath and circulation thermostat),
- Cooling thermostat (cooling/heating bath and circulation thermostat).

### Assembly as immersion thermostat

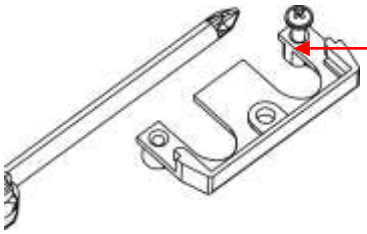


- Push the screw clamp on the underside of the control head into the guide rails.
- Insert the thermostat with the screw clamp into the temperature control vessel (⇨ 9) and screw the clamp tightly to the bath edge with the knurled screw.
- With plastic baths the tubular heating element must not contact the bath wall.
- Ensure that the ventilation opening at the back of the device is free.
- Keep a distance of at least 20 cm free on all sides of the device.


| Control head drops into bath |
| --- |
| *Electric shock hazard* |
| • Make sure that the control head mounting is securely joined to the bath. |

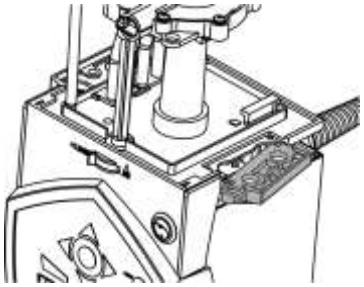
## Operation with cooling coil

For the optional operation with the cooling coil (LCZ 0720 and LCZ 0721) mount the cooling coil as follows:



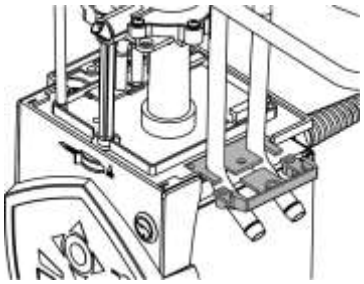
Cut the thread with the enclosed screw

- Cut the thread on the holed flange already before assembly.



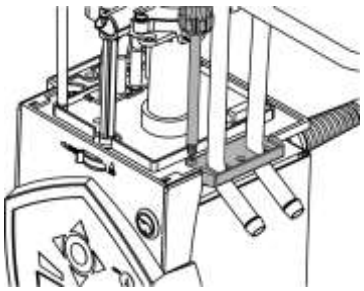
The cooling coil can only be mounted on one side of the control head. This is located on the side with the mains switch.

- Withdraw the mains plug.
- Use a soft underlay to avoid scratches to the upper side of the control head.
- To fit the cooling coil loosen the two cross-head screws on the blind flange and remove it (see illustration).



- Place the flange of the cooling coil in the position of the removed blind flange and push the holed flange underneath it.

Holed flange

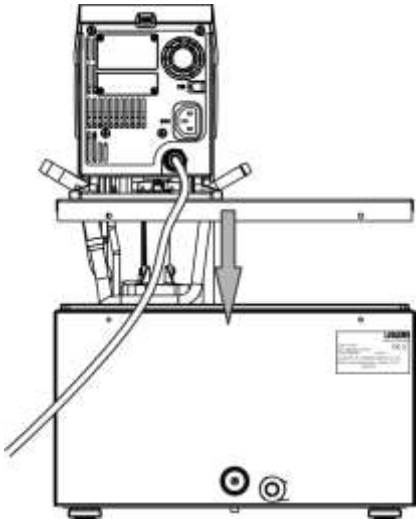


- With the two cross-head screws, mount the carrier plate of the cooling coil and the holed flange to the underside of the control head.

Please note: Use the cooling coil with cooling water only at operating temperatures below 100 °C.
At higher temperatures there is danger of hot steam forming.

For operation with an external consumer follow the connection instructions (⇨ 6.2).

Assembly as immersion thermostat



- Place the bath vessel on a flat surface.
- The control head is already screwed to the bath bridge.
  In the rear part of the bath there are two slots present on the bath edge. Guide the prongs of the bath bridge into the slots to the right and left from the rear of the bath. Place the bath bridge fully onto the bath bridge. Mount the bath bridge on the rear of the bath with the two enclosed cross-head screws.
- Ensure that the ventilation opening at the back of the control head is free.
- Keep a distance of at least 20 cm free on all sides of the device.

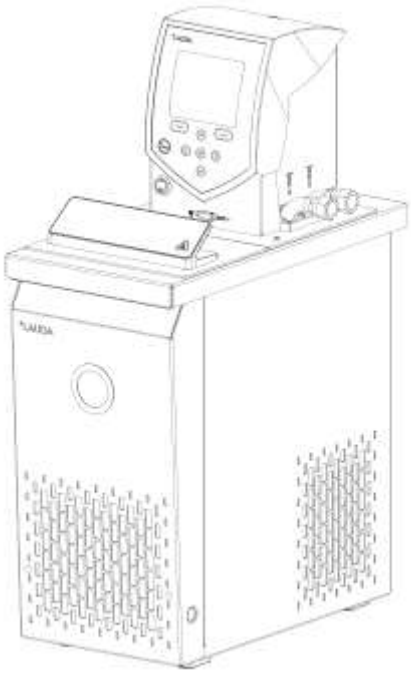
Important: Set the flow distribution to INT so that during operation as a bath thermostat (without external consumer) the flow is discharged from the opening for the internal bath circulation.
When mounting the pump connection set, the outflow nozzle of the pump set must be closed (use sealing plug) or connected to the return nozzle by a hose.

- For bath temperatures above 70 °C attach the sticker included in the supplied items to an easily visible point on the bath.

- The control head must be removed when optionally fitting the pump connection set (⇨ 6.2). To do this, release the two cross-head screws and carefully take the control head out of the bath bridge.

Assembly as cooling thermostat

| Notice | Falling / toppling equipment |
|---|---|
| | *Property damage* |
| | • Do not tilt the cooling device during transport and never turn it upside down. |



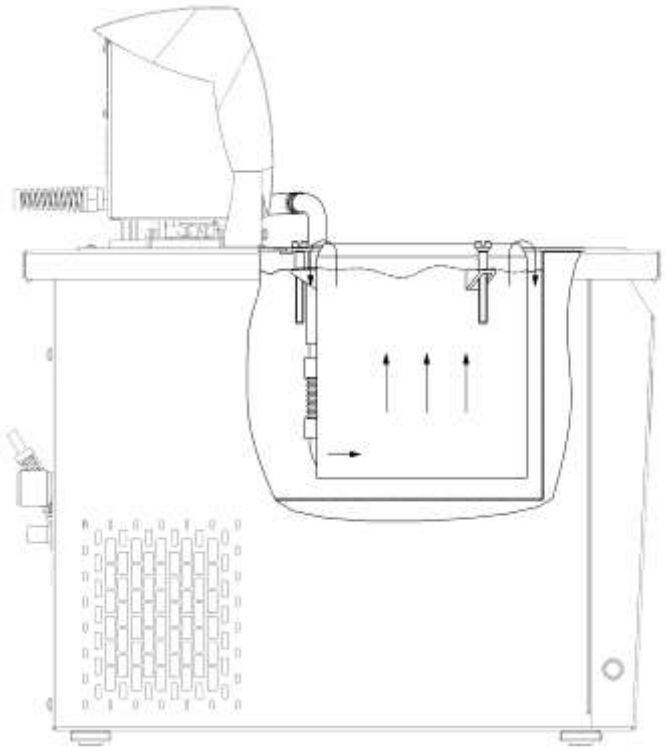
- After transport, site the device in place where possible two hours before putting it into operation so that, if necessary, oil deposits can form again and the compressor can develop its maximum power.
- Do not cover the ventilation openings.
- Keep a distance of at least 40 cm free on all sides of the device.
- Set the flow distribution to INT so that during operation as a bath thermostat (without external consumer) the flow is discharged from the opening for the internal bath circulation.
- Plug the appliance connector of the cooling underpart into the appropriate socket 51H and the control cable into the connection socket at the back of the operating panel.
- During operation as a bath thermostat without an external consumer and with the pump connection set fitted, the outflow nozzle of the pump connection set must be closed (use sealing plug) or connected to the return nozzle with a hose.
- For bath temperatures above 70 °C attach the sticker included in the supplied items to an easily visible point on the bath.

- Operation with external consumer (⇨ 6.2).

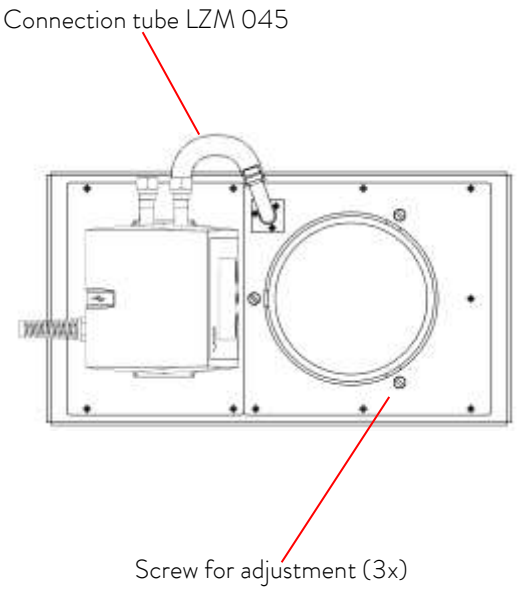
Device description of the calibration thermostat RE J 1225 G

The thermostats are especially equipped to calibrate glass thermometers or electric thermometers. The cylindrical (working) chamber can be adjusted in its height up to 20 mm approximately and therefore it is possible to adjust the surface of the liquid bath within the working chamber higher than the (bath) cover.

Therefore, the total immersing thermometers can be read right at the point of immersion. Additionally the separate working chamber provides a constant immersion depth, independent from the volume extension of the bath liquid, an extremely good temperature accuracy and distribution of temperature. There are pump connectors to connect other external closed circuits, but won't be available if the thermostat is used for calibrating.



Side view




Top view

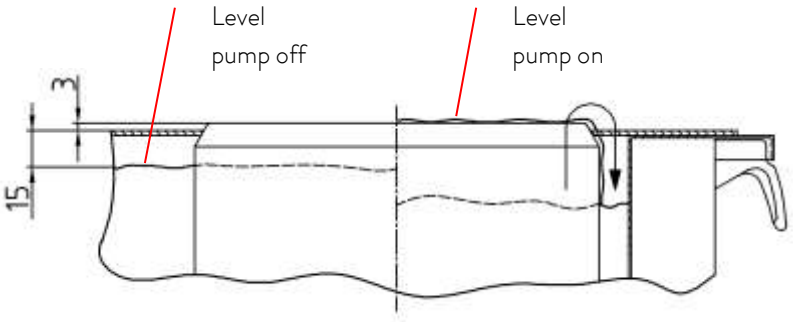
## Starting up of the calibration thermostat

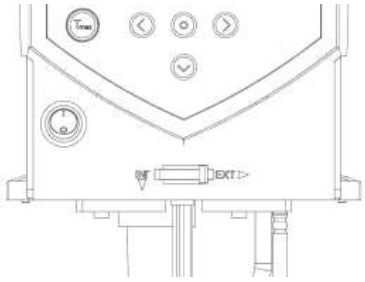
Firstly, assemble the connecting tube LZM 045 as per diagram.

**Attention!** Do not bend the tube! Hold up with open-end wrench SW 14 mm.

Please move the connecting screws for adjustment of the cylindrical chamber always gradually (about 2 rotations). Adjust the working chamber as per diagram, and fix it that way it rises 3 mm above the bath opening. Refill the bath liquid only up to 15 mm underneath the bath opening and only at working temperature and switched-off pump.

Recommendation for the adjustment of the cylindrical working chamber





Switch the button for the distribution of the pump flow to "EXT".

The position EXT gives the greatest flow in the external circuit (cylindrical chamber).

### Maintenance of the calibration thermostat

For cleaning purposes and check-up of the bath liquid, we recommend lifting the front cover with the chamber as follows: Remove the connecting flange and release the screws M4. This structural component can now be taken out.

### Connection of the cooling water

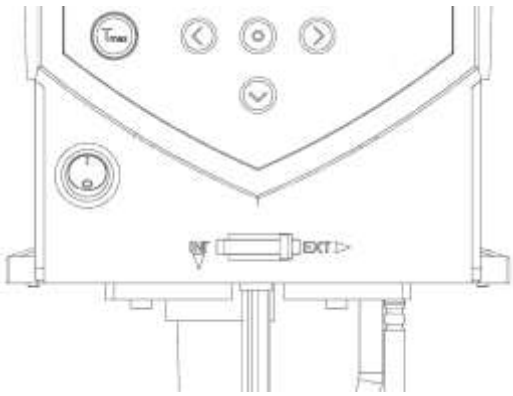
Note that the following conditions apply for the connection of the cooling water supply:

| | |
|---|---|
| Cooling water pressure (feed - outlet) | max. 10 bar overpressure |
| Differential pressure (feed - outlet) | min. 3.0 bar |
| Cooling water temperature | 10 to 15 °C recommended,<br>10 to 30 °C admissible with power restrictions) |
| Cooling water quantity | see Technical Data (⇨10) |
| Cooling water hose for connection to the device | min. 13 mm |

### Ways of adjusting the pump flow

The circulation of the heat transfer liquid by the pump can be divided between internal (INT) and external (EXT) with the aid of the selector switch at the front on the control head (flow distribution). This adjustment is continuously variable and is also possible at any time during operation.

The adjustment between internal and external circulation is only practicable when an external consumer is connected. You need a pump connection set for this. This set is included as standard with cooling devices and with the heating devices E 4 G and ET 15 G. With immersion thermostats and the other heating thermostats the pump connection set is available as an accessory (⇨ 9).



With a pure bath application the selector switch has to be set to INT.

## 6.2 Connection of external consumers

For heating thermostats a pump connection set is available as an accessory (⇨ 9) for the connection of an external consumer.
This pump connection set is included as standard with cooling thermostats and with the heating thermostats E 4G and ET 15 G.

Notice

| Confusing pump connector and cooling coil |
| --- |
| *Environmental hazard from leaking heat transfer liquid* |
| • Follow the illustrations in this section. |

Notice

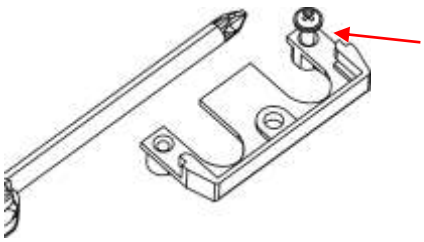
| Leaks from consumers, hoses and accessories |
| --- |
| *Environmental hazard from leaking heat transfer liquid* |
| • Always secure the hoses with suitable safety devices. |

The ECO thermostat can be equipped as an immersion thermostat or as a circulation thermostat.

### Immersion thermostat/heating thermostat

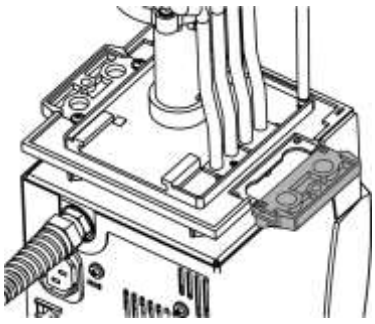
With heating thermostats the control head must first be removed by releasing the two cross-head screws from the bath bridge.

For optional operation with the pump first mount the pump connection set and then carry out the complete assembly:



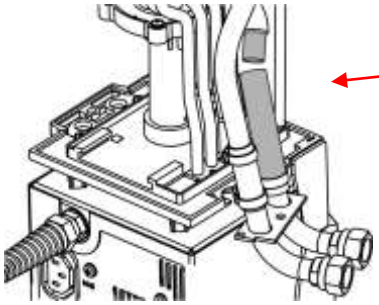
Cut the thread with the screw

- Cut the thread on the holed flange already before assembly.

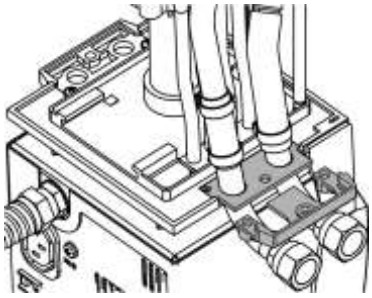


The pump connection set can be mounted on one side of the control head (see illustration).

- Withdraw the mains plug.
- Use a soft underlay to avoid scratches to the upper side of the control head.
- With heating thermostats: Remove the flat seal.
- Remove the blind flange by releasing the two cross-head screws.

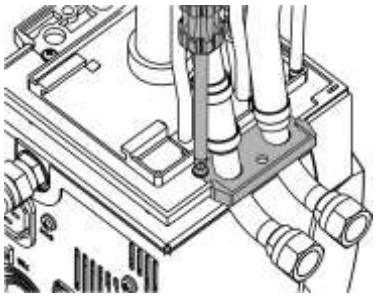


- Turn the pump output downwards for external bath circulation.
- Fit the hose section of the pump connection set onto the outflow elbow and place the pump connections in the position of the removed blind flange.

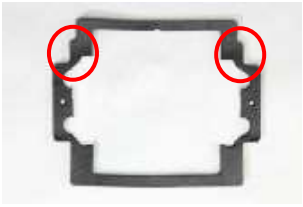


- Push the holed flange under the pump connections and fasten it with two cross-head screws to the underside of the control head.

Holed flange

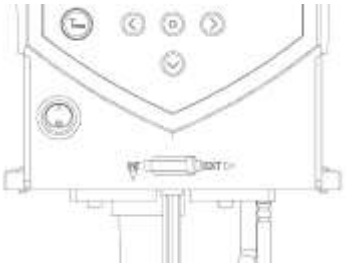


- Use the flat seal. Make sure the seal is in the correct position. On one side of the seal there are two steps:



They must be positioned on the side of the display.

- Refit the control head onto the bath bridge with the two cross-head screws.



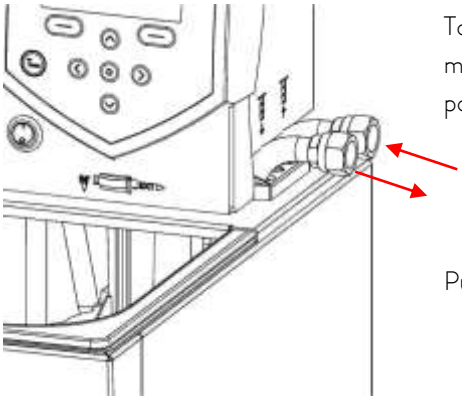
- Select the division of the pump flow to suit the thermostating task using the selector switch on the front of the control head.

The position EXT gives the greatest flow in the external circuit.

With the position INT the external flow is throttled to a minimum and the outlet for the internal bath circulation is fully opened.

With positions between INT and EXT the flow is divided up between internal and external circulation.

Operation as circulation thermostat



To ensure the greatest volume flow, with operation as a circulation thermostat ensure the shortest possible hose connections with the largest possible hose internal diameter.

- Connect a hose with 11 – 12 mm inside diameter (⇨ 6.4) to the pump connections.

Pump connection (⇨ labeling on the housing of the control head):

- Outflow **OUT** (front)
- Return to the bath **IN** (rear)

Note:

- Always use the largest possible cross-section and the shortest possible hose lengths in the external circuit.
- For a hose cross-section that is too small a temperature gradient occurs between the bath and external consumer due to a volume flow that is too low. In this case increase the bath temperature or the pump level appropriately.
- Secure the hoses with the aid of hose clips.
- If the thermostat is to be externally controlled, a temperature sensor must be fitted in the external consumer.
- If the consumers are situated at a higher level and with the pump stopped and air seeping into the external fluid circuit, then even with enclosed circuits the external volume may run empty. There is danger of the thermostat overflowing.
- If no external consumer is connected, the outflow nozzle must be sealed off or connected to the return nozzle by a hose.

Notice

| Pump connections not closed off |
| --- |
| *Environmental hazard from leaking heat transfer liquid* |
| • Fit sealing plugs to the pump connections when no external consumers are connected and set the flow distribution to internal **"INT"**. |

Notice

| Thermostat overflow |
| --- |
| *Environmental hazard from leaking heat transfer liquid* |
| • Do not position the thermostat above the consumer. |

## 6.3 Filling and emptying

LAUDA accepts no liability for damage caused by the use of unsuitable heat transfer liquids (approved heat transfer liquids (⇨ 6.4)).


| Contact with heat transfer liquid when filling / draining |
|---|
| *Harmful when inhaled,*<br>*damage to eyes and skin* |
| • Pay attention to the safety data sheet for the heat transfer liquid.<br>• Use CE gloves, protective clothing and eye protection during physical contact with heat transfer liquid.<br>• Avoid splashing the heat transfer liquid.<br>• Make sure that the drain tap is closed before filling. |


| Use of unsuitable heat transfer liquid |
|---|
| *Explosion, burns, scalds, fire* |
| • When selecting the heat transfer liquid, observe the admissible temperature range.<br>• Only use LAUDA heat transfer liquids. |

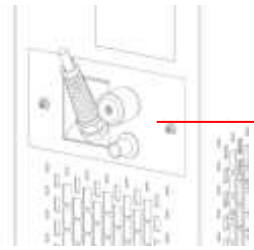
Notice

| Overfilling containers, spilling heat transfer liquid |
|---|
| *Environmental hazard from leaking heat transfer liquid* |
| • Note the thermal volume expansion of the heat transfer liquid.<br>• Where necessary, consider the displacement volume of the body being introduced.<br>• Take the volume of external consumers into account. |

### Filling

- Withdraw the drain tap.
- Optimum operation is ensured with a filling level of 20 - 40 mm below the bath bridge (max. filling level: 20 mm).
- Operation is possible down to a filling level of 60 mm below the bath bridge; a low level alarm occurs from a filling level of approx. 90 mm below the bath bridge. (⇨ 8.1)
- When using oils as heat transfer liquids note that they expand on heating (approx. 10 % per 100 °C).
- Take into account the displacement volume of any objects to be introduced into the bath.
- With a connected external consumer the complete expansion takes place in the bath.

## Draining and changing the heat transfer liquid



1

- Switch off the thermostat and withdraw the mains plug.
- Allow the device and heat transfer liquid to cool down to or warm up to room temperature.
- Push a hose onto the bath drain point.
- Drain the heat transfer liquid via the drain tap at the back of the device.

1 Drain tap, cooling thermostats

2 Drain tap, heating thermostats

2

Completely drain the bath, external consumers, accessories and hose connections and flush or clean them (e.g. with new heat transfer liquid).


| Contact with hot / cold heat transfer liquid |
|---|
| *Scalds, frostbite* |
| • Bring heat transfer liquids to room temperature before draining.<br>• Make sure that the drain tap is closed after draining. |


| Delay in boiling and thermal decomposition due to liquid residues |
|---|
| *Burns, scalds, development of harmful vapors* |
| • Remove all old heat transfer liquid completely from the bath, external consumers, accessories and hoses. Flush and clean them with new heat transfer liquid. |

## 6.4 Heat transfer liquids, cooling water and hoses

Note:

- Tap water is unsuitable for operation with the thermostat due to the calcium carbonate content. The bath vessel may calcify.
- High purity water (from ion exchangers) and distilled or bidistilled water are unsuitable for operation due to the corrosive properties of these media. High purity water and distillates are suitable as a medium after the addition of 0.1 g of soda (Na2CO3, sodium carbonate) per liter of water.
- Water containing iron (rust formation), chlorine (pitting) and untreated river water ("algae formation") is unsuitable.
- The bath vessels of the LAUDA ECO thermostats are produced in stainless steel 1.4301 and are accordingly resistant to mechanical and chemical stresses.
- Metals have different electrochemical potentials. Therefore, in the case of direct contact between the tank and a frame (copper for example) electrochemical oxidation may occur. The bath corrodes despite the use of high quality materials on the tank. Avoid the use of this type of frame or direct contact with it or contact with non-ferrous metal samples and the inside of the container. Use original LAUDA stainless steel frames or commercially available frames in temperature-resistant plastics.

a) Approved heat transfer liquids

| LAUDA designation | Operating temperature range | Chemical characterization | Viscosity (kin) | Viscosity (kin) at temperature | Flash point | Container size Catalogue number | | |
|---|---|---|---|---|---|---|---|---|
| | °C | | $mm^2/s$ at 20 °C | $mm^2/s$ | °C | 5 L | 10 L | 20 L |
| Kryo 51 | -50 – 120 | Silicone oil | 5 | 34 at -50 °C | 120 | LZB 121 | LZB 221 | LZB 321 |
| Kryo 30 ② | -30 – 90 | Monoethylene glycol/water mixture | 4 | 50 at -25 °C | 119 | LZB 109 | LZB 209 | LZB 309 |
| Kryo 20 | -20 – 170 | Silicone oil | 11 | 28 at -20 °C | 170 | LZB 116 | LZB 216 | LZB 316 |
| Therm 160 ③ | 60 – 160 | Polyalkylene glycol | 141 | 5 à 140 °C | 260 | LZB 106 | LZB 206 | LZB 306 |
| Therm 180 | 0 – 180 | Silicone oil | 23 | 36 at 0 °C | 250 | LZB 114 | LZB 214 | LZB 314 |
| Therm 250 | 50 – 250 | Silicone oil | 125 | 45 at 50 °C | 300 | LZB 122 | LZB 222 | LZB 322 |
| Aqua 90 ① | 5 – 90 | Decalcified water | 1 | -- | -- | LZB 120 | LZB 220 | LZB 320 |

① At higher temperatures vaporization losses occur. In this case use a bath cover (⇨ 9). Use distilled water or pure demineralized water only after adding 0.1 g of soda ($Na_2CO_3$ sodium carbonate) per liter of water. Otherwise there is the risk of corrosion!

② The proportion of water reduces with longer working at high temperatures and the mixture becomes flammable (flash point 119 °C). Check the mixing ratio using a hydrometer.

③ Not suitable for polycarbonate baths.

Silicone hoses are not suitable for silicone oils!

EPDM hoses are not suitable for mineral oils!

- When choosing the heat transfer liquid, it must be noted that at the lower limit of the operating temperature range impairment of the heat transfer properties is to be expected due to the increasing viscosity. Therefore, only use the full operating temperature range where necessary.
- The working ranges of the heat transfer liquids and hoses are general figures which can be tightened due to the operating temperature range of the devices.
- Never use contaminated heat transfer liquids. Contamination of the pump chamber may lead to the pump jamming and the device then switching off.
- Pay attention to the safety data sheet for the heat transfer liquid.
- Follow the regulations for disposal of the used heat transfer liquid.

If required, you can request the safety data sheets at any time. (⇨ 8.7)

### b) Cooling water

Certain requirements are placed on the cooling water with regard to purity. Depending on the cooling water contamination, a suitable method of purification and/or treatment of the water must be employed. The condenser and the complete cooling water circuit can become blocked, damaged and leaky due to unsuitable cooling water. Extensive consequential damage may arise on the whole cooling circuit. The cooling water quality depends on local conditions. If a fault or damage occurs due to unsuitable water quality, it is not covered by our guarantee.

Important: Danger of corrosion of the cooling water circuit due to water of unsuitable quality.

- Free chlorine (e.g. from disinfectants) and water containing chlorine lead to pitting in the cooling water circuit.
- Distilled, deionized or demineralized water is unsuitable due to its corrosive properties and leads to corrosion in the cooling water circuit.
- Seawater is unsuitable due to its corrosive properties and leads to corrosion in the cooling water circuit.
- Water containing iron or iron particles leads to rust formation in the cooling water circuit.
- Due to the high lime content hard water is not suitable for cooling and leads to calcification in the cooling water circuit.
- Cooling water with suspended matter is not suitable.
- Untreated and unpurified river or cooling tower water is not suitable due to its microbiological content (bacteria), which can become deposited in the cooling water circuit.
- Putrid water is not suitable.

### Suitable cooling water quality

| Specification | Value and Unit |
|---|---|
| pH – value | 7.5 – 9.0 |
| Hydrocarbonates [$HCO_3$-] | 70 – 300 mg/L |
| Chlorides ($Cl^-$) | < 50 mg/L |
| Sulfates [$SO_4^{2-}$] | < 70 mg/L |
| Hydrocarbonates [$HCO_3$-] / sulfates [$SO_4^{2-}$] | > 1.0 |
| Total hardness | 4.0 – 8.5 °dH |
| Conductivity | 30 - 500 µS/cm |
| Sulfites [$SO_3^{2-}$] | < 1 mg/L |
| Free chlorine gas ($Cl_2$) | < 0.5 mg/L |
| Nitrates ($NO_3$ -) | < 100 mg/L |
| Ammonia ($NH_3$) | Not permissible |
| Iron (Fe), dissolved | < 0.2 mg/L |
| Manganese (Mn), dissolved | < 0.05 mg/L |
| Aluminum (Al), dissolved | < 0.2 mg/L |
| Free aggressive carbonic acid ($CO_2$) | Not permissible |
| Hydrogen sulfide ($H_2S$) | Not permissible |
| Algae growth | Not permissible |
| Suspended matter | Not permissible |

### Risk to the environment due to oil contamination of the cooling water circuit

With a leaky condenser there is the danger that refrigerating machine oil from the refrigerant circuit of the cooling thermostat can pass into the cooling water.
Follow all the legal requirements and the regulations of the water supply utility which apply at the point of use.

### Water pollution due to leakage

To avoid pollution due to a leak in the cooling water system it is recommended that a leakage-water detector with a water cut-off is installed.

### Servicing intervals

Follow the information for cleaning and decalcifying the cooling water circuit (⇨ 8.3.4.2).

c) Approved elastomer hoses

| Type of hose | Internal diameter Ø mm | Temperature range °C | Application range | Catalogue number |
|---|---|---|---|---|
| EPDM hose uninsulated | 9 | 10 – 90 | For all LAUDA heat transfer liquids except mineral oils | RKJ 111 |
| EPDM hose uninsulated | 12 | 10 – 90 | For all LAUDA heat transfer liquids except mineral oils | RKJ 112 |
| EPDM hose insulated | 12 External Ø approx. 35 mm | -35 – 90 | For all LAUDA heat transfer liquids except mineral oils | LZS 021 |
| Silicone hose uninsulated | 11 | 10 – 100 | Water or Water/glycol mixture | RKJ 059 |
| Silicone hose insulated | 11 External Ø approx. 35 mm | -60 – 100 | Water or Water/glycol mixture | LZS 007 |

Note:

– EPDM hoses are **not** suitable for mineral oils!
– Silicone hoses are **not** suitable for silicone oils!
– Secure the hoses with the aid of hose clips.

d) Approved metal hoses in non-rusting stainless steel with union nut M16 x 1, inside diameter 10 mm

| Type | Length (cm) | Temperature range °C | Application range | Catalogue number |
|---|---|---|---|---|
| MC 50 | 50 | 10 – 400 | With simple insulation For all LAUDA heat transfer liquids | LZM 040 |
| MC 100 | 100 | 10 – 400 | | LZM 041 |
| MC 150 | 150 | 10 – 400 | | LZM 042 |
| MC 200 | 200 | 10 – 400 | | LZM 043 |
| Pump short circuit | 18 | 10 – 400 | | LZM 044 |
| MK 50 | 50 | -90 – 150 | With foam insulation for the cooling range For all LAUDA heat transfer liquids | LZM 052 |
| MK 100 | 100 | -90 – 150 | | LZM 053 |
| MK 150 | 150 | -90 – 150 | | LZM 054 |
| MK 200 | 200 | -90 – 150 | | LZM 055 |
| Pump short circuit | 18 | -90 – 150 | | LZM 045 |

## 6.5 Cooling of heating thermostats

At bath temperatures slightly above the room temperature (approx. 2 – 5 K) operation is possible at a low pump level (1 or 2) without cooling. For temperatures below room temperature cooling must be used.

With the immersion thermostat use a cooling coil (⇨ 6.1).

With bath and circulation thermostats the cooling coil is already built in as standard.

Connect external cooling fluid to the cooling coil. At temperatures above 20 °C, fresh water can be used. Ensure the lowest possible water consumption.

## 6.6 First switch-on

Make sure that the details on the name-plate match mains voltage and frequency.

| Notice | Use of inadmissible mains voltage or frequency |
|---|---|
| | *Property damage* |
| | • Compare the rating label with the available mains voltage and frequency. |

Note for electric installation on site:

The devices must be protected with a 16 ampere circuit breaker fitted during installation.

Exception: Devices with 13 ampere UK plugs.

Note:

– The device mains plug is used as a mains disconnection component.
  The mains plug must be easily recognizable and easily accessible.
– Only connect units to sockets having a safety earth conductor (PE). No liability is accepted for incorrect mains connection.
– Make sure that if not using an external consumer, the pressure nozzle is closed off or short-circuited to the return nozzle.
– Make sure that the unit is filled according to section (⇨ 6.3).

### Menu language

When switching the device on for the first time, you can select your desired menu language with the cursor keys ▲ and ▼. Confirm your choice with the enter key ◎.

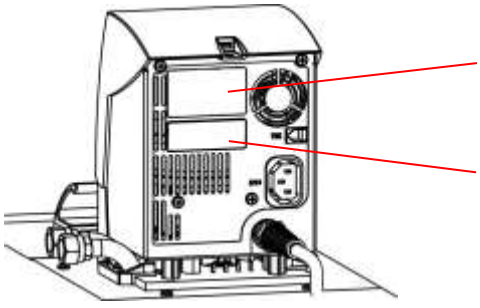

The menu language can be changed at any time (⇨ 7.4.7).

## 6.7 Installation of modules

When installing modules always follow this safety information:


| Live parts during module installation |
|---|
| *Electric shock hazard* |
| • Disconnect the device from the mains before module installation.<br>• Have the installation carried out only by specialists. |

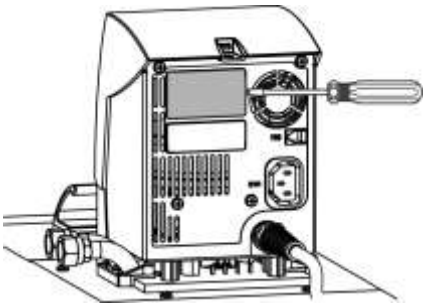
The ECO heating and cooling thermostats can be supplemented with interface modules which are inserted at the rear of the control head in two different module slots.



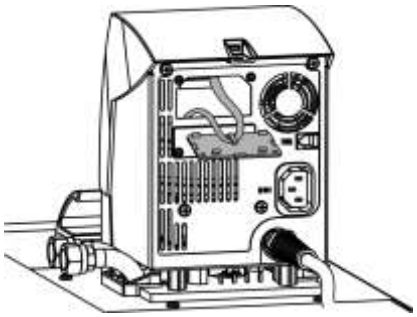
Upper module receptacle (approx. 51 mm x 27 mm) for RS 232/484 module / analog module / contact module / Profibus module

Lower module receptacle (approx. 51 mm x 17 mm) for Pt100/LiBus module

– Touch the bare earthed stainless steel back panel of the ECO thermostat to discharge any electrostatic charge.
– Remove the module from the packaging.
– Switch off the thermostat and withdraw the mains plug.



- The plastic cover has a recess on each side to ease removal. Insert a screwdriver first in the right and then in the left recess of the plastic cover and carefully lever it up.



- Pull the bus connecting lead out of the plastic cover.

- Plug in the bus connecting lead (red plug in the red socket).
- Introduce the module into the appropriate receptacle and fasten it using the two cross-head screws.
- Insert the mains plug again and switch on the thermostat.

The connectors have reverse-polarity protection. The plug has a projection which slides into a notch on the socket.

# 7 Operation

Always follow this safety information:


| Control head drops into bath |
| --- |
| *Electric shock hazard* |
| • Make sure that the control head mounting is securely joined to the bath. |


| Addition of liquids with low boiling points (e.g. water to hot oil), alteration of liquid properties (reducing the flash point) |
| --- |
| *Explosion, burns, scalds, fire* |
| • Site the device in suitable premises.<br>• Avoid dripping water and condensation.<br>• Do not position any small parts and liquids above the device.<br>• Keep the cover on the thermostat (if present) closed.<br>• Prevent the ingress of secondary liquids (e.g. from customer's heat exchanger).<br>• Do not work with liquids in the direct vicinity of the device.<br>• Check the heat transfer liquid at least every six months (e.g. mixing ratio with a hydrometer). |


| Skin contact with heat transfer liquid or hot / cold surfaces |
| --- |
| *Burns, scalds, frost bite, impacts, cuts, snagging* |
| • Only operate the device with its housing.<br>• Avoid splashes and hand contact with hot or cold heat transfer liquid.<br>• Use CE gloves, protective clothing and eye protection.<br>• Affix the symbol "Hot surface".<br>• Do not touch the connecting and drainage points in the operating state. |


| Contact with vapors from the heat transfer liquid |
|---|
| *Harmful by inhalation* |
| • Use an extractor hood.<br>• If possible, use a bath cover. |


| Bath overflow due to thermal expansion or immersion of objects |
|---|
| *Burns, scalds, frostbite* |
| • Take the volume of external consumers into account.<br>• Take into account the increase in volume with a rise in temperature. |


| Hot vapor formation / discharge of boiling cooling-water on the cooling coil |
|---|
| *Burns, scalds* |
| • Filling of cooling coil with cooling water only admissible up to $T_{max}$ of 100 °C! |

Notice

| Inadmissible operating temperatures; temperature difference between outflow and product too large |
|---|
| *Property damage (consumers, external components)* |
| • Note that an externally controlled bath temperature, especially during a transient response, may differ substantially from the set-point temperature.<br>• Note the various limitation options (Tih, Til, $T_{max}$, correction limitation).<br>• Set the overtemperature switch-off point $T_{max}$ according to the heat transfer liquid. $T_{max}$ must be below the flash point. |

## 7.1 Switching on

1 s

- Switch on the device with the mains switch. An acoustic signal sounds.



The current bath temperature ($T_{int}$) is displayed with the status display above it, the expanded status display at the top margin and the soft-key bar at the bottom margin.

The pump starts (exception: "Standby" operating status).


When standby is activated (⇨ 7.4.4), the last operating values are taken over.

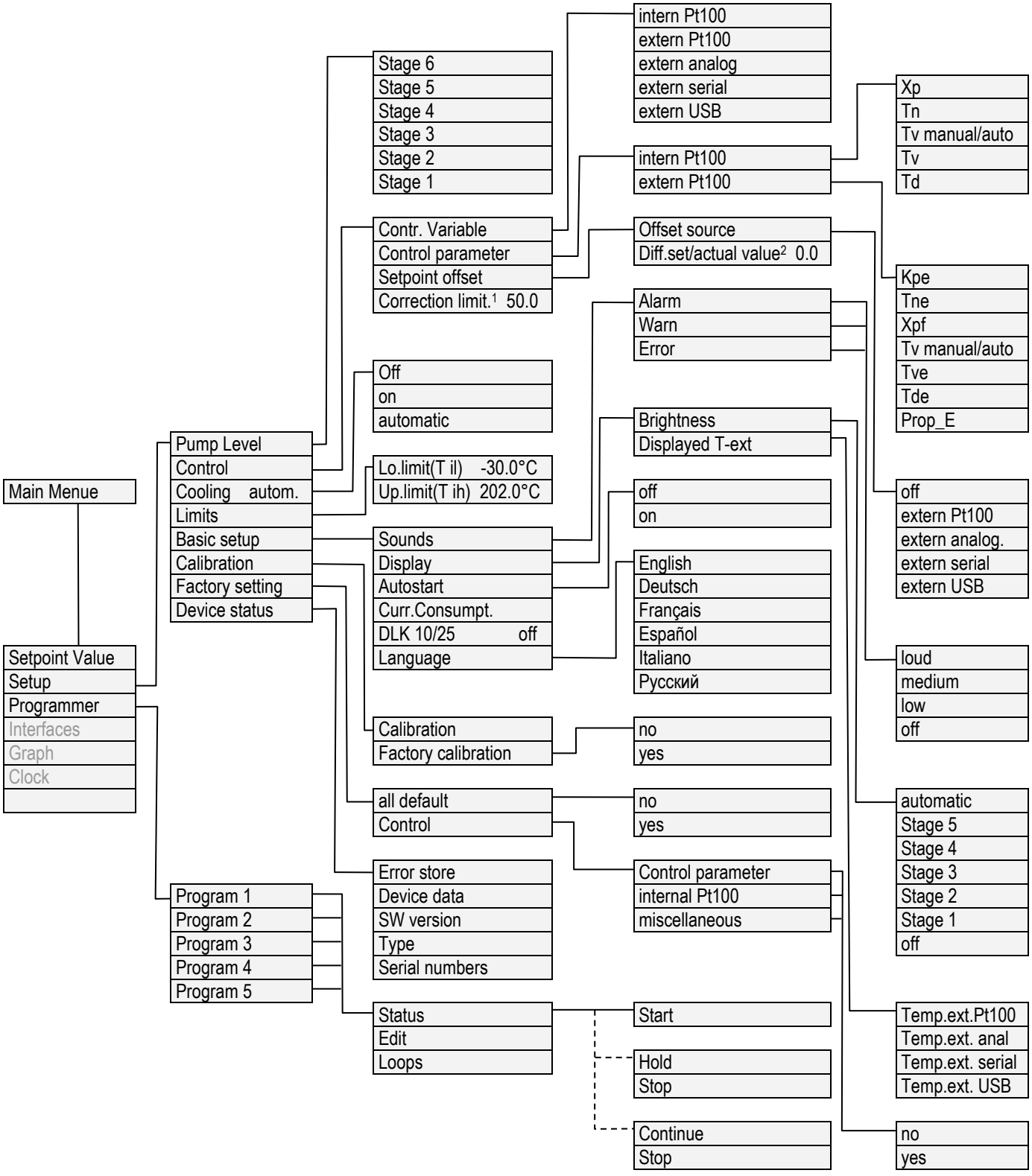

With the key $T_{max}$ you check or change the overtemperature switch-off point:

– On pressing the key $T_{max}$  the value in the upper line is displayed.

(Setting the overtemperature switch-off point $T_{max}$ (⇨ 7.4.1)).

## 7.2 Menu structure

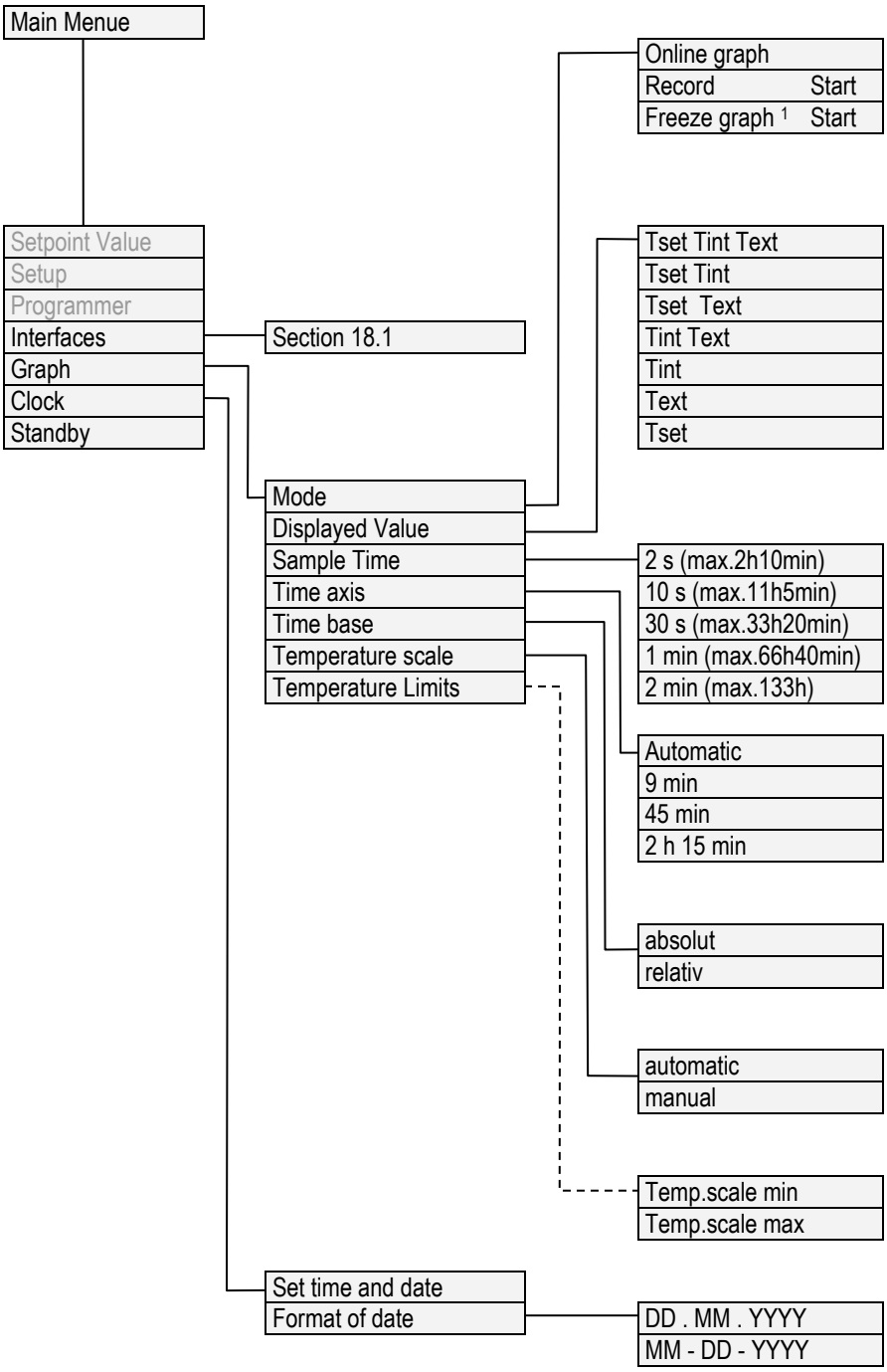
With the soft keys you can select the following menu points with the GOLD control head:




[1] Correction limitation [2] Difference between set point/actual value

Continued...

Continued from previous page




1 Freeze Graph

## 7.3 Display representation

The ECO thermostats offer you intuitive menu guidance. In the following the possible window views and the symbols used are explained.

### 7.3.1 Basic window


The following information is displayed depending on the operating status:

| | |
|---|---|
| 3 | Pump runs with the displayed pump level, graphical display with bars. |
| 25 % | Heating is active and heats with displayed percentage of total power. |
| 75 % | Heating is active and cools with displayed percentage of total power (only with cooling devices). |
| $T_{ext}$ | Temperature of the external application (if external temperature sensor is connected) |
| $T_{set}$ | Set-point temperature |
| $T_{int}$ | Current bath temperature |
| DISPLAY, O MENU, STOP | Soft-key bar; function call via associated keys |

If standby is activated (⇨ 7.4.4), "Standby" appears instead of the symbol for heating/cooling.

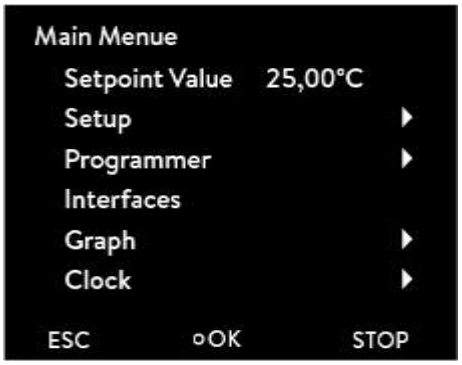
### 7.3.2 Menu window

The menu of the ECO GOLD thermostats consists of several menu levels. With the cursor keys , , , you can call the individual menu points and select them with the enter key .

| | |
|---|---|
| O | Symbolizes the enter key or its assigned function. |
| ✓ | Displays the currently selected function. |
| ▶ | Indicates that further menu levels (submenus) are present. |
| | The padlock symbolizes a blocked function.<br>(Possible reasons: No access rights or function deactivated by parameter settings). |

Examples of display representation:

Main menu




In the main menu selected menu points are displayed inversely.

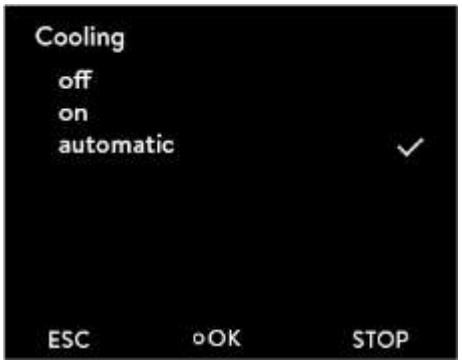
The soft-key bar is shown in the lower region of the display. The following functions, for example, can be selected with the soft keys:

ESC — You are returned to the main menu.

OK — You are taken to the submenu (this can also occur by pressing ).

STOP — Standby is activated.

Submenu "Cooling"




The following information is displayed in this window example:

- The setting on is displayed inversely and can be selected by pressing the enter key .

A tick ✓ behind the menu point indicates that this setting is active. In the example the cooling is set to "automatic".

### 7.3.3 Entry window

Values are input using the entry window.


In the entry window the following information is displayed:

The first line contains the input parameter in short form (cf. example: $T_{set}$).

The parameter is located below this in plain text.

Max. and Min. state the limits for the value to be entered.

The value to be entered is shown in large characters. The cursor flashes under the value.

You can change the value with the cursor key or . If you keep one of the two cursor keys pressed longer, input is speeded up.

By pressing or you can also select numbers individually and change them with or .

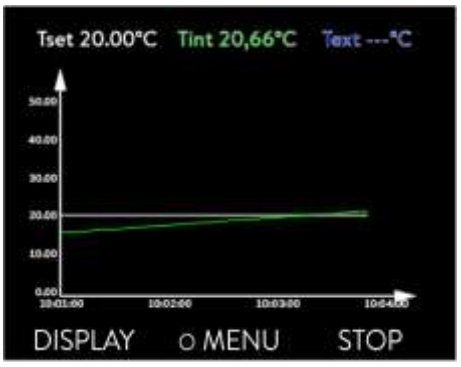
By pressing (+/-) the arithmetic sign can be changed.

The enter key takes over the set value.

By pressing (ESC) you are returned to the menu level without any change.

### 7.3.4 Graphics window

The ECO GOLD thermostats offer you the possibility of displaying temperature traces graphically.




In the graphics window the following information is displayed depending on the setting:

$T_{set}$ set-point temperature (grey)

$T_{int}$ internal bath temperature (green)

$T_{ext}$ Temperature on the external consumer, external temperature sensor (blue).

## 7.4 Basic setup

In this section the settings required for using the device as prescribed are summarized. For more extensive settings refer to the appendix.

### 7.4.1 Setting the overtemperature switch-off point $T_{max}$


| Overheating due to entering an incorrect $T_{max}$ and set-point temperature |
|---|
| *Burns, scalds, fire* |
| • Set $T_{max}$ in each case according to the heat transfer liquid used $T_{max}$ must be below the flash point. |

- Hold the key pressed during the complete setting procedure:


- Press the enter key.

The entry window appears. The cursor flashes under the $T_{max}$ value. The maximum and minimum adjustable temperature values are displayed.

- Change the value with or.

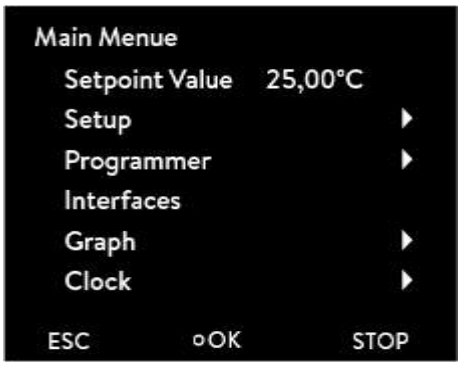
**Note:** With a longer depression the figures increment faster.

- Single figures can be selected by pressing or.
- Confirm your choice with the enter key.

On releasing you are returned to the menu level without any change.

For $T_{max}$ the following applies: 5 Kelvin above the required maximum bath temperature, but below the flash point of the heat transfer liquid.

### 7.4.2 Setting the temperature set-point value




- Access to the main menu level is obtained by pressing the enter key .
- Select the menu point "Set-point temperature" using the enter key .


The entry window appears. The cursor below the temperature value flashes and can be changed within the displayed limits.

- Change the value with or .
- Single figures can be selected by pressing or .
- By pressing (+/-), with appropriate equipment, the arithmetic sign can be changed.
- Confirm your choice with the enter key .

- *By pressing (ESC) you are returned to the menu level without any change.*

### 7.4.3 Setting the pump level

With the ECO Vario pump you have six pump levels available with which you can optimize the bath circulation, flow rate and pressure, the noise generated and the mechanical heat input. With small thermostats (e.g. E 4 G, RE 415 G, RE 420 G) without an external consumer power levels 1 to 3 are practicable and sufficient.


- Access to the main menu level is obtained by pressing the enter key .
- The adjacent menu window appears by selecting and confirming → Setup → Pump level.
- The level can be selected with or . The selected level is immediately active without confirmation.

- *You quit the menu by pressing (ESC) or .*

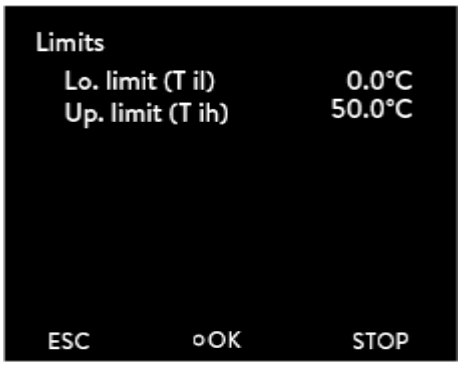
## 7.4.4 Activating the "Standby" operating state

In the "Standby" mode the pump, heater and chiller are switched off. The operating display remains active.


- Activate Standby by pressing (right soft key).

## 7.4.5 Defining temperature limits

With this function the temperature limits Til and Tih are defined. If, for example, you are using water as the heat transfer liquid, +5 °C is practicable as the minimum temperature and +95 °C as the maximum temperature.




- Access to the main menu level is obtained by pressing the enter key .
- Selection and confirmation of → Setup → Limits.

The adjacent menu window appears.

- Select the lower (Til) or upper (Tih) limit with or and confirm it with .


In the entry window the cursor flashes below the value to be changed. The permissible adjustment range is indicated with Min and Max.

- Change the value with or .
- Single figures can be selected by pressing or .
- By pressing (+/-) the arithmetic sign can be changed.
- Confirm your choice with the enter key .

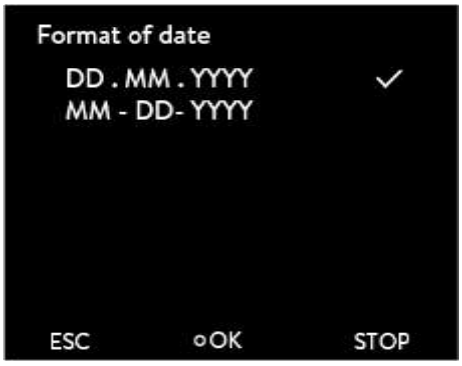
- *By pressing (ESC) you are returned to the menu level without any change.*

### 7.4.6 Setting the date and time


- Access to the main menu level is obtained by pressing the enter key ⊙.
- Selection and confirmation of → Clock → Set time and date.


The adjacent menu window appears.

- The cursor flashes under the hours display.
- Change the value with ▲ or ▼.
- Single figures can be selected by pressing ◀ or ▶.




- The adjacent menu window appears on selecting the menu point Format of date.
- The selection with ▲ or ▼ and confirmation with ⊙ selects between the date formats DD . MM . YYYY and MM - DD - YYYY.

- *By pressing ⊖ (ESC) you are returned to the menu level without any change.*

### 7.4.7 Selecting the menu language

The ECO GOLD thermostats offer you the possibility of selecting the menu languages of English, German, French, Spanish, Italian and Russian.


- Access to the main menu level is obtained by pressing the enter key ⊙.
- Selection and confirmation of → Setup → Basic setup → Language.

The adjacent menu window appears.

- Select the language with ▲ or ▼ and confirm with ⊙.

- *By pressing ◀ or ⊖ (ESC) you are returned to the menu level without any change.*

# 8 Maintenance

## 8.1 Alarms, warnings and errors

**Alarms**: Alarms are relevant to safety. Pump, heating and chiller switch off.

**Warnings**: Warnings are normally not relevant to safety. The device continues to run.

**Errors**: If a malfunction occurs, switch off the unit at the mains switch. If the malfunction recurs after switching on the device, contact LAUDA Service Constant Temperature Equipment (⇨ 8.7) or your local service organization.

All alarms, warnings or error messages triggered on the ECO thermostat are shown in the display as text. The list with alarms and warnings can be found in the appendix.

Once the cause has been rectified, you can clear alarms and warnings with .

Warnings can be ignored with without the message periodically appearing again.

### 8.1.1 Overtemperature protection: Alarm and checking

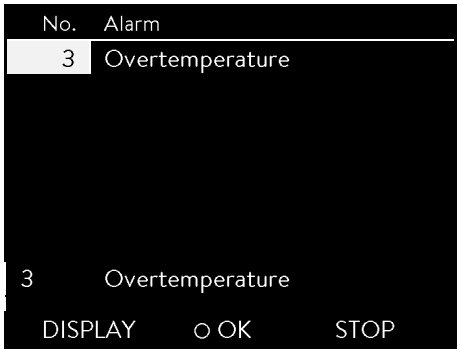

| Overheating due to entering an incorrect $T_{max}$ and set-point temperature |
|---|
| *Burns, scalds, fire* |
| • Set $T_{max}$ in each case according to the heat transfer liquid used. $T_{max}$ must be below the flash point. |

**Note:** The devices are rated for operation with flammable and non-flammable liquids according to DIN EN 61010-1 and DIN EN 61010-2-010.

Set the overtemperature switch-off point as described in (⇨ 7.4.1). Recommended setting: 5 K above the desired maximum bath temperature (Remark: The overtemperature switch-off point $T_{max}$ is controlled by a system which operates independently of the bath control.

Set the overtemperature switch-off point $T_{max}$ below the flash point of the heat transfer liquid.


- The set overtemperature switch-off point is shown on pressing $T_{max}$ in the display.




When the bath temperature is located above the overtemperature switch-off point, a two-tone alarm sounds. "Overtemperature" appears in the display, the heater switches off on all poles and the pump and chiller are switched off via the electronics.

- Rectify the cause of the malfunction.
- Wait until the bath temperature has cooled below the overtemperature switch-off point or set the overtemperature switch-off point higher than the bath temperature.

If "Overtemperature" appears in the display:

- Unlock the "Overtemperature" display with .

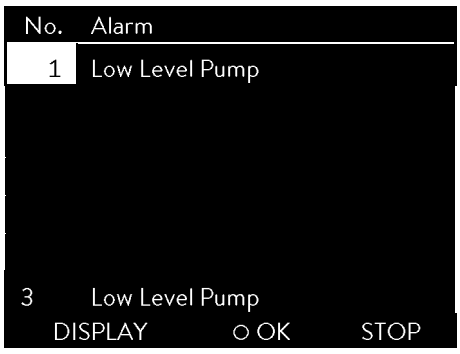
Before a longer unsupervised operation check the overtemperature **protection:**

- Slowly reduce $T_{max}$ as described in (⇨ 7.4.5). The thermostat should switch off when the actual temperature is greater than $T_{max}$.

Alarm signaling (see above) must occur.

- Reset the switch-off point to be higher than the bath temperature.
- Unlock the "Overtemperature" display with .

### 8.1.2 Low level: Alarm and checking




When the liquid level falls so far that the heaters are no longer completely covered with liquid, a two-tone alarm sounds. "Low Level Pump" appears in the display, the heater switches off on all poles and the pump and chiller are switched off via the electronics.

- Rectify the cause of the malfunction.
- Top up the missing heat transfer liquid (⇨ 6.3 and 6.4).
- Unlock the "Low Level Pump" display with .

**Check the safety system at regular intervals** (⇨ 8.3.2) by lowering the bath level. Do not carry out this test at a bath temperature below 0 °C or above 50 °C in order to avoid dangers due to temperatures that are too hot or too cold.

Alarm signaling (see above) must occur.

- Top up with heat transfer liquid.
- Unlock the "Low Level Pump" display with .

Switch the device off immediately and withdraw the mains plug if irregularities occur when checking the safety devices.

Contact LAUDA Service Constant Temperature Equipment (⇨ 8.7) or your local service.

## 8.2 Device status

Here, accumulated error messages as well as device and software data can be recalled.


- Access to the main menu level is obtained by pressing the enter key .
- Selection and confirmation of → Setup → Device Status.

The adjacent menu window appears.

Here, you can now

- Errorstore — Read out the error store
- Device data — Request device data
- SW version — Request the software version
- Type — Request the device type
- Serial numbers — Request serial number.

### 8.2.1 Store for errors, alarms and warnings

For error analysis the ECO thermostats have an error store in which up to 140 warning, alarm and error messages can be saved.


Error store

- confirm with .

The latest message is located in the first position.

- You navigate with or through the results which are sorted by date. The message text appears in the footer.

The relevant module which is causing the message is displayed under "Source".

"Code" is the coded alarm, warning or error description.

"Type" specifies alarm, warning or error. The list of alarms and warnings can be found in the appendix (⇨ 13).

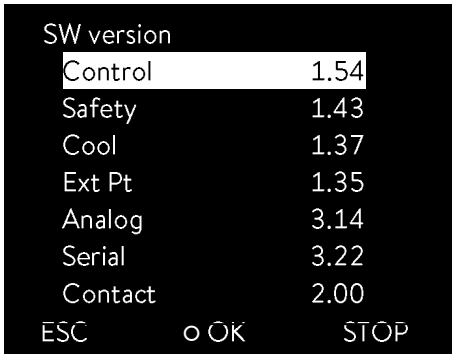
### 8.2.2 Device data


Device data

- confirm with .

The device parameters are displayed under the menu point Device data.

### 8.2.3 Software version




SW version

- confirm with .

Under the menu point SW version the appropriate software versions are displayed, depending on the device type and connected modules.

### 8.2.4 Displaying and changing the device type

Type

- confirm with .

The device type without the suffix "G" (GOLD) is shown in the menu.

You can change the device type .

Note:

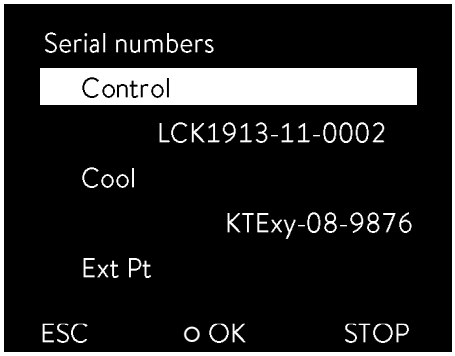
With a change of device type parameters are re-initialized and control parameters adapted by the user are lost!

Therefore, the type change has a three second delay on the key depression.

The overtemperature switch-off point $T_{max}$ is automatically adapted to the device type, i.e. with the ECO GOLD thermostat with a stainless steel bath $T_{max}$ = 202 °C, for the ECO GOLD thermostat with transparent bath $T_{max}$ = 102 °C.

You must now manually re-enter $T_{max}$ (⇨ 7.4.1), because otherwise the device enters the error status (error message in ECO GOLD "T max diff. Ctrl-Safety").

### 8.2.5 Displaying serial numbers




Serial numbers

- confirm with .

Under the Serial numbers menu point the serial numbers of Control and Safety are displayed. Provided they are available, the serial numbers of connected modules are also displayed.

## 8.3 Servicing

Follow all the safety information for cleaning and servicing the device.


| Critical temperature of device parts, heat transfer liquid or accessories (hoses) |
|---|
| *Burns, scalds, frostbite* |
| • Bring the device parts, accessories and heat transfer liquid to room temperature before touching them.<br>• Have repairs carried out only by a specialist.<br>• Affix the symbol "Hot surface". |

### 8.3.1 Cleaning


| Live parts in contact with cleaning agents |
|---|
| *Electric shock hazard* |
| • Disconnect the device from the mains before cleaning. |

Cleaning can be carried out with water with a few drops of a surfactant (washing-up liquid) added and with the aid of a damp cloth.

Notice

| Live parts in contact with cleaning agents |
|---|
| *Property damage* |
| • Disconnect the device from the mains before cleaning.<br>• Water and other liquids must not enter the control head. |

Only clean the control head with the cleaning agents, water (with washing-up liquid), petroleum benzine or ethanol.

Do not use any acetone or aromatic hydrocarbons (dilution) This would lead to permanent damage to the plastic surfaces.

Before all maintenance or cleaning work you must ensure that decontamination of the device is carried out if it has been in contact with hazardous materials.

### 8.3.2 Servicing intervals

| Device part | Mandatory for initial operation and before any longer unsupervised operation, then with recommended frequency | Section | Remarks |
|---|---|---|---|
| **Complete device** | | | |
| External condition of device | Monthly | | |
| **Heat transfer liquid** | | | |
| Inspect the heat transfer liquid | Every six months | (⇨ 8.3.3) | |
| **Bath vessel with drain tap** | | | |
| Sealing | Daily | | External inspection |
| **External hoses** | | | |
| Material fatigue | Monthly | | External inspection |
| **Chiller** | | | |
| Clean the air-cooled condenser | Monthly | (⇨ 8.3.4.1) | Cooling thermostat |
| Clean the screw-in sieve | Monthly | (⇨ 8.3.4.2) | Cooling thermostat, water-cooled |
| Decalcify the cooling water circuit | Quarterly | (⇨ 8.3.4.2) | Cooling thermostat, water-cooled |
| **Electronics** | | | |
| Overtemperature protection | Quarterly | (⇨ 8.1.1) | |
| Low-level protection | Quarterly | (⇨ 8.1.2) | |

*Bring the device parts and accessories to room temperature before touching them.*

### 8.3.3 Inspecting the heat transfer liquid

Contaminated or degenerated heat transfer liquid must be renewed.

The heat transfer liquid is to be checked for its usability as required, but at least every six months. Further use of the heat transfer liquid is only permissible if the inspection indicates this.

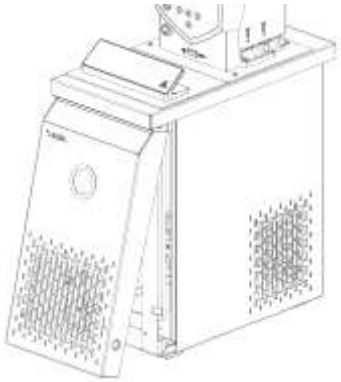
The test of the heat transfer liquid takes place according to DIN 51529; ("Testing and assessment of used heat carrier media"). Source: VDI 3033; DIN 51529.

Caution!

| Critical temperature of the heat transfer liquid |
|---|
| *Scalds, frostbite* |
| • Bring the heat transfer liquid to room temperature for the analysis. |

## 8.3.4 Cleaning the condenser

### 8.3.4.1 Air-cooled condenser



The cooling circuit is largely maintenance-free. Remove dust and contamination from the condenser at regular intervals (depending on operating period and exposure conditions).

- To do this, remove the front grille by grasping it at the bottom with both hands and pulling the grille to the front. To avoid damage, remove the front grille slowly and carefully.
- Then brush down the condenser and, where necessary, blow it out with compressed air.

Note:


| Contact with sharp-edged vanes on the condenser during cleaning |
|---|
| *Cuts* |
| • Clean the condenser with suitable tools (e.g. hand brushes, compressed air...). |

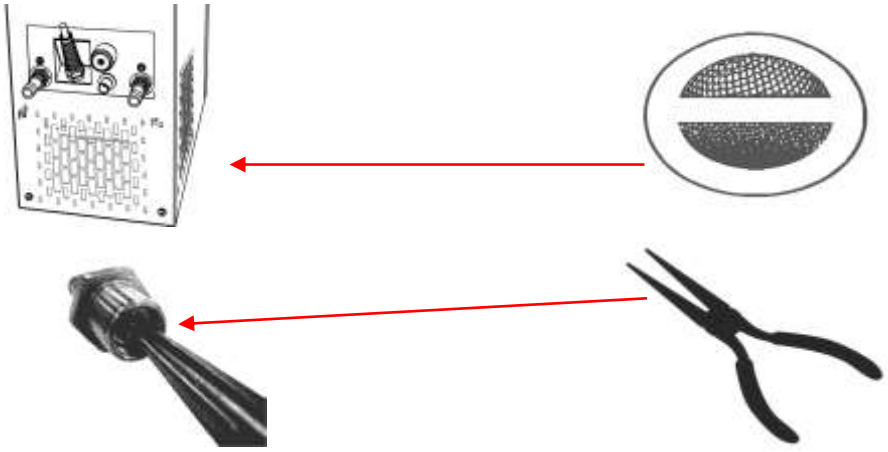
### 8.3.4.2 Water-cooled condenser

To obtain the full cooling output, the sieve and water circuit must be cleaned at regular intervals.

**Cleaning the screw-in sieve**

For regular cleaning (depending on the degree of contamination of the cooling water) screw-in sieve:

- Remove the water supply hose from the device.
- Unscrew the fitting from the device with a 19 AF open-ended wrench and remove the screw-in sieve from the fitting.
- Clean the screw-in sieve and then insert in back into the fitting.
- Mount the fitting and the water supply hose onto the device.



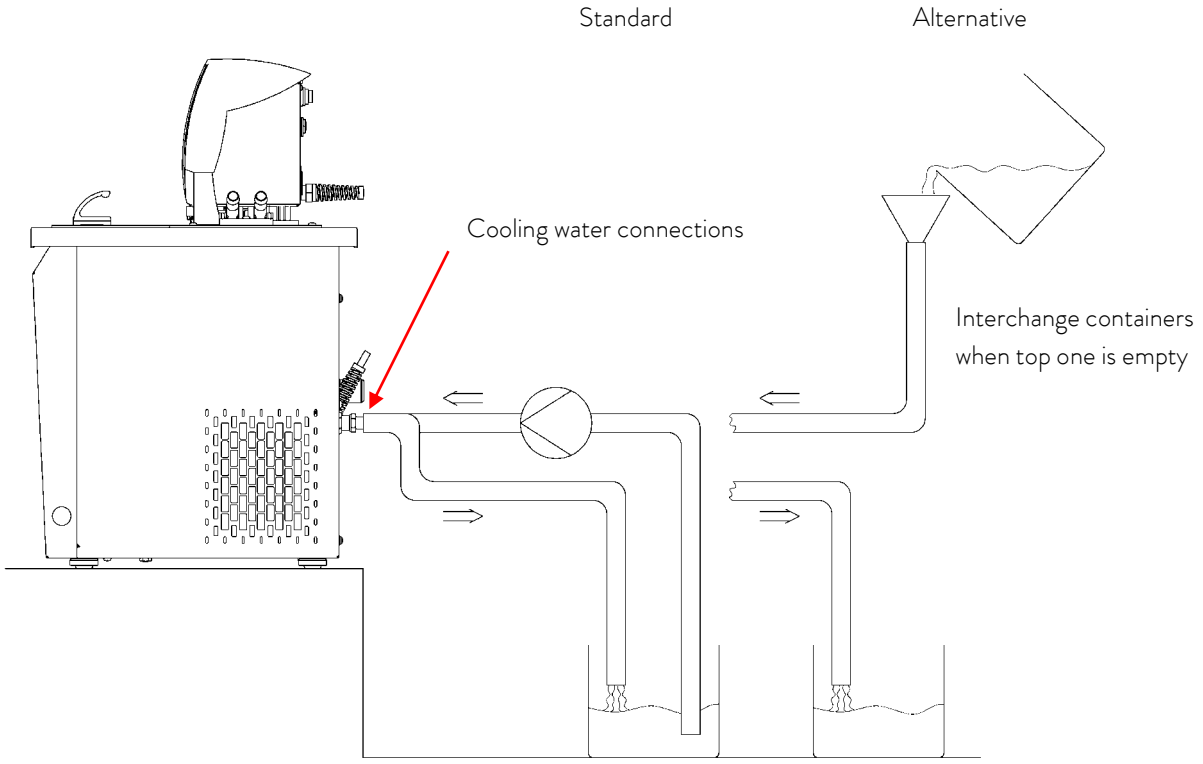
## Decalcifying the cooling water circuit

At regular intervals of 3 months or longer (depending on the water hardness / degree of contamination of the cooling water), the water-cooled condenser must be decalcified or cleaned.

Required equipment:

- Two containers of 10 to 20 liters.
- Use a suitable pump (drum pump) or possibly use hose with a funnel with funnel located above the cooling water inlet.

Hose between container, pump and cooling water inlet and also between cooling water outlet and container.




Via the water inlet hose, fill the device with decalcifier (pump or hose). Set the set value to 10 °C; after the chiller starts the water circuit can be filled. Circulate the decalcifier with the pump or continue to top up the decalcifier. Allow the decalcifier to have an effect (see table below). Then drain the device. Again connect the device to the water supply and thoroughly flush it out (see table below).

| | |
|---|---|
| Acting time | Continue with the pumping process until the foaming reaction decays. Generally, this is achieved after about 20 to 30 minutes. |
| Decalcifier | LAUDA article number: LZB 126 (5 kg)<br>When handling the chemicals, the safety information and the instructions for use on the package are to be followed. |
| Flushing | Allow at least 10 liters of water to flow through. |

## 8.4 Fault finding

Before you contact the LAUDA Service Constant Temperature Equipment (⇨ 8.7), check whether you can rectify the problem yourself with the following instructions.

In doing so, follow all this safety information:


| Live parts when fault finding |
|---|
| *Electric shock hazard* |
| • Disconnect the device from the mains before the repair (e.g. when changing components).<br>• Have repairs carried out only by a specialist. |


| Rotating / live parts when removing the ventilator fan |
|---|
| *Cuts, crushing, electric shock hazard* |
| • Disconnect the device from the mains before the repair.<br>• Have repairs carried out only by a specialist. |


| Uncontrolled start-up on release of jammed pump |
|---|
| *Crushing, electric shock hazard* |
| • Disconnect the device from the mains before the repair.<br>• Have repairs carried out only by a specialist. |


| Critical temperature of device parts, heat transfer liquid or accessories (hoses) |
|---|
| *Burns, scalds, frostbite* |
| • Bring the device parts, accessories and heat transfer liquid to room temperature before touching them.<br>• Have repairs carried out only by a specialist.<br>• Affix the symbol "Hot surface". |

| Fault | Possible remedy |
|---|---|
| Device does not cool | Dirty condenser → Clean condenser (⇨ 8.3.4).<br>Temperature limit Til too high → Reduce temperature limit Til (⇨ 7.4.5). |
| Device does not heat up | Temperature limit Tih too low → Increase temperature limit Tih (⇨ 7.4.5). |
| Device does not pump | Check selector switch for proportioning external and internal pump flow (⇨ 6.1); pump blocked by foreign bodies. |

## 8.5 Disposal information

The following applies for EU member states: The disposal of the device is regulated by EC Directive 2012/19/EU (WEEE Waste of Electrical and Electronic Equipment).

### 8.5.1 Disposal of the refrigerant

Type and amount of the refrigerant used are stated on the rating label. Repair and disposal are only to be carried out by specialists.

The following applies for EU member states: The disposal of the refrigerant must proceed according to EC Regulation 2015/2067/EU in conjunction with Regulation 517/2014/EU.

### 8.5.2 Disposal of the packaging

The following applies for EU member states: The disposal of the packaging proceed according to the EC Directive 94/62/EC.

## 8.6 Taking the device out of service

The device must be taken out of service by a specialist.
Comply with the following safety information:


| Contact with hot / cold heat transfer liquid |
|---|
| *Scalds, frostbite* |
| • Bring the heat transfer liquid to room temperature before draining.<br>• Drain the device and any accessories (e.g. hoses) before packing thoroughly. |


| Skin contact with hot / cold surfaces |
|---|
| *Burns, frostbite* |
| • Bring the surfaces to room temperature before touching them. |


| Uncontrolled escape of refrigerant / explosion |
|---|
| *Crushing, impacts, cuts* |
| • No disposal with cooling circuit under pressure.<br>• Only a specialist is permitted to take the device out of service. |


| Falling / toppling equipment |
|---|
| *Crushing of hands and feet, impacts* |
| • Use the handles (grip heating thermostats underneath the device). |

## 8.7 Ordering replacement parts / LAUDA Service

When ordering replacement parts, please state the serial number (rating label); this helps to avoid queries and incorrect deliveries.

Your contact for maintenance and expert service support.

LAUDA Service Constant Temperature Equipment
Phone: +49 (0)9343 503-350 (English and German)
Fax: +49 (0)9343 503-283
E-mail service@lauda.de

We are available at any time for queries and ideas!

LAUDA DR. R. WOBSER GMBH & CO. KG
Pfarrstraße 41/43
97922 Lauda-Königshofen
Germany
Phone: +49 (0)9343 503-0
Fax: +49 (0)9343 503-222
E-Mail info@lauda.de
Internet http://www.lauda.de

# 9 Accessories

Please take catalogue numbers for accessories from the following table.

Immersion thermostats

| Accessories | Suitable for | Catalogue number |
|---|---|---|
| Cooling coil set (small) | ECO GOLD, bath vessels up to 6 liters | LCZ 0720 |
| Cooling coil set (large) | ECO GOLD, bath vessels from 6 liters | LCZ 0721 |
| Pump connection set (outflow and return nozzles) with fitting 13 mm (plastic) | ECO GOLD | LCZ 0716 |
| Pump connection set (pressure and return nozzles) with thread M16 x 1 (stainless steel) 2 fittings, 2 union nuts | ECO GOLD | LCZ 0717 |

| Bath vessels | Material | Maximum temperature in °C | Volume L max. | Internal dimensions mm x mm x mm (W x D x H) | Catalogue number |
|---|---|---|---|---|---|
| 6 T | Polycarbonate | 100 | 6 | 130 x 420 x 160 | LCZ 0703 |
| 12 T | Polycarbonate | 100 | 12 | 300 x 315 x 160 | LCZ 0704 |
| 15 T | Polycarbonate | 100 | 15 | 416 x 130 x 310 | LCZ 0705 |
| 20 T | Polycarbonate | 100 | 20 | 300 x 490 x 160 | LCZ 0706 |
| B 4 | Stainless steel | 200 | 4 | 135 x 240 x 150 | LCZ 0707 |
| B 10 | Stainless steel | 200 | 11 | 300 x 329 x 150 | LCZ 0708 |
| B 15 | Stainless steel | 200 | 16 | 300 x 329 x 200 | LCZ 0709 |
| B 20 | Stainless steel | 200 | 19 | 300 x 505 x 150 | LCZ 0710 |
| B 25 | Stainless steel | 200 | 25 | 300 x 505 x 200 | LCZ 0711 |
| B 40 | Stainless steel | 200 | 40 | 300 x 750 x 200 | LCZ 0712 |

Heating thermostats

| Accessories | Suitable for | Catalogue number |
|---|---|---|
| Pump connection set (outflow and return nozzles) with fitting 13 mm (plastic) | All heating thermostats | LCZ 0716 |
| Pump connection set (outflow and return nozzles) with thread M16 x 1 (stainless steel) | All heating thermostats | LCZ 0717 |
| Bath cover in stainless steel | E 10 G | HDQ 169 |
| Bath cover in stainless steel | E 20 G, E 25 G | HDQ 170 |
| Bath cover in stainless steel (three-part) | E 40 G | LCZ 0718 |
| Cooling coil set for ET 15 | ET 15 G | LCZ 0719 |

Cooling thermostats

| Accessories | Suitable for | Catalogue number |
|---|---|---|
| Pump connection set (outflow and return nozzles) with fitting 13 mm (plastic) | All cooling thermostats | LCZ 0716 |

Viscothermostats

| Accessories | Suitable for | Catalogue number |
|---|---|---|
| BL 15 backlight | Viscotemp 15 | LCZ 9738 |
| BL 24 backlight | Viscotemp 24, 40 | LCZ 9739 |
| ET 15 cooling coil set | Viscotemp 15, 24, 40 | LCZ 0719 |
| Viscotemp 18 cover plate | Viscotemp 18 | LCZ 0736/0737 |
| Viscotemp 15 cover plate | Viscotemp 15 | LCZ 0730/0731/0729 |
| Viscotemp 24 cover plate | Viscotemp 24 | LCZ 0733/0734/0732 |
| Viscotemp 40 cover plate | Viscotemp 40 | LCZ 0735 |
| Insert for manual measurements | Viscotemp | LTZ 052 |
| Bath bridge | Viscotemp 15, 24 | HPB 139 |

For all devices

| Accessories | Catalogue number |
|---|---|
| USB 2.0 cable (USB A male to mini B) | EKS 089 |
| Upper module receptacle approx. 57 mm x 27 mm | |
| Analog module | LRZ 912 |
| RS 232/485 interface module | LRZ 913 |
| Contact module with 1 input and 1 output | LRZ 914 |
| Contact module with 3 inputs and 3 outputs | LRZ 915 |
| Profibus module | LRZ 917 |
| Ethernet USB interface module | LRZ 921 |
| LiBus interface box | LCZ 9727 |
| Upper module receptacle approx. 57 mm x 17 mm | |
| Remote control unit Command* | LRT 914 |
| External Pt100/LiBus module | LRZ 918 |
| LiBus interface module | LRZ 920 |

* functions only in conjunction with LRZ 918

# 10 Technical data and graphs

The figures were determined according to DIN 12876.

| Data applicable to all ECO GOLD thermostats | | |
|---|---|---|
| Ambient temperature range | °C | 5 – 40 |
| Relative humidity | | Maximum relative humidity 80 % at 31 °C and decreasing linearly to 50 % up to 40 °C. |
| Contamination level | | 2 |
| Setting resolution | K | ±0.01 |
| Display resolution | K | ±0.01 |
| Accuracy of indication | K | ±0.2 |
| Pump type/number of power levels | | Pressure pump/6 |
| Discharge pressure, max. | bar | 0.55 |
| Discharge flow, max. | L/min | 22 |
| Viscosity of the heat carrier liquid | $mm^2/s$ | Heating range: maximum 150;<br>Control range: ≤ 30 |
| Display field | | TFT display 3.5"; 320 x 240 pixel |
| Programmer | | 5 programs with a total of 150 temperature/time segments |
| Standard interface | | USB |
| Class of protection | | IP 21 |
| Class designation | | III |
| Marking | | FL (suitable for flammable and non-flammable liquids) |
| Overvoltages | | Overvoltage Category II and transient overvoltages according to Category II. |
| Class of protection for electrical operating equipment DIN EN 61140 (VDE 0140-1) | | Class I |

Immersion thermostats

| ECO GOLD | | 230 V | 220 V | 115 V | 100 V |
|---|---|---|---|---|---|
| Working temperature range ① | °C | 20 – 200 | | | |
| Working temperature range with water cooling | °C | 20 – 200 | | | |
| Operating temperature range ② | °C | -20 – 200 | | | |
| Temperature stability | K | ±0.01 | | | |
| Heater rating | kW | 2.6 | 2.4 | 1.3 | 1.0 |
| Heater surface loading | W/cm² | 6.8 | 6.2 | 6.8 | 5.1 |
| Power consumption | kW | 2.7 | 2.5 | 1.4 | 1.1 |
| Bath depth | mm | At least 150 | | | |
| Overall dimensions (W x D x H) | mm | 130 x 135 x 325 | | | |
| Weight | kg | 3.4 | 3.4 | 3.0 | 3.0 |
| Mains connection | | | | | |
| 230 V ±10 %; 50/60 Hz | | X | --- | --- | --- |
| 220 V ±10 %; 60 Hz | | --- | X | --- | --- |
| 115 V ±10 %; 60 Hz | | --- | --- | X | --- |
| 100 V ±10 %; 50/60 Hz | | --- | --- | --- | X |

① at Pump power level 1

② with extraneous cooling

| Heating thermostats with stainless steel bath | | | | | | |
|---|---|---|---|---|---|---|
| | | E 4 G | E 10 G | E 20 G | E 25 G | E 40 G |
| Working temperature range ① | °C | 20 – 200 | | | | |
| Working temperature range with water cooling | °C | 20 – 200 | | | | |
| Operating temperature range ② | °C | -20 – 200 | | | | |
| Temperature stability | K | ±0.01 | | | | |
| Bath volume | L | 3 – 3.5 | 7.5 – 11 | 13 – 19 | 16 – 25 | 32 – 40 |
| Bath vessels | | Inner tank in deep-drawn stainless steel 1.4301 conforming to SAE 30304 AISI 304 | | | | |
| Outer jacket | | Powder-coated steel sheet | | | | |
| Bath opening (B x T) | mm | 135 x 105 | 300 x 190 | 300 x 365 | 300 x 365 | 613 x 300 |
| Bath depth | mm | 150 | 150 | 150 | 200 | 200 |
| Usable bath depth | mm | 130 | 130 | 130 | 180 | 180 |
| Height of bath edge without cover | mm | 196 | 196 | 196 | 246 | 248 |
| Overall dimensions (W x D) | mm | 168 x 272 | 331 x 361 | 331 x 537 | 331 x 537 | 350 x 803 |
| Overall height | mm | 376 | 376 | 376 | 426 | 428 |
| Pump connection<br>Stainless steel fittings 13 mm<br>(thread M16 x 1) | | Standard | ③ Optional accessory | | | |
| 230 V ±10 %; 50/60 Hz | | | | | | |
| Heater rating / power consumption | kW | 2.6 / 2.7 | | | | |
| Weight | kg | 7.0 | 9.0 | 12.2 | 13.5 | 17.6 |
| 220 V ±10 %; 60 Hz | | | | | | |
| Heater rating / power consumption | kW | 2.4 / 2.5 | | | | |
| Weight | kg | 7.0 | 9.0 | 12.2 | 13.5 | 17.6 |
| 115 V ±10 %; 60 Hz | | | | | | |
| Heater rating / power consumption | kW | 1.3 / 1.4 | | | | |
| Weight | kg | 6.6 | 8.6 | 11.8 | 13.1 | 17.2 |
| 100 V ±10 %; 50/60 Hz | | | | | | |
| Heater rating / power consumption | kW | 1.0 / 1.1 | | | | |
| Weight | kg | 6.6 | 8.6 | 11.8 | 13.1 | 17.2 |

① at Pump power level 1 ② with extraneous cooling ③ Optional accessory

| Heating thermostats with transparent bath | | | | | |
|---|---|---|---|---|---|
| | | ET 6 G | ET 12 G | ET 15 G | ET 20 G |
| Working temperature range ① | °C | 20 – 100 | | | |
| Working temperature range with water cooling | °C | 20 – 100 | | | |
| Operating temperature range ② | °C | -20 – 100 | | | |
| Temperature stability | K | ±0.01 | | | |
| Bath volume | L | 5 – 6 | 9.5 – 12 | 13.5 – 15 | 15 – 20 |
| Bath vessels | | Polycarbonate | | | |
| Usable bath opening (W x D) with control head | mm | 130 x 285 | 300 x 175 | 275 x 130 | 300 x 350 |
| Bath depth | mm | 160 | 160 | 310 | 160 |
| Usable bath depth | mm | 140 | 140 | 290 | 140 |
| Height of bath edge without cover | mm | 169 | 208 | 356 | 208 |
| Overall dimensions (W x D) | mm | 143 x 433 | 322 x 331 | 428 x 148 | 322 x 506 |
| Overall height | mm | 349 | 389 | 532 | 389 |
| Pump connection<br>Stainless steel fittings 13 mm<br>(thread M16 x 1) | | ③ Optional accessory | ③ Optional accessory | Standard | ③ Optional accessory |
| 230 V ±10 %; 50/60 Hz | | | | | |
| Heater rating / power consumption | kW | 2.6 / 2.7 | | | |
| Weight | kg | 4.5 | 6.8 | 6.8 | 8.0 |
| 220 V ±10 %; 60 Hz | | | | | |
| Heater rating / power consumption | kW | 2.4 / 2.5 | | | |
| Weight | kg | 4.5 | 6.8 | 6.8 | 8.0 |
| 115 V ±10 %; 60 Hz | | | | | |
| Heater rating / power consumption | kW | 1.3 / 1.4 | | | |
| Weight | kg | 4.1 | 6.4 | 6.4 | 7.6 |
| 100 V ±10 %; 50/60 Hz | | | | | |
| Heater rating / power consumption | kW | 1.0 / 1.1 | | | |
| Weight | kg | 4.1 | 6.4 | 6.4 | 7.6 |

① at Pump power level 1 ② with extraneous cooling ③ Optional accessory

| Viscothermostats | | | | | |
|---|---|---|---|---|---|
| Viscotemp | | 18 G | 15 G | 24 G | 40 G |
| Working temperature range ① | °C | 30 – 105 | | | |
| Operating temperature range ② | °C | 0 – 105 | | | |
| Temperature stability | K | ±0.01 | | | |
| Bath volume | L | 16.5 – 18.5 | 16 – 19 | 22.5 – 27 | 37.5 – 44 |
| Bath vessels | | Glass | Stainless steel with glass windows | | |
| Bath opening (W x D) | mm | Diam. 290 | 252 x 145 | 430 x 145 | 430 x 250 |
| Bath depth | mm | 320 | 320 | 320 | 320 |
| Usable bath depth (thermal oil / water) | mm | 250/270 | 246/270 | 246/270 | 246/270 |
| Size of window pane (W x H) | mm | --- | 152 x 233 | 329 x 233 | 329 x 233 |
| Height of edge of bath | mm | 321 | 379 | 379 | 379 |
| Overall dimensions (W x D) | mm | Diam. 310 | 532 x 233 | 708 x 233 | 708 x 328 |
| Overall height | mm | 510 | 552 | 552 | 552 |
| Weight | kg | 9 | 22 | 28 | 33 |
| Pump connector set<br>with thread connection M16 x 1 (stainless steel) | | Standard | | | |
| Power supply | | Heater power / power consumption | | | |
| 230 V ±10 %; 50/60 Hz | kW | 2.6 / 2.7 | | | |
| 115 V ±10 %; 60 Hz | kW | 1.3 / 1.4 | | | |
| 100 V ±10 %; 50/60 Hz | kW | 1.0 / 1.1 | | | |

① at Pump power level 1

② with extraneous cooling

| Cooling thermostats (1) | | | | | | |
|---|---|---|---|---|---|---|
| | | | RE 415 G | RE 415 GW | RE 420 G | RE 630 G |
| Working temperature - ACC range* | | °C | -15 – 200 | -15 – 200 | -20 – 200 | -30 – 200 |
| Ambient temperature range | | °C | 5 – 40 | | | |
| Temperature stability | | K | ±0.02 | | | |
| Maximum storage temperature | | °C | 43<br>with water-cooled devices the evaporator must be completely drained | | | |
| Cooler | | | Air | Water | Air | Air |
| Cooling water consumption @ 15 °C reference temperature, pressure 3 bar | | L/min | --- | 0.2 | --- | --- |
| Cooling output at 20 °C ambient temperature, 15 °C cooling water temperature, 3 bar cooling water pressure and Pump stage 2 | 20 °C | W | 180 | | 200 | 300 |
| | 10 °C | W | 160 | | 180 | 270 |
| | 0 °C | W | 120 | | 150 | 240 |
| | -10 °C | W | 80 | | 100 | 190 |
| | -20 °C | W | 30 ① | | 30 | 100 |
| | -30 °C | W | --- | | --- | 20 |
| Bath volume | | liters | 3.3 – 4 | | 3.3 – 4 | 4.6 – 5.7 |
| Overall dimensions (W x D) | | mm | 130 x 105 | | 130 x 105 | 150 x 130 |
| Bath depth | | mm | 160 | | | |
| Usable depth | | mm | 140 | | | |
| Height to top edge of bath | | mm | 365 | | 374 | 400 |
| Overall dimensions (W x D) | | mm | 180 x 350 | | 180 x 396 | 200 x 430 |
| Overall height | | mm | 546 | | 555 | 581 |
| Sound level (1 m) | | dB(A) | 50 | | | |
| Pump connection | | | Stainless steel fittings 13 mm (thread M16 x 1) | | | |
| 230 V ±10 %; 50 Hz | | | | | | |
| Heater rating / power consumption | | kW | 2.6 / 2.8 | | | 2.6 / 2.9 |
| Weight | | kg | 20.0 | 20.9 | 22.0 | 27.6 |
| 220 V ±10 %; 60 Hz | | | | | | |
| Heater rating / power consumption | | kW | 2.4 / 2.6 | | | 2.4 / 2.7 |
| Weight | | kg | 20.0 | 20.9 | 22.0 | 27.6 |
| 115 V ±10 %; 60 Hz | | | | | | |
| Heater rating / power consumption | | kW | 1.3 / 1.5 | | | 1.3 / 1.6 |
| Weight | | kg | 19.6 | 20.5 | 21.6 | 27.2 |
| 100 V ±10 %; 50/60 Hz | | | | | | |
| Heater rating / power consumption | | kW | --- | | 1.0 / 1.2 | 1.0 / 1.3 |
| Weight | | kg | --- | --- | 21.6 | 27.2 |

*ACC range (Active Cooling Control) according to DIN 12876 is the working temperature range for operation with an active refrigerating machine

| Cooling thermostats (2) | | | | | | Calibration thermos. |
|---|---|---|---|---|---|---|
| | | | RE 1225 G | RE 2025 G | RE 1050 G | RE J 1225 G |
| Operating temperature, ACC * | | °C | -25 – 200 | -25 – 200 | -50 – 200 | -25 – 200 |
| Ambient temperature range | | °C | 5 – 40 | | | |
| Temperature stability | | K | ±0.02 | | | |
| Maximum storage temperature | | °C | 43 | | | |
| Cooler | | | Air | Air | Air | Air |
| Cooling output at 20 °C ambient temperature, 15 °C cooling water temperature, 3 bar cooling water pressure and Pump Level 2 | 20 °C | W | 300 | 300 | 700 | 300 |
| | 10 °C | W | 270 | 260 | 660 | 270 |
| | 0 °C | W | 240 | 230 | 600 | 240 |
| | -10 °C | W | 180 | 150 | 520 | 180 |
| | -20 °C | W | 90 | 60 | 350 | 90 |
| | -25 °C | W | 40 | 30 | --- | 40 |
| | -30 °C | W | --- | --- | 190 | --- |
| | -40 °C | W | --- | --- | 100 | --- |
| | -50 °C | W | --- | --- | 20 | --- |
| Bath volume | | liters | 9.3 – 12 | 14 – 20 | 8 – 10 | 9.3 – 12 |
| Overall dimensions bath (W x D) | | mm | 200 x 200 | 300 x 350 | 200 x 200 | Ø 150 |
| Bath depth | | mm | 200 | 160 | 160 | 200 |
| Usable depth | | mm | 180 | 140 | 140 | 180 |
| Height to top edge of bath | | mm | 443 | | | |
| Overall dimensions (W x D) | | mm | 250 x 435 | 350 x 570 | 280 x 440 | 250 x 435 |
| Overall height | | mm | 624 | | | |
| Sound level (1 m) | | dB(A) | 50 | 50 | 52 | 50 |
| Pump connection | | | Stainless steel fittings 13 mm (thread M16 x 1) | | | |
| 230 V ±10 %; 50 Hz | | | | | | |
| Heater rating / power consumption | | kW | 2.6 / 2.9 | 2.6 / 2.9 | 2.6 / 3.3 | 2.6 / 2.9 |
| Weight | | kg | 30.4 | 37.4 | 35.0 | 31.5 |
| 220 V ±10 %; 60 Hz | | | | | | |
| Heater rating / power consumption | | kW | 2.4 / 2.7 | 2.4 / 2.7 | 2.4 / 3.1 | --- |
| Weight | | kg | 30.4 | 37.4 | 35.0 | --- |
| 115 V ±10 %; 60 Hz | | | | | | |
| Heater rating / power consumption | | kW | 1.3 / 1.6 | 1.3 / 1.6 | 1.3 / 1.8 | 1.3 / 1.6 |
| Weight | | kg | 30.0 | 37.0 | 34.6 | 31.1 |
| 100 V ±10 %; 50/60 Hz | | | | | | |
| Heater rating / power consumption | | kW | 1.0 / 1.3 | 1.0 / 1.3 | 1.0 / 1.7 | --- |
| Weight | | kg | 30.0 | 37.0 | 34.6 | --- |

*ACC range (Active Cooling Control) according to DIN 12876 is the working temperature range for operation with an active refrigerating machine

Technical modifications reserved!

## Refrigerant and filling quantity

The cooling thermostat contains fluorinated greenhouse gases.

| | Unit | RE 415 G<br>RE 415 GW | RE 420 G | RE 630 G |
|---|---|---|---|---|
| Refrigerant | --- | R-134a | R-134a | R-134a |
| maximum filling quantity | kg | 0.065 | 0.063 | 0.075 |
| $GWP_{(100a)}$* | --- | 1430 | 1430 | 1430 |
| $CO_2$ equivalent | t | 0.1 | 0.1 | 0.1 |

| | Unit | RE 1225 G | RE 2025 G | RE 1050 G | Calibration thermostat<br>RE J 1225 G |
|---|---|---|---|---|---|
| Refrigerant | --- | R-134a | R-134a | R-452A | R-134a |
| maximum filling quantity | kg | 0.075 | 0.075 | 0.27 | 0.075 |
| $GWP_{(100a)}$* | --- | 1430 | 1430 | 2140 | 1430 |
| $CO_2$ equivalent | t | 0.1 | 0.1 | 0.6 | 0.1 |

Voltage version 115 V; 60 Hz

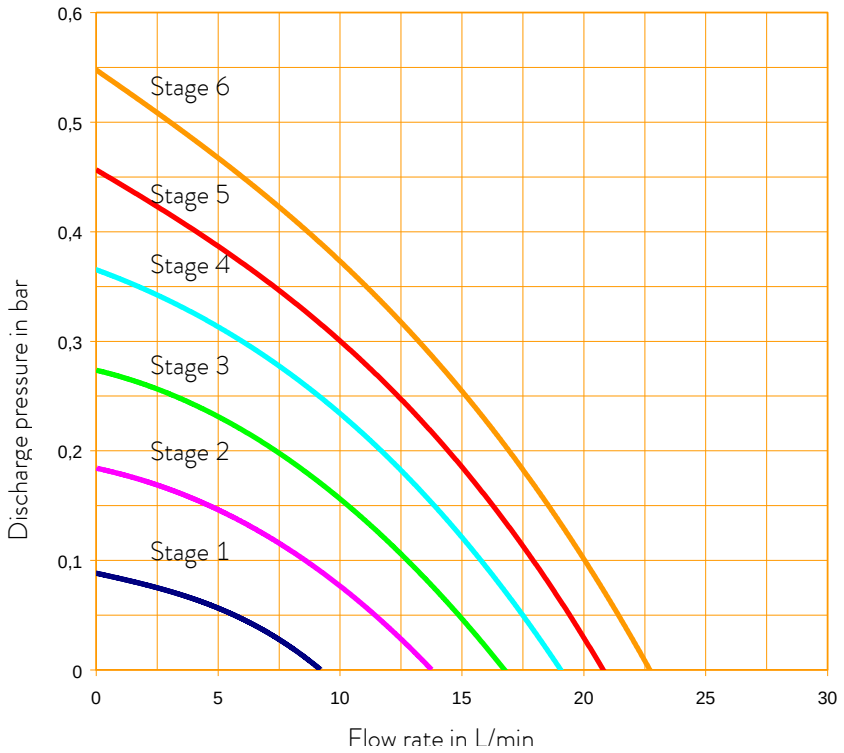
| | Unit | RE 415 G<br>RE 415 GW | RE 630 G | RE 1225 G<br>RE J 1225 G | RE 2025 G |
|---|---|---|---|---|---|
| Refrigerant | --- | R-134a | R-134a | R-134a | R-134a |
| maximum filling quantity | kg | 0.058 | 0.057 | 0.057 | 0.063 |
| $GWP_{(100a)}$* | --- | 1430 | 1430 | 1430 | 1430 |
| $CO_2$ equivalent | t | 0.1 | 0.1 | 0.1 | 0.1 |

Global Warming Potential (GWP),
Comparison $CO_2$ = 1,0

* Time span 100 years - according to IPCC IV

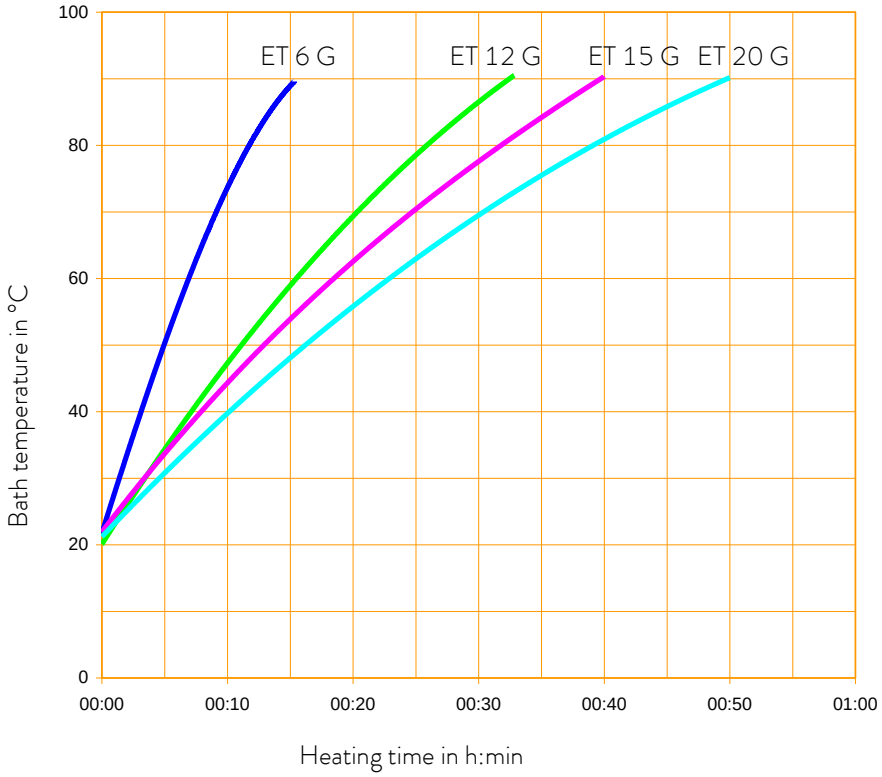
Technical modifications reserved

Pump characteristic ECO GOLD



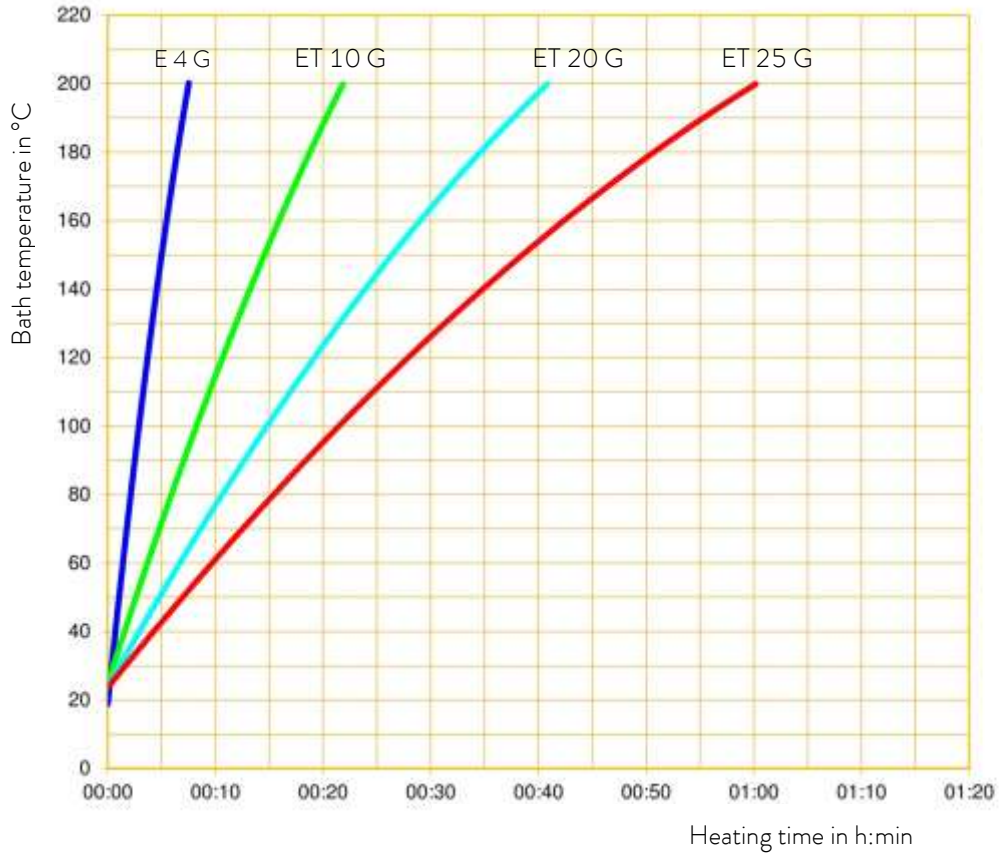

Pump characteristics measured with water

Heating curve for ECO GOLD heating thermostats with transparent bath



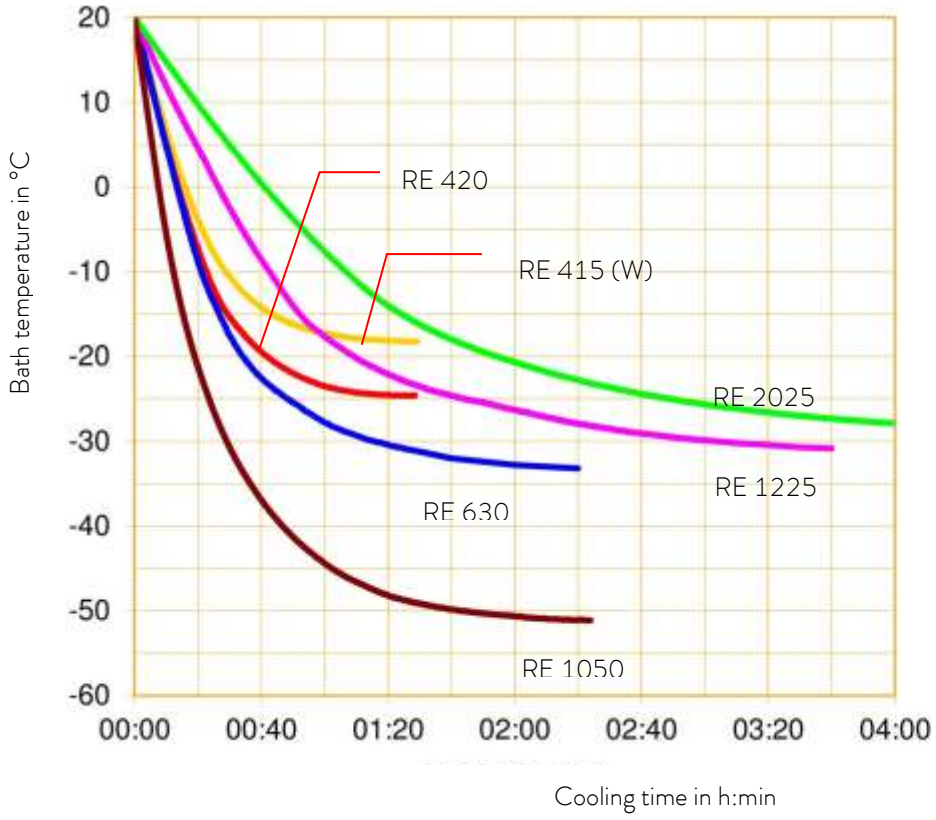

Heat transfer liquid: Water, bath closed

Heating curve for ECO GOLD heating thermostats with stainless steel bath




Heat transfer liquid:
Therm 240,
bath closed

Cooling curves for ECO cooling thermostats




Heat transfer liquid:
Ethanol,
bath closed

# 11 Index

*W*



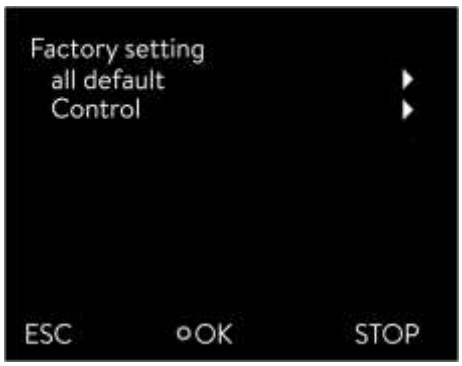
*X*

# Appendix with settings

The adjustments described in this appendix are only intended for specially qualified personnel.

# 12 Other settings

## 12.1 Resetting to factory settings



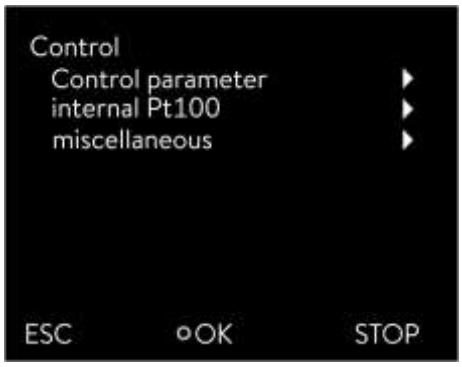

- Access to the main menu level is obtained by pressing the enter key .
- Selection and confirmation of → Setup → Factory Setting.

The adjacent menu window appears.

- Select the menu item all default.

Select one of the following options:

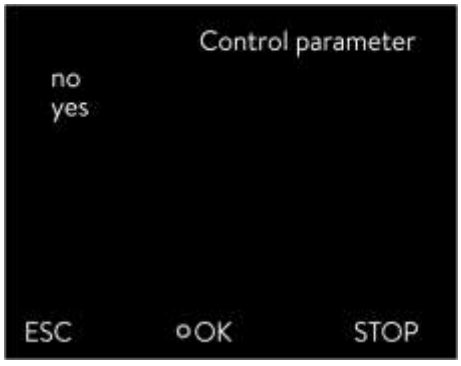
- Selecting no returns to the previous display without making any changes.
- Selecting yes restores the factory settings if you confirm this with the enter key.




- By selecting Control you can select the displayed parameters with or .

Select the appropriate menu item in the parameter list.

- The internal and the external control parameters can be reset using Control parameter.
- The settings for the internal sensor can be reset with internal Pt100.
- With miscellaneous the following can be reset: set value, pump level, max. current consumption, control to internal and auto-start to "auto".




Select one of the following options:

- Selecting no returns to the previous display without making any changes.
- Selecting yes resets the selected parameter if you confirm this with the enter key.

- *By pressing or (ESC) you are returned to the menu level without any change.*

## 12.2 Setting the volume of the acoustic signals

The ECO GOLD thermostats sound alarms and faults as a two-tone acoustic signal. Warnings a signaled as a continuous tone,


– Access to the main menu level is obtained by pressing the enter key .
– Selection and confirmation of → Setup → Basic setup → Sounds.
– Choose Alarm, Warn or Error.

The adjacent menu window appears.

– The volume is selected with or . The selected level is immediately active without confirmation.

- *By pressing (ESC), or you are returned to the menu level without any change.*

## 12.3 Setting the chiller

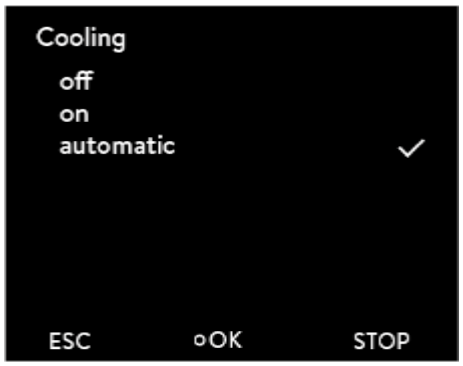
The chiller of the cooling thermostats is operated in the "automatic" operating mode as standard. Here, the cooling unit switches on or off automatically depending on the temperature and operating status. However, you can also switch the cooling unit on or off manually.


– Access to the main menu level is obtained by pressing the enter key .
– Selection and confirmation of → Setup → Cooling.

The adjacent menu window appears.

- (As well as Cooling the current operating mode is stated. This is "off", "on" or "automatic".)

– Select Cooling with .



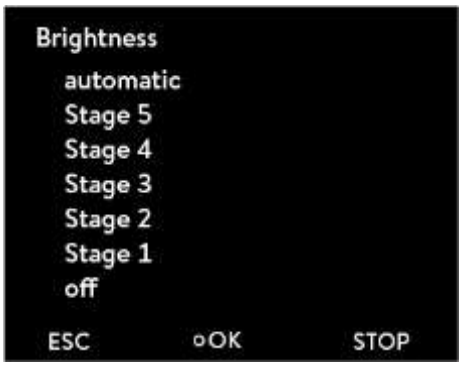

– With or and you select and confirm the operating status "off", "on" or "automatic".
– In the menu the set operating status is displayed by a tick ✓.

- *By pressing or (ESC) you are returned to the menu level without any change.*

**Note:** When the cooling unit is switched off, it can take up to two minutes before it switches on again.

## 12.4 Setting the display brightness

The ECO range of thermostats have a sensor which automatically adapts the display brightness according to the ambient light level. However, the automatic adaptation can be deactivated and the brightness set manually.




– Access to the main menu level is obtained by pressing the enter key .
– Selection and confirmation of → Setup → Basic setup → Display → Brightness.

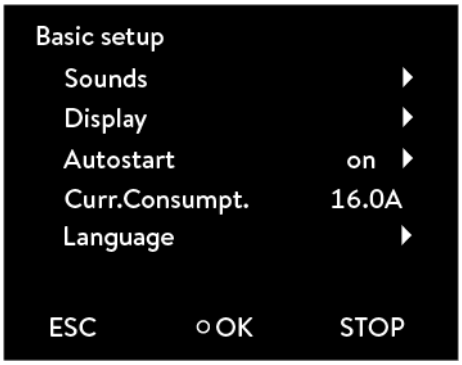
The adjacent menu window appears.

– Select "automatic", "level" or "off" with or . The selected level is immediately active without confirmation.

- *By pressing (ESC), or you are returned to the menu level without any change.*

## 12.5 Defining the starting mode (Autostart)

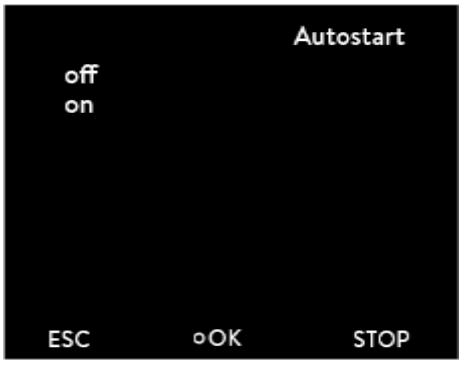
Generally, it is required that the thermostat starts operating again after a power interruption. For reasons of safety, for example, you can insert a manual activation step.




– Access to the main menu level is obtained by pressing the enter key .
– Selection and confirmation of → Setup → Basic setup.

The adjacent menu window appears. As well as Autostart the current setting is stated. This is "off" or "on"

– Select Autostart with .




– Select the operating status "off" or "on" with or and confirm with .

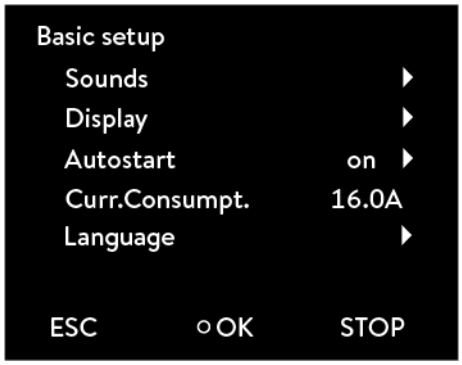
If "off" is selected, standby operation is activated after a mains interruption.

With the setting "on" the device continues running straight after the mains interruption.

- *By pressing or (ESC) you are returned to the menu level without any change.*

## 12.6 Limiting the mains current consumption

If your mains fusing is below 16 A, the current consumption can be reduced in steps from 16 A to 8 A. The maximum heating power is reduced correspondingly. Here, take into consideration whether other loads are connected to the same fused circuit or whether your ECO thermostat is the only load.




– Access to the main menu level is obtained by pressing the enter key .
– Selection and confirmation of → Setup → Basic setup.

The adjacent menu window appears.

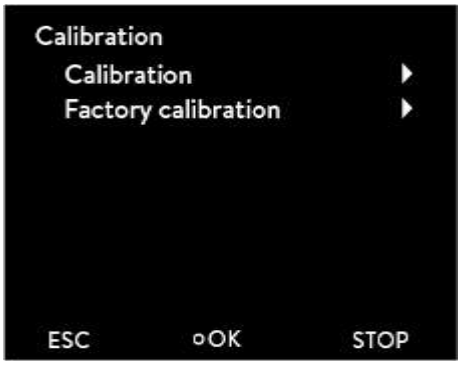
– As well as Curr.Consumpt. the set value is displayed.
– Select Curr.Consumpt. with .


– Change the value with or .
– Single figures can be selected by pressing or .
– Confirm the input with the enter key .

- *By pressing (ESC) you are returned to the menu level without any change.*

## 12.7 Entering the offset of the displayed temperature (calibration)

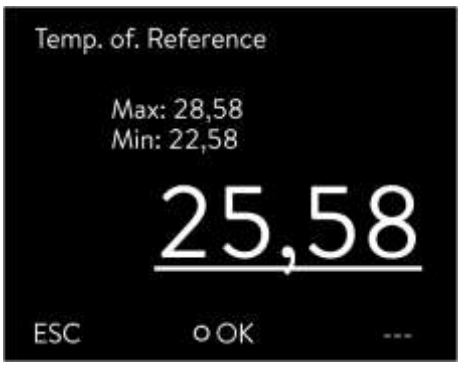
Deviations to the calibrated reference thermometers (e.g. LAUDA DigiCal) can be corrected internally by the "Offset" function.




– Access to the main menu level is obtained by pressing the enter key .
– Selection and confirmation of → Setup → Calibration.

The adjacent menu window appears.

– Select Calibration with or and confirm with .



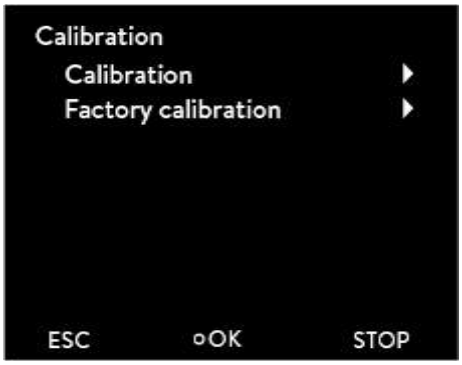

The entry window appears. The value indicated on the reference thermometer must be entered as the value.

– Change the value with or .
– Single figures can be selected by pressing or .
– By pressing (+/-) the arithmetic sign can be changed.
– You confirm the set value by pressing .

- *By pressing (ESC) you are returned to the menu level without any change.*

## 12.8 Restoring the factory setting of the internal temperature sensor

If the offset has been adjusted, the factory setting can be restored again.




– Access to the main menu level is obtained by pressing the enter key .
– Selection and confirmation of → Setup → Calibration.

The adjacent menu window appears.

– Select and confirm Factory calibration with or and .


The adjacent menu window appears.

– Select "yes" using or and confirm with to restore the factory settings.

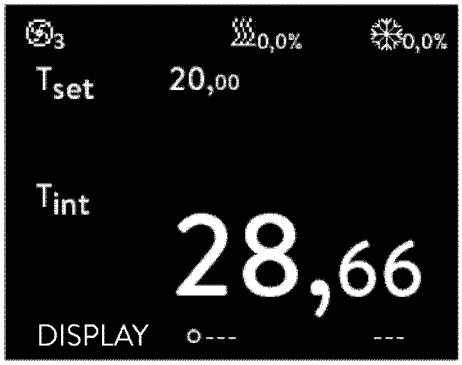
- *By pressing "no" (ESC) or you are returned to the menu level without any change.*

## 12.9 Key lock

The entry key and arrow keys on the control panel on the device can be locked.

This can be done directly using the control keys on the device or by using write commands provided by an interface module (for example RS 232/485 module, Ethernet USB module, or contact module).

When the device is being controlled using a process control system, it is important to be able to lock the control keys on the device.




Activating the key lock with the control keys:

It is possible to lock the keys when it is in "standby" or "running" operating mode and the home screen or graph window is displayed.

- Press the input key and keep it pressed.
- Press the **down** key and keep it pressed.
- After four seconds, the key lock is activated.

In the softkey bar, the middle softkey, "Menu", and the softkey on the right, "Standby", are hidden. The functions associated with them are no longer available.

The softkey on the left continues working. This is used to switch the display between the home screen and the graph window.

The overtemperature switch-off point can be viewed, but not changed, using the Tmax key.

Deactivating the key lock with the control keys:

- Press the input key and keep it pressed.
- Press the **up** key and keep it pressed.
- After four seconds, the key lock is deactivated.

The functions associated with the softkey bar and the Tmax key are all available again.

# 13 List of "Alarm and warning codes"

Alarms

| Alarm code | | Meaning |
|---|---|---|
| 1 | Low Level Pump | Pump runs too fast (low level) |
| 2 | Low Level Pump | Low level in the float |
| 3 | Overtemperature | Overtemperature (T > Tmax) |
| 4 | Pump blocked | Pump blocked (standstill) |
| 5 | Connection Command | Remote control unit command triggered in running operation |
| 9 | T ext Pt100 | External Pt100 actual value is not present. |
| 10 | T ext analog | External analog actual value is not present. |
| 11 | T ext serial | External serial actual value is not present. |
| 12 | Input Analog 1 | Analog module: Current interface 1, interruption. |
| 13 | Input Analog 2 | Analog module: Current interface 2, interruption. |
| 15 | Digital Input | Error on digital input |

Warnings

| Code | 0XX Control system | Meaning | Code | 3XX SmartCool | Meaning |
|---|---|---|---|---|---|
| 1 | CAN receive overf | Overflow during CAN reception | 1 | CAN receive overf | Overflow during CAN reception |
| 2 | Watchdog Reset | Watchdog reset | 2 | Watchdog Reset | Watchdog reset |
| 3 | T_il limit active | til llmit active | 3 | adaption missing | No adaption run |
| 4 | T_ih limit active | tih llmit active | 4 | Pressure switch activated | Pressure Switch in cooling circuit triggered |
| 5 | corrupt parameter | Inadmissible internal parameter | 5 | Clean condenser | Clean condenser |
| 6 | corrupt progr | Inadmissible programmer data | 6 | TO1 out of range (Klixon) | Injection temperature outside value range |
| 7 | Invalid Parameter | Inadmissible parameter in memory | 7 | Invalid Parameter | Inadmissible parameter in memory |
| 8 | CAN system | Problem during internal data interchange | 8 | CAN system | Problem during internal data interchange |
| 9 | Unknown Modul | Unknown module connected | 9 | Unknown Modul | Unknown module connected |
| 10 | SW control too old | Software version of control panel too old | 10 | SW control too old | Software version of control panel too old |
| 11 | SW safety too old | Software version of protection too old | 11 | SW safety too old | Software version of protection too old |
| 12 | SW command too old | Software version of command remote control unit too old | 12 | SW command too old | Software version of command remote control unit too old |
| 13 | SW cool too old | Software version of cooling module too old | 13 | SW cool too old | Software version of cooling module too old |
| 14 | SW analog too old | Software version of analog too old | 14 | SW analog too old | Software version of analog too old |
| 15 | SW serial too old | Software version of serial too old | 15 | SW serial too old | Software version of RS 232 too old |
| 16 | SW contact old | Software version of contact module too old | 16 | SW contact old | Software version of contact module too old |
| 17 | SW Valve 0 old | Software version of solenoid valve too old | 17 | SW Valve 0 old | Software version of solenoid valve 0 too old |
| 18 | SW Valve 1 old | Software version of solenoid valve 1 too old | 18 | SW Valve 1 old | Software version of solenoid valve 1 too old |
| 19 | SW Valve 2 old | Software version of solenoid valve 2 too old | 19 | SW Valve 2 old | Software version of solenoid valve 2 too old |
| 20 | SW Valve 3 old | Software version of solenoid valve 3 too old | 20 | SW Valve 3 old | Software version of solenoid valve 3 too old |
| 21 | SW Valve 4 old | Software version of solenoid valve 4 too old | 21 | SW Valve 4 old | Software version of solenoid valve 4 too old |
| 26 | SW HTC old | Software version of high temperature cooler too old | 26 | SW HTC old | Software version of high temperature cooler too old |
| 27 | SW Ext Pt100 old | Software version of external Pt100 too old | 27 | SW Ext Pt100 old | Software version of external Pt100 too old |
| 33 | RTC wrong data | Internal clock defective | 33 | valve sm0 break | Cable of injection valve 0 defective |
| 41 | wrong net voltage | Incorrect mains voltage setting | 34 | valve sm1 break | Cable of injection valve 1 defective |
| 42 | no eco type | Device type not configured | 35 | valve sm2 break | Cable of injection valve 2 defective |
| 43 | no eco voltage | Mains voltage not configured | 36 | valve sm3 break | Cable of injection valve 3 defective |
| 44 | chiller missing | Chiller not running | 37 | output sm0 | Triggering of injection valve 0 defective |
| 45 | Diff.voltages | Different mains voltage configured (head and cooling underpart) | 38 | output sm1 | Triggering of injection valve 1 defective |
| | # of heaters | Setting the heater configuration | 39 | output sm2 | Triggering of injection valve 2 defective |
| | | | 40 | output sm3 | Triggering of injection valve 3 defective |

| | | | | | |
|---|---|---|---|---|---|
| | | | 41 | sm0 min too small | Start value of injection valve too small |
| | | | 42 | no eco type | Device type not configured |
| | | | 43 | no eco voltage | Mains voltage not configured |
| | | | 44 | chiller missing | Chiller not running |

| Code | 1XX Safety system | Meaning | Code | 2XX Command | Meaning |
|---|---|---|---|---|---|
| 1 | CAN receive overf | Overflow during CAN reception | 1 | CAN receive overf | Overflow during CAN reception |
| 2 | Watchdog Reset | Watchdog reset | 2 | Watchdog Reset | Watchdog reset |
| 5 | Heat 1 failed | Heater 1 defective | 3 | Clock Error | Battery fault |
| 6 | Heat 2 failed | Heater 2 defective | 9 | Unknown Modul | Unknown module connected |
| 7 | Invalid Parameter | Inadmissible parameter in memory | 10 | SW control too old | Software version of control panel too old |
| 8 | CAN system | Problem during internal data interchange | 11 | SW safety too old | Software version of protection too old |
| 9 | Unknown Modul | Unknown module connected | 12 | SW command too old | Software version of command remote control unit too old |
| 10 | SW control too old | Software version of control panel too old | 13 | SW cool too old | Software version of cooling module too old |
| 11 | SW safety too old | Software version of protection too old | 14 | SW analog too old | Software version of analog too old |
| 12 | SW command too old | Software version of command remote control unit too old | 15 | SW serial too old | Software version of RS 232 too old |
| 13 | SW cool too old | Software version of cooling module too old | 16 | SW contact old | Software version of contact module too old |
| 14 | SW analog too old | Software version of analog too old | 17 | SW Valve 0 old | Software version of solenoid valve 0 too old |
| 15 | SW serial too old | Software version of RS 232 too old | 18 | SW Valve 1 old | Software version of solenoid valve 1 too old |
| 16 | SW contact old | Software version of contact module too old | 19 | SW Valve 2 old | Software version of solenoid valve 2 too old |
| 17 | SW Valve 0 old | Software version of solenoid valve 0 too old | 20 | SW Valve 3 old | Software version of solenoid valve 3 too old |
| 18 | SW Valve 1 old | Software version of solenoid valve 1 too old | 21 | SW Valve 4 old | Software version of solenoid valve 4 too old |
| 19 | SW Valve 2 old | Software version of solenoid valve 2 too old | 26 | SW HTC old | Software version of high temperature cooler too old |
| 20 | SW Valve 3 old | Software version of solenoid valve 3 too old | | | |
| 21 | SW Valve 4 old | Software version of solenoid valve 4 too old | | | |
| 26 | SW HTC old | Software version of high temperature cooler too old | | | |
| 27 | SW Ext Pt100 old | Software version of external Pt100 too old | | | |

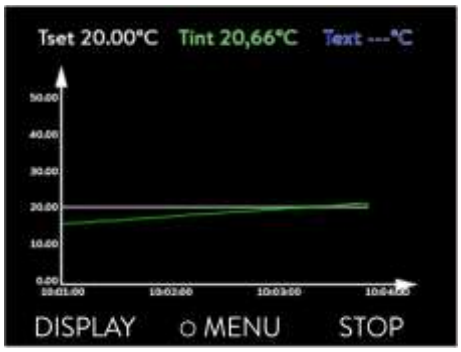
| Code | 4XX Analog module | Meaning | Code | 5XX Serial (RS 232/485) | Meaning |
|---|---|---|---|---|---|
| 1 | CAN receive overf | Overflow during CAN reception | 1 | CAN receive overf | Overflow during CAN reception |
| 2 | Watchdog Reset | Watchdog reset | 2 | Watchdog Reset | Watchdog reset |
| 9 | Unknown Modul | Unknown module connected | 9 | Unknown Modul | Unknown module connected |
| 10 | SW control too old | Software version of control panel too old | 10 | SW Contr. too old | Software version of control panel too old |
| 11 | SW safety too old | Software version of protection too old | 11 | SW safety too old | Software version of protection too old |
| 12 | SW command too old | Software version of command remote control unit too old | 12 | SW command too old | Software version of command remote control unit too old |
| 13 | SW cool too old | Software version of cooling module too old | 13 | SW cool too old | Software version of cooling module too old |
| 14 | SW analog too old | Software version of analog too old | 14 | SW analog too old | Software version of analog too old |
| 15 | SW serial too old | Software version of RS 232 too old | 15 | SW serial too old | Software version of RS 232 too old |
| 16 | SW contact old | Software version of contact module too old | 16 | SW contact old | Software version of contact module too old |
| 17 | SW Valve 0 old | Software version of solenoid valve 0 too old | 17 | SW Valve 0 old | Software version of solenoid valve 0 too old |
| 18 | SW Valve 1 old | Software version of solenoid valve 1 too old | 18 | SW Valve 1 old | Software version of solenoid valve 1 too old |
| 19 | SW Valve 2 old | Software version of solenoid valve 2 too old | 19 | SW Valve 2 old | Software version of solenoid valve 2 too old |
| 20 | SW Valve 3 old | Software version of solenoid valve 3 too old | 20 | SW Valve 3 old | Software version of solenoid valve 3 too old |
| 21 | SW Valve 4 old | Software version of solenoid valve 4 too old | 21 | SW Valve 4 old | Software version of solenoid valve 4 too old |
| 26 | SW HTC old | Software version of high temperature cooler too old | 26 | SW HTC old | Software version of high temperature cooler too old |
| 27 | SW Ext Pt100 old | Software version of external Pt100 too old | 27 | SW Ext Pt100 old | Software version of external Pt100 too old |

| Code | 6XX Switch contacts | Meaning |
|---|---|---|
| 1 | CAN receive overf | Overflow during CAN reception |
| 2 | Watchdog Reset | Watchdog reset |
| 9 | Unknown Modul | Unknown module connected |
| 10 | SW Contr. too old | Software version of control panel too old |
| 11 | SW safety too old | Software version of protection too old |
| 12 | SW command too old | Software version of command remote control unit too old |
| 13 | SW cool too old | Software version of cooling module too old |
| 14 | SW analog too old | Software version of analog too old |
| 15 | SW serial too old | Software version of RS 232 too old |
| 16 | SW contact old | Software version of contact module too old |
| 17 | SW Valve 0 old | Software version of solenoid valve 0 too old |
| 18 | SW Valve 1 old | Software version of solenoid valve 1 too old |
| 19 | SW Valve 2 old | Software version of solenoid valve 2 too old |
| 20 | SW Valve 3 old | Software version of solenoid valve 3 too old |
| 21 | SW Valve 4 old | Software version of solenoid valve 4 too old |
| 26 | SW HTC old | Software version of high temperature cooler too old |
| 27 | SW Ext Pt100 old | Software version of external Pt100 too old |

| Code | 7, 8, 9, 10, 11, 16XX Solenoid valve | Meaning |
|---|---|---|
| 1 | CAN receive overf | Overflow during CAN reception |
| 2 | Watchdog Reset | Watchdog reset |
| 3 | No cooling liquid | No cooling liquid present (HTC) |
| 6 | no unfill liquid too hot | No draining, because bath temperature is too hot (HTC) |
| 9 | Unknown Modul | Unknown module connected |
| 10 | SW Contr. too old | Software version of control panel too old |
| 11 | SW safety too old | Software version of protection too old |
| 12 | SW command too old | Software version of command remote control unit too old |
| 13 | SW cool too old | Software version of cooling module too old |
| 14 | SW analog too old | Software version of analog too old |
| 15 | SW serial too old | Software version of RS 232 too old |
| 16 | SW contact old | Software version of contact module too old |
| 17 | SW Valve 0 old | Software version of solenoid valve 0 too old |
| 18 | SW Valve 1 old | Software version of solenoid valve 1 too old |
| 19 | SW Valve 2 old | Software version of solenoid valve 2 too old |
| 20 | SW Valve 3 old | Software version of solenoid valve 3 too old |
| 21 | SW Valve 4 old | Software version of solenoid valve 4 too old |
| 26 | SW HTC old | Software version of high temperature cooler too old |
| 27 | SW Ext Pt100 old | Software version of external Pt100 too old |

| Code | 17XX Pt100/LiBus Module | Meaning |
|---|---|---|
| 1 | CAN receive overf | Overflow during CAN reception |
| 2 | Watchdog Reset | Watchdog reset |
| 3 | Ext_Pt_short | Line short on external t100 |
| 7 | Invalid Parameter | Inadmissible parameter in memory |
| 8 | CAN system | Problem during internal data interchange |
| 9 | Unknown Modul | Unknown module connected |
| 10 | SW Contr. too old | Software version of control panel too old |
| 11 | SW safety too old | Software version of protection too old |
| 12 | SW command too old | Software version of command remote control unit too old |
| 13 | SW cool too old | Software version of cooling module too old |
| 14 | SW analog too old | Software version of analog too old |
| 15 | SW serial too old | Software version of RS 232 too old |
| 16 | SW contact old | Software version of contact module too old |
| 17 | SW Valve 0 old | Software version of solenoid valve 0 too old |
| 18 | SW Valve 1 old | Software version of solenoid valve 1 too old |
| 19 | SW Valve 2 old | Software version of solenoid valve 2 too old |
| 20 | SW Valve 3 old | Software version of solenoid valve 3 too old |
| 21 | SW Valve 4 old | Software version of solenoid valve 4 too old |
| 26 | SW HTC old | Software version of high temperature cooler too old |
| 27 | SW Ext Pt100 old | Software version of external Pt100 too old |

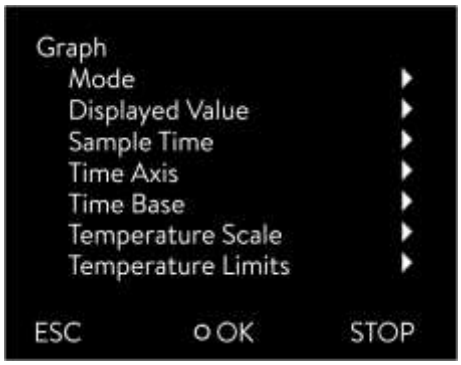
# 14 Graphical display of temperature measurements




- From the main menu window you access the graphics window by pressing (DISPLAY).

The temperature traces are shown in different colors.

- $T_{set}$ set-point temperature (grey)
- $T_{int}$ internal bath temperature (green).
- $T_{ext}$ external bath temperature (blue).



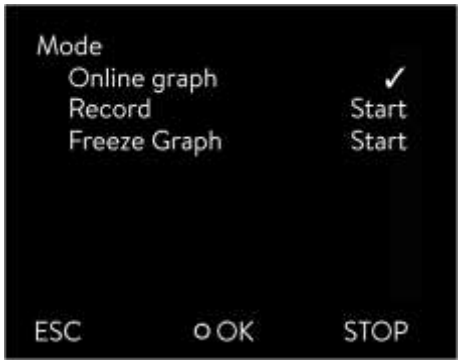

You can change the settings for the graphics window in the submenu Graph.

- Access to the menu level is obtained by pressing .
- Select and confirm Graph in main menu with or and .

The adjacent menu window appears.

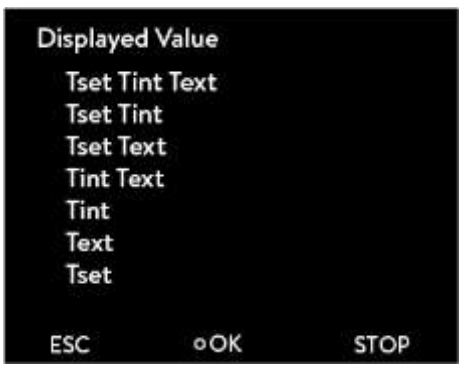
- With or you quit the respective window without changes.
- All menu points are selected with or and confirmed with .

In the following the individual menu points of the menu window "Graph" are described.



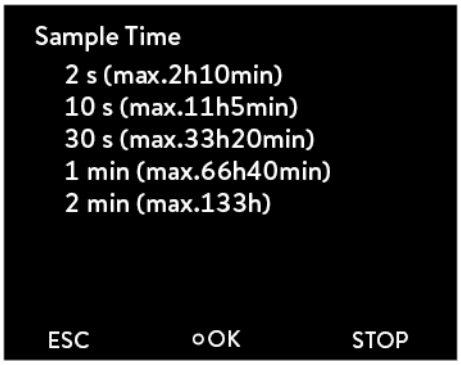

In the menu Mode there are the following settings:

- Online graph Recording runs continuously.
- Recording Start / Recording Stop Start or stop recording
- Freeze Graph Start Save current recording.



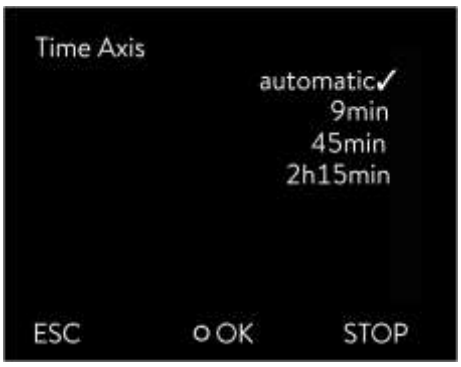

With display Measurements you can define which temperature values are to be graphically displayed.

Numerous combinations are offered in the menu (see illustration).



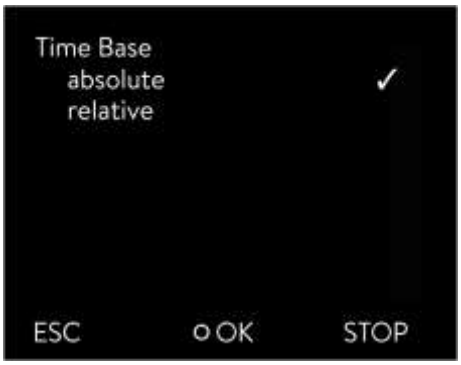

With Rec. Interval you define the time interval between recorded temperature measurements (the values in brackets state the maximum recording time).

The menu offers five options.



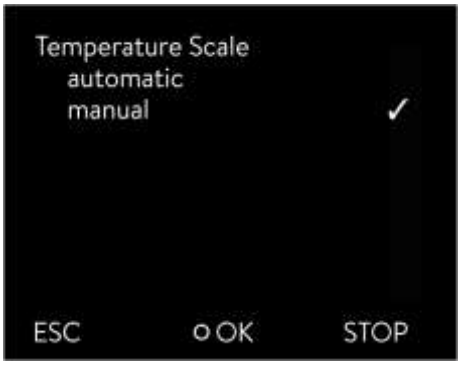

With Time axis you can define the temporal range over which the measurements are to be displayed.

- automatic — Program optimized display
- 9 min — time axes set manually
- 45 min — (depending on recording interval
- 2 h 15 min — up to 144 h)




You can set the scaling to be used via the menu point Time base.

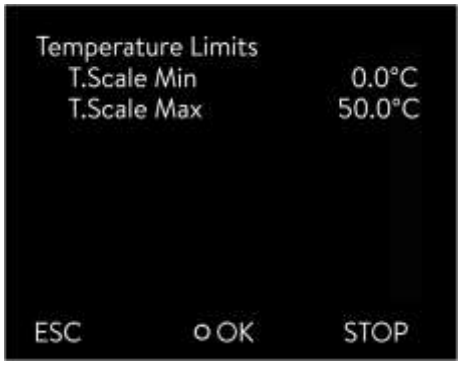
- absolute — Reference current time
- relative — Start time "00:00:00"




With Temperature Scale you can define the scaling of the y axis (temperature value).

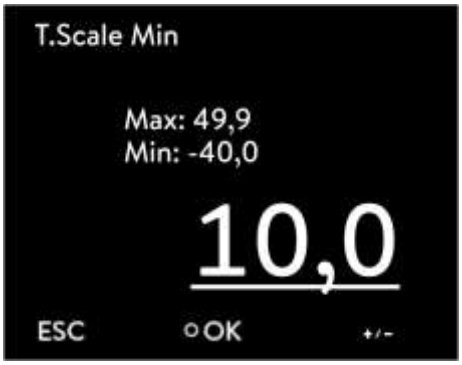
- automatic — Program optimized scaling
- manual — Here you can define the limits yourself.

**Note:** The temperature limits are entered via the menu point Temperature Limits.
This menu point only appears in the graphics menu when manual has been selected in the menu Temperature Scale.




With Temperature Limits you can display and manually input the temperature limits for the graphical display.

- Temp.Scale Min Displays current minimum value
- Temp.Scale Max Displays current maximum value




When Temp.Scale Max or Temp.Scale Min (as in the illustrated example) has been selected, the entry window appears.

The minimum and maximum possible temperature values and the current minimal temperature value are displayed.

- Change the value with or .
- Single figures can be selected by pressing or .
- By pressing (+/-) the arithmetic sign can be changed.
- Confirm your choice with the enter key .

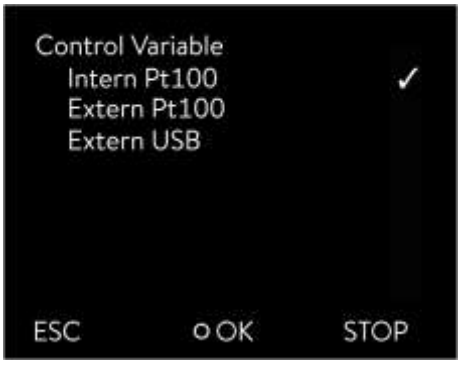
- *By pressing (ESC) you are returned to the menu level without any change.*

# 15 External control

The devices can also be optionally controlled via an external Pt100 temperature sensor, which can be connected at the back of the control head. It is necessary to install an external Pt100/LiBus module (⇨ 6.7) for external control (⇨ 17.2). The module is available as an accessory (⇨ 9).

Furthermore, the signal coming from an analogue or serial module can also be controlled. Analogue module and contact modules are available as accessories (⇨ 9).

## 15.1 Activating external control (external Pt100)




- Access to the main menu level is obtained by pressing the enter key ⊙.
- Selection and confirmation of → Setup → Control → Contr. Variable.

The adjacent menu window appears.

- The menu item extern Pt100 only appears when the module for an external connection is available. A temperature sensor has to be connected to the module
- Select and confirm extern Pt100 with ⌃ or ⌄ and ⊙.
- *By pressing ◀ or ▭ (ESC) you are returned to the menu level without any change.*

**Note:** To show the selected control variable on the display, carry out chapter (⇨ 15.2).

**Connection of the external Pt100 to Lemo socket 10S** (⇨ 18.5)

## 15.2 Show the selected control variable (external temperature) on the display

**Note:** This setup must be done so that the control variable (which was selected in chapter 15.1) is displayed in the basic window.


- Access to the main menu level is obtained by pressing the enter key ⊙.
- Selection and confirmation of → Setup → Basic setup → Display → Displayed T-ext.

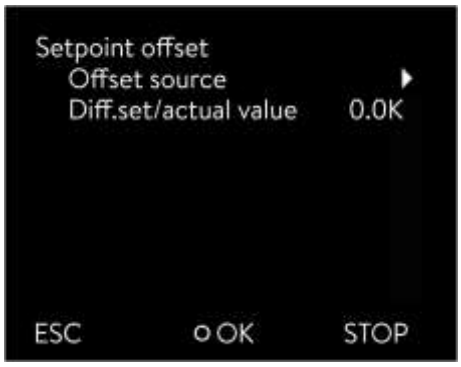
The adjacent menu window appears.

The different menu items only appear when the module is available (e.g. Temp. ext. Pt100).

- Select and confirm Temp. ext. Pt100 with ⌃ or ⌄ and ⊙.
- *By pressing ◀ or ▭ (ESC) you are returned to the menu level without any change.*

## 15.3 Setpoint offset operating mode (Diff.set/actual)

It is possible to apply an offset value to the temperature, which is provided by an external temperature sensor and to process it as the set value.
The bath temperature can therefore be operated, for example, -15 °C below the temperature of a reactor measured by the external temperature sensor.



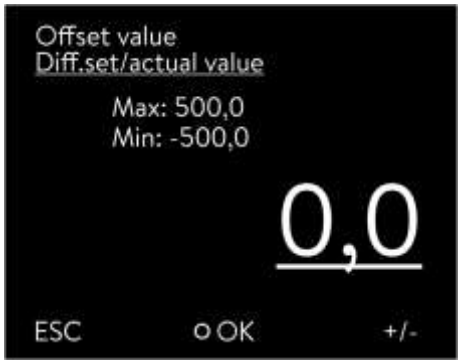

- Access to the main menu level is obtained by pressing the enter key ⊙.
- Selection and confirmation of → Setup → Control → Setpoint offset.

The adjacent menu window appears.

As well as Diff.set/actual value the currently set offset value is displayed.


The adjacent menu window appears on selecting the menu point Offset source.

- Select and confirm setpoint source with ▲ or ▼ and ⊙.
- The setpoint offset is deactivated with "off".




- Select and confirm Diff.set/actual value with ▲ or ▼ and ⊙.

The adjacent menu window appears. The minimum and maximum possible offset values and the current offset value are displayed.

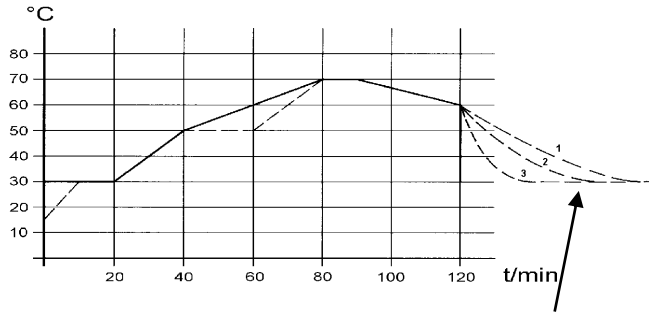
- Change the value with ▲ or ▼.
- Single figures can be selected by pressing ◀ or ▶.
- By pressing ⇄ (+/-) the arithmetic sign can be changed.
- Confirm your choice with the enter key ⊙.

- *By pressing ⟵ (ESC) you are returned to the menu level without any change.*

# 16 Programmer

- The programming function enables you to save five temperature/time programs. The programs consist of a number of temperature/time segments and details about their repetition. The total number of freely programmable segments is 150. Temperature step changes (time is zero) or also temperature retention phases for the same start and end temperatures in the segment are possible.
  On starting the current set value is taken as the starting value of the first segment.
- Changes to the pump level are entered in the relevant line. If the pump level is to remain unchanged, "0" is entered (display shows "---").

## 16.1 Programming example




The graph shows as an example the reprogramming of a set-point temperature trace.

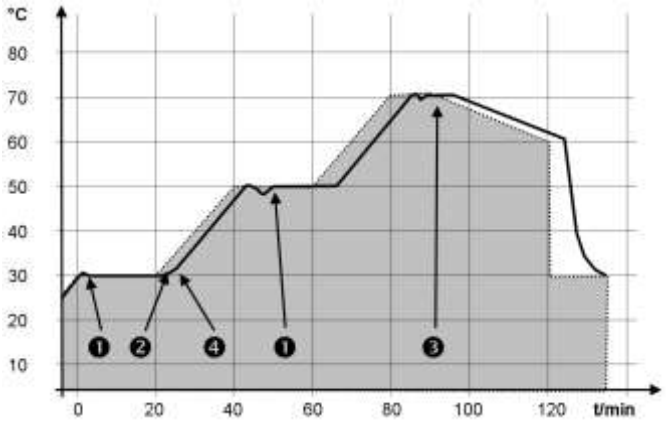
(Cooling time dependent on device type, consumer, etc.)

Example Seg. No. 2: ➡ "reach 50 °C within 20 minutes"

| before (┈┈) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. | $T_{end}$ | hh | mm | Tol. | | Pump | S1 | S2 | S3 |
| Start | 30.00 | -- | -- | 0.1 | | 2 | off | off | off |
| 2 | 50.00 | 0 | 20 | 0.0 | | 2 | off | off | off |
| 3 | 70.00 | 0 | 40 | 0.0 | | 3 | off | off | off |
| 4 | 70.00 | 0 | 10 | 0.1 | | 4 | off | off | off |
| 5 | 60.00 | 0 | 30 | 0.0 | | 2 | off | off | off |
| 6 | 30.00 | 0 | 0 | 0.0 | | 2 | off | off | off |

The original values ("before" table) are illustrated with a continuous line and the edited trace ("after") table with a broken line.
In the edited table a new segment has been ① entered, and ②, tolerance③ and pump level ④ have been changed (⇨ 0).

| after (- - - - , edited) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| No. | $T_{end}$ | hh | mm | Tol. | | Pump | S1 | S2 | S3 |
| Start | 30.00 | -- | -- | 0.1 | | 2 | off | off | off |
| 2 | 50.00 | 0 | 20 | 0.0 | | 2 | off | off | off |
| **3 ①** | **50.00** | **0** | **20** | **0.1** | | **3** | **off** | **off** | **off** |
| 4 | 70.00 | 0 | **20 ②** | 0.0 | | 4 ④ | off | off | off |
| 5 | 70.00 | 0 | 10 | **0.8 ③** | | 2 ④ | off | off | off |
| 6 | 60.00 | 0 | 30 | 0.3 | | 2 | off | off | off |
| 7 | 30.00 | 0 | 0 | 0.0 | | 2 | off | off | off |




The tolerance entry can have a large effect with external bath control. The adjacent graph of the edited trace shows the possible run-on of the actual temperature in the bath vessel (continuous line) for the set-point temperature of the programmer (highlighted in gray).

Note:

- The tolerance field facilitates exact conformance to the dwell time at a specified temperature. The following segment is only processed when the actual temperature reaches the tolerance band ❶, so that for example the ramp of segment 2 is only started delayed by ❷.
- A tolerance range which is too tight can however also cause undesired delays. In particular with external control the range should not be chosen too tightly. In Segment 5 a larger tolerance has been entered, so that the desired time of ten minutes is maintained even with settling action ❸.
- Only flat (slow) ramps should be programmed where necessary with a tolerance range. Steep ramps which lie close to the maximum possible heating or cooling rates of the thermostat may be severely delayed by a tolerance range that is too tight (here in Segment 2) ❹.

Note: No time specification is possible in the start segment (No. 1). The temperature of the first segment is attained as quickly as possible in order to switch to segment 2 after reaching the set tolerance.

## 16.2 Creating and editing a program

In the following functions are explained below:

- Creating and editing a program.
- Insert or append a new segment.
- Delete a segment.

Note:

– New segments and be inserted and existing ones changed, also the currently active segment, even when a program is currently being executed. Furthermore, except for the currently active segment, all segments can be deleted at any time.

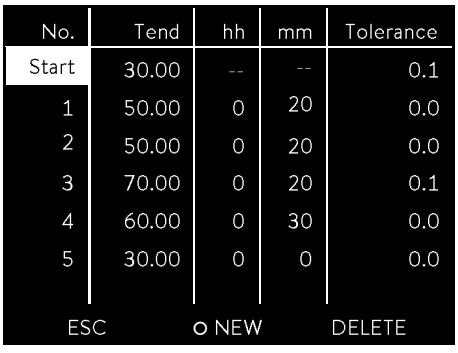
– Changes to the currently running segment are possible. The segment is continued as though the change has been valid since the start of the segment.

– If the new segment time is shorter than the already expired segment time,
then the program skips to the next segment.

– If a segment time is required > 999h: 59min, then this time must be spread over several consecutive segments.

Creating and editing a program: Compare the programming example (⇨ 16.1)

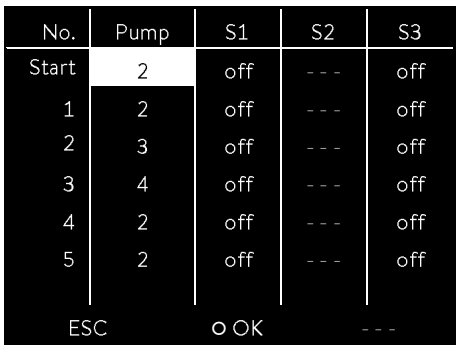

- Access to the menu level is obtained by pressing ⊙.
- The adjacent menu window appears by selecting and confirming → Programmer.



| No. | Tend | hh | mm | Tolerance |
|---|---|---|---|---|
| Start | 30.00 | -- | -- | 0.1 |
| 1 | 50.00 | 0 | 20 | 0.0 |
| 2 | 50.00 | 0 | 20 | 0.0 |
| 3 | 70.00 | 0 | 20 | 0.1 |
| 4 | 60.00 | 0 | 30 | 0.0 |
| 5 | 30.00 | 0 | 0 | 0.0 |

ESC O NEW DELETE

- By selecting and confirming Program 1 → Edit you obtain access to the editor view of the programmer. To view the complete window information go to the right with ▶.
- With the keys ▲, ▼, ◀ and ▶ you obtain access to the individual segments.
- The appropriate parameter is selected with ⊙ and can be changed with ▲ and ▼.
- Single figures can be selected by pressing ◀ or ▶.



| No. | Pump | S1 | S2 | S3 |
|---|---|---|---|---|
| Start | 2 | off | - - - | off |
| 1 | 2 | off | - - - | off |
| 2 | 3 | off | - - - | off |
| 3 | 4 | off | - - - | off |
| 4 | 2 | off | - - - | off |
| 5 | 2 | off | - - - | off |

ESC O OK - - -

- Confirm your choice with the enter key ⊙.
- You can now select the next segment to be changed using the control keys.

- You can quit the edit window at any time without changes using (ESC). When the cursor is located on a segment number, using you return to the menu level of the programmer without changes.

**Note:** No time specification is possible in the start segment. The temperature of the first segment is attained as quickly as possible in order to switch to segment 2 after reaching the set tolerance.

The programmer edit window contains the following parameters:

| | |
|---|---|
| No.: | Program segment number |
| Tend: | Final temperature to be attained |
| hh: | Time in hours (hh) in which the specified temperature is to be attained |
| mm: | Time in minutes (mm) in which the specified temperature is to be attained<br>If the value "0" is entered in the fields "hh" and "mm", the set value is accepted immediately and the bath temperature approached as quickly as possible. |
| Tolerance: | Defines how exactly the final temperature is to be attained before the next segment it processed.<br>If the tolerance range is selected too small in the "Tolerance" field, the program might not continue, because the required tolerance is not achieved. |
| Pump: | Pump level at which the segment is to be processed. |
| S1, S2, S3: | Switching contacts of the contact module (if present) can be programmed here. |

Contact modules are available as accessories (⇨ 9). The setting "- -" stands for no change to the preceding segment, i.e. if "- -" is present in all fields, the contact setting of the start setup or that before the program start is retained.

Inserting a new segment

| No. | Tend | hh | mm | Tolerance |
|---|---|---|---|---|
| Start | 30.00 | -- | -- | 0.1 |
| 1 | 50.00 | 0 | 20 | 0.0 |
| 2 | 50.00 | 0 | 20 | 0.0 |
| 3 | 70.00 | 0 | 20 | 0.1 |
| 4 | 60.00 | 0 | 30 | 0.0 |
| 5 | 30.00 | 0 | 0 | 0.0 |
| ESC | | O NEW | | DELETE |

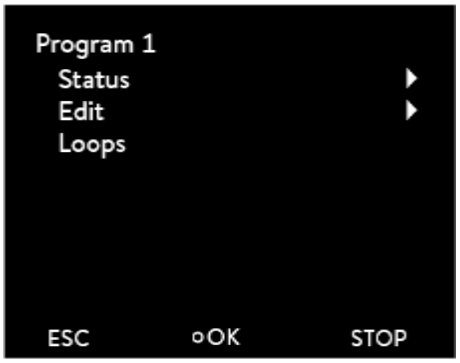
- With or go to the segment number under which the new segment is to be inserted.
- A new segment is inserted on pressing (NEW). You can edit it as described above.

Deleting a segment

| No. | Tend | hh | mm | Tolerance |
|---|---|---|---|---|
| Start | 30.00 | -- | -- | 0.1 |
| 1 | 50.00 | 0 | 20 | 0.0 |
| 2 | 50.00 | 0 | 20 | 0.0 |
| 3 | 70.00 | 0 | 20 | 0.1 |
| 4 | 60.00 | 0 | 30 | 0.0 |
| ESC | | O NEW | | DELETE |

- With or choose the segment to be deleted.
- The new segment is removed on pressing (DELETE).

## 16.3 Starting the program




- The submenu Status appears by selecting and confirming → Programmer → Program 1.
- With the menu Status you can carry out the following with the commands

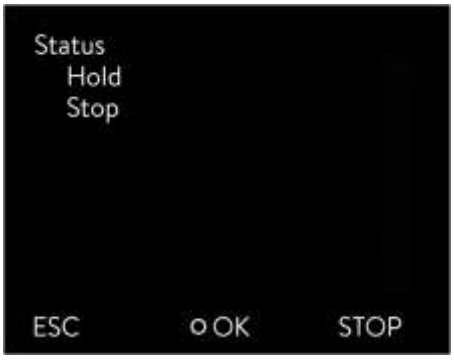
| | |
|---|---|
| Start | Start program |
| Hold | Hold program |
| Continue | Continue program |
| Stop | Terminate program |

by pressing the enter key.

- You can also pause the programmer with (STOP). When "Standby" is deactivated, the programmer continues running.

Instructions which cannot be executed due to the situation are not displayed. Continue therefore only appears if Hold has been activated.

## 16.4 Interrupting, continuing or terminating the program

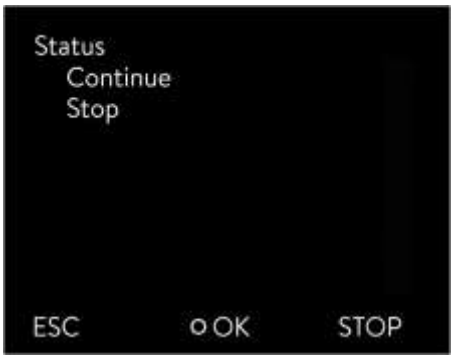



After the program start the menu points Hold and Stop are displayed.

- The options can be selected with or .

| | |
|---|---|
| Hold | Interrupt program |
| Stop | Terminate program |

- Confirm your choice with the enter key.

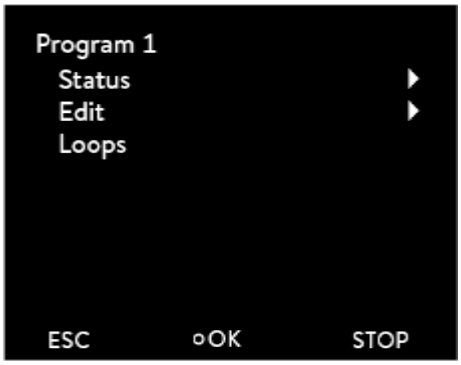



To continue a program held by Hold

- Select the option Continue with or .
- Confirm your choice with the enter key.

- Also (Standby) holds the programmer. Pump, heating and chiller are switched off.
- When (Standby) is pressed again, the programmer returns to the previously selected operating mode (Hold or active operation):

## 16.5 Defining the number of program loops (Loops)




Programs can be processed many times.

- The submenu Loops appears by selecting and confirming → Programmer → Program *n*.
- Select and confirm Loops with ▲ or ▼ and ⊙.


- Enter the desired number with ▲ or ▼.
- Confirm your choice with the enter key ⊙.

**Note:** To enter two or three-figure numbers move the cursor ◀▶ to the appropriate point and change the figures with ▲ or ▼.

If "0" is entered, the program is continuously repeated.

- *By pressing ⊖ (ESC) you are returned to the menu level without any change.*

# 17 Control parameters

The control parameters have been optimized at the factory for operation as a bath thermostat (with water as the heat transfer liquid) with internal control. The standard parameters are already set as default also for the thermostatic control of external applications with external control.
Depending on the application, the configuration can be adapted from case to case as required. Also the thermal capacity and the viscosity of the heat transfer liquid affect the control behavior.

***Note:*** *Only change the control parameters if you have adequate knowledge of control techniques.*

## 17.1 Internal control variable (internal temperature sensor)

If you have not connected any temperature sensor, read further here. For activated external control read (⇨ 17.2).

The control corresponds to the set-point temperature with the current bath temperature and calculates the set value for heating or cooling.

These control parameters can be set:

| Description | Short form | Unit |
|---|---|---|
| Proportional range | Xp | K |
| Reset time | Tn | s |
| Derivative time | Tv | s |
| Damping time | Td | s |

If "Tv manual/auto" is set to "auto" (automatic), Tv and Td cannot be changed. They are in this case derived from Tn with fixed factors.

Consider the effect of the temperature limits Tih and Til (⇨ 7.4.5) on the control.



- Access to the main menu level is obtained by pressing the enter key ⊙.
- Selection and confirmation of → Setup → Control → Control parameter → Intern Pt100.

The adjacent menu window appears. Apart from the control parameters the currently set values are displayed.

- Under the menu point "Tv manual/auto" you can select between manual and automatic entry using ⊙.

The selection "automatic" is displayed in the menu line by (auto). If "automatic" is selected, the entry is blocked for the parameters Tv and Td.

- Select and confirm parameters with ▲ or ▼ and ⊙.

The appropriate edit window appears with Min and Max figures for the parameter values Xp, Tn, Tv and Td.

- Change the value with ▲ or ▼.
- Single figures can be selected by pressing ◀ or ▶.
- Confirm your choice with the enter key ⊙.

- *By pressing ⊖ (ESC) you are returned to the menu level without any change.*

## 17.2 External control variable

The setting options illustrated in this section are only possible with a connected external temperature sensor or with an existing module (as activated as control variable in Section 15.1) for reading in the actual temperature.

The control system for external actual values is realized as a two-stage cascade controller to improve the response to setpoint changes. From the temperature setpoint and the external temperature, which is generally measured by the external Pt100, a "master controller" determines the "internal setpoint" which is passed to the slave controller. Its set value controls the heating and cooling.

### Correcting quantity limit

If a step change in set-point temperature is specified, the optimum control might set an outflow temperature which is substantially higher than the temperature desired on the external vessel. With the correction limitation the maximum permissible deviation between the temperature in the external consumer and the temperature of the outflow liquid can be limited. The limit can be set via a menu point (⇨ F.2.1).

These parameters can be set on the master controller (PIDT or external controller):

| Description | Short form | Unit |
|---|---|---|
| Gain | Kpe | - |
| Proportional range | Prop_E | K |
| Reset time | Tne | s |
| Derivative time | Tve | s |
| Damping time | Tde | s |

These parameters can be set on the slave controller (P-controller):

| Description | Short form | Unit |
|---|---|---|
| Proportional range | Xpf | K |

If "Tv manual/auto" is set to "automatic", Tve, Tde and Prop_E cannot be changed. Tve and Tde are in this case derived from Tne with fixed factors.


- Access to the main menu level is obtained by pressing the enter key ⊙.
- Selection and confirmation of → Setup → Control → Control parameter → extern Pt100.

The adjacent menu window appears. Apart from the control parameters the currently set values are displayed.

- Under the menu point "Tv manual/auto" you can select between manual and automatic entry using ⊙.

The selection "automatic" is displayed in the menu line by (auto). If "automatic" is selected, the entry is blocked for the parameters Tv and Td.

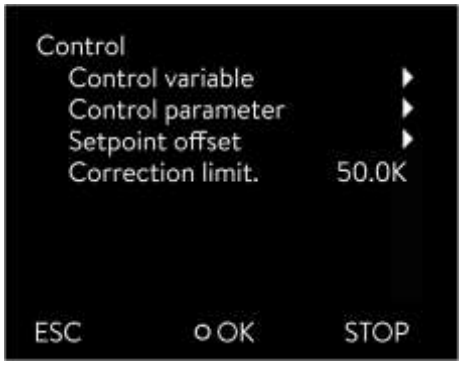
- Select and confirm parameters with ▲ or ▼ and ⊙.


The respective edit window appears with Min and Max figures for the parameter values Kpe, Tne, Tve, Tde and Xpf.

- Change the value with ▲ or ▼.
- Single figures can be selected by pressing ◀ or ▶.
- Confirm your choice with the enter key ⊙.

- *By pressing ⊖ (ESC) you are returned to the menu level without any change.*

### 17.2.1 Setting the correcting quantity limit




- Access to the main menu level is obtained by pressing the enter key ⊙.
- Selection and confirmation of → Setup → Control.

The adjacent menu window appears.

- Select and confirm Correction limit. with ▲ or ▼ and ⊙.


The adjacent menu window appears. The minimum and maximum possible values and the current value are displayed.

- Change the value with ▲ or ▼.
- Single figures can be selected by pressing ◀ or ▶.
- Confirm your choice with the enter key ⊙.

- *By pressing ⊖ (ESC) you are returned to the menu level without any change.*

### 17.2.2 Procedure for setting the control parameters for external control

1. Activating external control (⇨ 15.1).
2. Set the slave controller:

2.1. Parameter to auto;
Xpf in dependence of:

– Check or adjust device type (⇨ 8.2.4).
– Select heat transfer liquid with as low-viscosity and with as high a thermal capacity as possible.
Ranking list: Water, water/glycol, oils, Fluorinert®.
– Set pump level as high as possible,
– Make sure there is adequate circulation,
– select the hose length as short as possible, e.g. 2 x 1 m,
– select the hose cross-sectional area as large as possible, e.g. ½ inch,
– set the throughput through the external consumer as large as possible.

2.2. Set Xpf:

– With a tendency to oscillate with a short period of oscillation (e.g. 30 s) ➔ Xpf smaller, otherwise larger,
– with poor thermal coupling and a large mass to temper ➔ large (e.g. 2 – 5, possibly even larger),
– with good thermal coupling and a small mass to temper ➔ small (e.g. 0.2 – 0.7),
– if fast temperature changes are required, external baths should be controlled if possible with internal control. Otherwise choose Xpf to be very small (0.05 – 0.1).

3. Setting the master controller (PID controller):

– First start with Auto, then possibly continue with manual.

3.1. Setting Kpe:

– With a tendency to oscillate (long period of oscillation, e.g. 10 min) ➔ Kpe larger, otherwise smaller,

3.2. Setting Tne/ Tve/ Tde:

– Generally quite high values (Tne = 70 s – 200 s; Tve = 50 s – 150 s),
– with smaller values ➔ faster transient responses, otherwise slower transient responses and therefore less oscillation,
– Tve: To reduce transients ➔ increase Tve, otherwise vice versa,
– Tde (damping for Tve): generally approx. 10 % of Tve.

4. Correcting quantity limit (⇨ 17.2.1) and temperature limits (Til/Tih) (⇨ 7.4.5).

– Set according to the physical boundary conditions.

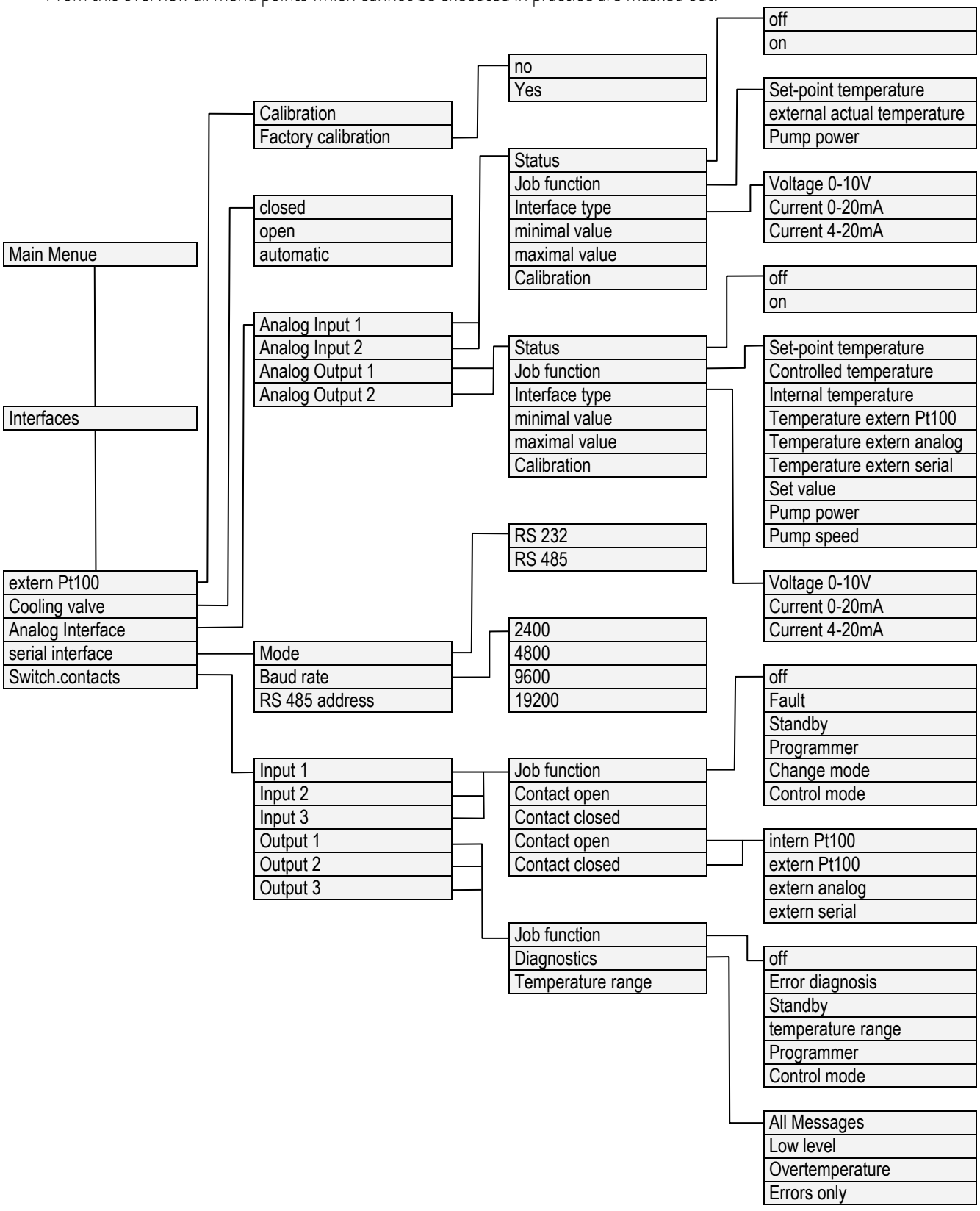
Example:

| Heat transfer liquid | Correcting quantity limit | Til | Tih |
|---|---|---|---|
| Water | depends on heat transfer liquid and vessel | 5 °C | 95 °C |

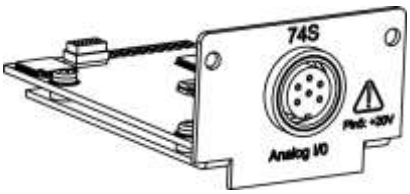
# 18 Interface modules

## 18.1 Menu structure of the modules

From this overview all menu points which cannot be executed in practice are masked out.



## 18.2 Analog module




Analogue Module (LAUDA catalogue no. LRZ 912) has two inputs and two outputs, which are brought out to a six-pole DIN socket to Namur Recommendation (NE28).

The inputs and outputs can be set independently of one another as a 0 – 20 mA, 4 – 20 mA or 0 – 10 V interface. Various functions can be selected for the inputs and outputs. Accordingly, the signal on the input is interpreted differently and different information appears on the output.

In addition the interfaces can be freely scaled according to the set function. 20 V DC is available for measurement transducers.

The following values can be defined via the inputs:

- Set-point temperature Setpoint temperature
- Ext. Actual temperature External actual temperature
- Pump power Pump power

The following values can be output via the outputs:

- Set-point temperature Set-point temperature
- Controlled temp. The temperature to which the system is being controlled.
- Internal temp. Actual temperature (bath temperature)
- Temp.extern Pt100 External actual temperature of Pt100
- Temp.extern analog External actual temperature of the analogue input
- Temp.extern serial External actual temperature of the serial interface:
- Set value Set value
- Pump power Pump power
- Pump speed Pump speed

In addition the interfaces can be freely scaled according to the set function with minimal value and maximal value.

For example: 4 mA corresponds to 0 °C and 20 mA corresponds to 100 °C.

Accuracy of the inputs and outputs after calibration better than 0.1 % of full scale.

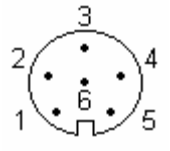
- Inputs, current - Input resistance < 100 Ohm
- Inputs, voltage - Input resistance > 50 kOhm
- Outputs, current - Burden < 400 Ohm
- Outputs, voltage - Load > 10 kOhm

Connection of analogue inputs and outputs

A six-pole round connector with screw lock and contact assignment according to DIN EN 60130-9 or IEC 130-9 are required.
A suitable coupling plug is obtainable under the catalogue no. EQS 057.

View of socket (front) or solder side of plug:

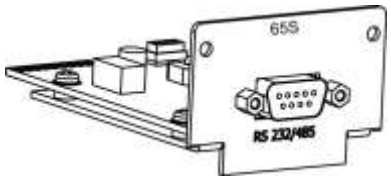
Socket 74S




| | |
|---|---|
| Contact 1 | Output 1 |
| Contact 2 | Output 2 |
| Contact 3 | 0 V reference potential |
| Contact 4 | Input 1 |
| Contact 5 | +20 V (max. 0.1 A) |
| Contact 6 | Input 2 |

**Note:** Only use screened connecting leads and connect the screen to the plug housing.

## 18.3 RS 232/485 interface module




RS 232/485 Interface Module (LAUDA catalogue no. LRZ 913) with nine-pole SUB-D socket. Electrically isolated using optocouplers. With the LAUDA instruction set, extensively compatible to Ecoline, Proline and Integral series.

The RS 232 interface can be connected directly to the PC with a 1:1 connected cable (catalogue no. EKS 037, 2 m cable and EKS 057, 5 m cable).

### 18.3.1 Connecting lead and interface test RS 232

| Computer | | | | | Thermostat | | |
|---|---|---|---|---|---|---|---|
| Signal | 9-pole Sub-D socket | | 25-pole Sub-D socket | | 9-pole Sub-D socket | | Signal |
| | ① | ② | ① | ② | ① | ② | |
| R x D | 2 | 2 | 3 | 3 | 2 | 2 | T x D |
| T x D | 3 | 3 | 2 | 2 | 3 | 3 | R x D |
| DTR | 4 | | 20 | | 4 | | DSR |
| Signal Ground | 5 | 5 | 7 | 7 | 5 | 5 | Signal Ground |
| DSR | 6 | | 6 | | 6 | | DTR |
| RTS | 7 | | 4 | | 7 | | CTS |
| CTS | 8 | | 5 | | 8 | | RTS |

① with hardware handshake: On connecting a thermostat to the PC use a 1:1 and **not a** null-modem cable.

② without hardware handshake: Set the operating mode on the PC "without hardware handshake".

- Use screened leads and connect screen to plug case.
- The wires are electrically isolated from the rest of the electronics.
- Non-assigned pins should not be connected.

The RS 232 interface can be checked in a simple way with a connected PC running Microsoft Windows operating system. With Windows® 95/98/NT/XP using the program "HyperTerminal".

"HyperTerminal" is no longer part of the operating system in Windows Vista, Windows 7, Windows 8 and Windows 10.

- With the LAUDA software "Wintherm Plus" (catalogue number LDSM2002) the RS 232 interface can be addressed.
- In the Internet there are terminal programs available as freeware. These programs offer similar functions as "HyperTerminal" (for example PuTTY). Search for "serial port terminal program".

### 18.3.2 RS 232 protocol

Note the following aspects:

- The interface operates with one stop bit, no parity bit and with eight data bits.
- Transfer speed alternatively: 2400, 4800, 9600 (factor setting) or 19200 baud.
- The RS 232 interface can be operated with or without hardware-handshake (RTS/CTS).
- The command from the computer must be terminated with a CR, CRLF or LFCR.
- The response from the thermostat is always terminated with a CRLF.
- After each command sent to the thermostat, it is necessary to wait for the reply before sending another command. This ensures that the sequencing of inquiries and answers is clear.

*CR = Carriage Return (Hex: 0D); LF = Line Feed (Hex: 0A)*

**Example:** Set-value transfer of 30.5 °C to the thermostat

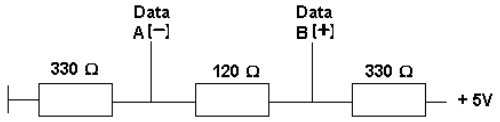
| Computer | Thermostat |
|---|---|
| „OUT_SP_00_30.5"CRLF | ⇨ |
| ⇦ | „OK"CRLF |

### 18.3.3 RS 485 connecting lead

| Thermostat | |
|---|---|
| 9-pole Sub-D socket | |
| Contact | Data |
| 1 | Data A (-) |
| 5 | SG (Signal Ground) optional |
| 6 | Data B (+) |

- Use screened connecting leads. Connect screen to the plug housing.
- The wires are electrically isolated from the rest of the electronics.
- Non-assigned pins should not be connected.

An RS 485 bus requires essentially a bus termination in the form of a terminating network, which provides a defined idle state in the high impedance phases of bus operation. The bus termination is as follows:




Generally, this terminating network is integrated on the PC plug-in card (RS 485).

### 18.3.4 RS 485 protocol

Note the following aspects:

- The interface operates with one stop bit, no parity bit and with eight data bits.
- Transfer speed alternatively: 2400, 4800, 9600 (factor setting) or 19200 baud.
- The device address always precedes the RS 485 commands. Up to 127 addresses are possible. The address must always consist of three figures
  (A000_... to A127_...).
- The command from the computer must be terminated with a CR.
- The response from the thermostat is always terminated with a CR.

*CR = Carriage Return (Hex: 0D)*

**Example:** Set-value transfer of 30.5 °C to the thermostat with address 15.

| Computer | Thermostat |
|---|---|
| „A015_OUT_SP_00_30.5“CR | ⇨ |
| ⇦ | „A015_OK“CR |

## 18.4 LiBus module


LiBus module (catalogue number LRZ 920) has a socket (70S) for connecting components via the LAUDA device bus LiBus (Command remote control, shut down/reverse flow protection, cooling water valve).

LiBus = LAUDA internal device BUS (CAN-based)

For extension cord for LiBus, see accessories (⇨ 9)

## 18.5 Pt100/LiBus module

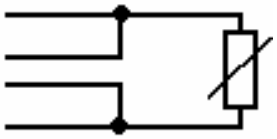
The Pt100/LiBus module (catalogue no. LRZ 918) has two connection sockets.

A Lemo socket (10S) to connect an external Pt100 temperature probe und a socket (70S) for connection of components via the LAUDA device bus LiBus (Command remote control, shut down/reverse flow protection, cooling water valve).

Plug: 4-pin Namur standard (Lemo) for Pt100 connection, catalogue number EQS 022.

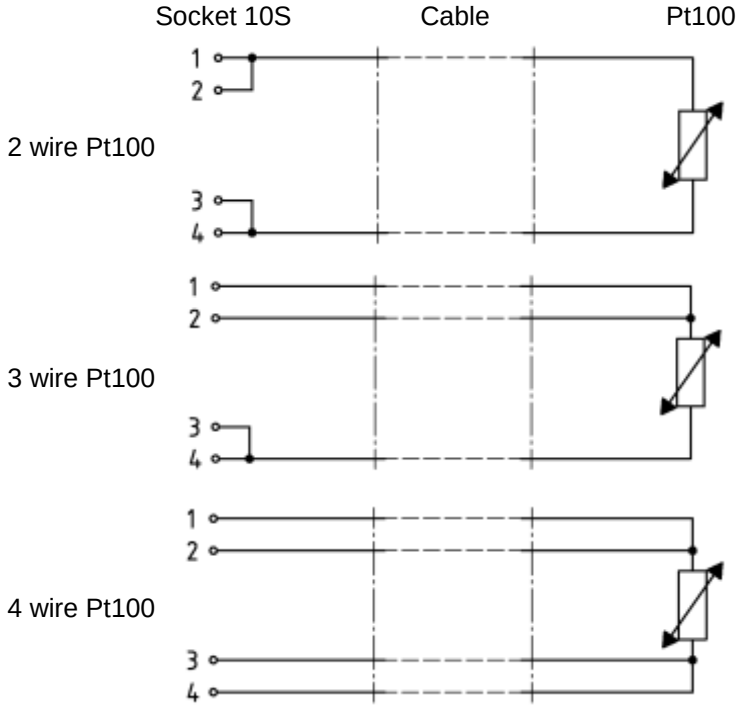
### External Pt100 (10S)

| Lemo socket 10S contact | | | |
|---|---|---|---|
| 1 | + | I | Current path |
| 2 | + | U | Voltage path |
| 3 | - | U | Voltage path |
| 4 | - | I | Current path |



Pt100
DIN EN 60751

**Contact assignment**




Please note:

– Use protected connection lines. Connect the protective screen with the connector shell.

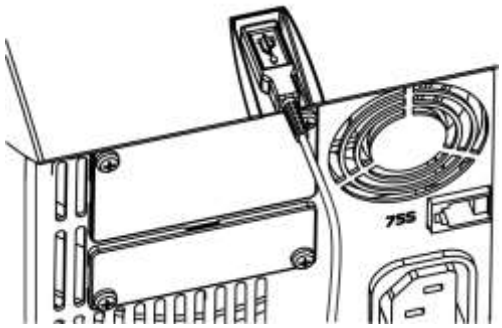
## 18.6 USB interface

**Important:** First install the driver and then connect the thermostat to the PC.

### 18.6.1 Description

The ECO heating and cooling thermostats are equipped with a USB interface at the back of the control head. This enables the connection of a PC and operation with the thermostat control software Wintherm Plus. In addition software updates are possible via the USB interface.

The connecting lead is not included in the items supplied. When connecting up, make sure the correct plug is used.



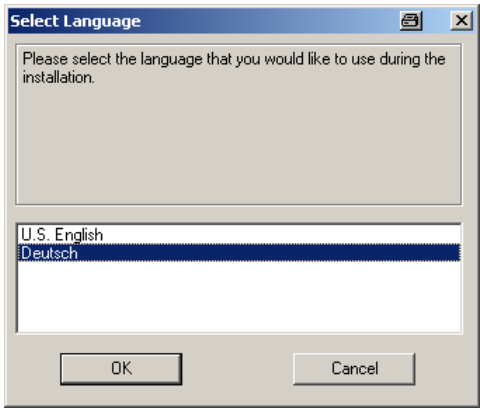

USB interface

LAUDA makes the drivers specially produced for the USB interface available free of charge for download at http://www.lauda.de.

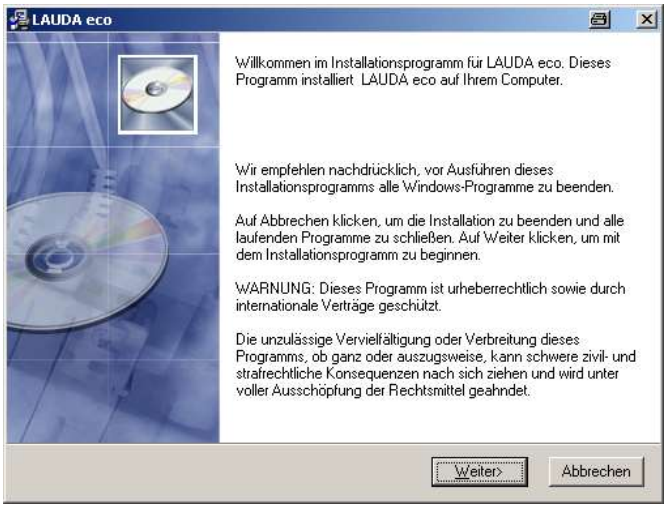
### 18.6.2 Installation of the USB driver

The driver is installed once per PC.
Supported operating systems: Windows ME, Windows XP, Windows 2000, Windows VISTA, Windows 7, Windows 8 and Windows 10.

Execute the file "LAUDA_ECO_USB_Driver.exe". The window below opens.




1. Select the language and confirm with OK.

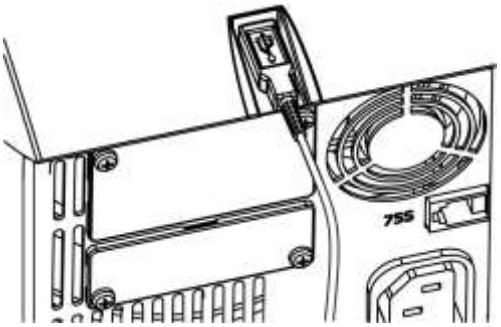



2. Key Continue


3. Key Finish
Driver installation is installed

### 18.6.3 Connecting the thermostat to the PC

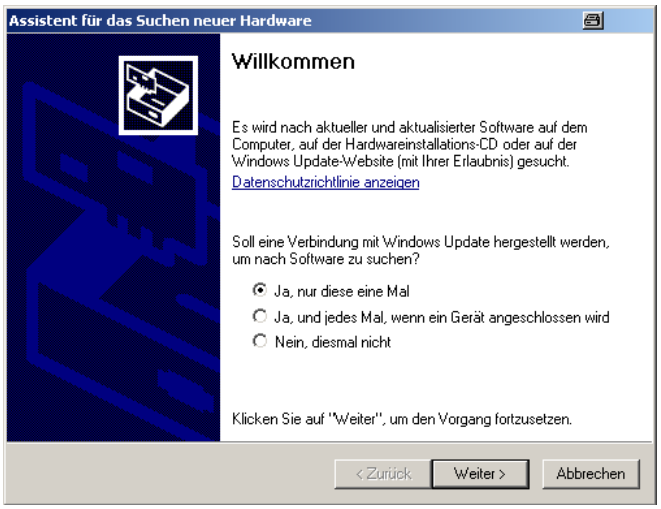
If an ECO thermostat is connected via the USB interface, it is automatically assigned to a free COM port. The PC unambiguously identifies the thermostat via a serial number internal to the thermostat and always assigns the same COM port to this thermostat.
If further ECO thermostats are connected via the USB interface, these thermostats are assigned other free COM ports.



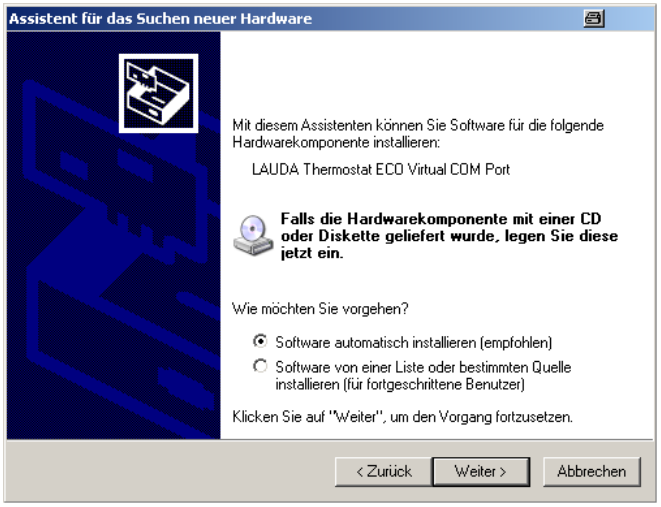

1. Plug the USB cable into the control head.

2. Switch on the thermostat at the mains switch.

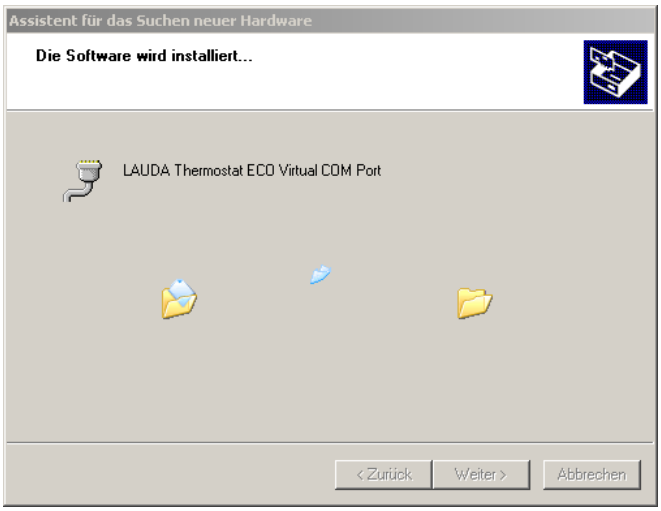
For the first time, after installation on the PC, a wizard opens to search for new hardware. Please follow the wizard instructions.




3. Key Continue

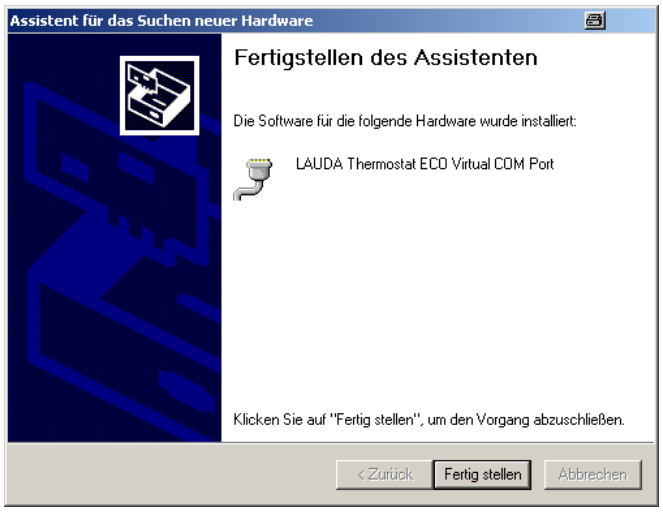



4. Key Continue




This window is covered by the following window "Hardware installation" (see below);

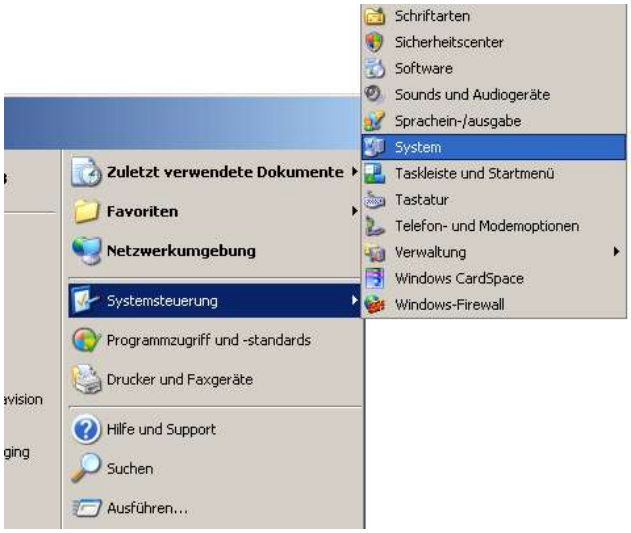

5. Click on Continue installation.

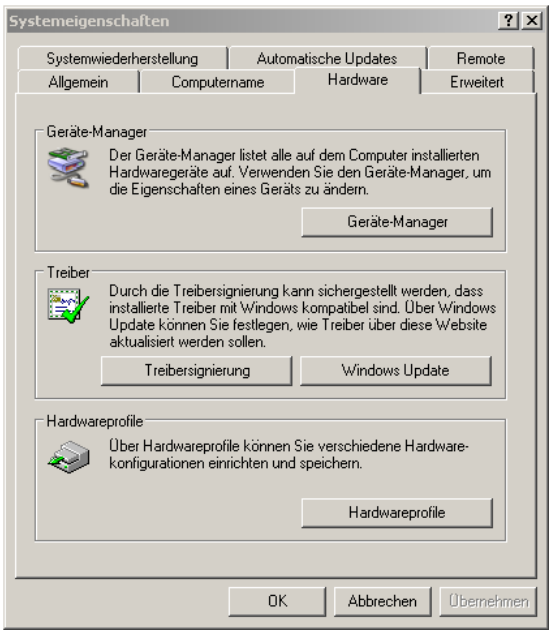


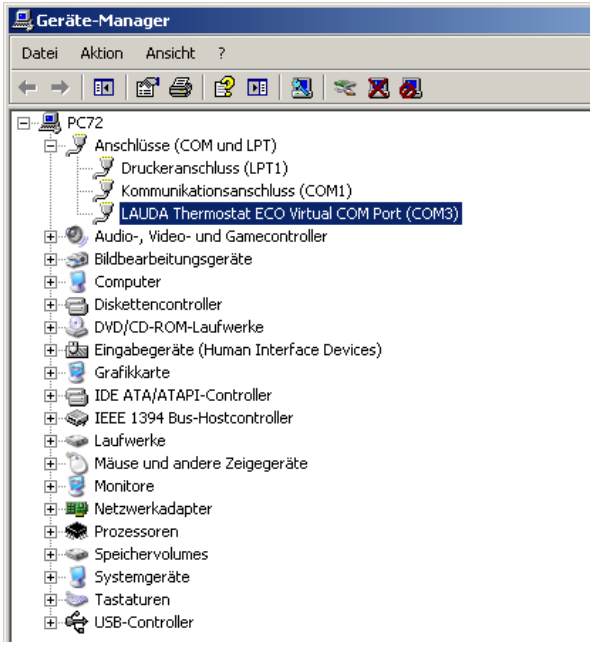

6. Click on the key Finish.

## 18.6.4 Where is the ECO Virtual COM Port?

The thermostat can be operated via conventional communication programs (e.g. HyperTerminal) as a COM port. Further settings, such as baud rate, are not needed.






Click on the tab with the mouse and then on the Device manager.

## 18.7 Commands and error messages applicable to the RS 232/485 interface module and to the Ethernet interface

### 18.7.1 Interface write commands (data issued to the thermostat)

| Command | Meaning |
|---|---|
| OUT_PV_05_XXX.XX | Specify external temperature via interface |
| OUT_SP_00_XXX.XX | Set-value transfer with max. 3 places before the decimal point and max. 2 places after it. |
| OUT_SP_01_XXX | Pump power level 1 to 6 |
| OUT_SP_02_XXX | Cooling operating mode (0 = OFF / 1 = ON / 2 = AUTOMATIC). |
| OUT_SP_04_XXX | TiH outflow temperature limit, upper value |
| OUT_SP_05_XXX | TiL outflow temperature limit, lower value |

| | |
|---|---|
| OUT_PAR_00_XXX.X | Setting of the control parameter Xp. |
| OUT_PAR_01_XXX | Setting of the control parameter Tn (5 – 180 s; 181 = Off). |
| OUT_PAR_02_XXX | Setting of the control parameter Tv. |
| OUT_PAR_03_XX.X | Setting of the control parameter Td. |
| OUT_PAR_04_XX.XX | Setting of the control parameter KpE. |
| OUT_PAR_05_XXXX | Setting of the control parameter TnE (0 – 9000 s; 9001 = Off). |
| OUT_PAR_06_XXXX | Setting of the control parameter TvE (5 = OFF). |
| OUT_PAR_07_XXXX.X | Setting of the control parameter TdE |
| OUT_PAR_09_XXX.X | Setting the correcting quantity limit. |
| OUT_PAR_10_XX.X | Setting of the control parameter XpF. |
| OUT_PAR_14_XXX.X | Setting of the setpoint offset. |
| OUT_PAR_15_XXX | Setting of the control parameter PropE. |

| | |
|---|---|
| OUT_MODE_00_X | Keypad: 0 = released / 1 = locked (corresponds to: "KEY"). |
| OUT_MODE_01_X | Control: 0 = int. / 1 = ext. Pt100 / 2 = ext. Analog / 3 = ext. Serial. |
| OUT_MODE_03_X | Keypad Command remote control: 0 = released / 1 = locked. |
| OUT_MODE_04_X | Setpoint offset source: 0=normal / 1=ext. Pt / 2=ext. analog / 3=ext. serial. |
| | |
| START | Switches the device on (from Standby) |
| STOP | Switches the device in Standby (pump, heating, chiller off). |

| | |
|---|---|
| RMP_SELECT_X | Selection of program (1 – 5) to which further commands are to refer. When the device is switched on Program 5 is selected. |
| RMP_START | Start the programmer. |
| RMP_PAUSE | Stop the programmer. |
| RMP_CONT | Start the programmer again after a hold. |
| RMP_STOP | Terminate the program. |
| RMP_RESET | Delete program (all segments) |

| | |
|---|---|
| RMP_OUT_00_XXX.XX_XXXXX_XXX.XX_X | Sets programmer segment (temperature, time, tolerance, and pump level). A segment is appended and assigned appropriate values. |
| RMP_OUT_02_XXX | Number of program loops: 0 = endless / 1 – 250. |

Note:

- For "_" " " (space character) is also admissible.
- Response from thermostat "OK" or with an error " ERR_X" (RS 485 interface e.g. "A015_OK" or with an error "A015_ERR_X".)
- The command from the computer must be terminated with a CR, CRLF or LFCR.
- The response from the thermostat is always terminated with a CRLF.
- After each command sent to the thermostat, it is necessary to wait for the reply before sending another command. This ensures that the sequencing of inquiries and answers is clear.

*CR = Carriage Return (Hex: 0D); LF = Line Feed (Hex: 0A)*

Admissible data formats:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| -XXXX.XX | -XXXX.X | -XXXX. | -XXXX | XXXX.XX | XXXX.X | XXXX. | XXXX |
| -XXX.XX | -XXX.X | -XXX. | -XXX | XXX.XX | XXX.X | XXX. | XXX |
| -XX.XX | -XX.X | -XX. | -XX | XX.XX | XX.X | XX. | XX |
| -X.XX | -X.X | -X. | -X | X.XX | X.X | X. | X |
| -.XX | -.X | .XX | .X | | | | |

### 18.7.2 Interface read commands

| Command | Meaning |
|---|---|
| IN_PV_00 | Query of the bath temperature (outflow temperature) |
| IN_PV_01 | Query of the controlled temperature (int./ext., Pt/ext., Analog/ ext. serial). |
| IN_PV_03 | Query the external temperature TE (Pt100). |
| IN_PV_04 | Query the external temperature TE (Analog Input). |
| IN_PV_10 | Query of the bath temperature in 0.001 °C. |
| IN_PV_13 | Query the external temperature TE (Pt100) in 0.0001 °C. |

| | |
|---|---|
| IN_SP_00 | Query of the temperature set value. |
| IN_SP_01 | Query of the pump power level. |
| IN_SP_02 | Query of cooling mode (0 = OFF / 1 = ON / 2 = AUTOMATIC). |
| IN_SP_03 | Query of the overtemperature switch-off point. |
| IN_SP_04 | Query of the outflow temperature limit TiH. |
| IN_SP_05 | Query of the outflow temperature limit TiL. |

| | |
|---|---|
| IN_PAR_00 | Query of the control parameter Xp. |

| Command | Meaning |
|---|---|
| IN_PAR_01 | Query of the control parameter Tn (181 = OFF). |
| IN_PAR_02 | Query of the control parameter Tv. |
| IN_PAR_03 | Query of the control parameter Td. |
| IN_PAR_04 | Query of the control parameter KpE. |
| IN_PAR_05 | Query of the control parameter TnE (response: XXXX; 9001 = OFF). |
| IN_PAR_06 | Query of the control parameter TvE (response: XXXX; 5 = OFF). |
| IN_PAR_07 | Query of the control parameter TdE (response: XXXX.X). |
| IN_PAR_09 | Query of the max. correcting quantity limit. |
| IN_PAR_10 | Query of the control parameter XpF. |
| IN_PAR_14 | Query of setpoint offset. |
| IN_PAR_15 | Query of the control parameter PropE. |

| | |
|---|---|
| IN_DI_01 | Status of Contact Input 1: 0 = open/ 1 = closed. |
| IN_DI_02 | Status of Contact Input 2: 0 = open/ 1 = closed. |
| IN_DI_03 | Status of Contact Input 3: 0 = open/ 1 = closed. |
| | |
| IN_DO_01 | Status of Contact Output 1:<br>0 = NO contact open/ 1 = NO contact closed. |
| IN_DO_02 | Status of Contact Output 2:<br>0 = NO contact open/ 1 = NO contact closed. |
| IN_DO_03 | Status of Contact Output 3:<br>0 = NO contact open/ 1 = NO contact closed. |

| | |
|---|---|
| IN_MODE_00 | Keypad: 0 = released / 1 = locked. |
| IN_MODE_01 | Control: 0 = int./ 1 = ext. Pt100 / 2 = ext. Analog / 3 = ext. Serial. |
| IN_MODE_02 | Standby operation: 0 = Device ON / 1 = Device OFF. |
| IN_MODE_03 | Keypad remote control unit Command: 0 = released / 1 = locked. |
| IN_MODE_04 | Setpoint offset source: 0 = normal/ 1 = ext. Pt/ 2 = ext. Analog/ 3 = ext. Serial. |

| | |
|---|---|
| TYPE | Query of the device type (response = "ECO") |
| VERSION_R | Query of the software version number of the control system. |
| VERSION_S | Query of the software version number of the protection system. |
| VERSION_B | Query of the software version number of the Command remote control. |
| VERSION_T | Query of the software version number of the cooling system. |
| VERSION_A | Query of the software version number of the analogue module. |
| VERSION_V | Query of the software version number of the RS 232/485 module. |
| VERSION_Y | Query of the software version number of the Ethernet-Modul |
| VERSION_Z | Query of the software version number of the EtherCAT-Modul |
| VERSION_D | Query of the software version number of the digital module. |
| VERSION_M_0 | Query of the software version number of the solenoid valve (cooling water). |

| Command | Meaning |
|---|---|
| VERSION_M_3 | Query of the software version number of the solenoid valve (shut-off valve 1). |
| VERSION_M_4 | Query of the software version number of the solenoid valve (shut-off valve 2). |
| VERSION_M_5 | Query of the software version number of the high temperature cooler. |
| VERSION_E | Query of the software version number of the external Pt100 module. |
| STATUS | Query of the device status 0 = OK, -1 = Error. |
| STAT | Query of error diagnosis response:<br>XXXXXXX → X = 0 no error, X = 1 error<br>1st character = Error<br>2nd character = Alarm<br>3rd character = Warning<br>4th character = Overtemperature<br>5th character = Low Level<br>6th character = 0<br>7th character = External control value missing |

| | |
|---|---|
| RMP_IN_00_XXX | Query of a program segment XXX<br>(Response: e.g. 030.00_00010_005.00_001.00 => Set-point temperature = 30.00 °C, Time = 10 min, Tolerance = 5,00 K, Pump stage = 1). |
| RMP_IN_01 | Query of the current segment number. |
| RMP_IN_02 | Query of the set program loops. |
| RMP_IN_03 | Query of the current program loops. |
| RMP_IN_04 | Query of to which program further commands refer. |
| RMP_IN_05 | Query of which program is currently running (0 = none). |

| | |
|---|---|
| LOG_IN_00_XXXX | Query of a measurement point XXX from data logger<br>(Response: e.g. 020.00_021.23_030.50 => Set-point temperature = 20.00 °C, bath temperature = 21.23 °C, external temperature = 30.5 °C). |
| LOG_IN_01 | Query of all measurement points from data logger<br>In contrast to the command "LOG_IN_00" a tabulator character is used here as delimiter instead of '_'. The measurement points are separated by CR and LF. The end is signaled by CR LF CR LF. |
| LOG_IN_02 | Query of starting time of data logger<br>(Response: e.g. 20_14_12_20 => Day 20, 14:12:20 hrs.). |
| LOG_IN_03 | Query of acquisition interval from data logger (Response in seconds). |

Note:

- For "_" " " (space character) is also admissible.
- Unless otherwise stated, with the command the response is always in the fixed-point format "XXX.XX" or for negative values "-XXX.XX" or "ERR_X" (RS 485 interface, e.g. "A015_XXX.XX" or "A015_ERR_X").
- The command from the computer must be terminated with a CR, CRLF or LFCR.
- The response from the thermostat is always terminated with a CRLF.
- After each command sent to the thermostat, it is necessary to wait for the reply before sending another command. This ensures that the sequencing of inquiries and answers is clear.

*CR = Carriage Return (Hex: 0D); LF = Line Feed (Hex: 0A)*

### 18.7.3 Interface error messages

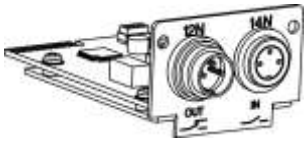
| Error | Meaning |
|---|---|
| ERR_2 | Incorrect entry (e.g. buffer overflow) |
| ERR_3 | Wrong command. |
| ERR_5 | Syntax error in the value. |
| ERR_6 | Impermissible value. |
| ERR_8 | Module or value not present. |
| ERR_30 | Programmer, all segments occupied. |
| ERR_31 | No set-point input possible. |
| ERR_33 | External probe missing. |
| ERR_34 | Analog value not present. |

### 18.7.4 Driver software for LABVIEW®

With the aid of the program development tool LABVIEW® from National Instruments (http://sine.ni.com/apps/we/nioc.vp?cid=1381&lang=US) an easy-to-use individual control or automation software program can be produced for operating ECO devices. In order to be able to address from the program the RS 232/485 interface that is used LAUDA makes the drivers specially produced for LABVIEW® available free of charge for download at http://www.lauda.de.

## 18.8 Contact module

### 18.8.1 Contact module LRZ 914 with 1 input and 1 output



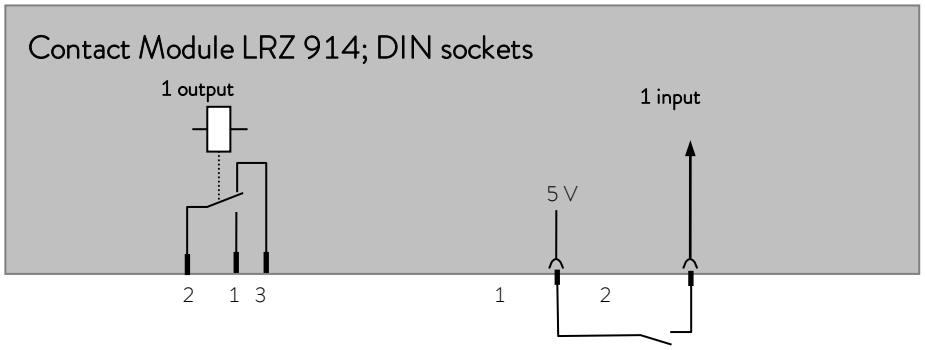

Contact module (catalogue no. LRZ 914) with connectors to NAMUR NE28, with 1 output and 1 input on each of 2 DIN sockets.

The inputs provide the following functions:

- Error — Set error
- Standby — Set standby
- Control programmer — Control programmer (Input 1 activates the programmer. The programmer is started on the first "Close" and is put into "Hold" on "Open". The next "Close" triggers "Continue").
- Change mode — Control change mode (the switching statuses of contact "Open" or "Closed" are assigned 2 different set-point temperatures) .
- Control mode — Control the Control mode (the switching statuses of input "Open" or "Closed" can have two different control temperature sources assigned to them, e.g. internal ↔ external control).

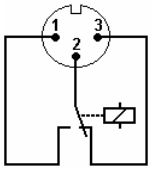
The outputs provide the following functions:

- Error diagnosis — Signal various error statuses
- Standby — Signal standby
- Temperature range — Give the status of the actual temperature within a certain range (within ↔ outside):
- Programmer — Give programmer status

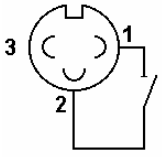


Contact outputs and inputs

| Output | Input |
|---|---|
| – View of flanged plug (front) or coupling-socket solder side<br>– Max. 30 V; 0.2 A<br>Coupling socket catalogue no. EQD 047 | – View of socket (front) or solder side of plug<br>– Signal approx. 5 V, 10 mA, do not assign Contact 3.<br>Coupling plug catalogue no. EQS 048 |

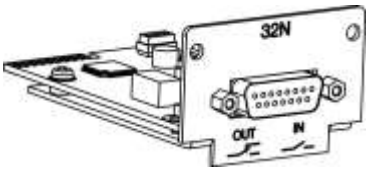



1 = NO contact
2 = Center contact
3 = NC contact

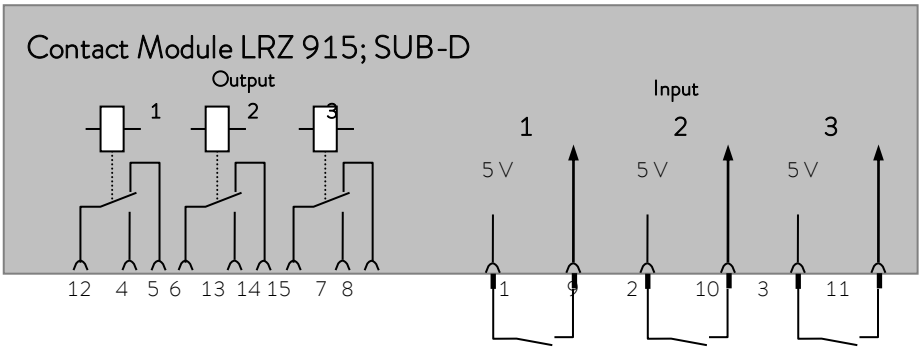



**Note:** Only use screened connecting leads and connect the screen to the plug housing. Cover unused connectors with protective caps.

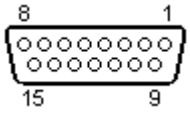
### 18.8.2 Contact module LRZ 915 with 3 inputs and 3 outputs




Contact module (catalogue no. LRZ 915) with 15-pole SUB-D socket. Range of functions as LRZ 914, but with three relay contact outputs (changeover, max. 30 V/0.2 A) and three binary inputs for control via external voltage-free contacts.




Contact inputs and outputs




View of sockets on the plug side or of sockets on the solder side.

A suitable 15-pole Sub-D plug can be obtained together with a suitable housing under the catalogue no. EQM 030 (plug case catalogue no. EQG 017).

# EC DECLARATION OF CONFORMITY

**Manufacturer:** LAUDA DR. R. WOBSER GMBH & CO. KG
Pfarrstrasse 41/43 97922 Lauda-Königshofen Germany

We hereby declare under our sole responsibility that the machines described below

**Product Line:** ECO **Serial number:** from S190000001

**Types:** E 4 S, E 4 G, E 10 S, E 10 G, E 20 S, E 20 G, E 25 S, E 25 G, E 40 S, E 40 G
ET 6 S, ET 6 G, ET 12 S, ET 12 G, ET 15 S, ET 15 G, ET 20 S, ET 20 G

comply with all relevant provisions of the EC Directives listed below due to their design and type of construction in the version brought on the market by us:

| | |
|---|---|
| Machinery Directive | 2006/42/EC |
| EMC Directive | 2014/30/EU |
| RoHS Directive | 2011/65/EU |

The equipment is not covered by the Pressure Equipment Directive 2014/68/EU, as the maximum classification of the equipment is Category 1 and it is covered by the Machinery Directive.

The protective objectives of the Machinery Directive with regard to electrical safety are complied with in accordance with Annex I Paragraph 1.5.1 in conformity with the Low Voltage Directive 2014/35/EU.

Applied harmonized standards:

- EN 12100:2011 (ISO 12100:2010)
- EN 61326-1:2013 (IEC 61326-1:2012)
- EN 61010-1:2011 (IEC 61010-1:2010 + Cor. :2011)
- EN 61010-2-010:2015 (IEC 61010-2-010:2014)

Authorized representative for the composition of the technical documentation:

Dr. Jürgen Dirscherl, Head of Research & Development

Lauda-Königshofen, 13.11.2019

A. Dinger

Dr. Alexander Dinger, Head of Quality Management

# EC DECLARATION OF CONFORMITY

**Manufacturer:** LAUDA DR. R. WOBSER GMBH & CO. KG
Pfarrstrasse 41/43 97922 Lauda-Königshofen Germany

We hereby declare under our sole responsibility that the machines described below

**Product Line:** ECO **Serial number:** from S190000001

**Types:** RE 415 S, RE 415 G, RE 415 SW, RE 415 GW, RE 420 S, RE 420 G,
RE J 1225 G, RE 630 S, RE 630 G, RE 1050 S, RE 1050 G,
RE 1225 S, RE 1225 G, RE 2025 S, RE 2025 G

comply with all relevant provisions of the EC Directives listed below due to their design and type of construction in the version brought on the market by us:

| | |
|---|---|
| Machinery Directive | 2006/42/EC |
| EMC Directive | 2014/30/EU |
| RoHS Directive | 2011/65/EU |

The equipment is not covered by the Pressure Equipment Directive 2014/68/EU, as the maximum classification of the equipment is Category 1 and it is covered by the Machinery Directive.

The protective objectives of the Machinery Directive with regard to electrical safety are complied with in accordance with Annex I Paragraph 1.5.1 in conformity with the Low Voltage Directive 2014/35/EU.

Applied harmonized standards:

- EN 12100:2011 (ISO 12100:2010)
- EN 61326-1:2013 (IEC 61326-1:2012)
- EN 378-2:2018
- EN 61010-1:2011 (IEC 61010-1:2010 + Cor. :2011)
- EN 61010-2-010:2015 (IEC 61010-2-010:2014)

Authorized representative for the composition of the technical documentation:

Dr. Jürgen Dirscherl, Head of Research & Development

Lauda-Königshofen, 13.11.2019

A. Dinger

Dr. Alexander Dinger, Head of Quality Management

# Product Returns and Clearance Declaration

**Product Returns**

Would you like to return a LAUDA product you have purchased to LAUDA? For the return of goods, e.g. for repair or due to a complaint, you will need the approval of LAUDA in the form of a *Return Material Authorization (RMA)* or *processing number*. You can obtain the RMA number from our customer service department at *+49 (0) 9343 503 350* or by email service@lauda.de.

**Return address**

LAUDA DR. R. WOBSER GMBH & CO. KG

Pfarrstrasse 41/43

97922 Lauda-Königshofen

Deutschland/Germany

Clearly label your shipment with the RMA number. Please also enclose this fully completed declaration.

| | |
|---|---|
| RMA number | Product serial number |
| Customer/operator | Contact name |
| Contact email | Contact telephone |
| Zip code | Place |
| Street & house number | |
| Additional explanations | |

**Clearance Declaration**

The customer/operator hereby confirms that the product returned under the above-mentioned RMA number has been carefully emptied and cleaned, that any connections have been sealed to the farthest possible extent, and that there are no explosive, flammable, environmentally hazardous, biohazardous, toxic, radioactive or other hazardous substances in or on the product.

| | | |
|---|---|---|
| | | |
| Place, date | Name in block letters | Signature |

LAUDA DR. R. WOBSER GMBH & CO. KG
Pfarrstraße 41/43 ◦ 97922 Lauda-Königshofen ◦ Germany
Tel.: +49 (0)9343 503-0 ◦ Fax: +49 (0)9343 503-222
E-mail: info@lauda.de ◦ Internet: www.lauda.de